

Intervention of Giving Moringa Biscuits (*Moringa Oleifera*) Mix Sori Fish Flour to Increased Blood Hemoglobin Levels in Young Girls, Kendari, INDONESIA

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ABSTRACT

Adolescents are the next generation and national development assets, one of the nutritional problems in adolescents is anemia, namely the lack of hemoglobin levels below normal (12 mg/dl). Efforts to deal with anemia are making food in the form of Moringa biscuits and sori fish which are rich in nutrients. The purpose of this study was to determine the effect of giving Moringa mixed sori biscuits on blood hemoglobin levels in adolescents. The type of research is a quasi-experimental conducted in June-September 2021 at Coastal Region Public Middle Schools throughout Kendari City in 2021, namely at SMPN 4 Kendari, SMPN 5 Kendari, SMPN 10 Kendari, SMPN 15 Kendari and SMPN 16 Kendari. The sample is anemic adolescent girls in the coastal area of Kendari City. The intervention sample was anemic adolescent girls who were given moringa biscuits mixed with sori fish flour as many as 36 people and the control sample was anemic adolescent girls who were not given moringa biscuits mixed with sori fish flour as many as 36 people. The case sampling technique used cluster random sampling and the control sample used matching. Data collection of blood hemoglobin levels using a portable device brand Easy Touch Meter. Data were analyzed using independent t-test test. The results of the study found blood hemoglobin levels before and after Moringa biscuits were given, namely in the case group before the intervention the average Hb level reached 10.51 mg/dl and after the intervention it reached 12.45 mg/dl, while in the control group before the intervention it was 12.79 mg/dl and after intervention 13.49 mg/dl. The results of the independent t-test obtained p value 0.000. The conclusion is that there is an effect of giving Moringa fish biscuits mixed with Sori fish flour on hemoglobin levels. Suggestions for young women are expected to increase the intake of protein sources of nutrients such as fish, eggs, tofu and tempeh and iron (Fe) which can be obtained from green vegetables such as Moringa to prevent and treat anemia.

Key words: Moringa Biscuits, Sori Fish, Blood Haemoglobin, Adolescents.

BACKGROUND

Nutritional status is one of the factors that greatly determines the quality of Human Resources (HR). Adolescents are a group that is vulnerable to health problems, if the amount of nutrients consumed does not match the body's nutritional needs, it can cause nutritional problems.¹

Iron deficiency anemia is more likely to occur in developing countries than in developed countries. Thirty-six percent (or about 1400 million people) of an estimated population of 38.00 million people in developing countries suffer from iron deficiency anemia, while the prevalence in developed countries is only about 8% (or about 100 million people) of an estimated population of 1200 million. People.²⁻⁵

Young women are one of the groups that are prone to anemia which is the future generation of the nation. The prevalence of anemia in Indonesia according to the 2013 Basic Health Research (Riskesdas) was around 37.1% and increased in the 2018 Riskesdas by 48.9%. Based on the target of the 2015-2019 RPJM, anemia was reduced to 28%.⁶

The results of the 2018 Riskesdas also showed that the proportion of young women who received iron tablets was 76.2% and 23.8% did not receive iron tablets. Then the consumption of blood supplement tablets for female adolescents <52 was 98.6% and >52 tablets was only 1.4%.⁶ Based on data obtained

from the Southeast Sulawesi Provincial Health Office, it can be seen that the coverage of administering iron tablets to young women in Southeast Sulawesi in 2017 was 78.81%, and in 2018 it decreased to 77.35%. Then in 2019 it was 75.35% and 2020 it was 51.03%. While the coverage of iron (Fe) tablets in Kendari City in 2019 was 65.42% and in 2020 it also decreased to 62.8%. This can trigger cases of anemia in young women in Southeast Sulawesi. Kendari City is one of the regions of Southeast Sulawesi with a total working area consisting of 15 Community Health Centers and of course it has the highest target of young women compared to other cities and regencies in Southeast Sulawesi, besides that the Kendari City area also has several coastal areas that have complex health problems including anemia which can be at risk for young women.⁷

Efforts to accelerate the handling of the problem of anemia can be carried out by developing additional food with nutritional standards that can increase immunity for adolescents and processing technology that takes into account the advantages of local food resources.⁸

Moringa leaves are one of the functional food plants that are often found in Kendari City. Moringa leaves contain multi-element micronutrients that are needed by teenagers such as beta carotene, thiamin (B1), riboflavin (B2), niacin (B3), calcium, iron, phosphorus, magnesium, zinc, and vitamin C.⁹ The nutritional content of Moringa leaves will increase in

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quantity if the Moringa leaves are consumed after being dried and made into powder (flour). Another benefit that Moringa leaves have is being able to improve nutritional status.¹⁰

Many previous studies have used additional formulations of Moringa leaves into food products to add nutritional value such as biscuits, soy meatballs, yogurt.¹⁰⁻¹² Processing Moringa leaves into biscuits that are liked by all groups, will increase the use of Moringa leaves in society so that the nutritional content and other benefits found in Moringa leaves can be absorbed by the body. The aim of this study was to analyze the effect of giving moringa biscuits on adolescent blood hemoglobin levels

MATERIALS AND METHOD

Types of research

The type of research used is quasy experimental research.

Location and time of research

This research has been conducted at Coastal Region Public Middle Schools throughout Kendari City in 2021, namely at Kendari 4 Middle School, Kendari 5 Middle School, Kendari 10 Middle School, Kendari 15 Middle School and Kendari 16 Middle School in Southeast Sulawesi. The research was carried out in June-September 2021.

Population and sample

The study population was all adolescents in the coastal area of Kendari City and the sample was anemic young women in the coastal area of Kendari City. The sample consisted of an intervention sample, namely anemic adolescent girls who were given Moringa biscuits mixed with sori fish flour as many as 36 people and a control sample were anemic teenage girls who were not given Moringa mixed fish flour biscuits in the coastal area of Kendari City as many as 36 people. The intervention sample was obtained using cluster random sampling based on adolescents who happened to have anemia during the study, while the control sample was obtained by matching, namely equalizing the age between the intervention group and the case group.

Data collection

The collection of adolescent identity data such as age, education and class were collected by means of interviews using a questionnaire and data on blood hemoglobin levels were obtained by measuring blood specimens using a portable device brand Easy Touch Meter. Prior to conducting the research, screening was first carried out on adolescents to obtain samples with anemia.

The standard hemoglobin for female adolescents is 12 mg/dl, categorized as anemia if Hb <12 mg/dl and normal if Hb level ≥ 12 mg/dl (Hardinsyah *et al.*, 2012). The intervention provided was Moringa biscuits mixed with sori fish flour, the raw materials of which came from local food varieties, Kendari City, Southeast Sulawesi.

Processing and analysis of data

Data processing of blood hemoglobin (Hb) levels was carried out by comparing data on Hb levels before and after being given Moringa biscuits mixed with sori fish flour. The data were processed using the aid of a computer and analyzed descriptively by calculating the distribution of the mean, standard deviation, and the minimum and maximum values of adolescent Hb levels and then bivariate analysis was carried out using an independent t-test to determine the effect of the intervention of fish flour mix moringa biscuits. sorry for the Hb level of young women.

RESULTS

This research was conducted on 36 adolescents who were given Moringa biscuits mixed with sori fish flour and 36 adolescents who

were not given Moringa biscuits mixed with sori fish flour. In terms of age, it can be seen that most of the sample age is 14 years old as much as 44% and a small portion is 13 years old as much as 28%. For more details, it can be seen in the following figure 1.

Figure 1 shows that in the case and control groups the majority were 14 years old, with 15 people each (41.7%) and a small portion aged 15 years, with 10 people each (27.8%).

The results of the study also found the average frequency distribution of female adolescent Hb levels which can be seen in table 1.

Table 1 shows that the average energy consumption Based on the table above, it can be seen that there was an increase in Hb levels in the case and control groups, where in the case group before the intervention the average Hb level reached 10.51 and after the intervention reached 12.45, while in the control group before the intervention 12.79 and after the intervention 13.49%. Based on the Anemia category based on Hb levels, it can be seen in figure 2.

Based on figure 2, it can be seen that in the case group before the intervention 100% experienced anemia and after the intervention the incidence of anemia became 25% and 75% the Hb levels were normal, while in the control group before and after the intervention the Hb levels were in the normal category, namely 100%. The effect of giving Moringa fish biscuits mixed with Sori fish flour on hemoglobin levels was started by carrying out a normality test using Kolmogorov Smirnov with a p value of 0.560 > 0.05 so that the data was normally distributed and continued with an independent t-test which obtained a p value of 0.000, so the hypothesis the alternative is accepted and the null hypothesis is rejected, which means that there is an effect of giving Moringa fish biscuits mixed with Sori fish flour on hemoglobin levels (increase of 1.32 mg/dl). For more details, it can be seen in table 2.

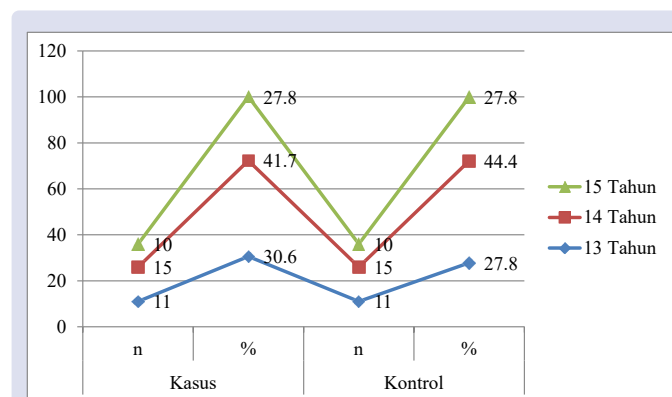


Figure 1: Age distribution of cases and controls

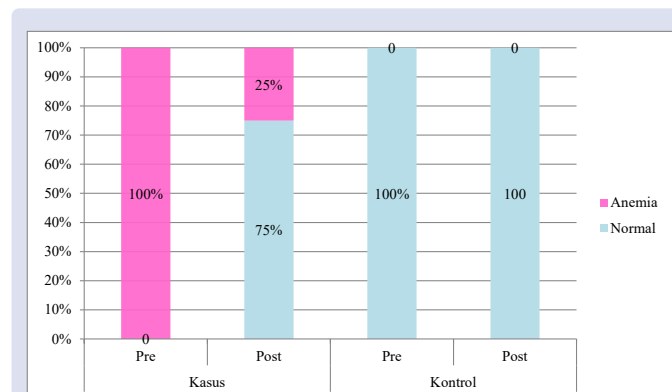


Figure 2: Distribution of anemia incidence

Table 1: Frequency distribution of average Hb levels for young girls.

Sample Group	Intervention	n	Mean	Min	Max	ST.Dev
Cases	Before Intervention (Pre-Test)	36	10.51	7	12	1.694
	After Intervention (Post Test)	36	12.45	10	15	1.247
Control	Before Intervention (Pre-Test)	36	12.79	12	15	.769
	After Intervention (Post Test)	36	13.49	12	15	.788

Table 2: The effect of giving moringa fish biscuits mixed with sori fish flour on hemoglobin level.

Kadar Hb (mg/dl)	n	Mean	Min	Max	p value
Before Intervention (Pre-Test)	72	11.6500	7.00	15.30	0,000
After Intervention (Post Test)	72	12.9708	10.00	15.30	

DISCUSSION

This study found that there was an increase in Hb levels in the case and control groups. after the intervention 13.49%, this shows that in the case group before the intervention 100% experienced anemia and after the intervention the incidence of anemia became 25% and 75% the Hb levels were normal, while in the control group before and after the intervention the Hb levels were in the normal category, namely 100%.

This study showed that the average (mean) Hb level of cases before administration of iron supplement tablets was 10.51 mg/dl mg/dl. When compared with the standard of anemia in young women, it can be seen that before being given blood supplement tablets 100% of the samples experienced anemia. This is because the female adolescent's Hb level is below the standard of 12 mg/dl. The low Hb level is also based on the lack of protein and iron intake for young women, namely the average protein intake before administering iron tablets is 46.85 g, when compared to the protein needs of adolescents aged 13-15 years, the average protein adequacy rate for adolescent's daughter is 65 or so if it is accumulated between intake and adequacy of protein most of the protein intake is a deficit of 95.4%. While the average intake of iron before administering iron tablets was 6.52 mg, where the iron intake indicated that iron intake was still below the standard iron adequacy rate of 15 mg/day. According to the researchers' assumptions, the increase in Hb levels in young women was influenced by the factor of giving Moringa biscuits mixed with sori fish and also accompanied by assistance in the form of monitoring the food intake of young women for 4 times accompanied by providing information about the importance of foods made from moringa and fish in supporting the increase adolescent girls' hemoglobin levels.

This research is in line with the research of Nuraeni et al. (2019)¹³ that after being given Fe tablets, those with mild anemia decreased from 42% to 22.6%, those with moderate anemia decreased from 58% to 42%. Meanwhile, female adolescents who are not anemic have increased to 35.4%. The importance of giving this iron to someone who is experiencing iron deficiency anemia and there is no absorption disorder, then within 7-10 days the level of increase in hemoglobin can occur by 1.4 mg/KgBW/ day.¹⁴ The factors that influence the increase in hemoglobin levels in female adolescents are age, menstrual frequency, nutritional status, diet, type of food consumed, consumption of Fe tablets and physical activity. Another factor that can be known to influence the increase in hemoglobin levels is that female students consume Fe tablets that have been given by researchers for 1 month (30 days) and continue to consume them during menstruation. This can be proven in theory which says that giving these Fe tablets to young women is very beneficial during menstruation, because at that time

iron loss can occur due to bleeding. Because the average menstrual bleeding is 60 ml per month which is the same as 30 mg of iron, so women need one milligram blood supplement tablet per day so that the balance is maintained.¹⁵

This research is confirmed by the rules in the Republic of Indonesia Ministry of Health, (2016)¹⁵ that when taking blood-boosting tablets it is not permissible to eat or drink containing alcohol, tea. Coffee or fruits that contain alcohol such as durian, tape, pineapple, mango because they can reduce the absorption of iron in the body so that the benefits are reduced. To reduce the symptoms of nausea and vomiting, it is the right time to take Fe tablets after dinner or at bedtime.

The results of the independent sample t-test found that there was an effect of giving Moringa fish biscuits mixed with Sori fish flour on hemoglobin levels. According to the researchers' assumptions, this was due to an increase in the average Hb level before and after giving iron tablets. The intervention of giving Moringa biscuits mixed with sori fish flour was carried out for 8 weeks with a frequency of giving 1 time per week and monitoring of protein and Fe intake was carried out 4 times. In addition to increasing Hb levels, it is also supported by an increase in protein and iron intake consumed by young women. According to researchers, giving Moringa mix sori fish biscuits to young women is really needed to meet the body's nutritional needs, especially to increase iron and as an effort to prevent stunting as well as a form for pre-marital preparation, pregnancy.¹⁶

Moringa leaves are one of the functional food plants that are often found in Kendari City. Moringa leaves contain multi-element micronutrients that are needed by teenagers such as beta carotene, thiamin (B1), riboflavin (B2), niacin (B3), calcium, iron, phosphorus, magnesium, zinc, and vitamin C.^{9,17} The nutritional content of Moringa leaves will increase in quantity if the Moringa leaves are consumed after being dried and made into powder (flour). Another benefit that Moringa leaves have is being able to improve nutritional status.¹⁰

Many previous studies have used additional formulations of Moringa leaves into food products to add nutritional value such as biscuits, soy meatballs, yogurt.^{10-12,18} Processing Moringa leaves into biscuits that are liked by all groups, will increase the use of Moringa leaves in society so that the nutritional content and other benefits found in Moringa leaves can be absorbed by the body. This research is in line with Aina's research (2017)¹⁹ which found that there were differences in hemoglobin levels (p = 0.000) in the treatment group before and after the biscuit leaf biscuits. Likewise, Yulni's research (2020)²⁰ which aims to determine the effect of supplements of Moringa oleifera leaf extract (KTR), Moringa leaf extract plus royal jelly (KRJ) and placebo (PLC) on hemoglobin levels in anemic pregnant women. The results of the study found that the average Hb level also increased from each group (mean ± SD): KRJ 10.06 ± 0.75 so 11.42 ± 1.23 P = 0.001, KTR 10.40 ± 0.46 so 11.15 ± 0.90 P = 0.001, and PLC 10.43 ± 0.42 so 11.14 ± 0.88 P = 0.002, so there is no significant difference in the difference in the average increase in Hb levels in the three groups, but there is a tendency for KRJ to be superior to the KTR group and PLC with an increase of 1.36 gr/dl, KTR 0.75 gr/dl and PLC 0.71 gr/dl. So, it was concluded that KRJ was superior to KTR in increasing Hb in anemic pregnant women.

Iron in hemoglobin can leave the body through bleeding, menstruation, and sweat/urine. The rest is taken to other parts of the body that need it and stored as ferritin and hemosiderin proteins in the liver (30%), spinal cord (30%), and the rest in the spleen and muscles (Nawal S, 2014). Foods containing Fe will improve oxygenation in cells for the better, metabolism will increase and cell function will be optimal so that food absorption becomes better. Therefore, low intake of food sources of iron is one of the causes of iron deficiency. When supplies are reduced, more iron is absorbed. Digested iron is converted to ferrous

iron in the stomach and duodenum by plasma transferrin to the bone marrow for hemoglobin synthesis or to tissue storage. An indicator of the success of the program giving biscuits cookies in this study is by looking at the increase in hemoglobin levels in adolescents who have anemia. It can be seen at the end of this study that there was an increase in hemoglobin levels before and after giving sori miz moringa biscuits of 1.56 mg/dl.

CONCLUSIONS AND RECOMMENDATIONS

The conclusion of this study was that the hemoglobin level of the blood before and after being given Moringa biscuits was in the case group before the intervention the average Hb level reached 10.51 mg/dl and after the intervention reached 12.45 mg/dl, while in the control group before the intervention 12, 79 mg/dl and after the intervention 13.49 mg/dl. There is an effect of giving Moringa fish biscuits mixed with Sori fish flour on hemoglobin levels with a p value of 0.000.

This research suggests that female adolescents are expected to be able to increase their intake of protein source nutrients such as fish, eggs, tofu and tempeh and iron (Fe) which can be obtained from green vegetables to prevent and treat anemia, one of which is by consuming moringa or processed products. moringa like moringa biscuits.

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