DIFFERENCES IN PROTEIN, VITAMIN C, AND FE INTAKE IN ADOLESCENT GIRLS BY GIVING FE AND VITAMIN C TABLETS

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ABSTRACT

Teenagers are the time of transition from children to adults. The nutritional needs of adolescence become very important because it impacts on its growth. Protein intake, Vitamin C and iron deficiency in adolescent girls can cause nutritional disorders in adolescent. Lack of iron intake can cause anemia. The aims of this study is to determine differences in protein, vitamin C, and Fe intake in adolescent girls by giving Fe and Vitamin C tablets. This study used a quasy experimental design with pre-test and post-test control group design. Sampling have done by purposive sampling on 52 people. The results showed that in the intervention group in the administration of Fe and Vitamin C tablets showed a significant difference for Fe and Vitamin C intake (p = 0,000), whereas for protein intake there was no significant difference (p = 0.202) before and after the intervention. In the control group by giving Fe tablets show significant differences for protein intake (p = 0.008), and Fe intake (p = 0,000), whereas vitamin C intake was no difference before and after the intervention (p = 0.038).

Keywords: *Protein intake, Vitamin C, Fe, Adolescent Girls*

INTRODUCTION

Teenagers is a transition period from children to adult, where adolescent growth is related to the nutritional fulfillment status. Poor consumption of iron in adolescents can cause anemia in adolescents, especially for young women. In general, anemia sufferers do not know the condition and still consider it as a problem that does not need to worry [1].

Iron nutrient anemia is anemia caused by a lack of iron in the body. Iron deficiency can be caused by several things, such as low food intake of iron or iron in foods that are in forms that are difficult to absorb [2]. Girls aged 10-19 years who have entered puberty and menstruated, will need more nutrition in their bodies. At that age, adolescents experience rapid growth and weight gain [3]. In addition, iron loss of 12.5 mg or 0.4-0.5 mg occurs every day during menstruation so that adolescent girls are prone to anemia [5]. The need for iron will increase in adolescent girls due to menstruation [6]. In general, women tend to have lower iron stores compared to men and this makes women more vulnerable to iron deficiency when iron intake is less or needs increase such as menstruation [7].

The prevalence of anemia in adolescent girls is still quite high, according to the World Health Organization (WHO), the prevalence of anemia in the world ranges from 40-88%. The total population of adolescents (10-19 years) in Indonesia is 26.2% which consists of 50.9% men and 49.1% women. Based on the results of the 2013 Basic Health Research, in Bali showed that 25% of adolescent girls had anemia [8].

According to the Indonesian Ministry of Health 2013, one of the long-term consequences of anemia in adolescent girls is decreasing fitness so that it will hamper sports performance and productivity. Micro nutrient deficiencies in adolescence can have a negative impact on the process of growth and maturity of the reproductive organs [6]. Biochemically vitamin C has various roles namely, enriching biological reductant as an important cofactor for metal reduction reactions such as iron and copper, as a protective

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antioxidant, reductive cofactor for hydroxylation during collagen formation, plays a role in the function of oxygenation systems, carnitine biosynthesis and increases absorption and metabolism of iron [9]. Research results Pradanti, et al show that there is a relationship between the adequacy level of vitamin C and Fe with hemoglobin levels [10]. Zulaekah results showed that iron supplementation, combined with vitamin C was more effective in raising hemoglobin levels to reduce the prevalence of anemia [11].

Responding to the above, the Ministry of Health of the Republic of Indonesia created a Nutrition Anemia Prevention Program for Young Women and Fertile Women. The prevention of nutritional anemia in this program is done by giving blood-added tablets (Fe) containing Ferro Fumarat equivalent to 60 mg Fe and 0.40 mg Folic Acid. However, this program has not included the provision of Vitamin C as part of efforts to increase hemoglobin concentrations. Therefore, this study was conducted to determine differences in protein, vitamin C, and Fe intake in adolescent girls by giving Fe and Vitamin C tablets.

METHODS

This research is an experimental study using quasy-experimental design with pre-test and post-test control group design. The population in this study were all students in class XI of SMA Negeri 1 Kediri the total is 226 people. Sampling is done by the method of non-probability sampling through purposive sampling, which is the technique of determining the sample with certain considerations as desired by researchers. The initial stage of sampling is to do initial screening. Initial screening was carried out by conducting socialization regarding the study of the addition of 50 mg vitamin C in the administration of Tablets Adding Blood (Fe) to the Increased Concentration of Hemoglobin in adolescent girls. Then a random sample was taken and those who were willing to be respondents were not ill or bleeding.

The determined sample was then divided into 2 groups, namely the treatment group (Fe and Vitamin C Tablet) and the control group (Fe Tablet). The sample size in this study were 52 people. The inclusion criteria in this study are students of class XI at SMA Negeri 1 Kediri, who have menstruated, are willing to consume Fe and Vitamin C tablets for 1 month, and are willing to be respondents and are not in a sick / bleeding condition. Exclusion criteria in this study were students who in the research process resigned from the sampling technique, and students who were suffering from chronic pain (tuberculosis, diarrhea or other diseases that required routine control).

Data used in this study were intake data obtained from the results 24-hour recall, and nutritional status data obtained from the calculation of height and weight then measured body mass index (BMI). The instruments used in this study include questionnaires, 24-hour recall form, digital weight scales, and microtoise. The data obtained were analyzed descriptively and using paired sample t-test and independent sample t-test.

FINDINGS AND DISCUSSIONS

Respondents in this study were adolescent girls in SMA Negeri 1 Kediri. Characteristics of respondents in this study include the age of respondents, namely 16 years old as many as 20 people and 17 years as many as 32 people. In this study respondents were divided into 2 groups, each group consisting of 26 people. The characteristics of respondents based on their age and parents' occupation can be seen in Table 1.

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Table 1. Characteristics of Respondents

Variable	Group		Total
	Fe dan Vit C n=26	Fe n=26	
Ager (year)			
16	9 (34,3%)	11 (5,8%)	20 (38,5%)
17	17 (65,4%)	15 (57,6%)	32(61,5%)
Parents Occupation			
Entrepreneur	11 (42,6%)	9 (34,5%)	20 (38,5%)
General Employees	8 (34,6%)	9 (30,7%)	14 (26,9%)
PNS	2 (8,3%)	3 (12,5%)	5 (41,6%)
TNI	1 (4,1%)	0	1 (2,0%)
Farmer	2 (8,3%)	3 (12,5%)	5 (41,6%)
Worker	1 (4,1%)	1 (4,1%)	2 (4,1%)
Driver	1 (4,1%)	0	1 (2,0%)
Polri	0	1 (4,1%)	1 (2,0%)

Source: Primary Data, 2018

Based on the above table, it is known that the majority of respondents were 17 years old, as many as 32 people (61.5%). Most of the respondent's parents occupation as entrepreneurs, as many as 20 people (38.5%). Adolescent girls who are 17 years old and have experienced menstruation are more prone to experience anemia [12]. The factors that can affect anemia in adolescent girls are body image, diet and eating disorders, habits to limit food consumption and dietary restrictions [13].

Occupation of parents determines their socioeconomic level, individuals with low socioeconomic status tend to have difficulty in meeting their nutritional needs [14]. Parents' income influences the purchasing power of the food itself, and influences the intake of nutritious food for young women, where the amount of iron is less in influencing anemia in young women [13].

Table 2. Mean Changes in Weight (Pre-Post) of Respondents

Group	Weight		Δ mean (%)	p
	Pre mean±SD (kg)	Post mean±SD (kg)		
Fe dan Vit C	48.06±5.62	49.23±5.44	0.85 (1.76%)	0.000
Fe	48.38±5.95	48.83±5.96	0.45 (0.39%)	0.000

t-Test

Table 2 shows the mean change in body weight in the Fe and Vitamin C groups which increased by 0.85 kg (1.76%), much higher than the Fe group that only experienced changes of 0.45 kg (0.39%). Based on the results of the t-test it was found that each group experienced a significant difference with a value of p = 0.000 <0.05, which means there was a change in body weight before and after the intervention.

Table 3. Mean IMT (pre-post) change between treatment groups

Group	Status Gizi		Δ mean (%)	p
	Pre mean±SD (kg/m^2)	Post mean±SD (kg/m^2)		
Fe dan Vit C	19.37±1.58	20.1±1.80	0.73 (3.77%)	0.013
Fe	19.24±1.89	19.26±1.89	0.02 (0.10%)	0.649

t-Test

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Table 3 shows that the mean change in nutritional status in the Fe and Vitamin C groups increased by 0.73kg / m2 (3.77%), which is higher than the group given Fe which was 0.02kg / m2 (0.10%). T-test results showed that there were significant changes in the Fe and Vitamin C groups, with a p value = 0.013 <0.05, which means there were differences in nutritional status before and after the intervention. Meanwhile, in the Fe group there was also a change in BMI but did not experience a significant difference marked by the value of p = 0.649> 0.005.

Vitamin C is a water soluble vitamin that helps the body absorb iron. Vitamin C functions as an antioxidant in maintaining endurance and can provide important benefits in supporting normal body growth [15]. Teenagers who have good immune system will not be easily affected by infectious diseases, because infectious diseases can reduce appetite in adolescents [16]. Food intake in adolescents affects the increase in body weight, weight gain during adolescence accounts for about 50% of the ideal adult body weight. Food intake contains at least fat, in adolescent girls the peak of body fat increase occurs between the ages of 15-17 years. Percent of body fat affects the maturity of adolescent girls' reproductive stages so that it affects weight at adolescence, weight gain affects the nutritional status of adolescents. [17].

Table 4. Comparison of Nutrient Intake Between Treatment Groups Before and After Intervention

Intake	Pre		Post		Δ mean	p
	Fe and Vitamin C (n=26) mean±SD	Fe (n=26) mean±SD	Fe and Vitamin C (n=26) mean±SD	Fe (n=26) mean±SD		
Protein	43.98	39.99	45.99	43.53	1^a. 2.01	1^c. 0.202
					2^b. 3.54	2^d. 0.008
Fe	10.56	9.95	69.14	69.00	1^a. 58.58	1^c. 0.000
					2^b. 59.05	2^d. 0.000
Vitamin C	22.76	17.10	65.85	20.83	1^a. 43.09	1^c. 0.000
					2^b. 3.73	2^d. 0.038

Note : 1^a = the results of the average nutritional intake of Fe and Vitamin C groups
2^b = the results of the average nutritional intake of the Fe group
1^c = t-Test results for Fe and Vitamin C groups
1^d = t-Test results for Fe groups

Based on Table 4, it is known that in the intervention group with Fe + Vitamin C, there were significant differences in the intake of Fe and Vitamin C which were marked by p = 0.000 <0.05, whereas the protein intake did not experience significant changes before and after the intervention. In the Fe group there was a significant difference in protein intake marked by p = 0.008 <0.05, and Fe intake was marked by p = 0.000 <0.05, whereas in vitamin C intake there was no difference at the time before and after the intervention.

The results of intake measurements in the Fe group carried out before and after the intervention experienced a significant difference compared to the Fe + Vitamin C. Group. According to the nutritional adequacy rate (RDA), the Fe's need for adolescents was 26 mg per day and 75 mg daily for vitamin C. In this study found that Fe intake in both groups after the intervention was seen to increase significantly. Before the intervention the intake of Fe in both groups was very less, but after being given the intervention of Fe tablets for 1 month there was an increase of 58.58 mg in the Fe + Vitamin C group and 59.05 mg in the Fe group. This is because they are given Fe tablets as well as other food intake such as water spinach and eggs that contain iron. Iron in the body can combine with protein so that it can receive and release oxygen and carbon dioxide. Iron is an essential mineral. Good sources of iron include meat, nuts, grains, soybeans and dark green vegetables [18]. Absorption of iron in the body occurs in the small intestine duodenum, whose settings depend on the body's needs. After being

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absorbed by the small intestine, Fe is transported by blood and distributed throughout the body bound to transferrin proteins. Iron (Fe) is used among other things for respiratory enzymes, Fe in blood plasma, production of hemoglobin and red blood cells in bone, in the liver, lymph and others [19]. Iron has a number of important roles for the body, namely as a carrier of O2 and CO2, formation of red blood cells, and part of enzymes. Iron when combined with vitamin C can accelerate the absorption of iron in the body [19]. In the research that has been done, there was an increase in vitamin C intake in the Fe + Vitamin C group because this group was given vitamin C 50 mg once a week for 1 month. Provision of Fe + Vitamin C can increase hemoglobin concentrations higher than administration of Fe alone [20].

Iron intake in accordance with the nutritional adequacy rate (RDA) can certainly affect a person's hemoglobin concentration and the body still has iron deposits in the liver which can be used at any time when intake of iron from food is lacking [21]. Ferritin deposits in the form of ferritin and ferritin stabilization are influenced by vitamin C. The hydroxylation process of vitamin C in iron can facilitate the absorption of iron and distributed throughout the body [19].

Non-heme iron sources derived from plants (vegetable protein) cannot influence the concentration of hemoglobin because the absorption rate of non-heme iron is lower than that of heme iron derived from animals [22]. In addition, there are several substances that can inhibit the absorption of iron in the body from food that is phytate (found in soybeans, milk, chocolate and nuts), polyphenols and tannins (found in tea, coffee, spinach, beans), calcium and phosphate (found in milk and cheese) [23].

CONCLUSION

The results showed that in the intervention group with the administration of Fe + Vitamin C there were significant differences in the intake of Fe and Vitamin C ($p < 0.005$), but in the protein intake there was no significant difference ($p > 0.005$). In the control group with Fe administration, there were significant differences in protein and Fe intake ($p < 0.005$), but in Vitamin C intake there was no significant difference ($p > 0.005$).

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