

Analysis Of Patients Suggested With Dengue Fever Based On Hematological Characteristics At Pirngadi Hospital, Medan City

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ABSTRACT

Cases of dengue hemorrhagic fever in Indonesia fluctuate every year and tend to increase in morbidity and spread to a wider area of infection. The purpose of this study was to determine the routine hematological characteristics of dengue hemorrhagic fever patients at Dr. Pirngadi city of Medan for the 2020-2022 period. The research method used was a descriptive cross-sectional research method with a sample of 93 people. The sample was obtained by the medical records of RSUD Dr. Pirngadi. The results of the study: The most age of dengue hemorrhagic fever sufferers was <20 years 46 people (49.5%), the most sex was male 57 people (61.3%), and the most occupation was not working 53 people (57%). The highest hemoglobin count was normal 65 people (69.9%), the highest erythrocyte count was normal 72 people (77.4%), the highest hematocrit was normal 50 people (53.8%), the highest leukocytes were normal 56 people (60.2%) The highest number of platelets decreased by 90 people (96.8%), the most basophils were normal 93 people (100%), the most eosinophils were normal 92 people (98.9%), the most neutrophils were normal 46 people (49.5%), the most monocytes was an increase of 61 people (65.6%), the most normal lymphocytes were 66 people (71%).

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1. INTRODUCTION

Dengue hemorrhagic fever is an infectious disease caused by the dengue virus and transmitted by *Aedes Aegypti* and *Aedes Albopictus* mosquitoes. This disease is a disease that occurs in tropical countries, including in Indonesia.¹Dengue hemorrhagic fever is common in more than 100 countries around the world. Forty percent of the world's population, or around 3 billion people, live in areas at risk of dengue hemorrhagic fever. Each year, up to 400 million people become infected with the dengue virus, and 22,000 people die from severe dengue hemorrhagic fever.³

The first case of dengue hemorrhagic fever was reported from the Philippines in Manila in 1954. Since then, the spread of dengue virus has occurred rapidly to most countries in Southeast Asia, including Indonesia.⁴In Indonesia, dengue hemorrhagic fever was first discovered in the city of Surabaya in 1968, where as many as 58 people were infected and 24 of them died. And since then, dengue hemorrhagic fever has spread widely throughout Indonesia.¹Dengue hemorrhagic fever can occur throughout the year and can affect all age groups. This disease is also related to environmental conditions and people's behavior.²

Cases of dengue hemorrhagic fever in Indonesia fluctuate every year and tend to increase in morbidity and spread to a wider area of infection. In 2016, dengue hemorrhagic fever was infected in 463 regencies/cities with a morbidity rate of 78.13 per 100,000 population, but the mortality rate could be kept below 1 percent, namely 0.79 percent.⁵Dengue hemorrhagic fever is also one of the major cases in North Sumatra. In 2020, the number of cases of dengue hemorrhagic fever in North Sumatra reached 7,584 cases, of which the number of cases of dengue hemorrhagic fever in the city of Medan was 681 cases.⁶

Delay in diagnosing can increase the risk of death so that a good and complete history and physical examination accompanied by laboratory tests are needed in making the diagnosis of dengue hemorrhagic fever.^{2,9}One of the laboratory tests needed is routine blood or hematology tests. Blood tests

are very useful in screening and monitoring the condition of patients infected with dengue virus. 10 Hematology is the study of blood both in healthy and pathological conditions. Routine hematology consists of hemoglobin, hematocrit, erythrocyte count, leukocyte count, platelet count, and leukocyte count.^{7,8}

Based on research by Rika et al using medical records of DHF patients at Prabumulih Hospital in 2019, routine blood tests for dengue hemorrhagic fever patients found decreased platelet levels, namely $\leq 100,000$ cells/mm³, leukopenia, and increased hematocrit levels (hemoconcentration). However, in some cases the hematocrit level can be normal.² Whereas in Lisa et al's study using medical record data at Arifin Achmad Hospital, Riau Province in 2016, routine blood tests for DHF patients found that the average hemoglobin level was normal or could slightly decrease, then the level will increase following the increase in hematocrit levels. The average hematocrit level is normal and can also increase, there is leukopenia and thrombocytopenia.^{4,5}

Based on some of the research data above, the presence of abnormalities that appear in routine blood tests of patients with dengue hemorrhagic fever has stimulated the desire of researchers to examine routine hematological characteristics in the incidence of dengue hemorrhagic fever at RSUD Dr. Pirngadi, Medan city. It is hoped that through this research information will be obtained regarding the treatment of dengue hemorrhagic fever patients at Dr. Pirngadi, Medan city.

2. METHOD

Descriptive research with cross sectional design, conducted at RSUD Dr. Pirngadi Medan, April-August 2022. The patient population is suspected of dengue hemorrhagic fever. Samples were taken from routine hematologic laboratory medical record data for the period 2020-2022, using the total sampling method. Univariate data analysis which describes the data presented in the form of narratives and frequency distribution tables.

3. RESULTS AND DISCUSSION

The results of this study were obtained based on the tables below:

Table 1. Characteristics of Dengue Hemorrhagic Fever Patients.

Characteristics	Category	N	%
Age	< 20 years	46	49.5
	20 – 40 years	33	35.5
	> 40 years	14	15,1
	Total	93	100
Gender	Man	57	61.3
	Woman	36	38,7
	Total	93	100
Work	Work	40	43
	Doesn't work	53	57
	Total	93	100

Table 1 shows that there were 46 patients with dengue hemorrhagic fever aged <20 years (49.5%), 33 persons aged 20-40 years (35.5%), and 14 persons aged > 40 years. (15.1%). For the sex of dengue hemorrhagic fever patients, there were 57 men (61.3%), while there were 36 women (38.7%). For the work of dengue hemorrhagic fever patients, there were 40 people working (43%), and 53 people (57%) not working.

Table 2. Distribution of platelet counts in dengue hemorrhagic fever patients.

Routine Hematology Profile	Category	N	%
Platelets	Normal	3	3,2
	Increase	0	0
	Decrease	90	96.8
	Total	93	100

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Table 2 shows that the platelets of dengue hemorrhagic fever patients decreased by 90 people (96.8%), normal by 3 people (3.2%), and none of them experienced an increase.

Table 3. Distribution of the number of hematocrit of patients with dengue hemorrhagic fever.

Routine Hematology Profile	Category	N	%
Hematocrit	Normal	50	53,8
	Increase	16	17,2
	Decrease	27	29
	Total	93	100

Table 3 shows that the hematocrit of patients with dengue hemorrhagic fever decreased by 27 people (29%), increased by 16 people (17.2%), and normal by 50 people (53.8%).

Table 4. Distribution of leukocyte counts in dengue hemorrhagic fever patients.

Routine Hematology Profile	Category	N	%
Leukocytes	Normal	56	60,2
	Increase	3	3,2
	Decrease	34	36,6
	Total	93	100

Table 4 shows that the leukocytes of dengue hemorrhagic fever patients decreased by 34 people (36.6%), increased by 3 people (3.2%), and normal by 56 people (60.2%).

Table 5. Distribution of basophil counts in dengue hemorrhagic fever patients.

Routine Hematology Profile	Category	N	%
Basophils	Normal	93	100
	Increase	0	0
	Decrease	0	0
	Total	93	100

Table 5 shows that the basophils of dengue hemorrhagic fever patients did not decrease or increase, all were within normal limits of 93 people (100%).

Table 6. Distribution of eosinophil counts in dengue hemorrhagic fever patients.

Routine Hematology Profile	Category	N	%
Eosinophils	Normal	92	98,9
	Increase	1	1,1
	Decrease	0	0
	Total	93	100

Table 6 shows that the eosinophils of patients with dengue hemorrhagic fever increased by 1 person (1.1%), normal by 92 people (98.9%), and none decreased.

Table 7. Distribution of neutrophil counts in dengue hemorrhagic fever patients.

Routine Hematology Profile	Category	N	%
Neutrophils	Normal	46	49,5
	Increase	14	15,1
	Decrease	33	35,5
	Total	93	100

Table 7 shows that the neutrophils of dengue hemorrhagic fever patients decreased by 33 people (35.5%), increased by 14 people (15.1%), and normal by 46 people (49.5%).

Table 8. Distribution of monocyte counts in dengue hemorrhagic fever patients.

Routine Hematology Profile	Category	N	%
Monocytes	Normal	28	30,1
	Increase	61	65,6
	Decrease	4	4,3
	Total	93	100

Table 8 shows that the monocytes of patients with dengue hemorrhagic fever experienced an increase in 61 people (65.6%), decreased by 4 people (4.3%), and those who were normal were 28 people (30.1%).

Table 9. Distribution of lymphocyte counts of dengue hemorrhagic fever patients.

Routine Hematology Profile	Category	N	%
Lymphocytes	Normal	66	71
	Increase	13	14
	Decrease	14	15
	Total	93	100

Table 9 shows that the lymphocytes of dengue hemorrhagic fever patients decreased by 14 people (15%), increased by 13 people (14%), and normal by 66 people (71%).

Table 10. Distribution of hemoglobin count of dengue hemorrhagic fever patients.

Routine Hematology Profile	Category	N	%
Hemoglobin	Normal	65	69,9
	Increase	4	4,3
	Decrease	24	25,8
	Total	93	100

Table 10. shows that the hemoglobin of dengue hemorrhagic fever patients decreased by 24 people (25.8%), increased by 4 people (4.3%), and normal by 65 people (69.9%).

Table 11. Distribution of the number of erythrocytes in dengue hemorrhagic fever patients.

Routine Hematology Profile	Category	N	%
Erythrocyte	Normal	72	77,4
	Increase	7	7,5
	Decrease	14	15,1
	Total	93	100

Table 11 shows that the erythrocytes of dengue hemorrhagic fever patients decreased by 14 people (15.1%), increased by 7 people (7.5%), and normal by 72 people (77.4%).

DISCUSSION

The results of the study based on age characteristics (table 1) showed that the most common occurrence of dengue hemorrhagic fever occurred in the age group <20 years, namely 46 people (49.5%). The results of this study are in line with research by Rika Mayasari, et al which was conducted at the Prabumulih City Hospital in 2019 which showed that the most DHF sufferers occurred in the age group 5-14 years, namely 26 people (33.7%).³¹This research is also in line with the research of Nia Audina Hasibuan, et al which was conducted at Haji Medan General Hospital in 2017, which showed that the most DHF sufferers occurred in the age group 11-20 years, namely 97 people (28.7%).

The results of the study based on sex characteristics (table 1) showed that the highest incidence of dengue hemorrhagic fever occurred in males, namely 57 people (61.3%). The results of this study are in line with Acivrida Mega Charisma's study conducted at Anwar Medika General Hospital in 2017,

which showed that more DHF cases occurred in males than females, namely 109 people (59.6%).²²This research is also in line with the research of Lisa Verbirani, et al at Arifin Achmad Hospital, Riau Province in 2016, where DHF was more common in men than women, namely 31 people (67.4%).⁴However, several studies have shown that the number of DHF cases in men and women is almost the same, even on the contrary, where there are more DHF cases in women than men, so it is said that the dengue virus can infect all age groups, both men and women.

The results of the study based on occupational characteristics (table 1) show that the incidence of dengue hemorrhagic fever occurs mostly in patients who do not work, namely students as many as 53 people (57%). The results of this study are in line with the research of Ni Putu Anindya Divy, et al which was conducted at Sanglah General Hospital in 2018, where the occupational category with the largest number of patients was students, namely 53 people (36.8%). These results are related to the age category where children or young adults experience the most DHF cases.

In the results of the routine hematological profile study of DHF patients, the platelet counts shown (Table 2) showed that many patients had decreased platelet levels, namely 90 people (96.8%). This research is in line with Acivrida Mega Charisma's study conducted at Anwar Medika General Hospital in 2017, where the platelet levels of 99% of DHF patients decreased, namely 181 people.²²This research is also in line with the research of Lisa Vebriani, et al at the Arifin Achmad Hospital in Riau Province in 2016 which showed DHF patients had decreased platelets, namely 45 people (97.9%).

Thrombocytopenia that occurs in dengue hemorrhagic fever can be due to plasma leakage. The decrease in platelet count is caused by impaired function and platelet count due to the formation of immune complexes as a reaction to antigens, namely the dengue virus. Thrombocytopenia also occurs due to suppression of the bone marrow and destruction or shortening of the life span of platelets.⁴The antigen-antibody complex will activate the complement system, cause platelet aggregation (platelet clusters), and activate the coagulation system due to damage to blood vessel endothelial cells. Platelet aggregation occurs due to the attachment of antigen-antibody complexes to the platelet membrane which causes the release of adenosine diphosphate (ADP), so that platelets will stick to one another. This causes platelets to be destroyed by the reticuloendothelial system and thrombocytopenia occurs. Thrombocytopenia also occurs due to an increase in the use of platelets in the blood clotting process.

The hematocrit count of DHF patients in this study (Table 3) showed that many patients had normal hematocrit levels, namely 50 people (53.8%), but there were some who experienced increases and decreases in hematocrit levels. According to WHO, laboratory parameters in diagnosing DHF are an increase in hematocrit and thrombocytopenia. Meanwhile, this study shows that not all sufferers experience hemoconcentration. This research is in line with the research of Lisa Vebriani, et al at Arifin Achmad Hospital, Riau Province in 2016, where the hematocrit of DHF patients was normal, namely 25 people (54.3%). However, some patients have increased and decreased hematocrit levels. This research is also in line with the research of Wardhy Arief Hidayat, et al at RSUP Dr. M. Djamil Padang in 2017, where as many as 44 people with DHF experienced hemoconcentration (31.9%), while there were 75 people with DHF who had normal hematocrit values (54.4%).

In DHF cases, an increase in the hematocrit value (hemoconcentration) is due to a decrease in blood plasma levels due to vascular leakage. In this study, many DHF patients had normal or even low hematocrit values and were diagnosed with DHF. The parameter of plasma leakage as a diagnosis of DHF according to WHO is not only an increase in the hematocrit value, but also a decrease in the hematocrit value of >20% after receiving fluid therapy is also an indicator of the diagnosis. The leukocyte count of DHF patients in this study (Table 4) showed that many patients had normal leukocyte levels, namely 56 people (60.2%), but 36.6% of DHF patients in the study had decreased leukocyte levels. But in other studies show that on the first day the average leukocytes of DHF patients were below the normal leukocyte count, but on the 3rd day onwards it increased. In this study, there were many normal leukocyte values, this could be due to some patients coming for treatment after a few days of being infected with the dengue virus, not on the first day. This research is in line with the research of Rosdiana, et al at Abdul Wahab Sjahranie Hospital Samarinda in 2017,¹³ where the average number of leukocytes obtained at each clinical degree is still in normal numbers. In another study conducted by Marlina at Major General HA Thalib Kerinci General Hospital in 2019, 70% of the leukocyte count was below normal limits (leukocytopenia), in 21 patients.

The course of DHF is often followed by a decrease in leukocyte levels (leukocytopenia). Early in DHF, leukopenia was found due to the destruction of mature PMN (polymorphonuclear) leukocytes.²³ Leukopenia occurs due to bone marrow suppression due to the process of viral infection directly or due to an indirect mechanism through the production of proinflammatory cytokines that suppress the bone marrow.

The basophil count of DHF patients in this study (Table 5) showed that many patients had normal basophil levels, namely 93 people (100%). The number of eosinophils in this study (Table 6) showed 98.9% eosinophil levels in normal DHF patients, namely 92 patients. Neutrophil levels in DHF patients (Table 7) showed 49.5% (46 people) neutrophil levels in DHF patients were within normal limits, but there was a decrease in neutrophil levels in 33 patients (35.5%). The monocyte levels of the DHF patients in this study (Table 8) were mostly elevated, namely in 61 DHF patients (65.6%), the rest were normal and only a few patients had decreased levels. Lymphocyte levels of DHF patients in this study (table 9) were 71% in normal circumstances, that is, in 66 patients.

This study is in line with the study of Denanda Wulandari, et al at Bandar Lampung Adventist Hospital in 2016, where basophil counts were 70% within normal limits, namely in 147 DHF patients, eosinophil counts were 34.8% within normal limits (73 people), neutrophil counts were 58.1% was within normal limits (122 people), the number of monocytes was 77.6% in an elevated state (163 people), and the number of lymphocytes was 42.4% within normal limits (89 people).²⁵ This research is also in line with Hidayat's research at RSUD Dr. H. Abdul Moelek Lampung in 2018, where the number of basophils was 100% within normal limits (39 people), the number of eosinophils in 31 of 39 patients decreased, the number of neutrophils in 19 of 39 patients decreased while 17 patients were normal, the number of monocytes was 100% increased (39 people), and lymphocyte counts in 32 of 39 patients were within normal limits.

In cases of DHF, there is a decrease in the number of leukocytes at the beginning of the disease, then they can return to normal with the dominance of neutrophil cells. In DHF, there is a decrease in the number of leukocytes due to a clear decrease in the number of neutrophil cells, which is one of the reasons for the decrease in neutrophil cells due to viral infection. replicate within the phagocytic cells.

Hemoglobin levels of DHF patients in this study (Table 4.10) showed that many patients had normal hemoglobin levels, namely 65 people (69.9%), but there were several patients with decreased Hb levels, namely 24 patients (25.8%). This research is in line with Annisa's research at Lubuk Basung Hospital in 2020, where it was found that many patients had normal Hb levels, namely 59 people (57.8%).²⁶ This research is also in line with the research of Lisa Vebriani, et al at Arifini Achmad Hospital, Province Riau in 2016 where many patients' Hb levels were obtained for several days within normal limits, namely on the 3rd day there were 18 people (39.2%), on the 4th day there were 21 people (45.6%), and on the day 5 as many as 22 people (47.8%).⁴ In this study, it was found that hemoglobin levels decreased, in contrast to the provisions of the Ministry of Health of the Republic of Indonesia, which explained that an increase in Hb levels of more than 20% supports the diagnosis of DHF. The increase in Hb levels follows the increase in hemoconcentration and is the earliest hematological abnormality found in DHF patients.

In this study, the number of erythrocytes in DHF patients (Table 4.11) showed that many patients had erythrocyte counts within normal limits, namely 72 people (77.4%). This research is in line with the research of Rai A., et al which was conducted at the Central Lab, Department of Pathology at SGRRIM & HS and Shri Mahant Indiresih Hospital, Dehradun in 2019, where the erythrocyte values of many DHF patients were within normal limits, namely 1153 cases (57 %).

4. CONCLUSION

Based on the results of the study, it can be concluded that the incidence of DHF mostly occurs in the age group <20 years by 49.5% compared to the age group 20-40 years or > 40 years. Based on gender, the incidence of DHF was more common in males (61.3%) than in females. Based on work, the incidence of DHF was more common in patients who did not work (57%) compared to patients who worked. had normal Hb levels (69.9%), normal erythrocyte values (77.4%), decreased platelet values (thrombocytopenia) of 96.8%, normal hematocrit values (53.8%), but also may increase

(hemoconcentration). have normal leukocyte values (60.2%), but these values can also decrease (leukopenia), have normal neutrophil values (49.5%), normal lymphocyte values (71%),

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