

Erythrocyte Morphology of Tuberculosis Patients

Ahmad Rifa'I*, Ahmad Muhlisin, Leka Lutpiatina

Medical Laboratory Technology Poltekkes Kemenkes Banjarmasin
JI Mistar Cokrokusumo Street 4a Banjarbaru, Indonesia.
e-mail: rifaiahmad@gmail.com

Abstract. Tuberculosis is one of the causes of anemia in chronic diseases in addition to rheumatoid arthritis, ulcerative colitis, Crohn's disease, ovarian malignancy and Hodgkin's lymphoma. Chronic disease anemia also known as anemia due to inflammation, occurs in patients with chronic infections. This anemia also occurs in some patients with malignancy. The causes of anemia are based on cell size, namely iron deficiency (often), anemia of chronic diseases (often), Thalassemia (often in certain ethnicities) causing the size of cells to become microcytic. Cells turn macrocytic due to liver disease, excess alcohol, megaloblastic anemia (vitamin B12 deficiency or folate or exposure to certain drugs), hemolysis, and aplastic anemia. Whereas the normal cell factors are blood loss, the initial phase of iron deficiency, anemia, chronic disease, and kidney failure. The aim of this study was to determine the type of anemia based on the morphological description of erythrocytes in the form, color, and size of erythrocytes seen in the smear blood supply of tuberculosis patients based on treatment duration of 0-6 months. The type of research used was a descriptive survey with a population of 15 people taken by accidental sampling. Data collection is done by examining the blood smear smears. Based on the examination of peripheral blood smear preparations in pulmonary tuberculosis patients, the morphology of erythrocytes in the form of Normocytic normochrome was 74% and microcytic normochrome was 26%. Suggestions in the research for further research can be carried out with support other than the examination of peripheral blood smear.

Keywords: erythrocyte morphology; peripheral blood smear preparations; tuberculosis

INTRODUCTION

According to Indonesia's health profile in 2016, Indonesia has 298,198 cases of tuberculosis (TB) in 2016. This number has decreased compared to 2015 with 330,910 cases. According to the Indonesian Ministry of Health's Directorate General of P2P in 2017 the province of South Kalimantan has 2,811 cases of new cases of tuberculosis, those cases by sex, 1,733 people suffered by men and 1,078 suffered by women.

Based on the health profile of Banjar Regency in 2016, one of the indicators used in TB control is the Case Notification Rate (CNR), which is a number that shows the total number of TB patients found and recorded in 100,000 residents in a particular area. This figure, if collected serially, will illustrate the tendency of case finding from year to year in a region. The CNR + cases of BTA + in Banjar District in 2012 (168.9 per 100,000

population) in 2016 experienced a decrease of 79.74 per 100,000 population. This is reflected in the number of new cases of AFB + decreased in 2012 by 894 cases, while in 2016 there were 443 cases. Based on data from the Martapura Barat Health Center in 2017, there were 57 tuberculosis patients with AFB +, based on sex, namely 32 men and 25 women.

Tuberculosis is one of the causes of anemia in chronic diseases in addition to rheumatoid arthritis, ulcerative colitis, Crohn's disease, ovarian malignancy and Hodgkin's lymphoma. Chronic disease anemia also known as anemia due to inflammation, occurs in patients with chronic or inflammatory infections. This anemia also occurs in some patients with malignancy¹.

The causes of anemia are based on cell size, namely iron deficiency (often), anemia of chronic diseases (often), Thalassemia (often in certain ethnicities) causing the size of cells to become microcytic. Cells turn macrocytic due to liver disease, excess alcohol, megaloblastic anemia (vitamin B12 deficiency or folate or exposure to certain drugs), hypothyroidism, aplastic anemia, hemolysis. Whereas the Normocytic cells causing factors are blood loss, the initial phase of iron deficiency and anemia of chronic disease, kidney failure, spinal cord suppression (eg due to chemotherapy)¹.

Suhartati & alwi (2015) study of 20 blood samples in pulmonary tuberculosis patients in Cineam and Karangnunggal health centers in Tasikmalaya Regency Indonesia, showed 10% normocytic hypochromes, 20% microcytic hypochromes, 10% macrocytic hyperchromes 5% macrocytic normochromes 5%, normocytic normochromes 55%².

Sadewo's study (2014) of 692 people who met the research criteria found that the 25-34 year age group had the most pulmonary TB (24.1%). Most pulmonary TB patients experience anemia (76.4%). Mild anemia is the most common in pulmonary TB patients (59.1%). The most common type of anemia is normocytic normochromic (54,8)³.

The type of anemia and morphological description of erythrocyte in tuberculosis patients according to previous studies have varied results. The description of patients in the Banjar district, especially in the Martapura Barat Health Center regarding this matter is unknown. This study used the method of smear blood supply, according to Waterbury, 2001, Edge blood smear can provide assistance and sometimes even certain diagnosis information in assessing anemia. The form of red blood cells, chromicity, objects in the cell (inclusion), is important to be known for definite diagnosis⁴.

This study aims to determine the morphological description of erythrocytes in the form, color, and size of erythrocytes seen in peripheral blood smear on tuberculosis patients at the Martapura Barat Community Health Center, Banjar Regency.

MATERIALS AND METHODS

This study uses descriptive observational, namely research conducted on a set of objects to describe or describe a health problem that occurs in society. The design of this study is cross sectional, researchers make observations or measurements of variables at a certain time. The researcher did not follow up on the measurements taken.

The population in this study were 24 tuberculosis patients at Martapura Barat Community Health Center, Banjar Regency in May 2018. The sample in this study was taken by accidental sampling with 15 people with the results of microscopic examination showing acid resistant bacilli positive, not having severe disease, and in the future 0-6 months treatment at Martapura Barat Health Center.

The morphology of erythrocytes is a picture of erythrocytes seen in color and size. Normocytic normochrome is the size and color of normal erythrocytes, ie diameter 6.2-8.2 μ . Microcytic hypochromes are erythrocyte sizes smaller than 6.2 μ , and the overall color is pale. Normochrome macrostic is an erythrocyte cell size of more than 8.2 μ , the color is normal.

The study used a Leica ICC50E type microscope. Making a smear of peripheral blood on two glass objects for each patient. The staining of the preparation using the Giemsa method using pH 6.8 buffer (1: 4) Incubation for 15 minutes.

RESULTS AND DISCUSSION

The study was conducted on 15 respondents. Most respondents are male (60%) and the rest (40%) are female. Respondents came from Keliling village, Iilir fort, around the central fort, Rangas Ulu river, Panggalaman, Selong Iilir Bay, Selong Ulu Bay, amounting to 1 person each (6.67%) while from the villages the middle Rangas river and Batang Iilir river each numbered 2 people (13.33%), and from the villages of Sungai Rangas Hambuku there were 5 people (33.33%). To be more clearly seen in figure 1.

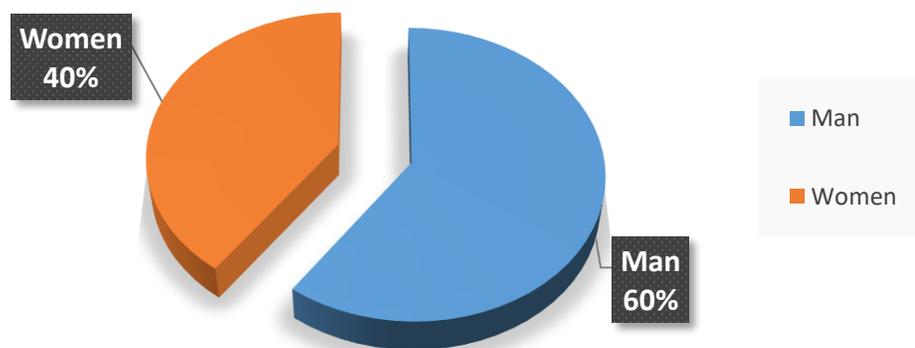


Figure 1 Graph of Respondent Percentages by Gender

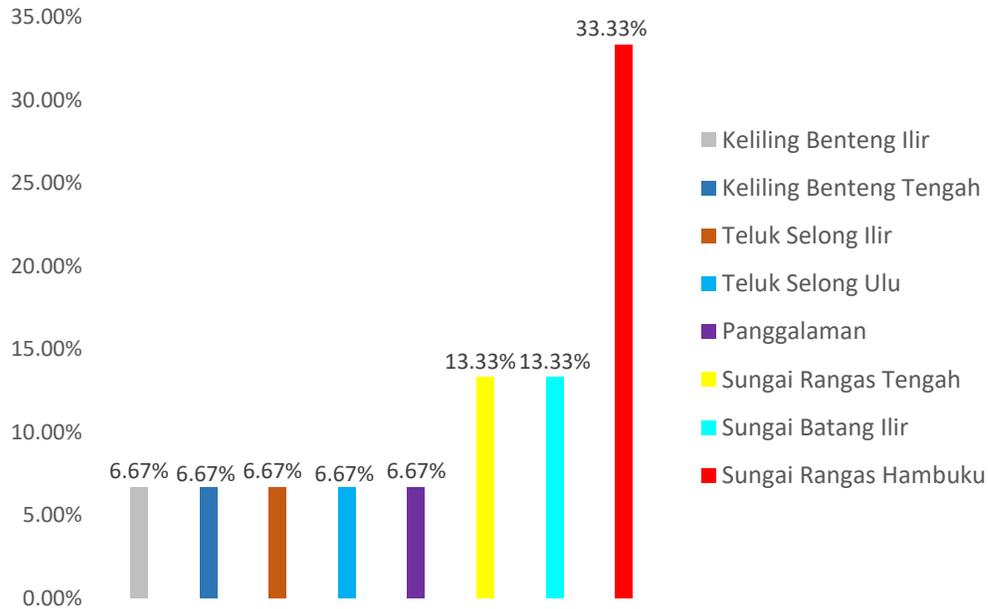


Figure 2 Graph of Respondent Percentages by Residence

In an effort to find tuberculosis patients who are in accordance with the criteria of the study sample, the researchers were assisted with data available at the Martapura Barat Health Center. The interview results recorded that almost all of the respondents had the habit of eating balanced nutritious food. Most respondents undergo an intensive treatment phase.

Data was collected based on the duration of treatment, there were 4 patients with 1 month treatment duration (27%), 7 patients with 2 months treatment duration (47%), 3 patients with 3 months treatment duration (20%), and 1 person with 4 months of treatment (7%).

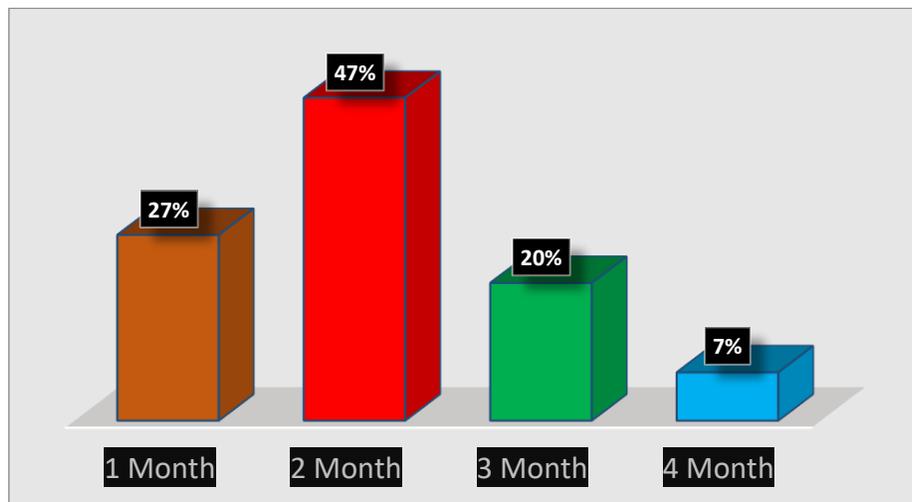


Figure 3 Graph of percentage of tuberculosis patients based on duration of treatment

Based on the results of microscopic examination of peripheral blood smear in Tuberculosis patients, it was found that 74% of tuberculosis patients who experienced changes in erythrocyte morphology to normocytic normochrome, and 26% of tuberculosis patients who experienced changes in erythrocyte morphology to hypochromic microcytosis.

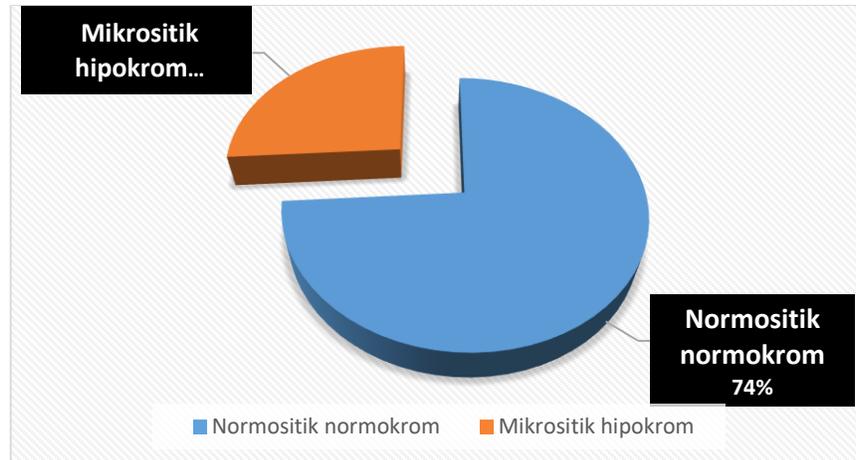


Figure 4 Graph of the morphology of erythrocytes in tuberculosis patients

The morphology of erythrocytes that shows anemia Normocytic normochrome and microcytic hypochrome in tuberculosis patients can be seen in Figure 5.

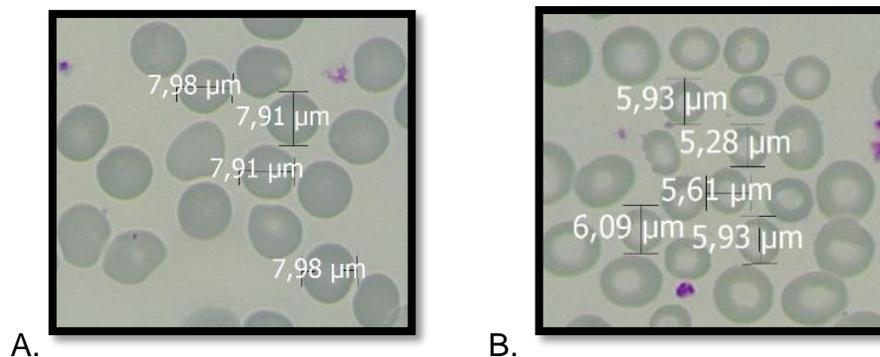


Figure 5 Morphology of erythrocytes in tuberculosis patients
A : Normositik normokrom, B : Mikrositik hipokrom

Table 1 Results of Recapitulation of Edge Blood Removal in Lung Tuberculosis Patients

Erythrocyte morphology	Gradation of BTA results in pulmonary TB Percentage			Total
	(+)	(++)	(+++)	
<i>Normositik Normokrom</i>	9 person (60%)	1 person (7%)	1 person (7%)	11 person (74%)
<i>Mikrositik Hipokrom</i>	2 person (13%)	2 person (13%)	-	4 person (26%)
	Total			15 person (100%)

Table 2: Respondents' results of hypochromic microsytic morphology

No.	Code sample	Duration of treatment	BTA	morphology of erythrocytes
1.	F3	3 Month	(+)	<i>Mikrositik hipokrom</i>
2.	F6	2 Month	(+)	<i>Mikrositik hipokrom</i>
3.	F13	2 Month	(++)	<i>Mikrositik hipokrom</i>
4.	F15	1 Month	(++)	<i>Mikrositik hipokrom</i>

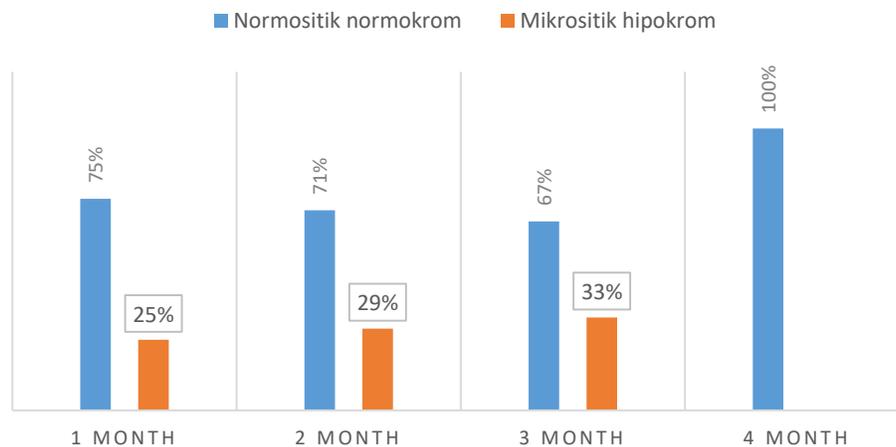


Figure 6 Percentage of Erythrocyte Morphology Graph Based on Duration of Treatment

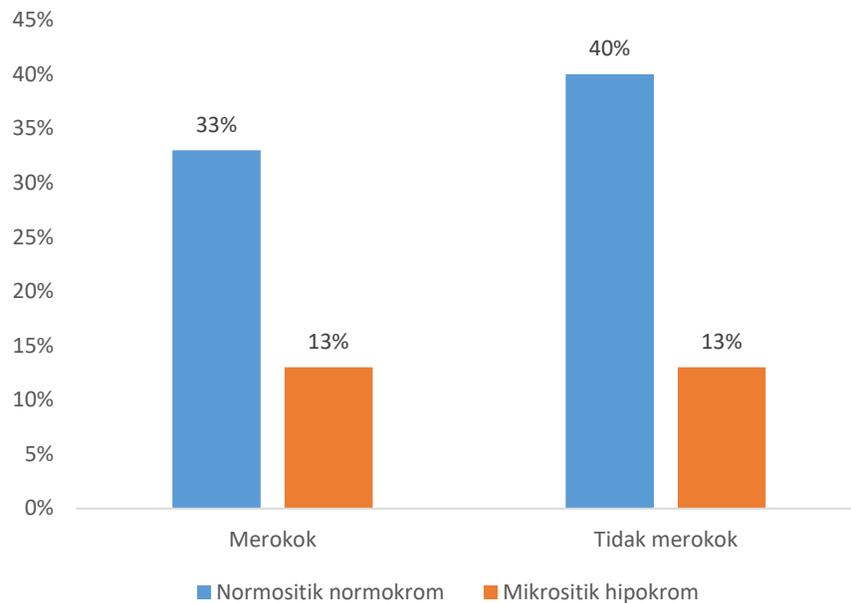


Figure 7 Percentage of smoking and non-smoking

In this study the respondents were mostly male, namely as many as 9 people and 6 people were female. Based on data from the questionnaire (table 3), as many as 47% or 7 people from 15 respondents had smoking habits, and most respondents who had a smoking habit were 78% male or 7 people from 9 people. It is likely that men are more at risk of contracting tuberculosis because men often have smoking habits that can affect their level of immunity. The situation is also likely to be influenced by the level of activity and work as labor.

In tuberculosis (++) and (+) patients there were examination results of peripheral blood smear in the form of 26% hypochromic microscopy (table 1), this is supported by the theory of Bakta (2017) that hypochromic microscopic anemia with iron metabolic disorders is a cause of anemia most often found, both in clinical practice and in the field⁵. Included in this group are iron deficiency anemia, anemia due to chronic disease (TB), and sideroblastic anemia. This was also supported by Suhartati's research (2015), the results of the study showed 20% microcytic hypochromic anemia².

Table 2 shows 4 person respondents with a microscopic hypochromic picture that has a long duration of treatment that varies, namely 1 person with 3 months duration of treatment (25%), 2 people with 2 months duration of treatment (50%), and 1 person with 1 month duration of treatment (25%). According to a study conducted by Fauziah and Siahaan (2014), the administration of anti-tuberculosis drugs affected the picture of hemoglobin in pulmonary TB patients, the decrease in hemoglobin levels was significant in 3 months of treatment, especially in the 3rd month of treatment⁶. The results of the study by Thuraidah et al (2017), the results of the average examination of red blood cell count, hemoglobin level and hematocrit value of pulmonary TB patients in the second month experienced anemia and there was a relationship between the duration of consumption of anti-tuberculosis drugs against anemia in pulmonary TB patients⁷.

Table 1 shows there are 74% of Normocytic normochrome erythrocytes, according to the theory of Hoffbrand & Moss (2013), one of the most common types of anemia in patients with various chronic inflammatory or malignant diseases, one of which is the normocytic or hypochrome erythrocyte morphology light⁸. The cause of anemia is chronic infection (eg pulmonary abscess, tuberculosis, osteomyelitis, pneumonia, bacterial endocarditis). The results of this study are in line with Sadewo's study (2014) in Tuberculosis patients with a percentage of 54.8% with morphological normocytic erythrocytes normochromic and morphological hypochromic erythrocytes amounting to 45.2%³.

This study was conducted in patients with adulthood. According to Nelson LJ 2004, more cases of tuberculosis are found in children under the age of 5 years compared to children of higher age⁹. Galih Purnasari's research on tuberculosis pediatric patients showed results of chronic disease anemia of 61.5% and iron deficiency anemia 36.5%¹⁰. Children aged ≤ 2 years each month around 50% experience anemia¹¹. Research in Brazil in children aged ≤ 2 years showed that age was an important risk factor associated with the incidence of anemia¹².

Anemia of the Normocytic normochrome and microcytic hypochromes is a type of anemia that occurs in tuberculosis patients in this study. Normocytic cells that cause factors include the initial phase of iron deficiency, new anemia symptoms will appear slowly over a long period of time as a result of chronic iron deficiency¹³. a state of iron intake deficiency if it occurs continuously can cause anemia¹⁴.

According to Hoffbrand & Moss (2013), Causes of anemia Other often hypochromic microcytics are anemia of chronic disease, which occurs in patients with chronic inflammatory disease or malignancy, and thalassemia⁸. Anemia Normocytic anemia, caused by acute blood loss, hemolysis, chronic diseases including infections, endocrine disorders, kidney disorders, marrow failure, and metastatic disease in the bone marrow. In anemia of chronic disease the severity of anemia is directly proportional to the severity of the disease¹⁵.

CONCLUSION

Pulmonary tuberculosis patients with Normocytic normochrome erythrocyte morphology of 74%. Patients with pulmonary tuberculosis with 26% hypochromic erythrocyte morphology.

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