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.
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.

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 (31.2%) 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>
<thead>
<tr>
<th>Table 1 Characteristics of Adult Lung TB Patients</th>
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<tbody>
<tr>
<td>Characteristics</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Age (year)</td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Body Mass Index (m/kg2)</td>
</tr>
<tr>
<td>Mean</td>
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<table>
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<tr>
<th>Table 2 Frequency Distribution of Anemia in Adult Lung TB Patients</th>
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<tbody>
<tr>
<td>Gender</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>
The most classification of anemia in women was hypochromic micrositer, whereas, the most in men was normokrom normositer and hypochromic micrositer (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. in 2013 showed that anemia in TB patients occurred in as high as 74% of cases. Lee et al. 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. 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. 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. 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. 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., 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. 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. 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 3 Anemia Description in Adult Lung TB Patients

<table>
<thead>
<tr>
<th>Anemia Type</th>
<th>Male n=14</th>
<th>Female n=17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normochromic normocytic</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Hypochromic microcytic</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Normochromic microcytic</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Hypochromic normocytic</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Anemia Type</th>
<th>Mild</th>
<th>Moderate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normochromic normocytic</td>
<td>6</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Hypochromic microcytic</td>
<td>4</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>Macrocytic</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Normochromic microcytic</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Hypochromic normocytic</td>
<td>5</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>13</td>
<td>31</td>
</tr>
</tbody>
</table>
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.

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