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by Amelia Donsu

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Moringa oleifera Teabags Increase Hemoglobin in Adolescent Females

Gusti Ayu Tirtawati*, Kusmiyati Kusmiyati, Atik Purwandari, Amelia Donsu, Martha Korompis, Wahyuni Wahyuni, Fonnie Kuhu, Femmy Keintjem, Sjenny Tuju, Robin Rompas, Agnes Montolalu

Department of Midwifery, Poltekkes Kemenkes Manado, Manado, North Sulawesi, Indonesia

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***Correspondence:** Gusti Ayu Tirtawati, Poltekkes Kemenkes Manado, Manado, North Sulawesi, Indonesia. E-mail: tirtagustiayu@gmail.com
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Abstract

AIM: The study aims to determine the effect of *Moringa oleifera* teabags on increased Hemoglobin (Hb) in adolescent girls.

METHODS: The research method used in this research was a pre-post-test one group design, a research design to determine the cause and effect or effect of an intervention. The treatment was carried out by giving *M. oleifera* teabags 2 times. Specifically, one sachet (3 g) in the morning and one sachet (3 g) in the afternoon, dipped in 250 ml hot water, and added two teaspoons granulated sugar. The treatment was given for 30 days.

RESULTS: An increase in the average of Hb (mean) before the intervention was 10.71 g/dl. After 15 days of the intervention, it was 11.03 g/dl. Subsequently, after 30 days of intervention, the average Hb value (mean) was 11.63 g/dl, then the p-value ≤ α, which was 0.000 ($p < 0.05$), and these results indicated a significant difference between Hb before and after the intervention.

CONCLUSION: There was a significant difference between Hb before and after the intervention, meaning that there was an effect of *Moringa* leaf teabags on the increase in Hb in adolescent females.

Introduction

Adolescents are undergoing various transitional period changes, both from a biological, psychosocial, intellectual, and economic perspective [1]. This change makes adolescents vulnerable to nutritional problems because they are experiencing rapid growth [2]. Their activities are increasing so that they require more energy and nutrients. Therefore, it deserves special attention because it affects the growth and development of the body and adulthood's current and future health.

A nutritional problem that is often experienced by adolescents is anemia. Anemia can reduce the body's resistance so that it is susceptible to disease; reduce activity and fitness, thereby hindering youth achievement and productivity [3]. Anemia often affects young women than men [4]. It is due to stress, menstruation, or eating late [5].

One of the efforts to overcome anemia in adolescent girls is to increase the intake of nutrients from local foods to meet their nutritional needs, such as *Moringa oleifera* leaves [6]. *M. oleifera* leaves are known to have various kinds of nutritional content, that is, iron, protein, Vitamin A, Vitamin C, potassium, calcium, and antioxidants [7]. *Moringa* leaves contain higher iron than other vegetables, about 26 mg/100 g [8].

Several other studies have also shown that giving *Moringa* leaves in tea to anemic adolescents is considered high effectiveness [9], [10]. Therefore, this study aims to determine the effect of *M. oleifera* teabags on increased hemoglobin (Hb) in adolescent girls.

Methods

The research method used in this research was a pre-post-test one group design, a research design to determine the cause and effect or effect of an intervention/treatment. The pre- and post-test was conducted in one group, involving about 100 female adolescents. The treatment was carried out by giving *M. oleifera* teabags 2 times. Specifically, one sachet (3 g) in the morning and one sachet (3 g) in the afternoon, dipped in 250 ml hot water, and added two teaspoons granulated sugar. The treatment was given for 30 days.

Data analysis was Paired t-test with a significant level of $p < 0.05$ and used SPSS. The protocol of this study had been approved by the Ethical Committee of Manado Health Polytechnic Ministry of Health (No. KEPK.01/04/025/2020).

Results

Univariate analysis

Table 1 shows that adolescent women involved in this study were mostly 15 years old (42.5%), and the rests were 14 years old (39.0%) and 13 years old (19.0%).

Based on Hb, Table 1 also shows that 25 respondents (25.0%) before the intervention were in anemia, and 75 (75.0%) were not in anemia. It changed after the 15 days intervention, about 12 respondents (12.0%) were anemic, and about 88 respondents (88.0%) did not experience anemia. Interventions continued for 30 days and showed a significant change. It appeared that there was no anemia in adolescent girls (100%) after 30 days of intervention.

Table 1: Respondent Characteristics (n=100)

Characteristics	n	%
Ages		
13 years	19	19.0
14 years	39	39.0
15 years	42	42.0
Hb		
Before intervention		
Anemia	25	25.0
Non-anemia	75	75.0
After intervention (15 days)		
Anemia	12	12.0
Non-Anemia	88	88.0
After intervention (30 days)		
Anemia	0	100.0
Non-anemia	100	100.0

Hb: Hemoglobin.

Bivariate analysis

Table 2 shows an increase in the average of Hb (mean) before the intervention was 10.71 g/dl. After 15 days of the intervention, it was 11.03 g/dl. Subsequently, after 30 days of intervention, the average Hb value (mean) was 11.63 g/dl, then the p-value $\leq \alpha$, which was 0.000 ($p < 0.05$), and these results indicated a significant difference between Hb before and after the intervention.

Table 2: Differences in Hb before and after the intervention

Hb	Mean	SD	95% confidence interval of the difference		p-value
			Lower	Upper	
Before intervention	10.71	1.04469	8.40	12.60	0.000*
After 15 days intervention	11.03	1.05282	9.30	12.80	
After 30 days intervention	11.63	0.89498	9.80	13.00	

Hb: Hemoglobin.

Discussion

One of the preventions of anemia in young women is to utilize local plants in the community, such as *M. oleifera* leaves. *Moringa* leaves contain high enough iron and vitamins suitable for improving Hb function [11]. Hb in blood cells functions to bind oxygen, oxygen bound, and carried by Hb in red blood cells. Oxygen supply to various places throughout the body will also be achieved, reducing the risk of ischemia, leading to dysmenorrhea in anemic adolescent [12], [13].

This study uses *Moringa* leaves packaged in tea bags, making it easy to consume, more safety, and increase shelf life. The results showed that according to Hb, about 88 (88%) female adolescents after 15 days of intervention were not anemic while those experiencing anemia had decreased, were 12 respondents (12%). Even after 30 days of intervention, there was a significant increase; about 100 respondents (100%) were not anemic. Before the increase in Hb mean before the intervention was 10.71 g/dl. After 15 days of intervention, the average Hb was 11.03 g/dl. After 30 days of intervention, the average was 11.63 g/dl with p-value $< \alpha$, which was 0.000 ($p < 0.05$). These results indicated there was a significant difference between Hb before and after the intervention.

Consuming *Moringa* leaf extract can increase Hb levels in the blood [14]. *Moringa* leaf extract is suitable for adolescent girls, especially those with anemia [15]. When anemia occurs, there is an increase in iron absorption due to high demand. There is an increase after intervention in giving *Moringa* leaf extract contains iron and Vitamin C, which can help iron absorption. Based on laboratory analysis results, the nutritional composition of *Moringa* leaf extract (Sulawesi varieties) includes 25.25% protein, 91.72 mg iron, 33.991.51 ug Vitamin A, 1125.71 mg Vitamin C, and 3.34% Vitamin E in every 100 g of material. *Moringa* leaves contain 773 mg of Vitamin C for every 100 g of dry matter.

Various studies have also stated that *M. oleifera* leaves have various kinds of nutritional content easily digested by the human body. Some of them are iron, protein, Vitamin A, Vitamin C, potassium, calcium, and antioxidants. *Moringa* leaves contain higher iron than other vegetables, which is 26 mg/100 g. The iron (Fe) content in dried *Moringa* leaves or *Moringa* leaf flour is equivalent to 25 times higher than spinach [7], [16].

Moringa leaves have considerable potential for nutrients, various macro and micronutrients, and active ingredients act as antioxidants. Furthermore, it contains essential nutrients such as 28.2 mg Fe, 2003.0 mg calcium, and 16.3 mg Vitamin A. Other nutrients include protein, C, Vitamin D, Vitamin E, Vitamin K, and Vitamin B (thiamine, riboflavin, niacin, pantothenic acid, biotin, Vitamin B6, Vitamin B12, and folate). The Vitamin C content in *Moringa* leaf extract also facilitates

iron absorption [14]. *Moringa* is also used as the main ingredient in hundreds of medicines, both for prevention and treatment [17].

Based on various studies, tea in *Moringa* leaves is very nutritious, and nutritionists and dietitians have recognized its benefits. Moringa leaf tea's recommended dose is 5 g/day, about one tea bag (2.5 g) in the morning, and one tea bag in the evening. The use of *Moringa* leaf dosages is adjusted to research considerations safe for consumption by young women. However, this Moringa leaf tea can be a source of oxidants, anti-inflammatory, and high nutrients [18].

Hundred grams of *Moringa* powder contain many amino acids that can help prevent the polymerization process and iron precipitation. Furthermore, *Moringa* contains ascorbic acid, a potent iron absorption stimulant. It functions as a reducing agent, converts ferries into ferrous oxide, maintains intestinal pH, and preventing iron precipitation. Besides, it may act as a chelator to forms iron-ascorbate; make it more easily absorbed by the body.

Moringa leaves are useful for anemic patients in low and relatively high doses. The significant increase in the number of red blood cells (erythrocytes) and white blood cells (leukocytes) with *Moringa* leaves' treatment shows that it is suitable as a dietary supplement and a drug for anemia patients [19].

Conclusion

Hb before the intervention was 10.71 g/dl on average. Hb levels after 15 days of the intervention were 11.03 g/dl on average, with an increase of 0.32 g/dl. After 30 days of intervention, the average Hb average was 11.63 g/dl, with an increase of 0.6 g/dl from the first intervention (15 days intervention) and an increase of 0.92 g/dl from before the intervention (0 days). There was a significant difference between Hb before and after the intervention, meaning that there was an effect of *Moringa* leaf teabags on the increase in Hb in adolescent girls. It is expected that young female is drinking *Moringa* leaf teabags diligently to prevent anemia.

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PAGE 1

PAGE 2

PAGE 3

PAGE 4