

Profile of Anemia on Lung Tuberculosis at Dr. Hasan Sadikin General Hospital and Community Lung Health Center Bandung

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Abstract

Background: Tuberculosis (TB) is a chronic infectious disease caused by *Mycobacterium tuberculosis* that can cause anemia. Anemia is a lack of erythrocyte mass needed to carry adequate oxygen to the whole bodies. The aim of this study was to describe the anemia in adult lung TB patients at Dr. Hasan Sadikin General Hospital and Community Lung Health Center (Balai Kesehatan Paru Masyarakat, BKPM) Bandung.

Methods: This descriptive study was conducted from August to October 2014. Study subjects were adult TB patients who came for their first control to TB Clinic Dr. Hasan Sadikin General Hospital and BKPM Bandung after receiving oral antituberculosis drugs, and willing to comply in study. The exclusion criteria were patients with other chronic diseases, pregnant, menorrhagia, and hemoptoe. Three mL of vein blood was taken and put into EDTA tube for routine hematologic measurement using automatic hematologic analyzer, sysmex KX-21®.

Results: There was 31 (63.26%) from 49 adult lung TB patients suffered anemia. In male subjects, mild and moderate anemia were found 57.14% and 42.86% respectively, and in female subjects were 58.82% and 41.18% respectively. In males, there were 42.86% normochromic normocytic, 42.86% hypochromic microcytic, 7.14% normochromic microcytic, and 7.14% hypochromic normocytic, while in females, there were 5.88% normochromic normocytic, 47.06% hypochromic microcytic, 17.65% normochromic microcytic, 29.41% hypochromic normocytic.

Conclusions: Anemia is found in 63.26% adult lung TB patients, most of which are mild anemia and hypochromic microcytic, especially in female subjects. [AMJ.2016;3(1):137-40]

Keywords: Anemia, hemoglobin, lung tuberculosis

Introduction

Tuberculosis (TB) is one of the major health problems and causes second-most deaths due to infectious diseases worldwide. Indonesia ranks fourth in countries with most TB patients after India, China, and South Africa.¹

Tuberculosis is a chronic infectious disease caused by *Mycobacterium tuberculosis* which commonly attacks the lungs.² TB can cause various and complex hematologic abnormalities, one of which is anemia.³ Isanaka et al.⁴ in 2011 reported that iron deficiency anemia as well as anemia without iron deficiency in TB patients are related to 2–3 fold increased risk of death. In TB patients,

anemia could manifest as chronic-disease-related anemia, anemia due to coughing blood (hemoptysis), anemia due to malnutrition and sideroblastic anemia as side effect of isoniazid.^{2,5,6} Anemia is functionally defined as insufficiency of erythrocyte mass to deliver oxygen in sufficient amount to peripheral tissues.⁶ Al Omar et al.⁷ in 2009 reported that anemia in adult TB patients happened as much as 60% in male and 45% in female, and 80% was normochromic normocytic anemia. The aim of this study was to describe the anemia in adult lung TB patients at Dr. Hasan Sadikin General Hospital and Community Lung Health Center (*Balai Kesehatan Paru Masyarakat, BKPM*) Bandung.

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Methods

This was a quantitative descriptive study, conducted from August to October 2014. The subjects were adult lung TB patients who came to TB Clinic Dr. Hasan Sadikin General Hospital and BKPM Bandung. Subjects were chosen by consecutive sampling. Study data was a primary data based on routine hematologic test results in adult lung TB patients. The inclusion criteria were patients diagnosed with TB, who received oral antituberculosis drugs and came for first time control to TB Clinic at Dr. Hasan Sadikin General Hospital and BKPM Bandung, who were willing to comply for study, adult aged >18 years old. The exclusion criteria were patients with other chronic diseases, hemoptysis, pregnancy, and menorrhagia.

Diagnosis of anemia in adult TB patients was confirmed when hemoglobin levels below 13 g/dl for male and below 12 g/dl for female; hematocrit levels below 42% for male and below 37% for female; erythrocyte count less than 4.95 million /mm³ for male and less than 4.25 million/mm³ for female. Anemia is classified as hypochromic microcytic when MCV<80 fL and MCHC <32%, as normochromic normocytic when MCV 80–100 fL and MCHC 32–36%, as macrocytic when MCV>100 fL. Severity of anemia in male patients is graded as mild:11–12.9 g/dl; moderate :8–10.9 g/

dl; and severe:<8 g/dl. Severity of anemia in female patients is graded as mild:11–11.9 g/dl; moderate: 8–10.9 g/dl, and severe: ≤8 g/dl.⁶

Study procedures conducted were getting study permit from Dr. Hasan Sadikin General Hospital and BKPM; ethical clearance from study Ethical Committee of Dr. Hasan Sadikin General Hospital; TB patients screening who fulfilled the inclusion and exclusion criteria in TB Clinic Dr. Hasan Sadikin General Hospital and BKPM; performing informed consent by examiner; preparing study equipments and materials; taking 3ml blood samples from vein and putting into EDTA tubes; homogenizing samples and hematologic measurement using hematology analyzer device, sysmex KX-21®; processing and analyzing study results; and announcing the results to patients through clinic

Results

The number of adult pulmonary tuberculosis patients who suffered from anemia was larger. The result showed that 31 of 49 subjects (63.26%) suffered anemia. Seventeen was female (Table 1).

Results of anemia distribution and frequency showed that there was no severe anemia found in male and female subjects

Table 1 Characteristics of Adult Lung TB Patients

Characteristics	Anemia (n= 31)	No anemia (n= 18)
Gender		
Male	14	12
Female	17	6
Age (year)		
Mean	32.4	32.9
Body Mass Index (m/kg ²)		
Mean	18.2	18.8

Table 2 Frequency Distribution of Anemia in Adult Lung TB Patients

Gender	Anemia		Total
	Mild N (%)	Moderate N(%)	
Male	8 (57.14%)	6 (42.86)	14 (100%)
Female	10 (58.82%)	7 (41.18)	17 (100%)
Total	18	13	31

Table 3 Anemia Description in Adult Lung TB Patients

Anemia Type	Male n=14	Female n=17
Normochromic normocytic	6	1
Hypochromic microcytic	6	8
Normochromic microcytic	1	3
Hipochromic normocytic	1	5

(Table 2).

The most classification of anemia in women was hypochromic mikrositer, whereas, the most in men was normokrom normositer and hypochromic mikrositer (Table 3). Moderate anemia dominated with hypochromic microcytic anemia (Table 4).

Discussion

This study found that 31 out of 49 subjects (63.26%) had anemia. Result of other studies was various outcomes. Yaranal et al.³ in 2013 showed that anemia in TB patients occurred in as high as 74% of cases. Lee et al.⁸ in 2006 reported that 31.9% TB patients suffer anemia. Characteristic and frequency distribution of adult lung TB patients who had anemia in this study were 28.57% in males and 34.69% in females. Al Omar et al.⁷ in 2009 reported that anemia in adult lung TB patients occurs as much as 60% in male and 45% in female. This diversity in results maybe due to another coexisting disease.⁶ The median age for male and female lung TB patients in this study was 31 years old with range 15–57 years old. Karoum et al.⁹ study reported that mostly, TB patients with anemia are over 16 years old. This study also showed that the average BMI of TB patients with anemia were 18.2 kg/cm² (underweight) and in TB patients without anemia 18.8 kg/cm² (normal) respectively.

The data showed that TB patients who

suffered from anemia had less nutrition, it is consistent with study by Oliveira et al.¹⁰ in 2014 that mentioned 68.7% of pulmonary TB patients with anemia have a BMI of 18.21 kg/m², so that concludes anemia is associated with malnutrition.

The distribution frequency results of this study showed that in male, 57.14% adult lung TB patients suffered mild anemia and 42.86% suffered moderate anemia. In female subjects, 58.82% had mild anemia and 41.18% had moderate anemia. There was no subject presented with severe anemia in this study. These results are comparable to the study conducted in 2012 by Hungund et al.¹¹, who reported that out of 100 TB patients, 50% have mild anemia, 37% have moderate anemia, but in Hungund study, 9% have severe anemia. Study Kumar et al.¹² in 2013 reported that 63 people have mild anemia. Anemia in TB patients is related to chronic inflammation process, where erythropoiesis is inhibited by cytokines and iron metabolism is altered, which results mild to moderate degree of anemia.^{13,14} Hematological changes that occur are often associated with the body's immune response to TB infection.

This study reported that in male adult, patients with lung TB, 42.86% had normochromic normocytic anemia, 42.86% had hypochromic microcytic anemia, 7.14% had normochromic microcytic anemia, 7.14% had hypochromic normocytic anemia, and

Table 4 Anemia Classification in Adult Lung TB Patients based on Severity

Anemia Type	Mild	Moderate	Total
Normochromic normocytic	6	1	7
Hypochromic microcytic	4	10	14
Macrocytic	0	0	0
Normochromic microcytic	3	1	4
Hypochromic normocytic	5	1	6
Total	18	13	31

none of them had macrocytic anemia. In female adult, patients with lung TB, 5.88% had normochromic normocytic anemia, 47.06% had hypochromic microcytic anemia, 17.65% had normochromic microcytic anemia, 29.41% had hypochromic normocytic anemia, and also none of them had macrocytic anemia. Overall, this study reported that most of the cases were hypochromic microcytic anemia. This result is different compared to the study conducted by Al Omar et al.⁷ in 2009, which reported that 80% anemia in TB patients are normochromic normocytic type and only 20% anemia are hypochromic microcytic type; and study by Lee et al.⁸ in 2006 which reported that 71.9% cases have normochromic normocytic anemia. Study by Atomsa et al.¹⁵ in 2014 reported that 37.5% cases have normokrom normositer and 30.4% hypochromic normositer. These differences in results might be caused by the existence of underlying anemia, most probably iron deficiency anemia. Theoretically, iron deficiency anemia presents itself in 3 stages: iron depletion, iron deficient erythropoiesis, and finally iron deficiency anemia. In the first two stages, anemia does not occur yet. In the third stage, anemia is detected initially with normochromic normocytic type, which slowly progresses to be normochromic microcytic anemia and finally, hypochromic microcytic anemia occurs.⁶

Conclusion of this study is 63.26% adult lung TB patients suffer anemia, most of which are mild anemia and the most category are hypochromic microcytic anemia.

The limitation of this study is the absence of database for previous health examination results before laboratory checkup and previous medical history. Recommendations for clinicians is to consider the importance of the examination of anemia in patients with TB and provide treatment of anemia.

References

- WHO. Global Tuberculosis Report 2012. Geneva: WHO; 2012
- Loscalzo J, editor. Harrison's pulmonary and critical care medicine. New York: McGraw-Hill Education; 2010.
- Yaranal PJ, Umashankar T, Harish SG. Hematological profile in pulmonary tuberculosis. *Int J Health Rehabil Sci.* 2013;2(1):50-5.
- Isanaka S, Mugusi F, Urassa W, Willett WC, Bosch RJ, Villamor E, et al. Iron deficiency and anemia predict mortality in patients with tuberculosis. *J Nutr.* 2011;142(2):350-7.
- Piso RJ, Kriz K, Desax M-C. Severe isoniazid related sideroblastic anemia. *Hematol Rep.* 2011;3(1):e2.
- Harmening D, editor. Clinical hematology and fundamentals of hemostasis. Philadelphia: FA Davis Co; 2009.
- Al-Omar I, Al-Ashban R, Shah A. Hematological Abnormalities in Saudis suffering from pulmonary tuberculosis and their response to the treatment. *Res J Pharma.* 2009;3(4):78-85.
- Lee SW, Kang YA, Yoon YS, Um SW, Lee SM, Yoo CG, et al. The prevalence and evolution of anemia associated with tuberculosis. *J Korean Med Sci.* 2006;21:1028-32.
- Karoum A, Mohamed B, Siddig M, Bari E. Anemia in Kassala area Eastern Sudan. *Sudan Journal of Medical Sciences.* 2009;4(1):31-5.
- Oliveira M, Delogo K, Oliveira Hd, Ruffino N, Kritski A, Oliveira M. Anemia in hospitalized patients with pulmonary tuberculosis. *J Bras Pneumol.* 2014;40(4):403-10.
- Hungund B, Sangolli S, Bannur H, Malur P, Pilli G, Chavan R, et al. Blood and bone marrow findings in tuberculosis in adults. *Al Ameen J Med Sci.* 2012;5(4):362-366.
- Kumar S, Singh U, Saxena MK, Saxena R. Hematological and biochemical abnormalities in case of pulmonary tuberculosis patients in malwa region. *IJBPS.* 2013;3(3):237-41.
- Muhammad A, Sianipar O. Determination of iron deficiency in chronic disease anemia by the role of sTfR-F index. *Indonesian Journal of Clinical Pathology and Medical Laboratory.* 2005;12(1):9-15.
- Weiss G, Goodnough LT. Anemia of chronic disease. *N Engl J Med.* 2005;352(10):1011-23.
- Atomsa D, Abebe G, Sewunet T. Immunological markers and hematological parameters among newly diagnosed tuberculosis patients at Jimma University Specialized Hospital. *Ethiop J Health Sci.* 2014;24(4):311-8.