

## Eel Chips (*Monopterus albus*) Can Increase Hemoglobin Levels in Teenage Girl

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**Abstract**— Eel (*Monopterus Albus*) is a type of animal protein that contains high iron. Iron supplements in the form of eel chips are an effort to increase iron intake in teenage girls adequately. This study aimed to determine the effect of consuming eel chips on increasing hemoglobin levels in teenage girls. The design of this research is analytical, using a Quasy experiment design (non-randomized control group pretest posttest design). The population in this study is teenage girls who have hemoglobin levels <12 mg% and the number of samples was fifty four people (27 in the treatment group and 27 in the control group). The nutritional content of eel chips can increase hemoglobin levels in teenage girls with an average increase of 1.429 mg%, this is different from the hemoglobin levels of teenage girls who didn't consume eel chips with an average increase of 0.533 mg%. The results of the dependent t test showed significance with Pvalue = 0.000 ( $\alpha = 0.05$ ). The test results of the content of eel chips showed that eel chips contained 10.9 grams of protein and 5 mg of iron, which are good for increasing hemoglobin levels in teenage girls.

**Keywords:** Eel Chips, Hemoglobin, Teenage Girl.

### Introduction

Adolescence is a period of growth for children towards maturity. During this period there were physical, biological and psychological changes. Physical changes will affect their health and nutritional status. The imbalance between the intake and the need for nutrients will cause nutritional problems, such as overnutrition and malnutrition [1]. One of the most common nutritional problems is anemia. Anemia is a micronutrient problem that often occurs throughout the world, especially in developing countries, it is estimated that 30% of the world's population is anemic. Until now, anemia in teenage girl is still high. Kemenkes data in 2013 shows the prevalence of anemia in the adolescent age group ( $\geq 15$  years) is 22.2% [2].

Teenage girl are one of the groups prone to anemia. Adolescence need special nutrition, because there is rapid growth, and iron needs have increased. Iron is needed by the body to form myoglobin in new muscle tissue. Teenage girl need more iron because they have menstruation every month, which causes them to lose iron  $\pm 1.3$  mg per day, so they need more iron than teenage boy. In addition, teenage girl usually want to have a slim body, so they limit their intake of foods that contain iron [3]. Several research have shown that iron intake in adolescents is still lacking, such as research by Hesti (2016) that iron intake in urban and rural teenage girl, most of the samples have less iron intake, as many as 95.7% of urban teenage girl and 100% of rural teenage girl [4]. The other research show that 27% of teenage girl aged 11-18 years do not meet their iron needs, while 6% of young men [5]. This confirms that teenage girl are more prone to experiencing iron deficiency.

If anemia is not treated properly, the impact that often appears is a decrease in adolescent learning achievement. According to Astiandani's 2015 in Dumilah (2017) research, it shows that anemia in teenage girl has a 1.875 times risk of obtaining low learning achievement compared to teenage girls who are not anemic [6]. Adolescence with anemia will cause fatigue and drowsiness easily. In addition, anemia also affects the immune system of adolescents, the immune system will decrease and cause adolescents to become susceptible to infection, and even impact on sexual maturation that is less than perfect. According to Hallberg (1994) in Permaesih (2005), the process of sexual maturity in adolescents makes the body need more iron, so if adolescents have anemia, their sexual maturation is not perfect [7].

In general, iron contained in animal protein foods such as meat, chicken and fish has high biological

availability. Eel (*Monopterus albus*) has a nutritional content similar to that of fish and even eels have a higher iron content than other fish. The results of the eel chips laboratory test at the Balai Besar Litbang Pasca Panen, showed that the iron contained in 100 grams of eel chips is 5 mg. This iron content can meet at least 30% of teenage girls' iron needs. The adequacy of iron in teenage girls is 14-25 mg [8]. This is the basis for choosing eel meat as an alternative in increasing adolescent Hb levels. Other sources of iron are green vegetables such as spinach. One source of iron that has a high biological availability is from animals, while vegetables have a low biological availability. It needs a good combination of foods to be able to increase the absorption of iron in the body, such as foods made from a mixture of iron sources from animals and plants and other sources that can help increase absorption.

Eel chips with spinach mixture is a variety of snacks that contain good nutrients specifically iron. It is hoped that by creating eel chips with a spinach mixture can reduce the prevalence of anemia, especially in adolescents, and can also have high economic value, especially for eel-producing community groups. Based on these descriptions, researchers are motivated to conduct research on "The effect of consuming eel chips (*Monopterus albus*) on increasing hemoglobin levels in teenage girl"

### RESEARCH PURPOSES

To determine the effect of consuming eel chips (*Monopterus albus*) on increasing hemoglobin levels in teenage girl.

### METHODS

The design of this research is analytical, using a Quasy experiment design (non-randomized control group pretest posttest design). The population was teenage girls aged 13 to 20 years with Hb levels less than 12 mg%. The number of samples was 54 teenage girls (27 in the treatment group and 27 in the control group). Hb examination was carried out before treatment and after treatment. Teenagers as the treatment group consumed 100 gr / day of eel chips mixed with spinach for 12 days. Teenagers as a control group consumed spinach chips as much as 100 g / day for 12 days. Hb check tool using an electric probe.

### RESULT

Table 1. Protein and Iron Content in 100 grams of Eel Chips

No	Nutrients	Total
1	Proteim	10,9 Gr
2	Iron	5 Mg

Table 1 shows that the protein content in 100 grams of eel chips is 10.9 grams and the iron content is 5 mg.

Table 2. Description of Nutritional Intake and Menstrual Cycle in Teenage Girl

Nutritional Intake (calories)	Mean	Median	Standard Deviation	Minimum Maximum
Nutritional Intake (calories)				
1. Do not consume eel chips	1.514	1.500	215,199	1200-2150
2. Consume eel chips	1.525	1.500	203,284	1.250-2150
Menstrual Cycle (day)				
1. Do not consume eek chips	29,00	28,00	4,641	20,00-38,00
2. Consume eel chips	30,89	30,00	4,610	21,00-40,00

Table 2 shows an overview of the nutritional intake of teenage girls in Islamic boarding school Al Ittifaq, Bandung Regency who do not consume eel chips, on average 1,514 calories. This isn,t much different from the calorie intake of teenage girls who consume eel chips with an average of 1.525 calories, while the

menstrual cycle in teenage girls who do not consume and consume eel chips isn't much different, 29 days and 30.89 days respectively.

Table 3. Differences on Increased Hemoglobin Levels in Teenage Girl who Consume and Didn't Consume Eel Chips

Hemoglobin Levels Increase	Mean	SD	P value	N
1. Do not consume eel chips	0,533	0,635	0,003	27
2. Consume eel chips	1,429	1,333		27

Table 3 shows the difference in the increase in hemoglobin levels of teenage girls who consumed and didn't consume chips, 1.429 g% and 0.533 g% in each group. The difference in hemoglobin levels was significant with a p-value of 0.003 and  $\alpha$  of 0.05.

Table 4. Effect of Eel Chips (*Monopterus albus*) Consumption on Increased Hemoglobin Levels in Teenage Girls

Consume Eel Chips	T	P-Value
Consume Didn't Consume	5,571	0,000

The test results of consuming eel chips (*Monopterus albus*) on increased hemoglobin levels in teenage girls at Al Ittifaq Islamic boarding school, Bandung Regency using the independent t test showed a significant result (pvalue 0.000 with  $\alpha$  0.05)

Table 5. Effect of Consumption of Eel Chips (*Monopterus albus*) on Increased Hemoglobin Levels in Teenage Girls with Nutritional Intake and Menstrual Cycle Control

Variable	B	SE	P-Value
(Const) (Constant)	-5,741	1,077	0,000
Menstrual Cycle	0,084	0,025	0,001
Nutritional Intake	0,003	0,001	0,000
Consumption Eel Chips	0,709	0,227	0,003

In teenage girls who have a longer menstrual cycle, the hemoglobin level will likely increase by 0.084 g%, and if the teenage girls increase their nutritional intake, the hemoglobin level will increase by 0.003 g%. Meanwhile, if teenage girl consume eel chips consistently, it will increase their hemoglobin levels by 0.709 mg%.

## DISCUSSION

### The Results of Measurement Protein and Iron content in Eel Chips

Eel meat is a source of animal protein that is recommended for consumption, because it has complete nutritional content. Eel meat contains 20 mg of iron, 14 grams of protein, 27 grams of fat, 200 mg of phosphorus, 20 mg of calcium, 1600 si of vitamin A, 0.1 mg of vitamin b, and 2 mg of vitamin C. Eel chips that have been processed are tested for nutritional content, especially protein and iron content. 100 grams packs of eel chips contain 10.9 grams of protein and 5 mg of iron.

### The description of Nutritional Intake and Menstrual Cycle in Teenage girl

The average of the nutritional intake of teenage girl in Bandung Regency is 1,514 - 1,525 calories. Shows that 95% of teenage girl in the Al Ittifaq Islamic boarding school in Bandung Regency are less than the

RDA. Another factor that affects anemia is the menstrual cycle. Menstrual cycle as one of the factors that is often associated with the incidence of anemia. Most teenage girls (97%) ovulated with menstrual cycles ranging from 18 to 42 days. Teenage girl is usually irregular menstrual cycles. Teenage girl who experience an 18-day menstrual cycle can develop anemia and teenage girl whose menstrual cycle is 42 days usually not ovulate [9]. The results of research Elok et al (2012) stated that the menstrual cycle is related to hemoglobin levels [10]. The results of this research indicate that the average menstrual cycle in teenage girl ranges from 29 to 30.89 days. The description of menstrual cycle in this research is averagely normal.

### **The differences in the increase in hemoglobin levels between teenage girl who consume and not consume eel chips**

Hemoglobin levels are affected by the iron content in the blood, because most of the iron in the blood binds to a protein called hemoglobin. Iron stores in the body (ferritin and hemosiderin) are found in the liver, spleen and bone marrow. If the amount of iron stored in the body is sufficient, the formation of red blood cells in the bone marrow will always be fulfilled. However, if the intake of foods that contain iron is deficient in the long term, the iron stores in the body will decrease, as a result, the hemoglobin level in the blood will drops. This causes iron nutritional anemia [11]. The results of Istiya Putri's research (2017) states that the higher a person consumes iron sources, the higher levels of hemoglobin [12]. The results from other studies explain that hemoglobin can increase after being given iron interventions for 12 times / 12 effective days [13]. The eel chips in this research contained 10.9 grams of protein and 5 mg of iron, so that if a adolescence can consume these eel chips consistently for 12 days, the adolescence's hemoglobin levels will likely increase. The results of this reasearch support the theory that the increase in hemoglobin levels in teenage girls who consume and not consume eel chips in this research is different, respectively, the increase in hemoglobin levels is 1.429 g% and 0.533 g%. The difference in hemoglobin levels was significant with p value 0.003 ( $\alpha = 0.05$ )

### **The Effect of Eel Chips (*Monopterus albus*) Consumption on Increased Hemoglobin Levels in Teenage girl**

The laboratory test results of eel chips were used as products in the intervention of this research contained 10.9 grams of protein and 5 mg of iron. The content of these nutrients is good enough to increase hemoglobin levels in teenage girls. Form of iron in the food affects its absorption. Hem iron contained in eel chips can be absorbed twice as much as non-hem iron. Eel is a food that contains iron which is very good compared to iron in meat and eggs [8]. The mechanism of the course of iron in the body needed protein as an introduction. Protein is called transferring which are synthesized in the liver and transferrin will carry iron in the blood to be used in the synthesis of hemoglobin. Protein also has an important role in the transportation of iron in the body [7]. This explains that someone who consumes eel chips has the opportunity to increase hemoglobin levels. The results showed that the consumption of eel chips (*Monopterus albus*) on the increase in hemoglobin levels in teenage girls used an independent t test showed significant (pvalue 0.000 with  $\alpha = 0.05$ ).

### **The Effect of Eel Chips (*Monopterus albus*) Consumption on Increased Hemoglobin Levels in Teenage Girls with Control of Nutritional Intake and Menstrual Cycle**

In teenage girls whose menstrual cycles are longer, the hemoglobin levels will likely increase by 0.084 gr%, and if teenage girl increase their nutritional intake, the hemoglobin levels will increase by 0.003 g%, whereas if teenage girl consume eel chips consistently it will increase hemoglobin levels by 0.709 mg%. The results of these statistical tests show that the hemoglobin level of a teenage girl is also influenced by menstrual cycle of the teenager, also influenced by nutritional intake. The results of this research concluded to consume food sources of protein and iron to maintain hemoglobin levels.

## **CONCLUSION**

The test results of the content of eel chips showed that eel chips contained 10.9 grams of protein and 5 mg of iron. consumption of eel chips has an effect on increasing hemoglobin levels with Pvalue = 0.000 ( $\alpha = 0.05$ ). Hemoglobin levels in teenage girls are also affected by the menstrual cycle and nutritional intake.

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