



Tempe Juice as an Alternative Treatment for Anemia in Adolescent Girls

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ABSTRACT

The highest prevalence of anemia is found in Southeast Asia, with an estimated 60% of children experiencing anemia. Young women are at a higher risk of developing anemia compared to boys. Anemia has a negative impact on adolescents which can cause physical growth, behavioral and emotional disorders. This study aims for this study to see the effect of tempeh spice juice on increasing hemoglobin levels in adolescent girls. The research design was quantitative pre-experiment using the One Group Pre-Test-Post Test design. The research subjects were 30 young women who were included in the inclusion criteria. This study was tested using the statistical paired sample t-test, obtained sig 0.002 < 0.005. The average hemoglobin level before being given tempeh spice juice was 13, 123 and the average hemoglobin level after being given tempeh spice juice was 13, 910. The results of this study have a significant effect on the presentation of tempeh spice juice on the hemoglobin levels of adolescent girls. The results of this study can be used as an alternative in an effort to reduce the prevalence of anemia, with naturally occurring preparations that make it more plausible for young women.

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ABSTRAK

Anemia akibat kekurangan zat gizi besi (Fe) merupakan salah satu masalah gizi utama di Asia termasuk di Indonesia. Prevalensi anemia tertinggi ditemukan di Asia Tenggara dengan perkiraan sekitar 60% anak mengalami anemia. Remaja putri berisiko lebih tinggi terkena anemia dibandingkan dengan remaja laki-laki, Anemia memberikan dampak yang kurang baik bagi remaja ya itu dapat menyebabkan keterlambatan pertumbuhan fisik, gangguan perilaku serta emosional. Tujuan penelitian ini adalah untuk mengetahui pengaruh jus rempah tempeh terhadap peningkatan kadar haemoglobin pada remaja putri. Desain penelitian adalah kuantitatif pre eksperimen dengan menggunakan rancangan One Group Pre-Test-Post Test. Subjek penelitian adalah 30 remaja putri yang termasuk dalam kriteria inklusi. Penelitian ini diuji menggunakan statistic paired sample t-test didapatkan sig 0,002 < 0,005 rata-rata kadar hemoglobin sebelum diberikan jus rempah tempe adalah 13.123 dan rata-rata kadar hemoglobin sesudah diberikan jus rempah tempe adalah 13.910. Hasil penelitian ini terdapat pengaruh yang signifikan pemberian jus rempah tempe terhadap kadar hemoglobin remaja putri. Hasil penelitian ini dapat dijadikan alternative dalam upaya penurunan prevalensi kejadian anemia, dengan olahan khas alami yang membuat rasanya lebih disukai oleh remaja putri.

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Kata kunci:

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INTRODUCTION

Anemia due to deficiency of iron (Fe) is one of the main nutritional problems in Asia, including Indonesia. Among school-age children, the highest prevalence of anemia is found in Southeast Asia, with an estimated 60% of children experiencing anemia (Kusnawati & Rokhanawati, 2016). Anemia is a condition in which the hemoglobin (Hb) level in the blood is lower than normal values. Anemia is very high (range between 80-90%) in preschool children, adolescents, pregnant and lactating women. In India 55.8% of adolescents aged 15-19 are reported to be anemic (Suryani, Hafiani, & Junita, 2017)

According to the World Health Organization (WHO) in 2013, the prevalence of anemia in the world ranges from 40-88%. The 2013 Basic Health Research Data also shows that the prevalence of anemia in Indonesia is 21.7% with anemia sufferers aged 5-14 years of 26.4% and 18.4% of patients aged 15-24 years. This data shows that young women are one of the groups that are prone to suffering from anemia.

Girls are at a higher risk of developing anemia than boys because the first reason is that young girls experience menstrual cycles every month and the second reason is because they have the wrong eating habits. (Masthalina, 2015). Anemia has a bad impact on adolescents, which can cause physical growth delays, behavioral and emotional disorders (Khoirunisa and Nugraheni, 2017).

Signs of anemia in adolescent girls are lethargy, weakness, tiredness, fatigue and neglect (5L), often complaining of dizziness and lightheaded eyes. Further symptoms are pale eyelids, lips, tongue, skin and palms. Meanwhile, the other effects of iron deficiency anemia are low productivity, inhibited mental development and intelligence, decreased immune system, and morbidity (Bakta, 2006). (Utami & Mardiyansih, 2015) Deficiency of micronutrients during adolescence can have a negative impact on the growth and maturity of the reproductive organs (Dea, 2014). Based on Djakaria (2019), it was found that young women who experience anemia during menstruation cause young women to not attend school due to dizziness and weakness.

Seeing the huge impact of anemia in reducing the quality of human resources, it is better if anemia control should be done from an early age, before young women become pregnant women, so that the physical condition of these young women is ready to become healthy mothers. Women experience menstruation every month which means that they lose blood regularly in quite a lot, and also have irregular eating habits, consume risky foods such as fast food, snacks and soft drinks and their high desire to diet to look slim which affects their intake of nutrients including source of Fe (Fikawati, Syafiq, & Nurjuaida, 2016)

Based on data from the Gorontalo Province Health Office in 2018, there are 16 junior high school-level girls who experience anemia in Gorontalo City. Based on the results of research conducted by Yulianingsih (2019) regarding the determinants of the risk factor for anemia, it was found that the number of young women who had anemia in the work area of Puskesmas Kota Selatan Kota Gorontalo was 32% with a total of 94 young women suffering from anemia. (Yulianingsih et al., 2020)

The Indonesian government program that focuses on overcoming anemia among adolescent girls, namely the Iron Nutritional Anemia Prevention and Control Program (PPAGB) with the target of Junior High School (SMP) and Senior High School (SMA) children through the provision of iron capsule

supplementation but it can have side effects, namely nausea vomiting and hard and black stool. In Djakaria's (2019) study, it was found that giving tempeh nuggets can increase hemoglobin levels in girls who are menstruating. Another type of processed tempeh that can treat anemia is tempeh juice. (Arumsari, 2008)

Based on the results of research data and references described above, researchers are interested in developing previous research on Tempe into Processed Tempe Spice Juice using a mixture of spices, namely cinnamon, cloves, Ambon banana. and palm sugar as an alternative in preventing anemia by increasing hemoglobin levels for female adolescents in SMA Negeri Gorontalo City.

METHOD

The subjects in this study were 30 female teenagers who were in SMP Negeri 2 Gorontalo City, using the sampling technique, namely the purposive sampling method. To place the data in accordance with the focus of this research, the researcher determines the research respondents critically as follows: 1). Young women experiencing menstruation 2). There is no history of allergies 3) Teenage girls who want to consume tempeh spice juice.

This type of research is a pre-experimental quantitative research using the One Group Pre-Test-Post Test design. Researchers observed and described the increase in hemoglobin levels in adolescent girls before and after being given tempeh spice juice.

The instruments used in this study were digital scales and measuring cups to measure the independent variables, a checklist sheet to measure the administration of tempeh spice juice and an observation sheet to assess the increase in hemoglobin levels in adolescent girls.

Data analysis in this study was univariate analysis consisting of the age of the respondent, measurement of haemoglobin levels at pretest and posttest, and bivariate analysis, namely to determine the effect of giving tempeh spice juice to increase hemoglobin levels of adolescent girls, using Paired sample t-test.

The research procedure on the first day is that the researcher collects research subjects, gives informed consent and takes hemoglobin measurements (pretest), then gives tempeh spice juice for 3 days, and takes hemoglobin measurements (posttest).

RESULTS AND DISCUSSION

Table 1
Distribution of respondents based on their hemoglobin levels before being given Tempe spice juice

Hemoglobin levels	Frequency	Percentage (%)
<7g/dl	7	23%
8 g/dl	12	40%
9 g/dl	8	27%
10 g/dl	3	10%
Total	30	100%

Based on table data 1. The results showed that there were 7 people with hemoglobin levels <7 g / dl, 12 people with a hemoglobin level of 8 g / dl, a hemoglobin level of 9 g / dl as many as 8 people and a hemoglobin level of 10 g / dl as many as 3 people.

This study is in line with the research conducted by Permatasari (2018) that the prevalence of anemia before supplementation intervention was 20.9% of 172 subjects. The distribution of the prevalence of anemia in moderate level is 11.1% (4 subjects) and anemia in mild level is 88.8% (32 subjects) (Permatasari, Briawan, & Madanijah, 2018).

Based on the WHO classification regarding the level of health problems, the proportion of anemia incidence is included in the category of serious public health problems. The prevalence of anemia in adolescents is quite large because in adolescence there is a rapid growth (growth spurt). During the adolescent period, bone mass increases and bone remodeling occurs; soft tissue, organs, and even the mass of red blood cells increase in size. This growth causes the need for iron to increase dramatically and it is during adolescence that the need for nutrients reaches their highest point (N. Amir, 2019).

Every day humans lose 0.6 mg of iron which is excreted, especially through feces (feces), teenage girls experience menstruation every month with iron loss ± 1.3 mg per day, so they need more iron than men. When the intake of iron as one of these micronutrients is reduced, our bodies will experience a decrease in hemoglobin levels, which we call anemia. Due to the reduced number of red blood cells or the amount of hemoglobin in the red blood cells, the blood cannot carry oxygen in the amount the body needs. Therefore, iron supplementation during menstruation is very necessary (Utami&Mardiyarningsih, 2015)

According to Utami et al (2015), anemia will result in stunted child growth, less muscle cell formation, decreased endurance, reduced achievement, and behavioral changes. (Utami& Mardiyarningsih, 2015). Anemia has an unfavorable impact on adolescents, which can cause physical growth delays, behavioral and emotional disorders, growth and development of the fetus in the womb and has the potential to cause pregnancy and childbirth complications, and even cause maternal and child deaths. (Yulianingsih, 2020).

Table 2
Respondents' Hemoglobin Levels After Intervention

Hemoglobin levels	Frequency	Percentration (%)
8 gr/dl	1	8%
11-12 g/dl	16	123%
12-13 gr/dl	9	69%
> 13 g/dl	4	31%
Total	30	100%

Table 3
Paired Sample T-test

Variable	N	mean	SD	P Value
Hb levels before	30	13,123	2,2624	0.002
Hb levels after	30	13,910	1,5372	

Based on the data in the table 3 shows that the average value of hemoglobin levels before being given tempeh spice juice is 13.123 and the average hemoglobin level after being given tempeh spice juice is 13,910, this can be concluded that after giving tempeh spice juice, hemoglobin levels have

Based on table data 2. The results showed that there were 1 person with a hemoglobin level of 9 g / dl, 16 people with a hemoglobin level of 11-12 g / dl, a hemoglobin level of 12-13 g / dl as many as 9 people and a hemoglobin level > 13 g / dl as many 4 people.

This research is in line with the theory of Susianto and Rita Ramayulis, (2013) that the benefits contained in tempeh juice are for the prevention of anemia, where adequate intake of iron, zinc, protein, vitamin B12, and folic acid, all of these substances are found in tempeh. . So that to minimize the damage to these substances, especially vitamin B12, it is recommended that tempeh processing is not done with high heating for a long time, and it is recommended to consume it immediately after processing. To maximize iron absorption, adequate intake of vitamin C, citric acid from bananas, papayas, guava, mangoes, oranges, apples, pineapples and malic acid from carrots, potatoes, broccoli, tomatoes, cabbage, pumpkin and the amino acid cystine found in protein sources including tempeh(Susianto Tseng, 2013)

The results of this study are in line with research conducted by Novianti et al (2019) on The group of third trimester pregnant women who were given tempeh milk with the basic ingredients of the formula using iron in the non-heme form was able to increase Hb levels. This can help increase the body's amino acid synthesis and Hb synthesis along with iron and other compounds such as vitamin B12, folic acid, and zinc which are also present in tempeh, even vitamin B12 increases its activity by up to 33 times compared to soybeans.(Novianti, Asmariyah, 2019)

assume that tempeh is a source of local food that is easy to find in the community, a relatively affordable price, as a source of protein researchers andhas a high iron content and has very good nutritional content. Processed tempeh made by juice is a good alternative for increasing hemoglobin levels in adolescent girls and as an effort to prevent anemia.

In the table above there is still 1 person who does not experience an increase in hemoglobin, according to observations made for 3 days on that the young woman consumes tempeh juice correctly but several inhibiting factors are having unhealthy eating habits and sleep duration less than 8. hourie only 3 hours. In accordance with the theoryPetronela, et al (2019) that sleep duration can affect the level of hemoglobin in the blood because it can interfere with a person's sleep quality for the worse. This can lead to oxidative stress which if it lasts more than 12 hours can cause erythrocyte lysis faster than time. Lysis of erythrocytes causes low hemoglobin in the blood.

Bivariate analysis was carried out to see the effect of giving tempeh spice juice on the hemoglobin levels of female adolescents at SMP Negeri 2 Gorontalo City using a paired sample t-test with the SPSS computerized program. Data analysis was carried out in the following stages:

increased. The results of the paired sample t-test statistical test obtained sig 0.002 <0.005, thus Ha is accepted and H0 is rejected, meaning that there is an effect of giving tempeh spice juice on the increase in hemoglobin levels in adolescent girls in SMP Negeri 2 Gorontalo City.

The basic ingredient for making tempeh spice juice is tempeh. This refers to several research results, among others, that tempeh is made into brownies (Mansur, 2017) stated that tempe supplementation can improve iron status. The spice ingredients used in making tempeh spice juice in the form of Ambon banana have vitamin C which can help increase and absorb iron in the body. The higher the content of vitamin C in food, the higher the absorption and use of iron in the body, cloves The eugenol compound is the main component contained in clove oil which is very good for health. Cinnamon is also often used as an aromatic essential oil because of its distinctive smell, aroma. is derived from cinnamic aldehyde or cinnamaldehyde, brown sugar also helps accelerate the absorption of iron in the body and plays a role in moving iron into the blood, mobilization of iron stores, especially hemosiderin in the spleen.

The manufacturing process begins with boiling the tempeh with palm sugar, cloves, cinnamon, and lemongrass until the water is half and the tempeh is cooked. Remove and chill. Discard the cloves, cinnamon, and lemongrass, put the boiled tempeh and water, Ambon banana and shaved ice in a blender and puree (Made, 2008)

Tempe spice juice contains 2 cloves, which contain eugenol and its main component is clove oil (*syzygium aromaticum*), which can reach 70-96%. 2 cinnamon sticks which are also often used as aromatic essential oils because of their distinctive smell, the aroma comes from cinnamic aldehyde or cinnamaldehyde. 3 tablespoons of palm sugar which has the benefit of increasing the immune system and can also be used as a substance that counteracts free radicals. 1 lemongrass with a citrus-like aroma that can be used fresh, or dried. Research also shows that lemongrass oil has antifungal effects. With the content of geraniol and citronellol, lemongrass can also be used as an antiseptic. 100 grams of Ambon banana has vitamin C which can help increase and absorb iron in the body. The higher the vitamin C content in food, the higher the absorption and use of iron in the body. Research shows that consuming Ambon bananas can prevent and overcome anemia by stimulating hemoglobin in the blood.

This is in line with research conducted by Wahyuni that in the case group the average hemoglobin level before the intervention was 10.15 gr / dl, and an increase after administration to 11.61 gr / dl, this indicates that there is an effect of giving brownies .tempe towards the increase in hemoglobin levels in the control group was seen at $p = 0.002$ ($p < 0.05$). The result of iron deficiency can be dangerous because this nutrient is very important for the formation of red blood cells. Every red blood cell in our body contains iron in hemoglobin (the protein that carries oxygen to body tissues from the lungs). Iron gives hemoglobin the power to bind oxygen in the blood, so that oxygen can be distributed to all parts of the body that need it (Mansur, 2017)

This is in accordance with the theory of Yunarsih, (2014) that adolescent experience iron loss due to menstruation causing an increase in the average need for iron every day so that the iron that must be absorbed is 1.4 mg per day. (Yunarsih & Antono, 2017). In accordance with the theory put forward by Gunatmaningsih, (2007) that young women who have experienced menarche, if the blood that comes out during menstruation is very large (many do not realize that there is too much menstrual blood) iron deficiency anemia will occur, because the amount of blood is lost. during a menstrual period ranging from 20-25 cc, this amount implies a loss of iron of 12.5-15 mg / month, or roughly equal to 0.4-0.5 mg / day. If this amount is added to the basal loss, the total iron loss is 1.25 mg / day. In this study, the difference

obtained was 787 g/dl. This could meet the hemoglobin requirement for female adolescent experiencing menstruation and as a prevention of anemia.

Limitation of The Study

In this study, the researcher only studied the respondent's eating patterns and did not examine the food that was often consumed by the respondent, examined the sleep pattern and did not examine the respondent's sleep pattern during the study, the researcher did not know that the respondent had a disease that could affect the decrease in hemoglobin levels, and the researcher did not clarify respondents menstruation period during the study.

CONCLUSIONS AND SUGGESTIONS

Conclusions

Based on the results of this study that after young women consumed tempeh spice juice every 2 times a day for 3 days there was an increase in hemoglobin levels by 787 grams / dl.

Suggestion

This tempeh spice juice can be consumed in women who have anemia.

CONFLICT OF INTEREST

This tempeh spice juice can be used and produced by the public health centre (puskesmas) and other health care facilities to be given to teenagers.

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