

EFEK PEMBERIAN BUAH KURMA (PHOENIX DACTYLIFERA L) TERHADAP PENINGKATAN KADAR HEMOGLOBIN PADA REMAJA PUTRI

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EFEK PEMBERIAN BUAH KURMA (*PHOENIX DACTYLIFERA L*) TERHADAP PENINGKATAN KADAR HEMOGLOBIN PADA REMAJA PUTRI

The Effect of Date Fruits (*Phoenix dactylifera L*) Intervention to Increase Hemoglobin Levels in Female Adolescents

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ABSTRACT

Background. Anemia is one of the common health problems globally, where a condition of red blood cells is inadequate to meet the physiological needs caused by iron deficiency. The short term impact of anemia on adolescents can cause growth disorders, while the long term impact on pregnant women can cause pregnancy and childbirth complications. Date fruit is one of the fruits that containing iron (Fe), vitamin C, vitamin B complex, and folic acid that can help form red blood cells. Consuming the date fruits may improve formation of red blood cells and prevent anemia. **Objective.** To determine the effect of the intervention of date fruits in increasing hemoglobin levels among female adolescents at Islamic boarding school. **Method.** This research was performed using a pre-experimental study with one group pretest and posttest design. The sampling method in this research used purposive sampling with samples of 30 female adolescent students aged 15–18 years old at Modern Islamic Boarding School (Pondok Modern Gontor Putri 2), Ngawi, East Java, Indonesia. The inclusion criteria was adolescent suffering from anemia (age 15 until 18 years, Hb <12 g/dL, not menstruation during intervention). The intervention was carried out for seven days by giving seven fruits (50 g) per day. Hemoglobin levels had recorded before and after intervention. The data were analyzed using paired t-test. **Results.** The median hemoglobin (Hb) level before giving date fruits was 10.8 g/dL and the median Hb level after giving date fruits was 11.9 g/dL. There were differences in Hb levels before and after giving date fruit ($p=0.001$). **Conclusion.** The intervention of consuming seven date fruits (50 g) for seven days effectively increased hemoglobin level.

Keywords: date fruits, female adolescents, hemoglobin levels

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ABSTRAK

Latar Belakang. Anemia merupakan salah satu masalah kesehatan yang sering terjadi di dunia. Anemia yaitu kondisi saat sel darah merah tidak mencukupi untuk memenuhi kebutuhan fisiologis yang disebabkan oleh kekurangan zat besi. Dampak anemia jangka pendek pada remaja dapat menyebabkan gangguan pertumbuhan, sedangkan dampak jangka panjang pada ibu hamil dapat menyebabkan komplikasi kehamilan dan persalinan. Buah kurma merupakan salah satu buah yang mengandung mineral dan vitamin diantaranya zat besi (Fe), vitamin C, vitamin B kompleks, dan asam folat yang dapat membantu pembentukan sel darah merah. Mengonsumsi buah kurma merupakan salah satu cara untuk meningkatkan pembentukan sel darah merah dan mencegah anemia. **Tujuan.** Untuk mengetahui efek pemberian buah kurma dalam meningkatkan kadar Hb remaja putri di pesantren. **Metode.** Penelitian ini dilakukan dengan menggunakan pre-experimental study dengan rancangan one group pretest and posttest design. Metode pengambilan sampel dalam penelitian menggunakan purposive sampling dengan sampel 30 santri remaja putri usia 15–18 tahun di Pondok Modern Gontor Putri 2, Ngawi, Jawa Timur, Indonesia. Kriteria inklusi adalah remaja yang menderita anemia (umur 15–18 tahun, kadar Hb

<12 g/dL, tidak menstruasi selama intervensi). Intervensi dilakukan selama 29 hari dengan pemberian tujuh buah kurma (50 g) per hari. Kadar hemoglobin dicatat sebelum dan sesudah intervensi. Data dianalisis menggunakan paired-t test. Hasil. Kadar Hb sebelum pemberian buah kurma sebesar 10,8 g/dL, sedangkan kadar Hb setelah pemberian buah kurma sebesar 11,9 g/dL. Terdapat perbedaan kadar Hb sebelum dan sesudah pemberian buah kurma ($p=0,001$). **Kesimpulan.** Intervensi konsumsi tujuh buah kurma (50 g) selama tujuh hari efektif untuk meningkatkan kadar hemoglobin.

Kata kunci: buah kurma, remaja putri, kadar hemoglobin

INTRODUCTION

Anemia is a health problem throughout the world, particularly in developing countries. Anemia is a condition in red blood cells that is insufficient to meet the physiological requirements caused iron deficiency. According to the research conducted by World Health Organization (WHO), the prevalence of anemia in female adolescents was 29 percent. The prevalence of anemia in adolescent girls (ages 10–18 years) reaches 41.5 percent in developing countries. Indonesia is a developing country that has the prevalence of anemia in adolescent girls was 37 percent.² This percentage was higher than prevalence of anemia in the world. Based on National Basic Health Research (Riskesdas) in 2013, the prevalence of anemia in Indonesia was 21.7 percent with anemia adolescent girls, aged 5–14 years were at 26.4 percent and 18.4 percent aged 15–24 years.³

The effects of anemia in adolescent girls are long term and short term. In a short term, anemia cause a delay of physical growth and sexual maturity. The results of More's research, about the relationship of anemia incidence with achievement in adolescent Egyptian girls showed a connection between the incidences of anemia and learning achievement. Iron deficiency leads to many non-hematological disturbances, including growth, development, and decreasing cognitive function in both infants and adolescents.⁴ The long term impact of a female adolescent with anemia was not able to meet the nutrient for mother and fetus when

pregnant in the later that can cause complications in pregnancy and childbirth, the risk of maternal death, the rate of prematurity, low birth weight, and perinatal mortality rate.⁵

Fitriani found that 30 percent of female teenagers experienced anemia, even though given iron-folic acid tablet. Furthermore, Yudina exposed that 29 percent of female teenagers was anemia.²⁴ Satria also explained that 39.3 percent of female students were less obedient to consume iron-folic acid tablet and 14.3 percent disobeyed that.²⁵ Based on preliminary research, most students did not report to the clinical center about their menstruation period and iron-folic acid tablet intake, so it disturbed the distribution of iron-folic acid tablets. Several side effects such as nausea, vomiting, dizziness, the sour taste, and foul smell of iron-folic acid tablet caused the student did not consume the tablets.²⁶

Food intervention was used as a strategy to resolve and prevent anemia. Date fruits have been used in this study because it is an immune booster in the Islamic Boarding School. Date fruit is one of the fruits that brings many benefits for health and has a high nutritional value, like glucose, calcium (Ca), Fe, zinc (Zn), cuprum (Cu), phosphor (P), niacin, and vitamin A considered an excellent supplement to treat iron deficiency anemia. The content of protein, carbohydrates, and fat in dates supports the process of hemoglobin (Hb) synthesis. In addition, dates contain vitamin C, which helps increase iron absorption.²⁸

Date fruits contain vitamin B2, vitamin E, vitamin A, P, and vitamin B6; if the function runs well, the red blood cells will be good maintenance. Thus, the Hb level increases to prevent anemia. Iron serves to help red blood cells. Folic acid functions in forming red blood cells and the production of deoxyribonucleic acid (DNA) for cell development and formation. Iron and folic acid are used as production in the formation of red blood cells in the presence of vitamins that help to maintain red blood cells and prevent anemia.²⁹

Moreover, date fruits contain flavonoids as an anti-inflammatory.⁶ Osman, in his research, shows that date fruits have beneficial health through immunomodulatory, anti-inflammatory, and antioxidant effects.⁷ Shodiqah researched to determine the impact of date juice on increasing Hb levels in white rats, and the conclusion was date juice increases Hb levels in white rats.⁸ The consumption of date fruits increased Hb, hematocrit, and serum ferritin levels in primary school girl students.⁹ Date fruits are also quickly processed in the body to easily absorb the vitamins and minerals. Date fruits consumed every day will provide good benefits for the body. This research aims to determine the effect of the intervention of date fruits in increasing hemoglobin levels among female adolescents at Islamic boarding school.

METHODS

This research design used a pre-experimental study with one group pretest and posttest design. It had chosen because the study was held together with the final examination in Islamic Boarding School, with limited respondents. This research was conducted from July–November 2020 at Modern Islamic Boarding School (Pondok Modern Gontor Putri 2), Ngawi, East Java, Indonesia. Based on Ridwan et al., consuming one piece of date fruits

each day for seven days can increase Hb level for about 1.2 g/dL.²³ So, the intervention has conducted for seven days by giving seven date fruits each day. The samples in this research were 30 female adolescent students age 15–18 years old who selecting according to the inclusion criteria (age 15 until 18 years, Hb <12 g/dL, not menstruation during intervention). The samples used Lemeshow formulas for sampling.¹⁰

$$n = \frac{2\sigma^2 (Z1 - \alpha/2 + Z1 - \beta)^2}{(\mu1 - \mu2)^2}$$

Description: Purposive sampling

n Total sampling

Z (1- α): Confidence level 95% ($\alpha=0.05$, Z=1.96)

Z (1- β): Test strength 80% = 0.84

σ : Standard deviation of previous research population

σ^2 : Varian of previous research population

$\mu0$: Before intervention average of previous research

$\mu\alpha$: After intervention average of previous research

σ^2 Calculation

$$\sigma^2 = \frac{(n1 - 1) \times (SD)^2 + (n2 - 1) \times (SD)^2}{(n1 - n2)^2}$$

$$\sigma^2 = \frac{14 \times (0,9)^2 + 14 \times (1,7)^2}{28}$$

$$\sigma^2 = \frac{14 \times 0,81 + 14 \times 1,69}{28}$$

$$\sigma^2 = \frac{11,34 + 23,65}{28}$$

$$\sigma^2 = \frac{35}{28}$$

$$\sigma^2 = 1,25$$

Sample Calculation

$$n = \frac{2\sigma^2 (Z\alpha + Z\beta)^2}{(\mu1 - \mu2)^2}$$

$$n = \frac{2 \times 1,25 (1,96 + 0,84)^2}{(12,1 - 11,3)^2}$$

Food recall 3 x 24 hours and Hb level were chosen as the food consumption variables. Hemoglobin levels had collected before and after intervention using the Accu-check-glucose meter strip. The FDA is currently reviewing and updating the guidelines for glucose meter accuracy. The 2016 rules called for ± 20 percent accuracy for most blood sugar ranges.

Data were analyzed using a paired-t test with a confidence level of $\alpha=0.05$. A 95 percent confidence interval had used in the statistical test. This research has been submitted to the Faculty of Medicine, University of Muhammadiyah Surakarta. The research ethics commission with number 3063/B.1/KEPK-FKUMS/1/2020.

RESULTS

Characteristic

The sample in this research was female adolescent students at Islamic boarding school. The age distribution of the samples in this research can be seen in the following Table 1.

Table 1. Age Distribution of the Sample

Age	Group	
	n	%
15	2	6.7
16	4	13.3
17	7	23.3
18	17	56.7
Total	30	100

Based on Table 1, the most significant sample was 18 years old, which as many as 17 people (56.7%); the number of samples in this study were 30 female adolescents age 15–18 years, students at the Islamic boarding school.

Nutrient Intake

The nutritional adequacy rate of students age 15–18 years can be seen from the results of the food recall three times. The first day of the screening, the second day during the intervention process, and the last day in the previous examination.

Table 2. Nutrient Intake

Nutrient	Median	Min–Max	RDA	%RDA
Vitamin C (mg)	10.1	2.6–131.8	75	36.6
Zinc (mg)	4.5	1.8–5.9	9	48.8
	Mean±SD	Min–Max	RDA	%RDA
Protein (g)	28.5±4.9	13.9–36.8	65	43.6
Folate (mcg)	62.5±17.03	33.3–96.4	400	15.9
Fe (mg)	3.9±1.1	2.0–7.1	15	26

In Table 2, all food intakes were inadequate because of less than 77 percent of requirement recommendations by RDA 2019.

Hemoglobin Levels Before and After Giving Date Fruits in the Female Students

The median Hb level before giving date

fruits was 10.8 g/dL and the median Hb level after giving date fruits was 11.9 g/dL. Based on the results of the paired-t test, the Hb level after giving date fruits obtained $p=0.001$, which means there was a difference in Hb levels before and after giving date fruits.

Table 3. Hemoglobin Levels Before and After Giving Date Fruits in The Female Students

Group	Mean±SD	p*
Before Treatment (n=30)	10.8±0.79	0.001
After Treatment (n=30)	11.9±1.5	

*paired-t test

DISCUSSION

The majority of these respondents who took part in the study were 18 years old (56.7%); the puberty and sexual maturation are faced quickly when an individual enters adolescence, regarding hormonal change that can trigger growth and physical and secondary development. Thus, the study used female adolescent. Respondent age 15–18 years due to puberty or menstruation in late adolescence. It is in line with statement of Ministry of Health; it knew that 37.5 percent of women start their reproductive phase at the age of 13–14 years.²⁷ Adolescence is a necessary period, because during this period, the early maturity of the reproductive organs occurs. In female adolescent, there was often a lack of blood due to menstruation, making young women susceptible to anemia. It affects the development of adolescents, which impairs the level of learning productivity.¹¹ According to Merryana in the health media nutrition series, one factor that encourages nutritional anemia in adolescents is excessive menstruation in young women.

Inadequate iron intake often occurs in people who consume a less diverse diet and lack of iron source such as nuts, meat, poultry, and fish. Iron deficiency occurs because of inadequate food intake, both quantity, and quality. It was due to food supply, poor food distribution, lousy eating habit, poverty, and ignorance. Based on Rossita, iron sufficiency will normalize the Hb level and prevent of anemia; instead, the lack of iron intake will cause anemia due to the less of Hb level. Iron absorption is assisted by vitamin

C. The consumption of iron in limited quantities gives effect of iron absorption and the function of vitamin C as an increase in iron absorption.¹² Vitamin C is essential needed for the body in the formation of red blood cells. Vitamin C inhibits the formation hemosiderin which is challenging to mobilize to free iron when required. The presence of vitamin C in the food will give a sour atmosphere, so facilitate reduction of ferric into ferro in small intestine.

Vitamin C increases non-heme iron absorption four times.¹³ Gibson stated that differences in food consumption will create a different energy and protein intake received. Protein is absorbed by the body of amino acids, transferred in blood cells, and then synthesized into another substance that contains energy and its excess stored of glycogen.¹⁴ Nutritional anemia is caused by nutrient lack that plays a role in the formation of Hb, either due to lack of nutrient or malabsorption. The nutrients concerned are iron, protein, and pyridoxine (vitamin B6).¹⁵

According to WHO, the limit value of Hb for adolescent girls is <12 g/dL with serum iron values <50 mg/mL and ferritin values <12 mg/mL. The value of ferritin is a reflection of the body's iron reserves to provide a picture of a person's iron status. The results show that the consumption of date fruits affect increasing Hb levels. In accordance with Ali's research, the intervention of Ajwa date fruits increased the Hb level in teenagers by 0.375 g/dL after intervention.¹⁶ The date fruits consumption

affected Hb levels. Date fruits contain various nutrients that are beneficial for the body.

One of the benefits was preventing anemia because date fruit is rich in Ca and Fe, which essential for blood formation and bone marrow. In the bone marrow, Fe was used to make Hb than was carried to the body's tissues.¹⁷ Nadia also reported that date fruits have a beneficial effect that significantly increases hematological parameters such as Hb level, red blood cell count, packed cell volume, and platelet count.¹⁸ In her review of six health articles, Dwi Ayu stated that date fruits were effective for increasing Hb levels and played a role in increasing ferritin, hematocrit, transferrin saturation, and serum Fe levels in the majority of people. Hence, date fruits can be used as an additional alternative to increase hemoglobin levels.¹⁹

Date fruit is rich source of carbohydrates, dietary fibers, some essential vitamins and minerals, and a various phytochemicals such as flavonoid, carotenoids, and anthocyanins, which contribute to date fruit's nutritional and sensorial properties.²⁰ In accordance with Mariyati in her research about chemical nutrient test in four date fruit varieties, namely Ajwa, Safawi, Omani, and Tunisian dates, the high nutrient in date fruit was iron, potassium, calcium, and carbohydrate.²¹ There was an effect of date fruits in increasing Hb levels.²² Consuming date fruits increases Hb levels. Respondents showed an increase in Hb levels by an average of 1.2 g/dL after finishing seven grain of date fruits for a week.

The consumption of date fruits can be used as a therapy for female adolescent students during their menstrual period to overcome and prevent anemia due to menstruation at the Islamic boarding school, when they could not approach Fe supplements. It is suggested to consume date fruits as many as seven dates every morning before consuming any food, particularly female adolescent students who are at their menstrual

period. It is part of it to overcome and prevent anemia due to menstruation. Someone who eats seven date fruits during *Dhuha* time can increase Hb levels and treat anemia. It corresponds to a treatise brought by the Prophet Muhammad SAW. It is because date fruits contain essential nutrients, such as sugars and acids, minerals, oils, proteins, etc. Apart from that, the date fruit contains iron of 1.2 mg/100 g.²³

CONCLUSIONS

There was a difference in the results of hemoglobin levels before and after giving dates to the samples ($p=0.001$). The intervention of consuming seven date fruits (50 g) for seven days effectively increased hemoglobin level.

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