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The addition of dates palm (*Phoenix dactylifera*) on iron supplementation (Fe) increases the hemoglobin level of adolescent girls with anemia

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ABSTRACT

Background: Young women have a tenfold anemia risk compared with young men, anemia that occurs in adolescent girls because it has hemoglobin levels less than the normal rate of 12 g / dL. Factors that cause anemia in adolescent girls are the iron deficiency (Fe) due to menstruation, lack of nutrient intakes such as Fe, fat, protein, carbohydrate and energy. In order for adolescents are not lack iron that the body needs, it is a necessary intake of Fe supplementation and also the provision of dates fruit.

Aim: The purpose of this study was to determine the effect of the addition of dates on supplementation of Fe to hemoglobin levels in adolescent girls.

Method: Type of experimental research with the design of Pre Test and Post Test Control Group Design. The sample in this research is adolescent girls with anemia in two Senior High School amounted to 68 people who are divided into two groups that is intervention group counted 32 people and control group counted 36 people. Data

collection techniques on Hb measurements with cyanmethemoglobin. The data analysis tools used are paired simple t-test and independent t-test.

Result: There was a significant difference in hemoglobin levels before and after the addition of dates in iron supplementation in adolescent girls with anemia with mean before intervention (9.94 g / dL) and mean after intervention (11.22 g / dL). There were significant differences in hemoglobin levels before and after iron supplementation in adolescent girls with anemia with mean before treatment (10.09 g / dL) and mean after treatment (10.93 g / dL). There was no significant difference in hemoglobin levels after treatment between the intervention groups (addition of dates on Fe supplementation) and control group (Fe supplementation) in adolescent girls with anemia ($p = 0.855$).

Conclusion: There is a difference of Hb levels between adolescent girls with anemia who were given additional dates in Fe supplementation with only Fe supplementation.

Keywords: Fe supplementation, dates, hemoglobin level, adolescent anemia

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BACKGROUND

Anemia is a public health and nutrition problem affecting developing and developed countries, affecting human health and also social and economic development. Anemia is more prevalent in developing countries with high prevalence rates due to nutritional deficiencies. Other causes of anemia include severe menstrual loss, parasitic infections, acute and chronic infections, micronutrient deficiencies, and hemoglobinopathy.¹ Young women have anemia risk tenfold compared with young men. Anemia is a state of hemoglobin in the blood less than normal for sex and age. The World Health Organization (WHO) determined that anemia criteria use hemoglobin levels, in women under 12 g / dL and in men less than 13 g / dL.² It is estimated that there are as many as two billion people in the world (50%) with anemia, with the greatest prevalence occurring in Africa and Southeast Asia.

World Health Organization (2015) reported by age group, the prevalence of anemia was greatest

in children under five by 42.6%, 38.2% of pregnant women, women of childbearing age (WUS) 29.4%, 29.0% of non-pregnant women, even men are at risk of anemia (12.7%). In the human life cycle, female adolescents (10-19 years) are among the groups that are prone to anemia. According to the 2007 Household Health Survey (SKRT), the prevalence of anemia in women of childbearing age (WUS) aged 15-19 years reached 26.5%, about 370 women suffering from anemia caused by iron deficiency.³ In Indonesia, based on Riskesdas 2013 data, it is known that the prevalence of anemia in adolescents aged 15-24 years is 18.4% and in the fertile age group is 16.9%, so it can also be categorized as a medium health problem.⁴

The high prevalence of anemia among female adolescents, for example, in girls in senior high school and MAN in six districts in West Java was 40.4%, in junior high school girls in Semarang by 50.12%.⁵ Some of the factors that lead to the high prevalence of anemia in those young women are

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related to energy, protein, iron, vitamin C, tea and coffee drinking habits, knowledge, education, type of parent work, family income and menstrual patterns.

Menstruation causes young girls to lose iron (Fe) an average of 20 mg per month.⁶ The prevalence of anemia in young women in 2013 in Indonesia reached 21.7%.⁷ The anemia rate in Central Java in 2013 reached 57.1%. Anemia of young women in Sukoharjo District is still a public health problem because the prevalence is more than 15%. The incidence of anemia in Sukoharjo District at adolescence was 26.5%.⁸ Based on the results of anemia examination survey in 2014 by Nutrition Promotion Division of Sukoharjo District Health Office to 1200 adolescent girls in 12 schools showed there were 559 people (46,58%) of adolescent girls experiencing anemia, whereas in 2015 the prevalence of anemia was 28,08% from 12 districts it was found that Nguter sub-district was the highest prevalence of anemia, 51%, and Kartasura sub-district at 9%.

Iron deficiency anemia is the most common anemia in both developed and developing countries because the human body has limited ability to absorb iron, and often the body suffers from excessive iron loss caused by bleeding.⁹ Iron is part of the molecule hemoglobin, with reduced iron therefore the synthesis of hemoglobin will decrease and cause hemoglobin level decreased. Reduced hemoglobin levels affect the ability to deliver oxygen throughout the body tissues, it can reduce the work productivity or reduce the ability to concentrate well therefore reduce the learning achievement.⁷ Iron content in dates can increase the number of erythrocytes thereby increasing hemoglobin levels.¹⁰ Dates are one of the fruits that contain iron (Fe) which is enough to match the needs of iron (Fe), vitamin C, vitamin B complex and folic acid that can help the formation of red blood cells, so that by consuming the dates can help improve the formation red blood cells and prevent anemia. Dates are fruits that have high Fe content, there are many types of dates, but the most favored Kurwa Ajwa by Prophet Muhammad is Ajwa dates. In Islam, there is a suggestion to consume Ajwa dates as the saying of Prophet Muhammad SAW which says that "Whoever eats 7 Ajwa dates between the two sandy soils of Medina in the morning, then the poison will not be harmful until the afternoon." (Sahih Muslim).¹¹ Some studies show that Ajwa dates extract has a function as a tissue protective effect because it is rich in antioxidant content.¹² Experimental studies in mice suggest that Ajwa dates have a protective effect and

repair damage from ochratoxin nephrotoxicity that causes renal failure.¹²

Preliminary study results in March 2017 conducted at two senior high schools in SMA Negeri 1 Nguter and SMK Muhammadiyah 2 Sukoharjo. Of the 50 female students in SMA Negeri 1 Nguter, there are 37 students who have anemia. Therefore the anemia level in this school is 74%, while in SMK Muhammadiyah 2 Sukoharjo it is known that from 50 students, there are 23 female students have anemia, therefore in this school can be known anemia level by 46%, indicating that the prevalence of anemia in both schools is quite high. The level of anemia in a person is influenced by the food consumed, a person consuming foods that have low Fe content will cause anemia. Therefore the step to prevent someone suffering from Anemia is to consume foods rich in Fe content.

The purpose of this study was to determine the effect of the addition of dates on supplementation Fe to hemoglobin levels in adolescent girls with anemia.

METHODS

This research was conducted in August 2017 at SMA N 1 Nguter and SMK 2 Muhammadiyah Sukoharjo. The population in this study were all adolescent girls with anemia in SMA Negeri 1 Nguter Sukoharjo and SMK Muhammadiyah 2 Sukoharjo, the sampling technique was done by purposive sampling toward the teenage population of the two schools by way of screening first to know the number of adolescent girls experiencing anemia, then the sample according to the inclusion and exclusion criteria, after which the subjects were asked to fill in informed consent, then divided into two groups, namely the intervention group (the fruit supply dates on Fe supplementation) and the control group (Fe supplement only) and the sample calculation with the formula Lameshow, obtained a sample of 68 adolescents with 32 adolescents in the intervention group and 36 in the control group. The data of respondent's identity was asked directly to the respondent by means of the questionnaire and Hb data collection using cyanmethemoglobin method. Provision of intervention using Fe artoferrum supplementation of whole date palm fruit variety of 7 grains for 30 days. For the control group was given Fe supplementation. The analysis used paired t-test sample, and independent test of a t-test previously tested the normality data with Kolmogorov Smirnov with the help of SPSS for Window 20.0 program.

RESULT AND DISCUSSION

1. The effect of the dates addition on supplementation of Fe to hemoglobin levels

The result of paired sample t-test to know the change of hemoglobin level at beginning and end is presented in [table 1](#).

[Table 1](#) shows that there is a significant effect of dates addition on Fe supplementation (intervention group) on hemoglobin level in adolescent girls with anemia with p-value = 0.000 smaller than the level of significance 0.05.

The subject of this study is adolescents aged 15-18 years with anemia, the onset of anemia that occurs in adolescents is caused by lack of Fe supplementation and also the occurrence of menstruation every month. As stated by Hentze et al. in 2010, that menstruation causes young girls to lose iron (Fe) an average of 20 mg per month, therefore with the loss of iron, anemia occurs.⁶

Iron has several essential functions in the body as a means of transporting oxygen from the lungs to the body tissues, as a means of transporting electrons in the cell, and as an integral part of various enzyme reactions in the body tissues, although there are many in food but many inhabitants the world suffers from iron deficiency including in Indonesia. Iron deficiency can affect work productivity, cognitive appearance, and immune system. Iron in food is present in the form of hem iron such as hemoglobin and animal food myoglobin. The hem iron is absorbed into the cell mucosa as an intact porphyrin complex. The porphyrin ring inside the mucosal cell is then broken down by a special enzyme (hemoxigenase), and the iron is released. The hem and non hem irons then pass through the same groove and leave the mucosal cells in the same form using the same conveyance means. Hem iron absorption is not much affected by food composition and gastrointestinal secretions and by one's iron

status. Hem iron is only a small part of iron obtained from food (approximately 5% of total food iron), especially in Indonesia, but which can be absorbed 25% while the non hem is only 5%.¹³

Increased levels of hemoglobin in the blood according to Almatsir's study in 2010, can also occur in addition to supplements that is by eating foods rich in iron, folic acid as well as vitamin B like dates and consume foods that easily absorb iron, for example foods that contain lots of vitamins C and avoid foods or beverages that inhibit the absorption of iron, such as coffee and tea.

Protein content, carbohydrates, and fat in dates support the synthesis process of hemoglobin.¹⁴ Carbohydrates and fats form succinyl CoA which further along with glycine will form protoporphyrin through a series of porphyrinogen processes. Protoporphyrin formed next to heme molecules, and globin proteins form hemoglobin.¹⁵

This research is reinforced by research conducted by Anita in 2013 that giving date juice effect on hemoglobin level. These results suggest that iron-rich dates can increase hemoglobin levels. The content of protein, carbohydrate, and fat in dates and glucose, Ca, Fe, Zn, Cu, P, and Niacin content with palmyra rich in Vit A supports hemoglobin synthesis.

The study by Faruk et al, in 2010, examining labor anemia in urban Bangladesh, explains that there is a significant increase in Hb levels after being supplemented with Fe, and folic acid or Fe, folic acid and vitamin A. Increased Hb levels in the group treated with Fe, folic acid, and vitamin A were higher than in the group receiving Fe supplementation and folic acid. The results of this study concluded that iron supplementation and folic acid could increase the levels of Hb, serum ferritin, RBC folic acid and serum vitamin A in adolescent girls who are anemic.

[Table 1](#) is also known that there is a significant effect of Fe supplementation (control group) on hemoglobin level in adolescent girls with anemia with p-value = 0.012 smaller than the level of significance 0.05.

Provision of Fe supplementation affects the hemoglobin level in adolescent girls with anemia. As Guyton and Hall study reported that hemoglobin synthesis begins in the proerythroblasts and continues slightly in the reticulocyte stage, when the reticulocytes leave the bone marrow and enter the bloodstream, the reticulocytes still form a small amount of

Table 1 Effect of adding dates to Fe Supplementation on Hemoglobin Levels

Variable	M ± SD	p
Hemoglobin levels (treatment)		
Beginning	9.94 ± 0.34	0.000
End	11.22 ± 0.41	
Hemoglobin levels (control)		
Beginning	10.09 ± 0.34	0.012
End	10.93 ± 1.91	

Source: Primary data, 2017

hemoglobin. Iron content can synthesize the formation of heme that can boost hemoglobin levels.^{17,18}

Anemia is generally caused by iron deficiency, so it is often known as iron nutritional anemia (Fe). Anemia affects about one-third of the world's population, half the cases are caused by iron deficiency, this is a major public health problem and global. Iron is required for the formation of hemoglobin, very little iron is excreted. When red blood cells break, iron is stored and then reused, but a small amount of iron should be present in the diet. A woman needs about 15 mg to replace iron loss during menstruation. In cases of excessive bleeding or normal bleeding in menstruation, iron loss due to bleeding should be replaced. Because of menstrual averages 60 ml of blood per month, which is equal to 30 mg of iron, women need an extra milligram per day to be absorbed to maintain balance.

The process of iron deficiency to become anemia occurs through several stages, it starts from deposits of iron reserves (Fe). If iron deposits have not been met with iron intake (Fe) there will be anemia symptoms accompanied by decreased hemoglobin.¹⁹

The results showed that the supplementation of Fe could increase hemoglobin level in adolescent girls with anemia. This is in accordance with research conducted by Pravitasari in 2009 which states that the intake of Fe can increase hemoglobin levels in a person.²⁰ This is also reinforced by Mulyawati's study in Jakarta explaining that there is an increase in Hb levels after iron supplementation is given to anemic workers.²¹ The combination of dates rich in glucose, Ca, Fe, Zn, Cu, P and niacin content of vitamin A is able to improve hemoglobin levels in anemic patients.²²

2. The effect difference of the dates addition on Fe supplementation with Fe supplementation on hemoglobin level in adolescent girls with anemia

The statistical test result of Independent sample t-test to know the difference of influence in the intervention group with control group presented in [table 2](#).

Table 2 Differences in hemoglobin levels in the treatment and control group in adolescent girls anemia

Variable	M ± SD	p
Hemoglobin levels (treatment)	11.22±0,41	0.855
Hemoglobin levels (control)	10.93±1,91	

Sources: Primary data, 2017

[Table 2](#). shows that there was no significant difference in hemoglobin level changes in both treated and control groups as indicated by significant p values ($p > 0.05$). Based on [table 2](#) it can be concluded that the addition of dates on Fe supplementation with Fe supplementation did not have a significant difference to changes in hemoglobin levels in adolescent girls with anemia. This can be seen from the average value of hemoglobin levels after being given additional dates on Fe supplementation of 11.22 g / dL and hemoglobin level after being given Fe supplementation only of 10.93 g / dL.

This is due to research time that is only done for one month or for 4 weeks. Nevertheless, this study explains the difference in mean hemoglobin levels of adolescent girls with anemia between those who were given additional dates on supplementation and anemic girls who were given Fe supplement only. This study is in line with the research of Sen and Kanani in 2012, namely the impact of Fe supplementation of hose twice a week on the level of hemoglobin and growth in early adolescence.²³ In line with the research conducted by Indriani in 2013, it showed that there was an increase in supplementation of Fe, multivitamins, and minerals after treatment.²⁴

CONCLUSION

Based on the presentation of research results and discussion of research results, it can be concluded that there is the effect of adding fruit dates on Fe supplementation on hemoglobin levels in adolescent girls with anemia and there is no difference in the effect of adding fruit dates in Fe supplementation with only given Fe supplementation to changes in hemoglobin levels.

SUGGESTION

Based on the conclusions and implications above, it can be suggested:

1. Young women to avoid anemia, it can consume foods that contain lots of nutrients.
2. Expected to be additional information in overcoming the problem of anemia in young women to get normal hemoglobin levels.
3. It is expected that schools may hold a joint iron supplement to anemia women in increasing hemoglobin levels.
4. It is hoped to add some variables that can influence the change of hemoglobin level in increasing the hemoglobin level in female adolescent besides pharmacology factor (giving of Fe

supplementation and the giving of date palm) for example dietary factor, stress, physical activity, genetic and pharmacologic handling.

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