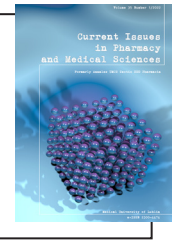
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Combinations of Fe tablets and dragon fruit and combinations of Fe tablets and date straw on increasing hemoglobin levels in adolescent women with anemia

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ABSTRACT

Anemia is a health problem related to the extensive presence of a variety of noncommunicable diseases in developing countries. Indeed, the prevalence of anemia in Indonesia in women of childbearing age (aged 15-49 years) in 2019 was around 29.9%; in West Kalimantan in 2018, it was 23.8%. The rate of anemia in young women can be overcome by increasing hemoglobin levels. One approach is to enhance the consumption of dragon fruit or date palm juice which can increase hemoglobin levels. This research aims to determine the effectiveness of giving a combination of Fe tablets and dragon fruit or a combination of Fe tablets with date palm juice on hemoglobin levels in anemic adolescent girls. The design of this study was a True Experiment with pre-test and post-test control groups. Research respondents were anemic adolescent girls, a total of 32 people, with 16 in each group.

With regard to the hemoglobin levels before and after administration of Fe tablets and dragon fruit, based on the paired t-test, the mean difference was 4.32 g/dl, with P-Value = 0.000. Thus, there is effectiveness in this intervention group. In the combination group of Fe tablets and date palm juice, the mean difference was 3.062 g/dl. P-Value = 0.001 (P<0.05). Hence, there is effectiveness in enhancing hemoglobin levels in this intervention group. Applying an independent t-test to determine the difference in the effectiveness of the two interventions revealed a P-value = 0.054, meaning that there was no significant difference between the two interventions in increasing hemoglobin levels.

INTRODUCTION

Anemia is a non-communicable disease health problem that is common in developing countries worldwide. According to the World Health Organization (WHO), the 2019 worldwide prevalence of anemia in the world is about 29.9% of all non-pregnant women of childbearing age (aged 15-49 years). In Southeast Asia, 25-40% of all women in this age and state bracket have mild to severe anemia. Anemia often attacks young women, leading to stress or late menstruation [1].

Anemia in adolescent girls is associated with high maternal mortality, a high incidence of low birth weight infants, high perinatal mortality and fetal wastage [2]. Anemia in adolescent girls also impacts mental motor development, leading to retarded intelligence and decreased learning achievement, decreased fitness levels and less maximal height [3,4]. In addition, the direct impact is manifested in complaints of dizziness, pale eyelids, lips, tongue, skin and palms, lethargy, chronic weakness and tiredness. The long-term impact is that adolescents who are already suffering from anemia will have more severe anemia during pregnancy, hence potential damage can occur to both mother and fetus [5].

Adolescent girls are more susceptible to low hemoglobin. In low income countries, this is usually associated with nutritional intake. Inadequate intake of micronutrients in adolescence is a risk factor for anemia that contributes to the intergenerational cycle of malnutrition. As women need more iron due to iron loss during menstruation [6,7]. This causes women to be more pr, this leads to this sex being more prone to iron anemia than men. Women with less iron or increased iron loss will exhibit iron nutritional anemia. The need for iron in adolescents aged 13-15 is 19 mg [8].

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Giving iron and vitamin C supplementation to anemic children will increase hemoglobin levels when compared to proffering nutrition education alone or to Fe supplementation alone, as vitamin C helps increase the release of insoluble iron. Vitamin C can also stimulate the release of iron from ferritin iron stores in reticuloendothelial cells so that iron can be used in red blood cells [9].

In addition to pharmacological treatment, anemia can also be treated non-pharmacologically, namely, by consuming iron enriched vegetables and fruits, one of which is dragon fruit [10-12]. Dragon fruit contains high levels of phytochemicals, among others, the flavonoids. Flavonoids in dragon fruit include quercetin, kaempferol and isorhamnetin. In addition, dragon fruit is a fruit that is rich in antioxidants and is high in calcium and iron, thus its consumption can play a good role in proper bone and blood function [13,14].

Another alternative that can be used to meet iron needs is through consuming date palm juice. Date palm juice is date fruit that is mashed, and the juice is taken. Date palm juice is in liquid form and has a thick consistency, is black in colour, tastes sweet, and contains the complete nutrients found in dates. Date (Phoenix Dactylifera) is a fruit that is rich in nutrients. It originates in the Arabian Peninsula, North Africa and the Middle East. Date fruits are a rich source of carbohydrates, protein, amino acids and minerals (selenium, potassium, calcium, magnesium, manganese, and iron). Date fruits are also rich in fiber, vitamins, carotenoids and fatty acids. Moreover, the biological and therapeutic profile of date palm pulp and pits shows the presence of polyphenols and flavonoids in both plant tissues [15,16]. This study aimed to determine the effectiveness of administering a combination of Fe tablets and dragon fruit or iron tablets with date juice on hemoglobin levels in anemic adolescent girls at Aliyah Islamic Boarding School, Khulafaur Rasyidin, Kubu Raya.

METHODS

This research is follows standard experimental research procedure and utilized a pre-test and post-test control group design. The study involved students of Aliyah Islamic boarding school Khulafaur Rasyidin-Kubu Raya and was sourced from a total population of 193 people. The experimental population consisted of anemic adolescent girls totaling 32 people who met the inclusion and exclusion criteria. Each treatment consisted of 16 people per group. The inclusion criteria applied to determine the research subjects included in this study was an Hb level <12 g/dl, being willing to be a respondent, not menstruating, and not taking Fe tablets or blood boosters. At the same time, the exclusion criteria was chronic pain and infection during the study. The data collection concerning respondent data was collected by interview and direct examination techniques.

Data analysis employed univariate data, using the Shapiro Wilk test to see the distribution of the data. This bivariate test was also implemented to analyze differences in Hb levels in intervention group 1, namely, before and after being given a combination of Fe tablets and dragon fruit, and in intervention group 2, before and after administration of a combination of Fe tablets and date juice. The hypothesis test used is Paired t-test. Furthermore, to analyze the difference in ineffectiveness in the intervention group 1 with a combination of Fe tablets and dragon fruit and in the intervention group 2, namely, the administration of a variety of Fe tablets and date palm juice, an independent t-test was applied with a significance level of 95% (α=0.05).

RESULTS AND DISCUSSION

Characteristics of respondents

Table 1. Distribution of respondents' characteristics based on Body Mass Index

Body mass index	Group 1 (Combination of Fe and dragon fruit tablets)		Group 2 (Combination of Fe tablets and dates extract)	
	n	%	n	%
Thin	3	18.75	0	0
Normal	11	68.75	15	93.75
Fat	2	12.5	1	6.25
Sum	16	100	16	100

It can be seen in Table 1 that most of the respondents in the intervention groups 1 and 2 had normal body mass index. This is evident both in the combination group of Fe tablets and dragon fruit (as many as 11 people – 68.75%) and in the combination group of Fe tablets and date palm juice (as many as 15 people – 93.75%). Based on thin body mass criteria, in intervention group 1 there were three people (18.75 %).

Hemoglobin level before and after intervention

Table 2. Average hemoglobin levels in intervention 1 and intervention groups 2

Group	Variable	Mean	Modus	Std. Dev
Fe Tablets and Dragon Fruit (Intervention 1)	Before	9.881	9.4	1.175
	After	14.206	13.1	1.365
Fe Tablets and Dates Extract (Intervention 2)	Before	9.913	9.7	1.571
	After	12.975	15.5	2.043

Table 2 reveals the average hemoglobin level before giving the combination of Fe tablets and dragon fruit to have been 9.88 g/dL, and to have been 14.20 g/dL in the group after administration, while the average hemoglobin level before administration of the combination of Fe tablets and date juice was 9.91 g/dL, and 12.97 g/dL after.

Table 3. Differences in the effectiveness of Hb levels before and after intervention 1

Group	Mean	Std. Dev	Mean Difference	Min-Max	P-Value
Before	9.88	1.175	4.32	7.1-11.6	≤0.001*
After	14.20	1.364		11.4-16.7	

[a]Paired T-Test; Significant≤0.005

Table 3 presents the results of the paired t-test conducted on the combination group of Fe tablets and dragon fruit. Here, the mean difference is 4.32 (14.20-9.88) with P-value = 0.000 (P>α), and it can be concluded that there is a significant difference in the effectiveness of hemoglobin levels in the intervention group 1 before and after administration.

Table 4. Differences in the effectiveness of Hb levels before and after intervention 2

Group	Mean	Std. Dev	Mean Difference	Min-Max	P-Value
Before	9.91	1.571	3.06	7.1-11.8	0.001*
After	12.98	2.043		10.3-16.4	

[a]T-Test; significant ≤ 0.05

Table 4 presents the results of the paired t-test conducted in intervention group 2. The results obtained indicate the mean difference to be 3.06 (12.98-9.91) with P-value = 0.001 (P > α). Hence, it can be it was concluded that there was effectiveness in the intervention group 2 on the increase in hemoglobin levels before and after the administration of the combination of Fe tablets and date palm juice.

Table 5. The effectiveness of differences in Hb levels after intervention used Fe Tablets-dragon fruit and Fe Tablets-dates extract

Variable	Mean	Std.Dev	Mean Difference	P-Value[a]
Fe Tablets and Dragon Fruit	14.206	1.365	1.26	0.054
Fe Tablets and Dates Extract	12.975	2.043		

[a]Independent t-test; significant ≤ 0.005

According to the information found in Table 5, the P-value is 0.054, meaning that there was no significant difference between the two interventions with regard to increase in hemoglobin levels. However, if we look at the mean value of intervention group 1(Fe Tablets and Dragon Fruit) and intervention group 2 (Fe Tablets and Dates Extract), the mean difference value is 1.26, which means that the combination group of Fe tablets and dragon fruit is more effective in increasing hemoglobin levels.

Body Mass Index (BMI) describes the nutritional status of the respondents based on their height and weight measurements [17]. The nutritional status of the respondents in the combination group of Fe tablets and dragon fruit demonstrates a thin category of 12.5% (2 people), normal of 87.5% (11 people), and 12.5% of fat (2 people). In the combination group of Fe tablets and date palm juice, there is no body mass index in the thin category, in the normal category, 93.75% (15 people), while the fat category consists of 6.25% (1 person). The dominant body mass index is the normal category.

The absorption of iron, such as the Fe tablets consumed by the respondents, can be better when combined with foods high in vitamin C, such as dragon fruit. Vitamins with iron form a soluble complex iron ascorbate that is easily absorbed. In certain cases, the factors that determine absorption are more important than the amount of iron in the food itself [18,19]. Dragon fruit contains both iron and vitamin C, which facilitates the absorption of iron.

Date fruit juice is processed from dates that contain many nutrients that are beneficial for the body, one of which is iron. Date fruit also has various other nutrients such as folic acid, as well as vitamins that support iron absorption in the body that aid in the prevention of anemia. Date palm juice was found to not increase hemoglobin levels in several studies. However, date palm juice, rich in iron, can increase hemoglobin levels functionally [13,14].

The increase in Hb levels can be influenced by various factors such as diet and daily nutritional intake. In our research, we found that Fe levels increased in both intervention groups. Still, there is a significant mean difference of 1.26. Thus, the combination group of Fe tablets and dragon fruit is more effective in increasing hemoglobin levels.

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CONFLICT OF INTERESTS

The authors declared no conflict of interests.

ETHICAL APPROVAL AND INFORMED CONSENT

The research protocol has received approval from the Health Ethics Commission of the Pontianak Health Ministry of Health Poltekkes, with registration no: 182/KEPK-PK.PKP/VIII/2021. Written consent was obtained from all respondents involved in this study.

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