



Physical activity in affecting hemoglobin changes (Hb) in adolescent females received *Moringa oleifera* (MO) supplementation in Jeneponto[☆]



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KEYWORDS

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Abstract

Objective: This study aimed to investigate the role of physical activity in the Hb level of adolescent girls who previously supplemented with the *Moringa oleifera* (MO) powder in Jeneponto District.

Method: This study was a quasi-experiment study with pre- and post-test control group design. It was conducted in four (4) senior high schools in Tamalate subdistrict, where anemia among adolescent girls is more prevalent compared to other subdistricts. Senior High School no 2, Babussalam DDI Kassi School, Vocational High School of Persada and Islamic High School of Darul I'tisham were purposively selected representing the public and private school in Jeneponto Regency. A total of 48 respondents divided into two groups, MO group (receiving MO powder with 2 × 2 of 500 mg capsule) and control group (without treatment), were observed for three months. Hb samples were collected twice with Finger Prick method using HemoCue. Mann-Whitney and Wilcoxon test were performed to analyze the result.

Results: There was no difference in characteristic variables between the treatment and the control group. This study shows that the average percentage of nutrient intakes was varied across the type of nutrients. The lowest was protein intake (1.85%) while the highest was vitamin A (27.22%). Linear regression analysis shows that physical activity did not change Hb levels ($p = 0.11$) with R^2 was 0.054.

Conclusion: In summary, it was found that physical activity did not significantly affect Hb changes, as this factor only has a small contribution. Intensive monitoring and observation should be promoted to keep the students doing physical activity. Thus, they maybe protected to the risk of anemia.

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Introduction

Adolescence is one of the crucial phases in the life cycle determining human health. This phase is the transition from childhood to adulthood, which signed with various physiological and psychological changes. In this period, nutrition needs are increased because of an increase in the number and size of body cell tissue, changing body composition (weight and height).¹ Anemia, as the major problem in pregnant women,² is also found to be a problem for adolescent females.³ In 2013, according to the national reports of Basic Health Research (Riskesdas), the prevalence of anemia among children (5–14 years) and adolescent (15–25 years) were 26.4% and 18.4%, respectively.⁴ The impact of the incidence of anemia in adolescents can reduce concentration and learning achievement and affect productivity among adolescents.⁵ As a result of the prolonged effect of iron deficiency anemia, young women who will later become pregnant are unable to fulfill the nutrients in themselves and their fetus. Thus, the risk of maternal death, delivery prematurely, having LBW babies, and perinatal death are increased.⁶

Moringa oleifera leaves (MO) is a nutrient-sources food that can help increase hemoglobin (Hb) levels as this food contains various nutrients including nitrogen, phosphorus, potassium, iron (Fe), manganese, zinc, and copper.⁷ It is confirmed that *Moringa* leaves contain high amounts of vitamin A, vitamin C, vitamin B, calcium, potassium, iron, and proteins as antioxidants, which are easily digested and assimilated by the human body.⁸

In addition to the important of iron-sources foods for adolescent females, physical activity is also essential for

the future health of adolescents. Sufficient physical activity is associated with well-being and better cognitive performance.⁹ A study reports that children with sickle anemia presented a lower level of physical activity compared to healthy children,¹⁰ indicating that physical activity may affect Hb fluctuation in the human body. Therefore, this study aimed to investigate the effect of physical activity on Hb changes in the population supplemented with MO leaves.

Method

This study was a quasi-experiment with pre- and post-test control group design conducted in senior high school of Babussalam DDI, Jeneponto, Indonesia. Data collection was conducted from January to March 2018. The population of this study was adolescent females with dysmenorrhea in Tamalatea sub-district, Jeneponto. A total of 48 students were observed and divided into two groups, intervention (24 students) and control (24 students) groups. Sampling method was purposive sampling. Data were collected using questionnaires and interview methods. Chi-square, Mann-Whitney *U* test, and Wilcoxon test were used for data analysis.

Results

Table 1 shows the characteristic of respondents. There was no difference in characteristic variables between the treatment and the control group.

Table 2 shows that physical activity does not affect Hb levels ($p=0.111$). The R^2 value was 0.054 (Table 2), indicating that the contribution of the physical activity on Hb levels

Table 1 Characteristics of respondents.

Characteristics	Intervention		Control		p-value
	n	%	n	%	
<i>Age</i>					
15 years	4	30.8	9	69.2	0.103 ^a
16 years	10	47.6	11	52.4	
17 years	10	72.4	4	28.6	
<i>Father's education</i>					
Low	12	54.5	10	45.5	0.772 ^b
High	12	46.2	14	53.8	
<i>Mother's education</i>					
Low	15	50	15	50	1.000 ^b
High	9	50	9	50	
<i>Family income</i>					
Low	22	57.9	16	42.1	0.076 ^b
High	2	20.0	8	80.0	
<i>Nutritional status</i>					
Lean	8	50.0	8	50.0	0.800 ^a
Normal	14	48.3	15	51.7	
Overweight	2	66.7	1	33.3	
<i>Total</i>	24	50.0	24	50.0	

^a Mann-Whitney test.

^b Chi-square test.

Table 2 The effect of physical activity on Hb change.

Variable	Standardized coefficient beta	<i>p</i>	<i>R</i> ²
Constant	–	0.000	
Physical activity	–0.233	0.111	0.054 ^a

^a Linear regression.

was only 5.4%, while the rest were contributed from other variables, which were not included in the analysis.

Discussion

It is indicated that respondents of this study between treatment and control groups were homogenous, meeting the requirements for group matching. The finding of this study revealed that physical activity only had a small contribution to the Hb level of adolescent females. It is mostly influenced by other factors which are not observed in this study. Theoretically, however, physical activity can affect Hb levels through its role in the metabolic process.¹¹ The optimum physical activity can lead to an imbalance between free radical production and the body's antioxidant defense system, known as oxidative stress. In conditions of oxidative stress, free radicals will cause cell membrane lipid peroxidation and damage the cell membrane organization. Cell membrane lipid peroxidation facilitates erythrocyte cells to experience hemolysis. Hemolysis occurring in the erythrocyte membrane can promote the hemoglobin to be released and ultimately causes a decrease in Hb levels.¹²

The findings of this study are in agreement with a study that shows that students who have good hemoglobin levels (15.10 g/dl) tend to physically active. Conversely, less active students tend to have low hemoglobin levels (9.50 g/dl), although the statistical results do not show significant differences. Thus, it can be concluded that there is no significant relationship between physical activity and hemoglobin levels.¹³ Also, it is in line with a study showing that there was no significant relationship between physical activity and hemoglobin levels, although the samples of this study were adults women.¹⁴ Similarly, finding by Wibowo and Ponco revealed that there is no significant difference between iron levels after the heavy intensity of physical activity exercise.¹⁵

Small influence of physical activity may be due to all samples were females in which this group are likely to have low physical activity. WHO reports that many youth girls are less active than boys, while the importance of physical activity is applied for both.¹⁶ Physical activity among adolescent girls may be influenced by many factors which unlikely affects those of adolescent male. According to a study, five interrelated aspects identified influence physical activity participation among adolescent females, including the presence of friends, good or not good enough, fun or not fun, feeling good, and peer support.¹⁷ Individuals who routinely exercise their hemoglobin levels will rise. This is because the network or cell will need more oxygen when doing activities.^{14,18} During exercise, the demand for oxygen is higher due to the oxygen is bound by hemoglobin forming an oxy-hemoglobin binding. However, some people may have

normal Hb, despite a lack of physical activity. It is probably due to other factors that may influence Hb levels, despite the determination of physical exercise.¹⁸

Conclusion

In conclusion, it was found that physical activity did not significantly affect Hb changes, as this factor only has a small contribution. Intensive monitoring and observation should be promoted to keep the students doing physical activity. Thus, they may be protected to the risk of anemia. Further study is necessary aiming to investigate the gender-specific effect of physical activity on Hb levels.

Conflict of interest

The authors declare no conflict of interest.

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