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ORIGINAL RESEARCH

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## THE EFFECT OF MORINGA OLEIFERA LEAVES ON CHANGE IN BLOOD PROFILE IN POSTPARTUM MOTHERS

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### ABSTRACT

**Background:** Postpartum anemia among mothers is a health problem in Indonesia. Consuming moringa oleifera is assumed as one of the efforts to deal with anemia. However, lack of the study conducted in the working in the working area of Health Center of Tlogosari Wetan, Indonesia.

**Objective:** This study was conducted to examine the effect of moringa oleifera on blood profile in postpartum mothers.

**Methods:** The study was quasi-experimental study with pretest posttest control group design. The sample in this study were all postpartum mothers in the working area of the Health Center of Tlogosari Wetan. It was 30 respondents selected by purposive sampling, divided into intervention group (15 respondents) who received moringa leaf capsule and iron tablet, and control group (15 respondents) were given iron tablet. Data were analyzed using Independent t-test.

**Results:** Findings showed a significant difference in the mean of hemoglobin level (intervention group 11.9467; control group 11.0600), hematocrit (intervention group 38.3867; control group 33.8133), thrombocyte (intervention group 3.02536; control group 2.35805), and erythrocyte (intervention group 4.30137; control group 3.78206) with p-value < 0.05.

**Conclusion:** there was a significant effect of moringa oleifera on changes in blood profile (hemoglobin, hematocrit, erythrocyte, thrombocyte) in postpartum mothers in the working area of the Health Center of Tlogosari Wetan. Thus, it is suggested that moringa leaves could be used to prevent anemia in postpartum mothers.

**Keywords:** moringa oleifera, blood profile, postpartum mothers

## INTRODUCTION

Postpartum anemia among women is a medical condition in which the number of red blood cells or the hemoglobin is less than 11gr/dL.<sup>1</sup> Hemoglobin is the oxygen-carrying substance in red blood cells with normal levels 12-16gr/dL.<sup>2</sup> Physiologically, anemia occurs when there is a shortage of hemoglobin to carry oxygen to tissues. A decrease in hemoglobin concentration is due to disruption of the formation of red blood cells due to the low levels of iron in the blood.<sup>2</sup>

Maternal iron deficiency will cause the difficulties in caring for the baby and affect the emotional relationship between mother and baby, increase prevalence of shortness of breath, fatigue, palpitations, slow involution of the uterus, and lack of breast milk production.<sup>3</sup>

Based on the data in the Health Center (Puskesmas) of Tlogosari Wetan, there were three cases of maternal death in 2014.<sup>4</sup> High mortality in maternal mothers during postpartum was 54.55%, followed by the time of delivery.<sup>4</sup> The cause of this condition was that lack of hemoglobin check postpartum that led to the high case of anemia in postpartum women in the working area of this health center.<sup>4</sup>

Efforts in meeting the needs of iron, postpartum mothers took iron supplements. Provision of iron tablet in postpartum mothers was recommended up to 40 days after delivery.<sup>4</sup> The body's response to administration of iron tablet was observed through the improvement of hemoglobin values with an increase of at least 0.3 g/dL.<sup>4</sup> But in fact the iron tablet consumption cannot increase the overall levels of blood profile, thus it needed the support nutrition to up the iron level.<sup>5</sup>

One alternative in fulfilling the need for iron in postpartum mothers is eating vegetables or herbs that contains high levels of iron in the diet.<sup>5</sup> One of the green plants that contain lots of nutrients intake is the moringa plant. Moringa

oleifera or moringa leaf or called "*daun kelor*" in Indonesian term is a good source of nutrients for maternal postpartum. This plant is in addition easily found in all parts of Indonesia, which is also cheap and can be consumed as a food source that has rich proteins, amino acids, minerals and vitamins.

Moringa is well known in Indonesia, especially in rural areas, but not fully utilized in life. In Indonesia, the moringa tree is often planted as a living fence, planted along the edge of the field, serves as the green plants. In addition, moringa plant is also known as an efficacious medicinal plants by utilizing all parts of the moringa plant ranging from leaves, bark, seeds, up to the root.<sup>6</sup>

Today, moringa leaves have been extracted in the form of powder or capsule, which was used in this study. The content of moringa leaf capsule was 205.0 g of protein, 38.2 g of carbohydrates, 2003.0 mg of calcium, 368.0 mg of magnesium, 204 mg of phosphorus, 1324.0 mg of potassium, 28.3 mg of iron, 16.3 mg of vitamin A, 2.6 mg of vitamin B1, 20.5 of B2, 8.2 mg of vitamin B3, 17.3 mg of vitamin C, 113.0 mg of vitamin E, 1325 mg of arginine, 613 mg of histidine, 1325 mg of lysine, 425 mg of tryptophan, 1388 mg of phenylalanine, 350 mg of methionine, 1188 mg of threonine, 1950 mg of leucine, 825 mg of isoleucine, and 1063 mg of valine.<sup>6</sup>

Another study also mentioned that moringa provide 7 times more vitamin C than oranges, 10 times more vitamin A than carrots, 17 times more calcium than milk, 9 times more protein than yoghurt, 15 times more potassium than bananas and 25 times more iron than spinach.<sup>7</sup>

Research had been conducted to see the effect of moringa leaf to increase the level of hemoglobin in adolescents and it proved effective.<sup>8</sup> However, little is known about its effect in postpartum mothers. Thus, this study aims to examine

the effect of moringa oleifera on changes in blood profile in postpartum mothers.

## **METHODS**

### *Design*

This study employed a quasi-experimental design with pretest-posttest with control group. Independent variable in this study was moringa oleifera, and dependent variable was blood profile in postpartum mothers (hemoglobin, hematocrit, erythrocytes, and thrombocytes).

### *Setting*

The study was conducted in the working area of the Health Center of Tlogosari Wetan Indonesia in November 2016 – January 2017.

### *Target population and sample*

The target population in this study was postpartum mothers, both primipara and multipara. Purposive sampling was used in this study to recruit 30 respondents, which divided into two groups: 1) intervention group (15 respondents), and 2) control group (15 respondents). The inclusion criteria of sample in this study included: the first day postpartum mother, not currently taking herbal medicine, aged 20 - 35, and willing to become respondents. The exclusion criteria were postpartum mother who was ill and had complication disease (infection).

### *Intervention*

Both intervention and control group received standard health education about nutrition during postpartum and iron tablet provided by the researchers. But for this study, the intervention group was also given moringa oleifera capsules with dose 250 x 2 mg per day for 14 days. The 250 mg capsule was made by Faculty of

Biochemistry, University of Diponegoro. The powder of moringa plant was taken from the Company of Moringa, Indonesia.

### *Instrument*

Blood profile in postpartum mothers was checked in the laboratory before and after the intervention. The researchers also provided the observation sheet for the respondents to check the time when they consumed the capsules.

### *Data analysis*

Independent t-test was used in this study because the data were in normal distribution and homogeneous. Independent t-test is a comparative test to determine the differences between the two groups.

### *Ethical consideration*

Ethical consideration was obtained from the Health Ministry Polytechnic Semarang with Ethical Clearance Number. 253/KEP/POLTEKES-Smg/ EC/ 2016. Study permission also obtained from the Health Department of Semarang. Before data collection, informed consent was performed to the respondents. Maintaining the confidentiality was the important thing in this study, and respondents could withdraw anytime they wanted to.

## **RESULTS**

Table 1 shows that the characteristics of the respondents in the intervention and control group were similar, which the mean age of the intervention group was 26.4 and 26.7 in the control group. The number of primipara and multipara in both groups were also the same, and the nutritional status had no much difference with mean 25.2533 in the intervention group and 25.0533 in the control group.

**Table 1** Characteristics of the respondents (n = 30)

Variable	Groups	
	Intervention	Control
Age		
Mean ± SD	26.4 ± 4.61	26.7 ± 3.52
Median (Min-Max)	20-33	20-31
Gravida	n (%)	n (%)
Primipara	3 (10.0%)	3 (10.0%)
Multipara	12 (40.0%)	12 (40.0%)
Nutritional status (IMT)		
Mean ± SD	25.2533± 22.30	25.0533 ± 3.09097
Median (Min-Max)	22.30-27.70	22.30-30.00

**Table 2** The mean difference of the effect of moringa oleifera in blood profile in the intervention and control group (Pretest)

Pretest	Group	Mean ± SD	p-value
Hemoglobin	Intervention	10.8933±0.96693	0.873
	Control	10.9000±1.26604	
Hematocrit	Intervention	31.5667±4.93452	0.380
	Control	33.3000±5.67488	
Thrombocyte	Intervention	1.30675±7.53484	0.784
	Control	2.23005±76715.7	
Erythrocyte	Intervention	3.44536±6.91815	0.460
	Control	3.66006±8.67365	

Table 2 shows that there was no significant difference of the levels of hemoglobin, hematocrit, thrombocyte, and erythrocyte between the intervention and

control group with p-value > 0.05. So, it was a very good point to start the treatment.

**Table 3** The mean difference of the effect of moringa oleifera in blood profile in the intervention and control group (Posttest)

Posttest	Group	Mean±SD	p-value
Hemoglobin	Intervention	11.9467±1.77907	0.034
	Control	11.0600±1.30865	
Hematocrit	Intervention	38.3867±1.14759	0.002
	Control	33.8133 ±4.83142	
Thrombocyte	Intervention	3.02536±3.00005	0.008
	Control	2.35805±798983.4	
Erythrocyte	Intervention	4.30137±3.95675	0.017
	Control	3.78206 ±8.04105	

As shown in the table 3, it was revealed that there was a significant difference in the mean of hemoglobin level between the intervention (11.9467) and control group (11.0600) with p-value (0.034). The significant differences were also in the hematocrit (Intervention group 38.3867; Control group 33.8133), thrombocyte (intervention group 3.02536; control

group 2.35805), and erythrocyte (intervention group 4.30137; control group 3.78206) with p-value < 0.05, which indicated that there were significant effects of moringa oleifera in the levels of hemoglobin, hematocrit, thrombocyte, and erythrocyte.

## DISCUSSION

The finding of this study showed that there was a significant effect of moringa oleifera capsule on blood profile in postpartum mothers. The capsule was given in dose 250x2 per day for 14 days. This is in line with the study said that moringa leaf can meet a woman's daily iron and calcium requirements, during pregnancy.<sup>9</sup> Supported by Idohou who explained that after administration of Moringa leaf powder, the average concentration of hemoglobin levels was significantly increased.<sup>8</sup>

The increase of blood due to the high nutrient content in the leaves of moringa particularly iron (60.8 mg of iron in 100 grams of moringa leaves)<sup>10</sup> and vitamin C that could help the absorption of iron in the body. While non-haem iron is absorbed in the intestine duodenum and jejunum, then dissolved in the stomach, and converted from ferric iron into ferro with the help of vitamin C, and then carried by the blood plasma to the bone marrow. In the bone marrow, iron is used to make hemoglobin, which is part of the red blood cells. The rest of the iron is stored in the liver, bone marrow, spleen and muscle.<sup>11</sup>

Another blood profile measured in this study was hematocrit. Hematocrit or packed cell volume (PCV) is the percentage of red blood cells to total blood volume.<sup>12</sup> A hematocrit value is proportional to the number of erythrocytes and hemoglobin concentration. Hematocrit value changes due to an increase in plasma water (hemodilution) or a decrease in plasma water (hemoconcentration) without entirely affecting cell number.<sup>12</sup> Hematocrit values are also influenced by the ambient temperature can be increased if the state of hypoxia or polycythemia (the number of red cells in the body increases) so that the red cell count is more than the normal amount.<sup>13</sup> Additionally, increased hematocrit value

is affected by high levels of hemoglobin, which is able to increase the volume of erythrocytes.<sup>13</sup> It may also be affected by high levels of hemoglobin, which is able to increase the volume of eritrosit. However, the use of moringa leaf capsule in this study was proven to be able to improve the hematocrit value to the normal range.

Moringa oleifera also had an effect on erythrocyte in this study. Based on literature, erythrocyte formation is influenced by vitamin B12, folic acid, iron, protein, glycoprotein hormones (hormone-forming erythrocytes), and oxygen.<sup>14</sup> However, in this study moringa leaf content such as iron, vitamin A, vitamin C, vitamin K, vitamin B6, thiamine, riboflavin, flavonoid, and protein that have a role in the formation of erythrocytes that can increase hemoglobin levels in the blood.<sup>6</sup> So, thiamine and riboflavin also have functions in the formation and maturation of red blood cells, while protein in the leaves of Moringa acts as a shaper of erythrocytes. Vitamin A, C, K, and B6 also have roles in the formation of erythrocytes in the blood, especially in the formation of hemoglobin. Like according to literature said that the factors that may affect the formation of erythrocytes are protein, vitamin B2, B12, and folic acid.<sup>14</sup>

Thrombocyte profile in this study was also increased after given the intervention. It could be explained that the flavonoid in the moringa leaves had an influence to the thrombocyte, as literature said that the increase of thrombocyte profile in the blood is related to the effect of moringa leaves. The chemical structure of flavonoids determine the biological activity, bioavailability and physiological effects.<sup>15</sup> Hyaluronic acid which does not decompose will be associated with the CD4 receptor and stimulate the release of IL-6, IL-6 that will further stimulate the proliferation and speed up maturation of

megakaryocytes, thus increases thrombocyte production in the blood.<sup>16</sup>

## CONCLUSION

Based on the findings of this study, it could be concluded that there was a significant effect of moringa oleifera on changes in blood profile (hemoglobin, hematocrit, erythrocyte, and thrombocyte) in postpartum mothers in the working area of the Health Center of Tlogosari Wetan. Thus, it is suggested that moringa leaves could be used as an alternative treatment for midwives to prevent anemia in postpartum mothers, and can be a part of traditional medicine study in midwifery education.

## Declaration of Conflicting Interest

None declared.

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## Authorship Contribution

Authors have equal contribution in this study.

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