

Analysis of Hemostasis Blood Examination in Patients with Leukemia at Santa Elisabeth Hospital Medan

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ABSTRACT

Blood cancer or commonly referred to as leukemia is a malignant disease of white blood cells originating from the bone marrow. To determine if someone has leukemia, it can be done by analyzing the results of a complete blood count. The research method is descriptive qualitative from secondary data taken from the medical records of Santa Elisabeth Hospital Medan for the period 2016-2023. Hemostasis analysis of 33 samples, the leukocyte count was obtained with the highest value above normal 76% (n=25). Count the type of platelet value with the highest value below normal 88% (n=29) and erythrocyte with the highest value below normal 94% (n=31). Abnormal value of hemoglobin level 100% (n=33). Hematocrit abnormal value 100% (n=33). LED with the highest abnormal value obtained 91% (n=30). Bleeding time normal value 100% (n=33). Blood clotting time normal value 100% (n=33). D-Dimer normal values were 51% (n=17) and abnormal values were 49% (n=16). PTT with the highest abnormal value was 79% (n=26). APTT normal value is 58% (n=19) and abnormal value is 42% (n=14). TT abnormal value 100% (n=33). Analysis of hemostasis in patients with leukemia at Santa Elisabeth Hospital Medan obtained that the number of erythrocytes, platelets, hemoglobin levels, hematocrit, blood sedimentation rate was low while the number of leucocytes was found high. The results of examination of bleeding time and blood clotting time were found normal, D-Dimer and APTT were found normal and some were found abnormal, the results of PTT were mostly found abnormal and TT overall abnormal.

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1. INTRODUCTION

Hemostasis is the body's process by which blood is maintained in a liquid state, for example if a blood vessel is injured and ruptured, then hemostasis is needed to stop bleeding as soon as possible. Small blood vessels, such as capillaries, will often experience minor bleeding due to everyday trauma. Hemostasis system in the body that will stop the bleeding that occurs in these blood vessels [1]. Blood cancer or commonly referred to as leukemia is a malignant disease of white blood cells originating from the bone marrow. This disease is generally characterized by the proliferation of white blood cells and an increase in the number of cells exceeding the normal value in the peripheral blood (blast cells), causing disruption of normal white blood cells [2].

Hematopoiesis disorders in leukemia associated with bone marrow and lymph vessels occur due to uncontrolled white blood cell count. The first cells will agglomerate in granulocytes and bone marrow and progress to larger organs. This rapid division of white blood cells will result in decreased immunity and infection [3].

In Indonesia, according to data from Riskesdas, there are an average of \pm 4000 children with cancer year. Based on this research, cancer ranks as the 6th biggest cause of death in Indonesia every year. The are 100 new cases among 100.000 residents. According to the doctor's diagnosis or symptoms, the highest prevalence of cancer is in the Province of D.I. Yogyakarta, and the lowest is in West Nusa Tenggara and Gorontalo [2].

Based on the research from [4] who obtained samples from Sanglah General Hospital, Denpasar, Bali, it was found that the prevalence of Acute Lymphocytic Leukemia (ALL) in children

with blood cancer was 87%, namely 88 cases out of 101 cases diagnosed with leukemia from all the violence.

According to [5] who obtained 50 samples from RSUP Dr.Kariadi Semarang, the research results obtained were that there was a relationship between Chronic Myelocytic Leukemia (CML) with age, family history and smoking.

Based on [6] who also obtained 30 samples from RSUP Dr.Kariadi Semarang, the results of the study indicated that there was a significant relationship between the contact history of more than one benzene pollutant with the incidence of acute leukemia in children.

The research conducted [7] obtained samples from M.Natsir Hospital, Solok, West Sumatera, as many as 31 samples obtained blood test results, namely low hemoglobin levels, high leucocytes, low erythrocytes, low platelets, and low hematocrit. This is a hallmark of leukemia.

To determine if someone has leukemia, it can be done by evaluating the initial leukemia, namely paying attention to the symptoms that arise, analyzing the results of a complete blood count, observing the types of cells, that are found in abundance, and assessing the maturation of cells that are found in large numbers (dominate). Leukemia is a bone marrow cells is suppressed when abnormal neoplastic cells take over. A complete blood count will generally show anemia and thrombocytopenia. The degree of anemia and thrombocytopenia tends to be more severe in acute leukemia. Meanwhile, the characteristics of chronic leukemia are leukocytosis and hepatosplenomegaly [8].

Based on this background, the authors want to examine how the analysis of hemostasis blood tests in patients with leukemia at Santa Elisabeth Hospital Medan.

2. METHOD

The research design is descriptive research, namely research conducted to describe important events that occur in the present. The description is based on factual and systematic data [9]. The population in this study was medical record data from patients treated at Santa Elisabeth Hospital Medan for a period of years (2016-2023). The sample for this study were medical records from patients who met the acceptance criteria, namely patients diagnosed with leukemia and having blood tests done. If the population is 50 people, then the sample size is based on the formula from Nalendra, 2021, the sample size is 33 people. This study uses secondary data based on sources, data provided through documents, books, evidence that already exists or in the form of archives that may or may not be published.

3. RESULTS AND DISCUSSION

The results of this study were then analyzed using the univariate analysis method by means of computerization using spss for windows version 26.0. Each variable in this study would be analyzed using univariate which would show the results of the frequency and percentage of each variable. Variables that will be analyzed univariately are Bleeding Time/BT, Blood Clotting Time/CT, D-Dimer, Protrombin Time/PTT, Activated Partial Thromboplastin Time/APTT, Trombin Time/TT, Hemoglobin, Leukocytes Count, Erythrocytes, Platelets, Hematocrit and Blood Sedimentation Rate. The number of samples that met the acceptance criteria was 33 patients. The recapitulation of research results is shown in table 1 below:

Table 1. Recapitulation of Leukemia Patient Hemostasis Laboratory Results (n=33)

	Frequency (n)	Percentage (%)
Bleeding Time/BT (m)		
Normal (1 – 6)	33	100
Abnormal	0	0
Total	33	100
Blood Clotting Time/CT (m)		
Normal (4 - 15)	33	100
Abnormal	0	0

Total	33	100
D-Dimer (ng/ml)		
Normal (0,00 – 500,00)	17	51
Abnormal	16	49
Total	33	100
Protrombin Time/PTT (s)		
Normal (11 – 13)	7	21
Abnormal	26	79
Total	33	100
Activated Partial Thromboplastin Time/APTT (s)		
Normal (30 – 45)	19	58
Abnormal	14	42
Total	33	100
Trombin Time/TT (s)		
Normal (15 – 20)	0	0
Abnormal	33	100
Total	33	100
Complete routin Leukocytes count ($10^3/\text{mm}^3$)		
Normal (3,8 – 10,6)	3	9
Abnormal (< 3,8)	5	15
Abnormal (> 10,6)	25	76
Total	33	100
Complete routin Platelets count ($10^3/\text{mm}^3$)		
Normal (150 – 450)	2	6
Abnormal (< 150)	29	88
Abnormal (> 450)	2	6
Total	33	100
Complete routin Erythrocytes count ($10^6/\text{mm}^3$)		
Normal (4,4 – 5,9)	2	6
Abnormal (<4,4)	31	94
Abnormal (> 5,9)	0	0
Total	33	100
Hemoglobin (gr/dl)		
Normal (13,2 – 17,3)	0	0
Abnormal (<13,2)	33	100
Abnormal (>17,3)	0	0
Total	33	100
Hematocrit (%)		
Normal (40 – 52)	0	0
Abnormal	33	100
Total	33	100
Blood Sedimentation Rate (mm/jam)		
Normal (10 - 15)	3	9
Abnormal	30	91
Total	33	100

Based on the complete routin blood count, the leukocyte count obtained was a normal value of 9% (n=3), a low value below normal 15% (n=5), a high value above normal 76% (n=25). From the results of the examination of the type of platelet count, it was obtained that the normal value was 6% (n=2), the low value below the normal 88% (n=29) and the high value above the normal 6% (n=2). Meanwhile for the examination of the erythrocyte count, a normal value was obtained, namely 6% (n=2), a low value below the normal 94% (n=31) and no high value above normal.

Based on the results of the examination of hemoglobin levels, a low value below 100% abnormal (n=33) was obtained, where as no normal value was obtained. A high incidence of anemia was found in leukemia patients. The same things was also found on the hematocrit examination, 100% abnormal value was obtained (n=33), and and no normal value was also obtained. Blood sedimentation rate, normal values were obtained 9% (n=3) and abnormal values were obtained 91% (n=30).

Based on laboratory findings of blood hemostasis, bleeding time was obtained with a normal value of 100% (n=33), as well as blood clotting time with a normal value of 100% (n=33). In contrast to the results obtained on D-Dimer, a normal value of 51% (n=17) and an abnormal value of 49% (n=16) were obtained. The results of the PTT examination obtained with a normal value of 21% (n=7) and and an abnormal value of 79% (n=26), in line with the results of the APTT which were obtained with a normal value of 58% (n=19) and an abnormal value of 42% (n=14). TT examination results obtained with an abnormal value of 100% (n=33) and no normal value was was obtained.

Discussion

Leukemia comes from the Greek, namely leukos meaning white and haima meaning blood, so leukemia is also called blood cancer. When blood cells become abnormal, it will result in uncontrolled behavior and become cancer cells. This blood cancer will attacked the white blood cells produced by the bone marrow. This leukemia in an uncontrolled amount will also end up becoming anemia and thrombocytopenia, and the most fatal will result in death [10].

Hemostasis is the body's mechanism for spontaneously stopping bleeding. This mechanism is very necessary, so that the body does not lose too much blood when an injury occurs [11].

The process of formation of blood cells (red white cells, white blood cells, platelets) development, differentiation and maturation occurs in the body and is called hematopoiesis. Its function is to produce and regulate the development of blood cells in the body and this process occurs in the bone marrow. These bone marrow cells include cells that actively proliferate to continue the cycle of hematopoiesis [8].

Disruption of the process of hematopoiesis in the bone marrow will have an impact on the occurrence of leukemia disorders. Leukemia is characterized by abnormally produced blood-forming cells in the spinal cord. These abnormal cells will replace the function of normal blood cells and can be found in peripheral blood cells [12].

The formation of these abnormal cells will increase in number and exceed normal limits, and immature cells can be also found released into the bloodstream. These immature cells will be recognised as foreign body, and will eventually be eaten by the body's immune system and and there will be a build up of blood cells in the bone marrow. The process of hematopoiesis will also be disrupted and will result in a decrease in the number of erythrocytes and platelets, a decrease in hemoglobin and hematocrit levels, and an increase in the number of leukocytes [13].

Several risk factors for the occurrence of leukemia are divided into endogenous and exogenous risk factors. Endogenous factors are genetic in nature such as gene mutations and hereditary congenital disease. Exogenous factors are those that come from outside, such as exposure to radiation, viral infections, exposure to harmful chemicals and smoking [14].

These two risk factors play a role in changes in gene expression that will lead to abnormal cell proliferation, differentiation and apoptosis in lymphoid tissue. The purpose of analyzing risk factors is to find out the cause of leukemia. The diagnosis made on the patient include anamnesis, physical examination, and laboratory examination. Several laboratory tests were performed, such as a complete routine blood count and hemostasis examination [15].

One of the important routine blood test (morphology) in laboratory test to diagnose leukemia is bone marrow aspiration. Bone marrow aspirates and blood smears are performed with Wright's stain or Giemsa's stain. Bone marrow blast cells and white blood cells were counted to determine the percentage [14].

The human body will normally give signs to produce cells on a regular basis. However, in leukemia white blood cells do not respond to the signs to produce cells on a regular basis. However, in leukemia white blood cells do not respond to the signs given and can be found in the peripheral or

peripheral blood an excessive (abnormal) number of white blood cells derived from bone marrow cells. This will interfere with the normal function of other cells, and this condition is called leukemia [12].

Leukemia cells that have already been formed can interfere with the maturation of young cells and will inhibit the formation of normal blood cells in the bone marrow. Later these leukemia cells will enter the blood circulation and will infiltrate the organs of the body. This will disrupt organ function and disrupt cell metabolism in the body [14].

4. CONCLUSION

Based on the results of research of this study, analysis of hemostasis blood examination in patients with leukemia at Santa Elisabeth Hospital Medan it can be concluded that hemostasis factors play an important role in the occurrence of leukemia. That can be obtained the number of erythrocytes, platelets, hemoglobin levels, hematocrit, blood sedimentation rate was low while the number of leukocytes was found to be high. The results of examination of bleeding time and blood clotting time were found to be normal and some were found to be abnormal, D-Dimer and APTT were found to be normal and some were found to be abnormal, PTT results were mostly found to be abnormal and TT overall to be abnormal.

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