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Epok-Epok Bilis Tempe (EPOLIST) as a Healthy Snack to Treat Anemia in Pregnancy in the Archipelago

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ABSTRACT

EPOLIST is a healthy snack in the form of Epok Bilis (anchovies), typical food from the Riau islands with good nutritional content; it is believed to be able to increase the hemoglobin level of pregnant women with anemia in the archipelago region. This research was a quasi-experiment one group pre-test-post-test with a randomized block design. The sample consisted of 36 people. The inclusion criteria were multigravida pregnant women who were willing and working as housewives in the third trimester with anemia. The exclusion criteria were primigravida pregnant women and pregnant women with complications in pregnancy who were not present at the time of the study. Data were collected by conducting home visits for ten days. The research was conducted in the Tanjungpinang Health Center working area. The results showed that the average Hb level before administration was 9.7 g% with a standard deviation of 0.97 g%. The average Hb level after the intervention was 11.2 g% with a standard deviation of 1.28 g%. It can be seen that the mean difference between the first and second measurements was 1.5 g% with a standard deviation of 0.63 g%. The results of statistical tests obtained p value = 0.024 (p <0.005). Epok-Epok Bilis Tempeh (EPOLIST) affects the hemoglobin level of pregnant women with anemia. For this reason, it is hoped that the distribution of Epolist can increase the hemoglobin level of multigravida pregnant women in the Archipelago Region.
Keywords: Epok-Epok Bilis Tempeh (EPOLIST); anemia of pregnancy; hemoglobin

INTRODUCTION

The first thousand days in life are essential for a baby because human qualities are determined from the beginning of the fetus growing in a mother's body. Therefore, the nutritional intake of pregnant women must be concerned for the fetus's optimal formation, growth, and development. The thrifty phenotype theory states that a malnourished fetus during pregnancy will have metabolic and endocrine adaptations that will lead to difficulty adapting after birth to a nutrient-rich environment and experience impaired glucose tolerance and obesity [(1)]. One of the nutritional problems in pregnant women that often occurs is low blood hemoglobin levels or nutritional iron deficiency anemia. Nutritional iron deficiency anemia is a condition where the number of red blood cells is deficient due to a lack of dietary intake of iron sources. The state of anemia in pregnant women can be identified by measuring blood hemoglobin levels; if the Hb level is less than 11 g%, it is categorized as anemia [(2)]. he incidence of anemia in pregnant women globally reached 40.1% in 2016. These numbers show an increase from 2010 (39.4%) and 2015 (39.0%) [(3)]. In Indonesia, the prevalence of anemia in pregnant women in 2018 was 48.9%, an increase of 37.1% compared to Riskesdas 2013 [(4,5)]. Based on the WHO category, this condition is included in the severe category of public health problems (40% pregnant womenwith anemia) [(6)].

In Indonesia, anemia caused by iron deficiency is better known as Nutritional iron deficiency anemia. Iron deficiency anemia is one of the most common disorders during pregnancy. Pregnant women generally experience iron depletion so that only a small amount of iron is given to the fetus for normal iron metabolism [(7)]. The risk factors for anemia in pregnant women consist of direct and indirect causes. The direct causes of the anemia risk are lack of intake/ nutrients and strenuous physical activity. Insufficient intake during pregnancy happens because of the competition for nutrients between the fetus and the mother also the deterioration of placental function [(8)].

The low compliance of pregnant women in consuming blood-boosting medicine is one of the causes of anemia. Several reasons related to non-compliance in consuming the medications are the smell and taste of iron tablets which cause nausea [(9)]. Moreover, taking iron tablets will turn the stool black. These weaknesses of the blood-booster medication make pregnant women less comfortable taking the tablets. Some people prefer to eat local iron-rich foods to meet their iron deficiency. One of the famous traditional local foods from the city of Tanjung Pinang is epok-epok. Another name for Epok-epok is a pastel filled with sweet potatoes. The filling can be varied;

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some contain potatoes and carrots. Tanjungpinang city is also famous for producing much marine fish; one of them is bilis fish or anchovies.

Tempeh is a food made from fermented soybean seeds or other ingredients using several types of mold; Rh. oligosporus, Rh. Oryzae, Rh. stolonifer (bread mold), or Rh. Arrhizus. This fermented preparation is commonly known as "Tempeh Yeast". Tempeh is rich in dietary fiber, calcium, vitamins B, and iron. Various tempeh content has medicinal value, such as antibiotics to cure infections and antioxidants to prevent degenerative diseases. Tempeh is a traditional Indonesian food. In Indonesia, tempeh has been known for centuries [(10)]. Tempe has long been recognized as a food with a high nutritional value. Research on the nutritional value of tempeh continues to be carried out, and the results show that tempeh contains elements that are useful for the body, such as fatty acids, vitamins, minerals, and antioxidants [(11)].

Bilis (anchovies) are small fish 7-40 cm in length. Anchovies are a source of protein and rich in calcium. Anchovies have a high calcium content, so they can be used to substitute eggs, milk, and meat. Anchovy is a marine fish with a high enough protein content [(12)]. Research by Zou Y et al (2017) under the title of "Key factors characterization of anchovy Engraulis japonicas in increasing the absorption of Nanoparticles-Mediated Non-Heme iron" found that anchovy has been shown to increase the absorption of non-heme iron through oxyhydroxide nanoparticle (FeONP) mediated mechanisms, it resulted in the efficiency of hemoglobin regeneration in anemic rats [(13)]. The research concluded that the cause of anemia is due to iron deficiency, and one of the iron-rich foods is anchovies. Every 100 grams of anchovy flour contains 3.9 mg of iron. High iron content will prevent anemia and facilitate the red blood cells in flowing oxygen and nutrients throughout the body. With sufficient benefits, anchovies are recommended to be consumed correctly according to daily nutritional needs. Based on the description of the background above, the researchers are interested in researching "Epok-Epok Bilis Tempeh (EPOLIST) as a healthy snack that can increase the hemoglobin of anemic pregnant women in the Archipelago Region in 2020.

METHODS

This research was conducted to determine the effect of giving affordable and healthy snacks to pregnant women with anemia to increase their hemoglobin (Hb) level. This study was quasi-experimental with a non-randomized pre-test and post-test with a control group design. The population in this study was all pregnant women. The sampling technique in this study used a minimum sample calculation formula with a randomized block design; from a total population of 50 people, a sample of 36 pregnant women with anemia was obtained. The inclusion criteria in this study were pregnant women with multigravida trimester III with anemia who were willing to be respondents and could consume tempeh.

In contrast, the exclusion criteria were primigravida pregnant women and pregnant women with complications in pregnancy who were not present at the time of the study. Data were collected by conducting home visits and comparing pregnant women's hemoglobin (Hb) levels before and after being given Epok-Epok Bilis Tempeh (EPOLIST) 50 g per pack with an iron content of 18 mg regularly for 10 days. After the ten days of intervention in the treatment group, the hemoglobin (Hb) level of pregnant women with anemia was measured again on the eleventh day. The study was conducted from May to August 2020 in the Tanjungpinang City Health Center working area. All research data were collected and analyzed using SPSS statistical test software version 22.0. The confidence level used is 95%, with a p-value of <0.05. The data normality test uses the Shapiro Wilk test. A dependent sample t-test was carried out to determine prenatal yoga's effect on decreasing pregnant women's physical complaints.

RESULTS

Research on the effect of giving Epok-Epok Bilis Tempeh (EPOLIST) to pregnant women with anemia on hemoglobin (Hb) in Kampung Baru Village, Tanjungpinang Health Center working area. Based on the results of the organoleptic test above, the formula of Epok-Epok Bilis Tempeh (EPOLIST) used in this study was 50 g per chip with an iron dose of 18 mg. The food was packaged in plastic containers for respondents (36 pregnant women) and during the treatment period (10 days).

Quality Test and Evaluation of Epok-Epok Bilis Tempeh (EPOLIST)

Based on the results of the food quality test at the Laboratory of the Agricultural Department Industrial Technology (TIN) and the Laboratory of Food Science and Technology (ITP) of the Faculty of Agricultural Technology (Fateta) IPB, the following test results were obtained:

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Table 1. Fe and moisture content of Epok-Epok Bilis Tempeh (EPOLIST)

No	Parameter	Unit	Results	Method
1	Iron (Fe)	Mg/kg	18.03%	APHA ed. 22nd 3111 B, 2012
2	Water content	%	57.57%	SNI 01-2891-1992

Source: IPB Laboratory Processing and Testing, 2020.

Table 1 shows that the iron content per 100 g of Epok-Epok Bilis Tempeh (EPOLIST) has the most significant iron content of 18.03 mg/100 g. In addition, the water content of Epok-Epok Bilis Tempeh (EPOLIST) is 57.57%.

Table 2. Distribution of respondents by incidence of anemia before the intervention

Anemia	Intervention		Control	
	Frequency	Percentage	Frequency	Percentage
Very mild anemia	11	61.1	12	66.7
Mild anemia	5	27.8	4	22.2
Moderate anemia	2	11.1	2	11.1

Table 2 shows the distribution of respondents based on the level of anemia before treatment in the intervention group and the control group, the majority of the respondent is mild anemia (61.1%) in the intervention group and 66.7% in the control group. However, in the intervention group, 18.3% were normal/non-anemic, while none were normal/not anemic in the control group.

Table 3. Distribution of respondents by incidence of anemia after intervention

Anemia	Intervention		Control	
	Frequency	Percentage	Frequency	Percentage
Very mild anemia	12	66.7	12	66.7
Mild anemia	1	7.5	5	27.8
Moderate anemia	1	7.5	1	7.5
Normal/non anemia	5	18.3	0	0

The average difference test of physical complaints in the pre-test and post-test begins with testing the normality of the data using the Shapiro Wilk test. It resulted in the pre-test p-value of 0.076 and the post-test p-value of 0.123. This shows that the significance value for the two data groups is > 0.05, so it can be concluded that the distribution of the two data groups is normal. Since the normal distribution conditions are met, the hypothesis test used is the dependent samples t-test as shown in table 3.

Table 4. Different test analysis

Hb	n	mean	SD	SE	p-value
Pretest	36	9.7	0.97	0.24	0.024
Posttest		11.2	1.28	0.34	

Table 4 shows the results of the dependent samples t-test with a p-value = 0.024 ($p<0.05$), indicating a significant relationship between EPOLIS consumption in pregnant women and Hb levels. In other words, EPOLIS effectively increases Hb levels in pregnant women. The Hb level value indicates it increased due to the treatment. The dietary regulator influences the absorption of iron for each individual differently; after iron consumption, the absorptive cells will be resistant to iron absorption for some time.

DISCUSSION

The main ingredients for making Epok-epok tempeh are tempeh and bilis. This refers to the results of the Sevenile (2019) study, which states that tempeh supplementation can improve iron status [(14)]. Iron is one of the main elements that make up hemoglobin. A high iron intake will reduce the chances of anemia [(15)]. The value of the Hb level indicates that due to treatment or intervention, the Hb level of pregnant women has increased. The

absorption of iron for each individual is different; the dietary regulator influences this; after iron consumption, the absorptive cells will be resistant to iron absorption for some time [16]. In this study, pregnant women were given Epok-Epok Bilis Tempe (EPOLIST) daily with an iron content of 18 mg per 100 grams of tempeh and 100 grams of bilis. However, not all of the iron can be absorbed by the body because the body can only absorb a maximum of 20-40 mg. /day. To avoid this, respondents are advised not to consume tea, coffee, chocolate, oregano, and milk when consuming Epok-Epok Bilis Tempe (EPOLIST). Because in tea, coffee, chocolate, oregano, and milk, some elements inhibit iron absorption, including tannins and calcium.

The results of Indartanti and Kartini's research stated that anemia could be reduced by reducing the habit of drinking tea or increasing protein consumption [17]. Although tea has many health benefits, it turns out that tea is also known to inhibit the absorption of iron from non-heme sources [18]. Iron deficiency anemia in children in Nepal has also been reported to be associated with tea drinking. This can be caused by several things, among others, because tea contains tannins which can bind minerals (including iron) and in some teas (especially black tea) polyphenol compounds that act as antioxidants have been oxidized, so they can bind minerals such as Fe, Zn, and Ca so that iron absorption is reduced. While in green tea there are still a lot of polyphenolic compounds, so we can still increase its role as an antioxidant [19].

Changes in Anemia Status Before and After Intervention

The results showed that most respondents experienced changes in anemia status, meaning there was a significant difference in pre and post-Hemoglobin levels after the intervention. Pregnant women with moderate anemia changed to mild anemia status, and pregnant women with mild anemia status changed to non-anemic or normal. This can be seen from the average Hb level before the intervention is 9.7 g% with a standard deviation of 0.97 g%. In comparison, the average Hb level after the intervention was 11.2g% with a standard deviation of 1.28 g%. The mean difference between the first and second measurements is 1.5 g% with a standard deviation of 0.63 g%; it can be concluded that there is an effect of giving Epok-Epok Bilis Tempe (EPOLIST) to pregnant women with anemia on hemoglobin (Hb) levels in the Archipelago area.

The main factor for anemia is a lack of iron intake, because about 2 of 3 iron in the body is found in red blood cells (hemoglobin). Anemia caused by nutritional deficiency is characterized by a disturbance in hemoglobin synthesis due to a lack of nutrients that play a role in the formation of hemoglobin, lack of iron consumption or due to impaired absorption. The nutrients are iron, protein, and pyridoxine (vitamin B6), which are a catalyst in the synthesis of heme in the hemoglobin molecule. These nutrients, especially iron (Fe), are one of the nutritional elements as a component of forming hemoglobin or forming red blood cells. [15]

In Indonesia, many pregnant women do not realize that one of the nutrients or foods that are highly nutritious, affordable, and easy to find in the community is tempeh. Tempeh is a food made from fermented soybean seeds or several other ingredients using several types of mold Rh. oligosporus, Rh. Oryzae, Rh. stolonifer (bread mold), or Rh. Arrhizus [20]. This fermented preparation is commonly known as “Tempeh Yeast”. Molds grown on soybeans hydrolyze complex compounds into simple compounds that humans easily digest. Tempeh is rich in dietary fiber, calcium, vitamin B, and iron (10 mg in 100 grams of tempeh) [10]. One of the benefits of tempeh is that it can prevent anemia and osteoporosis, two diseases many women suffer from. Because it is the nature of women to experience menstruation, pregnancy, and breastfeeding. Anemia can attack women who eat less for fear of being fat, so the body's supply and production of red blood cells decreases [20]. Tempeh can act as a supplier of minerals, vitamin B 12 (found in animals), and iron, which is needed to form red blood cells. So that it can increase blood hemoglobin (Hb) levels. Hemoglobin (Hb) levels can be increased through quality or nutritious food sources. [11]

Anemia can negatively impact pregnant women and the fetus in the womb because it can cause complications during pregnancy and childbirth. Pregnant women can experience bleeding during and after delivery. This side effect or result of blood loss depends on the amount of blood that comes out and the iron substitute in the body [21]. The amount of blood that comes out affects the incidence of anemia because women do not have enough iron supplies, and iron absorption into the body cannot replace the loss. Pregnancy complications that lead to bleeding during and after delivery, such as placenta previa and placental abruption, are at risk of developing anemia after delivery. In a normal delivery, a pregnant woman will bleed an average of 500 ml or the equivalent of 200 mg of Fe. Bleeding also increases during cesarean/operative delivery [9].

CONCLUSION

It can be concluded that there is an effect of giving Epok-epok Bilis Tempeh (EPOLIST) on increasing hemoglobin levels of pregnant women with anemia.

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