\DESCRIPTION OF ERYTHROSITE INDEX VALUE IN PATIENTS WITH ADVANCED TREATMENT PULMONARY AT PUSKESMAS KABILA, BONE BOLANGO DISTRICT, 2020

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ABSTRACT

Pulmonary Tuberculosis (Pulmonary TB) is a contagious infectious disease caused by the bacteria Mycobacterium Tuberculosis which usually attacks the lungs. When germs enter the body, tuberculosis can affect all series of hematopoiesis, especially in red blood cells (erythrocytes). This can affect the condition of erythrocyte production so that it is damaged, these factors will also affect the lower hemoglobin concentration and experience anemia. The purpose of this study was to determine the description of the Erythrocyte Index Value in Patients with Advanced Stage Treatment of Pulmonary TB at Kabila District Health Center. Bone Bolango 2020.

This research is descriptive with a quantitative approach. The population in this study were all patients with pulmonary TB with advanced treatment at Kabila Health Center as many as 28 people. The sample used was 28 respondents with the sampling technique using total sampling. Check the erythrocyte index in an automatic way using a hematology analyzer.

The results showed that 4 samples of abnormal MCV (14.3%) were normal, 24 samples (85.7%) normal, 8 (28.6%) abnormal MCH values, 20 samples (71.4% normal %), abnormal MCHC values were 2 samples (7.1%), and normal were 26 samples (92.9%). The conclusion is that patients with advanced stage pulmonary TB have anemia less than normal. It is recommended for pulmonary TB patients to maintain nutritional intake and consume lots of vitamins to avoid anemia which can worsen the condition of tuberculosis.

Keywords: Pulmonary TB, Advanced Treatment, Erythrocyte Index.

INTRODUCTION

Tuberculosis is a direct infectious disease caused by the bacterium Mycobacterium Tuberculosis or what is often known as TB. Most of the TB germs attack the lungs, but can also affect other organs. Transmission is often airborne. Sources of transmission are smear positive pulmonary TB patients who when coughing, sneezing or talking, emit droplets (sputum sparks) that contain M. tuberculosis. [4].

Pulmonary TB disease is at the top of the world. Pulmonary TB disease in Southeast Asia 44%, Africa 24% and the West Pacific 18%, with a smaller percentage in the East Mediterranean 8%, America 3% and Europe 3%. Eight

countries contribute two thirds of the global total, namely India 27%, China 9%, Indonesia 8%, Philippines 6%, Pakistan 6%, Nigeria 4%, Bangladesh 4% and South Africa 3%.[15].

TB disease in Indonesia is still a major public health problem and is a very deadly disease [8] in 2016 with the second largest number of TB sufferers in the world after India. In 2017, according to the Indonesian Ministry of Health, the number of new TB cases in Indonesia was 420,994, which were divided by sex, namely 175,696 males and 245,298 females, which is equivalent to 254 per 100,000 population. Then in 2018 as many as 511,873 divided by gender, namely 294,757 men and 217,116 women, which is equivalent to 193 per 100,000 population. This shows that there is an increase in TB cases every year, especially in 2017 and 2018 in Indonesia.

Gorontalo is one of the provinces that have experienced TB cases with a population of 1,185,492 in Indonesia from 34 provinces with a number of case findings of 3,521 cases which is equivalent to 297 per 100,000 population after Central Kalimantan with TB case findings of 3,548 cases which is equivalent to 133 per 100,000 population. [8].

Based on data from the Gorontalo Province Health Office regarding TB cases in 2019, there were new TB cases found in districts and cities, namely in Gorontalo District there were 1417 cases, Gorontalo City had 732 cases, Bonebolango Regency had 639 cases, Pohuwato Regency 447 cases, North Gorontalo District had 342 cases, and Boalemo District there were 338 cases of tuberculosis. [3].

Based on data from the Bone Bolango District Health Office (2019), Kabila Puskesmas is in the first place for TB cases, with 86 people, then Puskesmas Suwawa with 40 people. Based on data from the Kabila Health Center (2020), 28 TB cases undergoing advanced treatment in January-June.

The high incidence of TB disease cannot be separated from the ease of transmission of this disease. Sunlight and air ventilation play a role in increasing the ability of droplets to reach the lungs. When germs enter the body, tuberculosis can affect all series of hematopoiesis, especially in red blood cells (erythrocytes). When red blood cells (erythrocytes) are infected, the lifespan of red blood cells (erythrocytes) is shorter, which is about 10-20 days, whereas in normal conditions the lifespan of red blood cells (erythrocytes) is 120 days, this can affect the condition production of erythocytes so that they experience damage, these factors will also affect the lower hemoglobin concentration and experience chronic anemia. [12].

TB disease can cause haematological abnormalities, both hematopoietic cells and plasma components. These disorders are very varied and complex. These disorders can be valuable evidence as an indication of a complication or are a complication of anti-tuberculosis drugs (OAT). [13] TB treatment should always follow two stages: the intensive stage and the advanced stage. In the intensive stage, the treatment is given every day for 2 months, while in the advanced stage the patient is given fewer types of drugs, but for a longer period of time.

TB treatment with Anti-Tuberculosis Drugs (OAT) that can cause haematological abnormalities is isoniazid or INH and rifampin [14]. These abnormalities can be assessed through laboratory tests such as hemoglobin (HB), hematocrit, and red blood cell index (erythrocytes).

The results of the erythrocyte index study in patients with pulmonary TB were mostly hypchromic microcytic at 2-6 months of treatment. According to

previous researchers, Anti-Tuberculosis (OAT) drugs can have an effect on health because taking drugs during treatment can cause drug buildup in the body which can affect erythrocytes, especially on the erythrocyte index [1]. Isoniazid (INH) and rifampin are drugs that can cause hemolytic anemia by means of an immune complex mechanism, antibody drugs bind to red blood cell membranes and red blood cell destruction. Therefore, the longer the TB patient takes OAT, the lower the red blood cell count. [14].

One of the laboratory tests in the field of hematology that can be performed is the erythrocyte index examination such as Mean Corpuscular Volume (MCV) which is used to determine the size of the cell, Mean Corpuscular Hemoglobin (MCH), and Mean Corpuscular Hemoglobin Concentration (MCHC) which is used to determine the size, The shape and color of erythrocytes and the value of hemoglobin are necessary in order to support laboratory diagnosis. Examination of the erythrocyte index in patients infected with TB, if there is a decrease in the erythrocyte index value and decreased hemoglobin value, indicates that the patient has anemia. This examination is a supporting examination. [12].

As mentioned above, the result of treatment of TB infection can worsen the condition of pulmonary TB patients, so it is necessary to conduct research on determining the value of the erythrocyte index in pulmonary TB patients. Therefore, the researcher took the research title "An Overview of Erythrocyte Index Values in Patients with Advanced Treatment of Pulmonary TB at Kabila District Health Center. Bone Bolango in 2020 ".

Some of the risk factors that play a role in the incidence of tuberculosis include socio-economic factors, namely socio-economic factors such as house conditions, occupancy density, home environment, and poor workplace environment and sanitation. All of these factors can facilitate the transmission of tuberculosis, family income is also very closely related to tuberculosis transmission, because small income makes people unable to live properly, which meets the requirements, nutritional status, namely malnutrition or malnutrition will affect a person's immune system, making it vulnerable against various diseases, including pulmonary tuberculosis in both adults and children, the age at which TB can cause death in children and adolescents. The incidence of TB infection in children under 5 years has a 5 times risk compared to children aged 5-14 years. In Indonesia, it is estimated that 75% of pulmonary TB patients are in the productive age group, namely 15-55 years, sex, which occurs in men, this disease is higher, because smoking and drinking alcohol can reduce the body's defense system. So it is natural that smokers and alcoholic drinkers are often referred to as agents of pulmonary TB disease. [6].

RESEARCH METHODS

This research is descriptive with a quantitative approach. The research site was conducted at the Kabila Health Center, Bone Bolango Regency. The time of the research was carried out from 15 September to 6 October 2020.

The population in this study were all patients with pulmonary tuberculosis with advanced treatment in the Kabila Community Health Center, Bone Bolango District, Gorontalo Province in 2020, namely 28 people, with the sampling method using total sampling.

The variables of this study consisted of pulmonary tuberculosis patients undergoing advanced treatment and Erythrocyte Index values (MCV, MCH, MCHC).

The operational definition in this

research is tuberculosis patients who undergo advanced treatment who are registered at the Kabila District Health Center. Bone Bolango, erythrocyte index which consists of: content / volume or size of erythrocytes (MCV: mean corpuscular volume or average volume of erythrocytes. The normal MCV value is 82-92 fl), weight (MCH: mean corpuscular hemoglobin or average erythrocyte hemoglobin The normal value of MCH is 28-32 pg), the concentration (MCHC: mean corpuscular hemoglobin concentration. The normal value of MCHC is 31-35 gr / dl), and the type of anemia that is often found in pulmonary TB patients, namely hypochromic normocytic anemia (normal MCV and abnormal MCH), hypochromic microcytic anemia (abnormal MCV and abnormal MCH),

The tools and materials used in this research are 3 ml syringe, tourniquet, EDTA tube, 70% alcohol cotton and a Hematology analyzer (Mindray BC-2800).

The research procedure carried out is to connect the power cable to the stabilizer (stavol), turn on the tool (the on / off switch is on the upper right side of the tool), the tool will self check, the message "please wait" will appear on the screen, the tool will automatically perform a self check then back ground check, When ready, the sample is prepared and confirmed to be homogeneous with the anticoagulant, Press the Whole Blood "WB" button on the screen, press the ID button and enter the sample number, press enter, Press the top of the purple sample holder to open and place the sample in the adapter, close the sample holder and press "RUN", the results will appear on the screen automatically, the examination results (MCV, MCH and MCHC) are recorded on the result sheet that has been prepared.

The reference values for the Erythrocyte Index examination were MCV 80-100 fl, MCH 28-32 pg, MCHC 31-35 g / dl.

The data were processed by univariate analysis to calculate the frequency and characteristics of the research sample, and presented in tabular form and reported as a percentage.

The formula used is:

$$P = \frac{f}{N} \times 100\%$$

Information:

P: Percentage.

F: The frequency / number of samples of the erythrocyte index value is abnormal.

N: The total number of samples.

100%: Fixed number.

RESEARCH RESULT

Table 1. Distribution of Pulmonary TB Patients by Gender

JenisKelamin	Frekuensi	Presentase (%)
laki-laki	10	35,7
Perempuan	18	64,3
Jumlah	28	100

Source: Primary Data, 2020

The table above shows that of the 28 respondents, 10 were male (35.7%), while 18 were female (64.3%).

Table 2. Distribution of Pulmonary TB Patients by Age

Usia	Frekuensi	Persentase (%)
10-20 tahun	2	7,1
21-30 tahun	3	10,7
31-40 tahun	2	7,1
41-50 tahun	7	25,0
51-60 tahun	5	17,9
> 61	9	32,1
Jumlah	28	100

Source: Primary Data, 2020

The table above shows that out of 28 respondents, 2 people aged 10-20 years

(7.1%), 3 people aged 21-30 years (10.7%), 2 people aged 31-40 years (7,1 %), 7 people aged 41-50 years (25.0%), 5 people aged 51-60 years (17.9%) and 9 people aged 61 and over (32.1%).

Table 3. Distribution of Pulmonary TB Patients by Phase of Treatment

Fase Pengobatan	Frekuensi	Persentase (%)
3 bulan	17	60,7
4 bulan	6	21,4
5 bulan	2	7,1
6 bulan	3	10,7
Jumlah	28	100

Source: Primary Data, 2020

The table above shows that of the 28 respondents, 17 people underwent treatment in the 3-month phase (60.7%), 6 people in the 4-month phase (21.4%), 2 people in the 5-month phase (7.1%) and patients with the moon phase as many as 3 people (10.7%).

Table 4. Distribution of Pulmonary TB Patients Based on Mean Corpuscular Volume (MCV) Value

Nilai MCV	Frekuensi	Presentase (%)
Abnormal	4	14,3
Normal	24	85,7
Jumlah	28	100

Source: Primary Data, 2020

The table above shows that of the 28 respondents, the results of abnormal MCV values were 4 people (14.3%) while the normal MCV values were 24 people (85.7%).

So, it can be concluded that Lung TB Patients who experience Microcytic Anemia are 14.3%.

Table 5. Distribution of Pulmonary TB Patients Based on Mean Corpuscular Hemoglobin (MCH) Value

Nilai MCH	Frekuensi	Persentase (%)
Abnormal	8	28,6
Normal	20	71,4
Jumlah	28	100

Source: Primary Data, 2020

The table above shows that of the 28 respondents, the results of abnormal MCH values were 8 people (28.6%) while the normal MCH values were 20 people (71.4%).

So, it can be concluded that Pulmonary TB Patients who experience Hypochromic Anemia are 28.6%.

Table 6. Distribution of Pulmonary TB Patients Based on Mean Corpuscular Hemoglobin Concentration (MCHC) Value

Nilai MCHC	Frekuensi	Persentase (%)
Abnormal	2	7,1
Normal	26	92,9
Jumlah	28	100

Source: Primary Data, 2020

The table above shows that of the 28 respondents, 2 people had abnormal MCHC values (7.1%) while the results of normal MCHC values were 26 people (92.9%).

So, it can be concluded that Pulmonary TB Patients with an abnormal weight of Hemoglobin per Erythrocyte is 7.1%.

Table 7. Distribution of types of anemia based on erythrocyte index value in patients with advanced stage treatment of pulmonary TB.

Indeks Eritrosit	Nilai Indeks Eritrosit Abnormal	Presentase (%)	Keterangan
MCV	4	14,3	Anemia Mikrositik
MCH	8	28,6	Anemia Hipokromik
MCHC	2	7,1	

Source: Primary Data, 2020

The table above shows that of the 28

respondents, the MCV value that was not normal was 4 people (14.3%) and the results of the MCH value that were not normal were 8 people (28.6%), while the abnormal MCHC value was 2 people. (7,1%).

So, it can be concluded that Lung TB Patients who experience Normocytic Hypochromic Anemia are 43% and for hemoglobin weight per Erythrocyte that is not normal is 7.1%.

DISCUSSION

Tuberculosis is an infectious disease caused by the bacteria Mycobacterium tuberculosis which usually attacks the lungs, but can also attack other organs such as the lymph nodes, heart and so on. [2]. Lung TB sufferers can experience health problems, one of the problems that will occur is that it can cause anemia. Several types of anemia in tuberculosis patients are normocytic hypochromic anemia, microcytic hypochromic anemia, microcytic normochromic anemia, and normocytic normochromic anemia.

This problem can be assessed through laboratory tests such as an erythrocyte index examination. Erythrocyte index consists of volume and size of erythrocytes (MCV), weight (MCH), and concentration (MCHC). Erythrocyte index examination is used as a test to determine the types of anemia.

Based on the results of the study, most of the respondents who suffered from pulmonary tuberculosis were female than male. The results of this study are not in line with the theory which states that more men are infected with pulmonary tuberculosis than women because many men who smoke and drink alcohol can lower their immune system so that they are more prone to pulmonary tuberculosis. In addition, men have higher mobility than women so that they are more likely to be exposed to the Mycobacterium tuberculosis bacteria,

besides that habits such as smoking can make it easier for men to become infected with pulmonary tuberculosis.[6].

On the age characteristics of pulmonary tuberculosis patients, based on the results of the study, it was found that most of the respondent patients infected with pulmonary tuberculosis were of productive age. Productive age is 15-55 years. The number of productive age patients with pulmonary tuberculosis in this study were 16 people, while the non-productive age was 12 people. It can be concluded that the productive age is the age where a person is at the stage to work or produce something for himself or others, at the age of 15-55 years as a productive workforce which makes it possible to easily contract the bacteria Mycobacterium tuberculosis, if suffering from pulmonary tuberculosis then can result in individuals not being productive anymore and even losing an average of 3 to 4 months of working time,[10].

Based on the results of the study, most of the respondents underwent 3 months of treatment. Because in this phase of treatment, the Mycobacterium tuberculosis bacteria are still being destroyed in the body, so the occurrence of anemia in Pulmonary TB Patients is a natural thing that can happen, that is why it is recommended that Lung TB Patients complete their treatment to the next stage. Treatment must be up to 6 months because if it is less than 2 months or until it is interrupted, it will cause resistance or resistance to the drug.[9].

As for the research conducted on 28 samples, at the Mean Corpuscular Volume (MCV) value with a reference value of 80-100 femto liters (fl), there were fewer abnormal values found, namely 4 samples (14.3%). Where the 13 respondents who were female, aged 68 years, underwent a 5-month treatment phase, with an MCV value of 79.9 femto liters (fl), 18 respondents who were

female, aged 46 years, underwent a 4-month treatment phase, with MCV value is 77.7 femto liter (fl), 20 respondents who are female, age 48 years, underwent a 3-month treatment phase, with MCV value of 55.3 femto liters (fl), respondent 22 who are female, age 21 years old, underwent a 3-month treatment phase, with an MCV value of 53.9 femto liters (fl). While the normal MCV value was 24 people (85.7%). It can be concluded that from 28 samples, 4 samples experienced microcytic, in other words, MCV values were below normal values, while the other 24 samples experienced normocytic or in other words, MCV values were normal. Decreased MCV values have been seen in iron deficient anemia patients. This situation is characterized by reduced ferritin levels and decreased hemoglobin levels.[11].

As for the research conducted on 28 samples, the value of Mean Corpuscular Hemoglobin (MCH) with a reference value of 28-32 picogram (pg) was found less abnormal values, namely as many as 8 samples (28.6%). Where the 7 respondents who were female, aged 54 years, underwent a 3-month treatment phase, with an MCH value of 27.4 picograms (pg), 9 respondents who were male, aged 17 years, underwent a 4-month treatment phase, with an MCH value of 27.7 picograms (pg), 13 respondents who were female, aged 68 years, underwent a 5-month treatment phase, with an MCH value of 25.6 picograms (pg), 17 respondents who were male, age 70 years, who underwent the treatment phase 4 months, with an MCH value of 26.1 picogram (pg), respondents 18 were female, age 46 years, who underwent a 4-month treatment phase, with an MCH value of 25.6 picograms (pg), 19 respondents were female, aged 49 years, who underwent a 4-month treatment phase, with an MCH value of 26.1 picograms (pg), respondents 20 were

female, aged 48 years, who underwent a 3-month treatment phase, with an MCH value of 16.8 picograms (pg), 22 respondents were female, aged 21 years, who underwent a 3-month treatment phase, with an MCH value that is 15.9 picogram (pg). Meanwhile, the normal MCH value was 20 people (71.4%). It can be concluded that of the 28 samples, 8 samples had hypochromic, in other words the MCH value was below the normal value. Meanwhile, the other 20 samples experienced normochromic or in other words, the MCH value was normal.

As for the research conducted on 28 samples, the value of Mean Corpuscular Hemoglobin Concentration (MCHC) with a reference value of 31-35 g / dl (grams / deciliter) was found to be less of an abnormal value, namely 2 samples (7.1%). Where the 20 respondents who were female, aged 48 years, who underwent a 3-month treatment phase, with an MCHC value of 30.5 grams / deciliter (g / dl), 22 respondents who were female, aged 21 years, who underwent the phase 3 months of treatment, with an MCHC value of 29.5 grams / deciliter (g / dl). Meanwhile, the normal MCHC value was 26 people (92.9%). The decrease in MCHC levels is influenced by the decrease in hemoglobin synthesis beyond the decrease in the size of red blood cells, so the MCHC will decrease.

There was an abnormal erythrocyte index value in pulmonary TB patients, namely 4 people (14.3%) microcytic and 8 hypochromic (28.6%) or 12 microcytic hypochromic patients even though they are already in the treatment stage it can be caused by side effects of Anti Drugs. Tuberculosis (OAT) itself which according to OAT researchers has side effects for the body because consuming drugs continuously during treatment which can cause drug buildup in the body which can affect erythrocytes, especially on the erythrocyte index. This is in line

with the theory that Isoniazid (INH) can cause hematological side effects in the form of: agranulocytosis, aplastic anemia, or hemolysis, anemia, thrombocytopenia, eucinophilia and methemoglobinemia.[6]. Rifampin also has side effects on haematological reactions such as anemia and thrombocytopenia. Although most of the anti-tuberculosis (OAT) drugs are acceptable in therapy, they have potential toxic effects including the side effects of haematological reactions. Therefore, the longer tuberculosis patients consume OAT, the lower the number of red blood cells in their bodies[7]. Isoniazid (INH) can inhibit the use of vitamin B6 in tissues and will increase the excretion of vitamin B6. Vitamin B6 or pyrodixin functions in metabolism, protein synthesis and the formation of red blood cells and vitamin B6 is a coenzyme in the hemoglobin synthesis process. Excretion of vitamin B6 can cause vitamin B6 deficiency in the body so that it can interfere with hemoglobin synthesis due to insufficient hemoglobin concentration which causes red blood cells to shrink, pale in color and the number is less than the normal limit of hypochromic microcytic (sidoblastic anemia).[5].

However, even so, at 5 to 6 months the side effects of OAT have started to decrease and an increase in erythrocyte cell count, hemoglobin level and hematocrit value. This is because the frequency of taking medication is not as frequent as in the first month and up to the 4th month, so that the patient's appetite is not disturbed, because in the first to the 4th month side effects of OAT appear such as loss of appetite, nausea, vomiting, weakness, and dizziness. .[14].

CONCLUSION

Based on this research, it can be concluded that:

1. The abnormal mean corpuscular volume (MCV) is 4 people (14.3%) and the normal MCV value is 24 people (85.7%).
2. The abnormal mean corpuscular hemoglobin (MCH) was 8 people (28.6%) and the normal MCH value was 20 people (71.4%).
3. The abnormal Mean Corpuscular Hemoglobin Concentration (MCHC) value is 2 people (7.1%) and the normal MCHC value is 26 people (92.9%).
4. The type of anemia based on the erythrocyte index value in patients with pulmonary TB, the advanced treatment, namely Microcytic Hypochromic Anemia, was 12 people.

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