OVERVIEW OF PLATELET LEVELS OF PATIENTS WITH PULMONARY TUBERCULOSIS AT KABILA HEALTH CENTER

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ABSTRAK

The purpose of this study was to determine the results of the examination of normal and abnormal levels of platelets in patients with pulmonary tuberculosis and the causative factors that influence these levels.

This research method used a descriptive quantitative approach method. The population in this study were all patients with pulmonary tuberculosis at the Kabila Health Center as many as 23 patients. The sample used was 23 respondents using the Total Sampling technique.

The results showed that the abnormal platelet levels were 14.6% and normal platelet levels were 82.6%. Patients aged 15-50 years have abnormal platelet levels (17.4%) and normal platelet levels (82.6%). Patients with an age range of >50 years had normal platelet levels (21.7%). Male patients had normal platelet levels (26.1%), while women had abnormal platelet levels (17.4%) and had normal platelet levels (56.5%). Patients weighing 30-35kg 8.7% had abnormal platelet levels, and 4.34% had normal platelet levels. At 36-45 kg of body weight, 8.7% had abnormal platelet levels and 65.2% had normal platelet levels. At 46-55 kg of body weight, 8.7% had normal platelet levels and at 56-65 kg, 4.3% had normal platelet levels. Another factor is the length of treatment. In patients with two months of treatment, 8.7% had normal platelet levels, 17.3% had abnormal platelet levels, and 74% had normal platelet levels.

Keywords: Pulmonary TB, Mycobacterium tuberculosis, Anti Tuberculosis Drugs, Platelet Levels, Hematology Analyzer

INTRODUCTION

Health is needed by humans to live life. Without health, it is difficult for humans to carry out their activities to achieve prosperity . The level of prosperity of welfare in general is influenced by four components, namely behavior, heredity, welfare administration, and climate or environmental conditions. An unfavorable environment can trigger the emergence of various diseases. One of the diseases caused by these environmental factors is tuberculosis (TB) [9].

TB is a disease that attacks the lungs by a bacterial infection called *Mycobacterium tuberculosis*. These bacteria enter the human body through the respiratory tract, digestive tract, and open wounds on the skin. This tuberculosis infection can spread through the air, from the sprinkling of the patient's phlegm in which the infected phlegm contains *tuberculosis bacilli*. Tuberculosis sufferers will experience some problems in the respiratory system and blood circulation [21]. This TB disease can attack various

ages with different clinical conditions ranging from asymptomatic to severe conditions. TB is still an infectious disease that is of global concern and there is not a single country in the world that is free from TB [9].

According to WHO (2018), it is estimated that one third of the world's population is infected with TB. Its incidence has decreased, but TB remains a new case of tuberculosis wherein 3.2 million cases are in women; 5.4 million cases are in men; and 1.0 million cases are in children. TB still includes global health problems. WHO released data in 2018 which showed that in 2016 there were 10.4 million TB cases worldwide, where the percentage of people suffering from pulmonary TB in India, China, Pakistan and the Philippines were 56%. In Indonesia, there were 298,000 cases of pulmonary TB and there were 156,000 cases of smear-positive pulmonary tuberculosis (TB) in 2016 [20].

Pulmonary TB will develop rapidly in the body because it has the ability to multiply into phagocytic cells. This disease will get worse until it can cause complications if not treated properly. Complications that can occur in pulmonary tuberculosis are divided into two, namely early complications which include pleurisy, pleural effusion, empyema, laryngitis, and intestinal arthropathy; and advanced complications which include airway obstruction for acute respiratory distress syndrome (ARDS), post-tuberculosis obstructive syndrome, severe parenchymal damage, pulmonary fibrosis, cor pulmonale, amyloidosis, lung cancer, and multiple organ complications due to miliary tuberculosis [14].

The diagnosis of pulmonary tuberculosis can be made through several examinations. Physical examination is the first examination performed in diagnosing tuberculosis patients. There may be symptoms such as conjunctival eyes (pale skin) due to anemia, fever, and weight loss in the patient. In this examination, the patient did not show any abnormalities, especially in the initial cases or in cases of asymptomatic infiltration. The clinical presentation in patients with pulmonary tuberculosis is usually asymptomatic, but routine examination will reveal chest radiographic abnormalities. Radiological examination is one of the practical examinations to find TB lesions. In general, the location of TB lesions is in the area affected by the bacteria, but it can also affect the lower lobe or the hilum area with a lesion that looks like a lung tumor. The result of the radiological picture is spots with borders that are not clearly visible. On blood tests, the white blood cell count slightly increases when TB is just starting to activate. When the patient begins to recover, the white blood cell count will turn into normal. Other results of blood tests may also show mild anemia (normochromic and normocytic levels), decreased sodium, and increased gamma globulin [17].

Factors which are related to platelet levels in pulmonary TB patients include gender and in general men are more affected because they do a lot of daily activities. Pulmonary TB sufferers will have a weak physique that triggers an increasingly severe infection. Platelets will work hard in large numbers to cover the wound of infection causing platelets that are not old enough to break easily so that the platelet count actually decreases.

Age factor also affects the platelet levels of the patients. Productive age of 15-50 years who directly receive

antituberculosis drugs therapy will affect the hematology of the patients. In one case, it was found that age affects the metabolism of the body and the blood volume. Blood volume including the volume of erythrocytes, platelets and blood plasma will vary depending on the ages of the patients.

The duration of treatment of TB also has an influence on platelet levels. The duration of this treatment is divided into two phases. The first phase is an intensive phase for two months. The next phase takes place in four months so that the length of treatment is six months. Anti-tuberculosis drugs that are given during treatment can cause various negative side effects if consumed in the long term.

Body weight affects the production of platelets. Body weight will have an effect because someone who suffers from a disease will often lose weight so that the process of repairing body cells to replace damaged cells also slows down. In the use of anti-tuberculosis drugs, the dose given to the patient will be adjusted based on body weight. The fatter a patient is, the higher the dose given. However, this still has a negative impact on the patient as a result of the side effects of these drugs in high doses. The higher the dose, the greater the side effects that can arise [1].

There are four factors that determine the spread of tuberculosis, namely body resistance; transmission rate; environment; and air circulation. One of the media for the spread of Mycobacterium tuberculosis is HIV/AIDS infection. People with HIV/AIDS are at high risk of developing TB because this infection will greatly damage the immune system so that if a person with HIV/AIDS is exposed to TB, the condition of the patients will become severe that can lead to death. The rate of transmission of TB patients occurs directly based on the number of the tubercle bacillus released into the air by the patients. Patients with tubercle bacillus are more infectious than patients with small tubercle bacillus or no bacilli. If the sputum examination is negative, the patient is considered non-infectious. The environment is also a factor that causes the increase in the spread of *Mycobacterium tuberculosis* bacteria. The more droplet nuclei in the air, the higher the spread of these bacteria. Exposure in a small and closed room as well as poor air circulation also greatly affects the spread of the disease [7].

Pulmonary and laryngeal TB disease in children is less infectious than in adults. However, transmission from children can still occur. Destruction can persist over time, holes on chest radiographs, or respiratory infections [1].

Tuberculosis causes hematological abnormalities in both hematopoietic stem cells and plasma components. Tuberculosis can affect all hematopoietic cells so that platelet levels decrease. This is caused by disseminated intravascular coagulation which is one of the complications of tuberculosis. Patients with tuberculosis also take anti-tuberculosis drugs that can cause the destruction of platelets mediated by the immune system [11].

Platelets are convex in shape with a diameter of 0.752.25 mm. Platelets do not have a nucleus, but cell fragments are capable of synthesizing proteins although to a limited extent. Platelets have mitochondria and glycogen granules that act as energy stores. Granules contain acid hydrolase enzymes in the form of clots, growth factors, as well as various types of glycoproteins. Decreased platelet levels

often occur due to certain diseases or pathological conditions [16].

According to the Indonesian Ministry of Health (2018), the prevalence of pulmonary TB in Indonesia is 1.0%. Provinces in Indonesia with prevalence above the national figure include Aceh 32.41%; DKI Jakarta 32.41%; DI Yogyakarta 42.50%; West Sumatra 32.87%, and Riau Province 33.53% [8].

Based on the number of tuberculosis cases reported by the Gorontalo Provincial Health Office in 2019, there were several findings of tuberculosis cases in districts and cities spread across Gorontalo, namely in Gorontalo district by 1477 cases, Gorontalo City by 732 cases, Bone Bolango district by 639 cases, Pohuwato district by 447 cases, North Gorontalo district by 342 cases, and Boalemo district by 338 cases [5].

The number of tuberculosis cases reported by the Health Service of Bone Bolango, South Bulango District was 44 patients; East Bulango district of 17 patients, Bulango District of 6 patients, Tapa District of 57 patients, Tilongkabila District of 45 patients, Suwawa District of 49 patients, Kabila Bone District of 58 patients, Bone Pantai District of 37 patients, Bulawa District of 36 patients, Bone Raya District of 53 patients, and District Kabila of 52 patients. Based on data reported by the Kabila Health Center (2021), there were 23 cases of pulmonary tuberculosis (TB) [4].

WHO has recommended a pulmonary TB control strategy known as Directly Observed Treatment Short-course (TB-DOTS) using anti-tuberculosis drugs (ATD). These drugs are given in two stages, namely the intensive stage consisting of isoniazid (H), rifampin (R), streptomycin (S); and ethambutol (E) which was given intensively for two months. The next stage consisted of isoniazid (H) and rifampin (R) given three times a week for 4 months [1].

RESEARCH METHOD

This research approach is a descriptive quantitative approach with the aim of knowing the description of the platelet levels of pulmonary TB patients in the working area of the Kabila Health Center. This type of research is cross sectional by looking at the percentage of the platelet levels of the patients.

The primary data was obtained through the results of the platelet examination carried out in the laboratory, while the secondary data was obtained from the medical records of the Kabila Public Health Center.

In this study, the population used were all patients with pulmonary TB at the Kabila Health Center as many as 23 patients. The sample used was pulmonary TB patients who were undergoing treatment at the Kabila Health Center, as many as 23 patients. The sampling method used was total sampling; where all members of the population were sampled in this study.

Data analysis with a descriptive test was conducted to describe the platelet levels in patients with pulmonary tuberculosis in the working area of the Kabila Health Center. The research data is presented in tabular form and given as a percentage which is calculated using the following formula:

$$\% = \frac{f}{N} \text{x } 100\%$$

RESULTS

Table. 1 *Distribution of Platelet Levels Frequency in Patients with Tuberculosis*

Results of platelet levels	Frequency	Percentage (%)

Normal	19	82,6
Abnormal	4	17,4
Total	23	100,0

(Source: Primary Data, 2021)

Based on table 4.1, it shows that patients with pulmonary TB in the working area of the Kabila Health Center who have normal platelet levels are 19 samples with a percentage of 82.6%; patients with pulmonary tuberculosis who have abnormal platelet levels are 4 samples with a percentage of 17.4%.

Table. 2 *Distribution of Platelet Levels Frequency in Patients with Tuberculosis based on Age*

Age	Abnormal		Normal		Total	%
	F	%	F	%		
15-50 years	4	17,4	14	60,9	18	78,3
>50 years	0	0	5	21,7	5	21,7
Total	4	17,4	24	82,6	23	100,0

(Source: Primary Data, 2021)

Based on age (Table 4.2), patients aged 15-50 years who had abnormal platelet levels were 4 samples or 17.4% and normal platelet levels were 19 samples or 82.6%. Patients with an age range of >50 years who had normal platelet levels were 5 samples or 21.7%.

Table. 3 *Distribution of Platelet Levels Frequency in Patients with Tuberculosis based on gender*

Gender	Abnormal		Normal		Total	%
	F	%	F	%		
Male	0	0	6	26,1	6	26,1
Female	4	17,4	13	56,5	17	73,9
Total	4	17,4	19	82,6	23	100,0

(Source: Primary Data, 2021)

Based on gender (Table 4.3), male patients with advanced pulmonary tuberculosis who had normal platelet levels were 6 samples or 26.1%; female patients who had abnormal platelet levels were 4 samples or 17.4% and normal platelet levels were 13 samples or 56.5%.

Table. 4 *Distribution of Platelet Levels Frequency in Patients with Tuberculosis based on body weight*

Body Weight	Abnormal		Normal		Total	%
	F	%	F	%		
30-35	2	8,7	1	4,34	3	13,0
36-45	2	8,7	15	65,2	17	73,9
46-55	0	0	2	8,7	2	8,7
56-65	0	0	1	4,3	1	4,3
Total	4	17,4	19	82,54	23	100.0

(Source: Primary Data, 2021)

Based on gender (Table 4.3), male patients with advanced pulmonary tuberculosis who had normal platelet levels were 6 samples or 26.1%; female patients who had abnormal platelet levels were 4 samples or 17.4% and normal platelet levels were 13 samples or 56.5%. Based on body weight (Table 4.4), patients with a range of 30-35 kg who had abnormal platelet levels were 2 samples or 8.7%; while patients with normal platelet levels were 1 sample (4.34%). Patients with a body weight of 36-45 kg who had abnormal platelet levels were 2 samples (8.7%) and patients with normal platelet levels were 15 samples (65.2%). Patients weighing 46-55 kg who had normal platelet levels were 2 samples (8.7%). While patients with body weight 56-65 kg who have normal platelet levels as many as 1 sample (4.3%).

DISCUSSION

Tuberculosis is a disease caused by microorganisms belonging to the *Mycobacterium tuberculosis* group. These bacteria usually attack the lungs, or other organs such as lymph nodes, heart, and others. Patients can experience health problems. One of the problems that can occur in patients is thrombocytopenia (reduced platelet levels) and

thrombocytosis (excess platelet levels). These problems can be assessed through examination of platelets in the laboratory [18].

Platelets are very important for the human body. Platelet levels can be used to identify or analyze infections and conditions causing blood clotting problems. These platelets will respond when a blood vessel is injured. In physical wounds, platelets will quickly plug the wound [6].

Platelet Level Examination Results

The samples used were tuberculosis patients who are in the work area of the Kabila Health Center. Table 4.1 provides an overview of the results of the platelet examination. From 23 samples, 19 samples of normal platelet levels were examined with a percentage of 82.6%, while for abnormal platelet levels there were 4 samples with a percentage of 17.4%. This is in line with research conducted by Wahyu (2015) which states that consuming antituberculosis drugs can affect platelet levels in the body of the patients due to a decrease in levels.

Tuberculosis drugs can cause the destruction of platelets. When the drug enters the body, it is considered an antigen so that it activates antibodies. Antibodies are then produced by the body and directed against the drug and not against the platelets. If the drug is absorbed by the platelets, the platelets will be damaged so that the platelets cannot be read on the measuring device [2].

Treatment is needed to cure the patients, prevent recurrence, break the chain of transmission, and prevent bacterial resistance to drugs. Anti-tuberculosis drugs are given in combination form and are taken every day and under supervision to avoid drug resistance. This treatment consists of 2 stages. The intensive phase will be given regularly for two months, then proceed to an advanced stage within four months which aims to eliminate the remaining dormant bacteria [3].

If the treatment of pulmonary TB is stopped before two months (before the treatment period is completed), then the patients can develop drug resistance making the bacteria resistant to the drug [3].

Age

Pulmonary tuberculosis generally attacks the productive ages group, namely 15-50 years. Undergoing treatment using antituberculosis will affect the hematology of the patients [1].

Table. 2 describes platelet levels in patients with pulmonary TB aged 15-50 years with abnormal platelet levels of 4 samples (17.4%), and normal platelet levels of 19 samples (82.6%). These results are in line with the results of a research conducted by Apriani (2019) that of 20 patients with an age range of 25-50 years, 12 patients (60%) experienced a decrease in platelet levels.

In some cases, it was found that there was an influence in terms of age when it was associated with the metabolism of the body, one of which was blood volume. Blood volume at each age is different, as well as platelet levels. In the productive age of 15-50 years, many TB cases are found because in that range a person will carry out active activities without maintaining their health so that they can be at risk of being more susceptible to lung disease [10].

Gender

In general, men do a lot of daily activities. Patients with pulmonary TB have physical weakness that triggers the infection to get worse because the platelets will work massively to cover the infection wound. Platelets that are not old enough will easily break during these conditions [1].

Table. 3 provides an overview of tuberculosis patients by gender. A total of 6 male samples suffered from pulmonary TB (26.1%) but did not experience an increase or decrease in platelet levels, while 4 female samples (17.4%) had abnormal platelet levels and 19 samples (82.6%) had normal platelet levels.

Previous research by Mistuti (2019) showed that from 30 samples, 20 samples of pulmonary TB patients were male (67%) while 10 samples were female (33%). This is because men do more activities than women.

However, the results of the study at the Kabila Health Center showed that women were more susceptible to experiencing abnormal platelet levels than male patients. The platelet levels of male patients are normal because, based on interviews conducted by researchers, most of the male patients stop doing strenuous physical activity and start living a healthy lifestyle.

Weight

Platelet production will be affected if a person who is suffering from a disease experiences weight loss due to lack of appetite resulting in body cell repair to replace damaged cells. In the use of antituberculosis drugs, the dose to be given to the patient is based on body weight. The fatter a patient is, the higher the dose given. This will have a negative impact on patients as a result of the side effects of anti-tuberculosis drugs consumed in high doses which also cause major side effects [1].

Table. 4 provides an overview of the effect of body weight on platelet levels. A total of 2 samples (8.7%) had platelet levels below normal in the body weight range of 30-35 kg, and as many as 2 samples (8.7%) above normal values at weight 36-45 kg. Meanwhile, 19 samples (82.6%) had normal platelet levels at weight 46-55 and 56-65 kg.

In a study conducted by Ripai (2010) with a risk category, as many as 6 samples (19.4%) experienced a decrease in platelet levels, 16 samples (51.6%) had normal platelet levels and 9 samples (29.0) experienced an increase in platelet levels . The most decrease in platelet levels occurred in the 30-35 kg body weight category.

The body weight of patients with pulmonary tuberculosis will greatly affect the health of the body. All functions of the immune system are the defense of the body against infections. The cause of pulmonary TB infection are the nutritional status of pulmonary TB patients, as well as intense weight loss that affect the resistance of the body. This situation will affect the healing process [2].

Treatment Duration

In patients with tuberculosis, the length of treatment is divided into two phases, namely the intensive phase which lasts for two months, and the continuation phase which will last for four months, so that the length of treatment is six months. Antituberculosis drugs therapy can cause various negative side effects when consumed in the long term [1].

Table 4.5 provides an overview of the effect of treatment duration on platelet

levels. Based on the results of the study, there were 2 patients with pulmonary TB who underwent antituberculosis drugs treatment for two months (8.7%) and the results of the measurement of platelet levels were normal. On patients with six months of treatment, 4 samples (17.4%) had abnormal platelet levels. These results are in line with research conducted by Astuti (2018), where 4,444 pulmonary TB patients who underwent antituberculosis treatment for two months and six months experienced changes in platelet levels. After six months of treatment, the platelet level was reduced from 13.42% to 237,360 cells/l of blood.

This is because taking anti-tuberculosis drugs can reduce platelets (thrombocytopenia). These drugs, among others, Rifampin and INH which are consumed by patients with pulmonary tuberculosis can cause the destruction of platelets mediated by the immune system which plays a role in the formation of resistance structures that are stored in the platelet layer [2].

Increased platelets (thrombocytosis) is caused by several conditions such as hypersensitivity, heart failure, strenuous exercise, iron deficiency, nutritional deficiencies, and tuberculosis contamination. In patients with tuberculosis, bleeding that often occurs is hemoptysis [15].

In this study, 19 samples (82.6%) of normal platelets were obtained. These results are in accordance with a study conducted by Sinaga (2019) with the results of pulmonary TB patients who took antituberculosis drugs where 70% experienced an increase in platelet levels. Antituberculosis drugs such as Rifampin can minimize or suppress the number of platelet levels in the patient's body.

CONCLUSION

Based on the research that has been carried out to measure the platelet levels of 23 samples of pulmonary TB patients at the Kabila Health Center, Bone Bolango district, it can be concluded that:

1. Abnormal platelet levels in patients with pulmonary TB as many as 4 samples (17.4%) and 19 samples (82.6%) had normal platelet levels. The number of patients who have normal platelet levels is more than the number of patients who had abnormal levels.

2. Based on the causative factors that affect platelet levels in patients with pulmonary tuberculosis, it is known that:

   a. Patients aged 15-50 years have abnormal platelet levels (17.4%) and normal platelet levels (82.6%). Patients with an age range of >50 years had normal platelet levels (21.7%).

   b. Male patients had normal platelet levels (26.1%), while women had abnormal platelet levels (17.4%) and had normal platelet levels (56.5%).

   c. In patients weighing 30-35kg, 8.7% had abnormal platelet levels, and 4.34% had normal platelet levels. At 36-45 kg of body weight, 8.7% had abnormal platelet levels and 65.2% had normal platelet levels. At 46-55 kg of body weight, 8.7% had normal platelet levels and at 56-65 kg, 4.3% had normal platelet levels.

   d. In patients with two months of treatment, 8.7% had normal platelet levels, 17.3% had abnormal platelet levels, and 74% had normal platelet levels.

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