



Tuna Fish in the waters of Raja Ampat West Papua, How can it beincrease Haemoglobin levels of pregnant women?

Sunaeni^{1*}, Zaenab Ismail²
sunaenieni607@gmail.com^{1*}, zaenabismail49@gmail.com²

^{1,2}Poltekkes Kemenkes Sorong

Abstract.

Anemia is one of the indicators of malnutrition, more than forty percent of pregnant women have anemi, resulting in various complications for mothers such as young pregnant bleeding, uterine atony to premature pregnancy, low birth weight for babies. This study aims to determine the effectiveness of Tuna cookies in increasing Hb levels of pregnant women. Type of QuasiExperiment with Non equivalent Control Group Design conducted from March 2021 to May 2022. This research was conducted at the Waisai Health Center, Raja Ampat Regency. The respondents in the study were anemi pregnant women who were divided into two groups, 20 pregnant women consumed Tuna cookies and 20 more consumed pmtbuskuit pregnant women. The criteria for the study respondents were pregnant women in trimester I-III who experienced anemi. The data collected included demographic data in the form of age, parity, education and occupation and specific data related to maternal Hb levels before and after the intervention. Data collection using Observation Sheets. The average N-gain score for the experimental class of giving *ThunnaSp Cookies* to pregnant women of $1.91 > 0.7$ was more effective in increasing Hb levels, compared to the control class of PMT biscuits of $0.6 < 0.7$.

Keywords: Cookies, Thunna, Anemi, Hb, Pregnant

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Introduction.

The first thousand days of life is a golden period for the growth and development of the child next, deficiencies in this period will have a different impact on pregnancy outcomes (Super & Wagemakers, 2021). Nutrition during pregnancy is very important, not only to maintain maternal health but more than that mainly to ensure optimal fetal development (Kebbe et al., 2021). One of the nutritional problems faced in Indonesia is nutritional problems during pregnancy. Nutrition during

pregnancy is an important factor that affects the development of embryos and fetuses as well as the health status of pregnant women. One form of deficiency in pregnant women is Anemi.

Based on Riskesdas 2018, anemia of pregnant women increased when compared to 2013, namely 37.1% to 48.9% in 2018 indicating that the nutritional intake of pregnant women is still lacking. (Ministry of Health of the Republic of Indonesia Research and Development Agency, 2018). Anemia is



common worldwide and affects 33% of the global population (Rahman et al., 2020), (Achebe & Gafter-Gvili, 2017). In Africa, sixty percent experience nutritional deficient anemia, pregnancy anemia, hemoglobinopathy, and adversely affect the quality of life as well as social status and economy. (Vanobberghen et al., 2021). Anemic pregnant women are predicted to have eight times the risk of estimated fetal weight not according to gestational age (Wardiyah et al., 2019). The causes of anemia during pregnancy among women in different countries are varied and multifactorial. Anemia is generally caused by food intake that is lacking in iron.

During pregnancy, the need for iron intake increases by about 1000 mg and as much as 500 mg of which is needed for the expansion of red blood cell mass. Iron has an important role in various metabolic processes and as the center of hemoglobin (Hb) structure for the oxygen transport process. In fulfilling such iron it is not enough to rely only on food intake, but also need additional food and oral supplementation of iron. Pregnant women have a diverse understanding in meeting daily nutritional intake. During antenatal care health workers can make healthy modifications to their food intake (Super & Wagemakers, 2021), so in some countries it is necessary to be given additional food. This is in line with Malek's research which states that nine out of ten Women feel the need for dietary supplements during pregnancy, most of them will feel calm and confident that their nutrition is sufficient when consuming supplement. (Malek, PhD et al., 2018). In the micronutrient dietary supplements consumed contain certain vitamins or minerals, iron, vitamin D, and folic acid (de Guingand et al., 2020). Morning dose is 60-120 mg of iron as iron salts administered is the optimal oral dose regimen for women with iron deficiency (Wilson & O'Connor, 2022), (Stoffel et al., 2020), recommended daily dose 30-60 mg of iron element, 60 mg per day in countries where the prevalence of anemia exceeds 40%. (Bah et al., 2019).

On the other hand, the intake of pregnant women from food is still insufficient for their daily iron needs, even though they take nutritional tablet supplements. Therefore additional food is needed for those who are deficient in nutrients. Supplementary feeding (PMT) can be an effort to diversify food and there are many developed supplementary food programs for pregnant women that are full of nutrients. Among them are fortification of foods made from moringa flour (Nadimin et al., 2020) (Loa et al., 2021), green beans, kidney beans, anchovies (Talib et al., 2021) and several other foodstuffs to increase iron supply. Additional food in the form of cookies that have been fortified multigizi substances can also be sought as a countermeasure to the problem of malnutrition in pregnant women. Indonesia has many natural resources both on land and at sea, which can be consumed and provide nutrients for its population.

In West Papua, there are many sources of food ingredients that contain a lot of nutrients, both plants and animals. Commonly found moringa leaf plants, katuk leaves, spinach, cassava leaves, gedi leaves and various types of fish such as skipjack tuna, snapper, tuna, momar grouper and others. One type of fish that contains high protein is tuna. In addition to protein, tuna fish also contains other nutrients such as vitamin A, vitamin C, Vitamin B6, vitamin B12, calcium, iron and magnesium. It is quite easy to get this fish, available along the Flores sea and the Makassar Strait with a fishing area of about 605 square kilometers. One of the uses of tuna that can be done is made into fishmeal to be used as an ingredient in the diversity business. Consuming a variety of foodstuffs will improve the quality of food nutrition. However, the discovery of pregnant women who are anemic, this is very contrary to biological wealth that can be utilized to meet the daily nutrition of pregnant women. Therefore, researchers want to develop the wisdom of local natural resources as an effort to improve the nutritional status of pregnant women in West Papua.



Material and Methode

The research design used *Pre experimental with Pretest-Posttest Control Group Design*. Clinical trials were carried out on pregnant women by dividing a sample of respondents into two groups (intervention group and control group) selected according to the inclusion criteria, then given a pretest to determine the Hb levels of pregnant women before the intervention. Furthermore, pregnant women are required to consume Tuna cookies as much as 3 pieces equivalent to 180-200 mg every day for 90 days in the intervention group, while the ontrol k uit group consumes buskuit PMT for pregnant women. Furthermore, *a post-test* was carried out to determine Hb levels after intervention in both groups. After that, a test was carried out to assess whether there was a difference between the

experimental group, namely a group of pregnant women who consumed *ThunnaSp Cookies* and the control group.

The respondents in this study were pregnant women who were in the work area of the Waisai Health Center, Raja Ampat Trimester I-III Regency, who experienced anemia. The number of respondents was 40 mothers, which were divided into two groups. 20 people included an intervention group that consumed Tuna cookies, another 20 people in the control group consumed PMT biscuits for pregnant women.

Demographic data collection was carried out which included Age, Parity, Education, Occupation. Meanwhile, special data on Hb levels before and after the intervention was carried out. Data collection using observation sheets.

Result:

Based on the results of the analysis from the data obtained, it is presented in the following table:

1. Age

Table 1. Characteristics of pregnant women by Age in the ecpersen group and the control group

Age	N	Minimum	Maximum	Mean	Std. Deviation
Experimental class	20	18	41	26.20	6.246
Control Class	20	19	39	26.85	5.112

2. Parity

Tabel 2.Characteristics of pregnant women based on parity in theecperimen group and the control group

Parity	N	mum	Maximum	Mean	Std. Deviation
Experimental class	20		3	1.90	.968
Control Class	20		3.00	1.8500	.74516

3. Education

Tabel 3. Characteristics of pregnant women based on education in the ecpersen group and the control group

Education	Experimen Group	Control groups
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	f	%	f	%
Primary school	1	5	5	25
Secondary School	16	80	13	65
College	3	15	2	10
Total	20	100	20	100

4. Work

Tabel 4. Characteristics of pregnant women based on work in the ecperimen group and the control group

Work	Experimen Group		Control groups	
	f	%	f	%
Housewives	8	40	8	40
Private	3	15	4	20
Civil servant	9	45	8	40
Total	20	100	20	100

5. Distribution of Average Values of Hb levels

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Table 5 distribution of average values of Hb Levels in experimental groups and control groups

Group	Hb levels	N	Min	Max	Mean	SD
Experimental class	Hb levels before treatment	20	7.8	10.9	9.825	.9262
	Hb levels after treatment	20	10	14	11.54	1.084
Control classes	Hb levels before treatment	20	7.5	13.0	9.990	1.0983
	Hb levels after treatment	20	9.0	12.4	10.410	.9095

6. Data Normality Testing

Table 6 Normality of Hb levels before and after treatment in experimental and control groups

Group	Hb levels	df	Sig. (2-tailed)
Experimental group	Hb Levels Before Treatment	20	0.087
	Hb levels after treatment	20	0.238
Control Group	Hb levels before treatment	20	0.114
	Hb levels after treatment	20	0.211

7. Differences in the average Hb of pregnant women before and after in the experimental class and control class

Table 7 Differences in the average Hb of pregnant women before and after in the control group

No	Variable	Sig. (2-tailed)
	Hb Pre-after experimental group	0,000



8. Hb Control Group Before-After 0,006
 Categorization of the interpretation of the effectiveness of the N-Gain (N-gain Score) Hb value of pregnant women after treatment in the experimental group and control group.

Table 8 Interpretation of effectiveness based on the N-Gain (N-gain score) Hb value of pregnant women after treatment of the experimental group and the control group

Group	N	Mean
Experimen	20	1.9056
control	20	0.6178

9. Comparison of the difference in the average Hb levels of pregnant women after treatment in the experimental class and control class.

Tabel9.Comparison of differences in the average Hb levels of pregnant women before and after the exercise in the experimental group and the control group.

	Levene's Test for Equality of Variances	Sig.	Test for Equal variances assumed of	Sig. (2-tailed)
Experimental group- Control group	0,434	0,000		0,000

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Data on the characteristics of pregnant women can be seen that the average age of pregnant women in the experimental class is 26 years, the lowest age is 18 years and the highest is 41 years. While in the control class the average age is 27 years. The lowest age is 19 years and the highest is 39 years. The average maternal parity of the experimental and control groups was the same, namely the parity of 2 children. Maternal education in the experiment and control group Most of it is high school, the lowest level of junior high school education. While the work of the two is at most as a housewife.

Based on table 7, there were Hb levels of pregnant women before being given the intervention the lowest level was 7.8 gr%, the highest was 10.9gr% with an average value of 9.8 gr% and SD 0.926. After being given the intervention, Hb levels increased, namely the lowest value of 10 gr%, the highest was 14 gr% with an average value of 11.5gr% of the signification value of 0.000 ($p < 0.05$). Meanwhile, in the control group, the previous lowest Hb level was 7.5gr%, the highest was

11.2gr% with an average value of 9.8gr% and SD 0.878. After the intervention the lowest value of 9.0 gr%, the highest of 12.4gr% with an average of 10.4gr% obtained a signification value of 0.006 (< 0.05).

Based on the results of statistical tests using the Shapiro wilk test, it was seen that pregnant women in the experimental class and control class had normal distribution values, with details: in the experimental class before treatment 0.087 and after treatment 0.238. Meanwhile, in the control group before treatment, the value was 0.114 and after the treatment was 0.211. Known sig value. in Levene's Test for Equality of Variances is 0.434 > 0.05 then it can be concluded that the variance of N-Gain data for the experimental group and the control group is the same (homogeneous). Based on table 4.6 based on the results of the calculation of the N-gain value test, it shows that the average N-gain score for the experimental class of *giving ThunnaSp Cookies* to pregnant women of 1.91 > 0.7 belongs to the category of high effectiveness (high effectiveness in increasing



Hb levels). As for the average value of N-gain for the control class of *pmtcookies* of $0.6 < 0.7$ is included in the category of effectiveness is in increasing the level of Hb. Based on the results of the independent samples t test, it is known that the value of Sig. (2-tailed) is $0.000 < 0.05$, it is concluded that there is a significant difference in effectiveness between the provision of *ThunnaSp Cookies* and the provision of *Cookies* PMT to increase Hb levels of pregnant women.

Discussions

Age, Education, Occupation

Based on the results of the study, it was found that the average maternal age was in the active reproductive period (20-35 years), the level of education was more high school, the average maternal work as a civil servant in the intervention group and housewives in the control group. Every pregnant woman needs to ensure that her nutrition has been adjusted in a balanced manner. The level of education and work can affect the daily diet of the expectant mother. Some pregnant women say they still don't understand how much the need to consume foods that contain good nutrients in their daily menu, including micronutrients. One of them is foods that contain iron and folic acid. This is also influenced by the level of knowledge of mothers related to education and education. Studi has linked high maternal knowledge to higher supplement use (Kamau et al., 2019), (Nadimin et al., 2020), (Sumiyati et al., 2021). In addition, mothers' need to consume iron supplementation is very important for the prevention of pregnancy anemia (Triharini et al., 2018). (Mohan et al., 2021). Iron and folic acid supplementation programs (IFAS) are key to global interventions for the control and prevention of anemia in pregnancy. (Kamau et al., 2019), (Caniglia et al., 2022)

Most women want to receive information about the diet during pregnancy. However, a third of the women surveyed do not remember receiving information about the

diet during pregnancy. There is a need to develop pathways to provide this information to women in early pregnancy. Reliable internet-based resources can help achieve this (Bryant et al., 2019). Therefore, in providing health education to pregnant women, it is necessary to develop promotional strategies so that the receipt of pregnant women's materials is more optimal (Berhane & Belachew, 2022) and adapted to the culture of the local community, Culture can influence decision making in food intake during perinatal period. Cultural traditions on Godang Kari Island, Riau, Indonesia can limit the type, quantity, and time of consumption of certain foods with the belief to protect the unborn child and his mother. However, food consumption is also influenced by family income and maternal health conditions. (Tobing et al., 2019).

Therefore, it is hoped that pregnant women can consume food from food sources that contain a lot of protein that can be obtained from meats, fish, nuts, liver, brown rice, oranges, fruits, and vegetables.

Hb levels

Based on the results of the study, it is stated that Tuna cookies have an effect on changes in haemoglobin levels of pregnant women after intervention. We can know that the formation of Hb depends on the formation of red blood cells in the spine. If the spinal cord is good, then the formation of red blood cells takes about 5-9 days, and the lifespan of red blood cells and Hb is about 120 days. Maternal nutritional intake in the pre-conception, conception and pregnancy periods plays a very important role in the nutritional status of pregnant women. Iron is an important component constituent of haemoglobin (Hb). About 73% of iron in the body, stored as ferritin reserves (Talib et al., 2021).

Iron metabolism is influenced by various factors, one of which is protein. Protein is the most abundant nutrient in the body (goleman, daniel; boyatzis, Richard; Mckee, 2019). Protein has an important role in

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providing organic iron intake (haem), organic iron (haem) obtained from food intake. (Raden Tina Dewi Judistiani Mochamad Ari Wibowo, Adhi K Sugianli, 2018). The results of the recall of food consumed by respondents showed that the average pregnant woman consumed enough protein zar, this is in line with the results of studi diet total showed that the level of protein adequacy of pregnant women who were categorized as very insufficient (<80% Protein Adequacy Rate / AKP) was found in 49.6% in urban areas and 55.7% in rural areas (Kusuma et al., 2017). Likewise with zat important micronuterents one of which is folic acid. The development and regulation of the body's genetic material, RNA and proteins requires folic acid as its constituent ingredient. the lack of this substance is closely related to the occurrence of neural tube defects (De Seymour, Beck and Conlon, 2019)..

In helping the process of forming red blood cells, mothers can consume foods high in iron and protein. Proteins function to transport iron (transferin and ferritin) from the GI tract to all body tissues such as bone marrow. Anemic pregnant women have an average protein intake below the provisions of the nutritional adequacy rate (AKG) and pregnant women who are not anemic, the average protein intake is already above the AKG (Husein, 2016). Iron consumption, iron folic acid intake among pregnant women is a leading indicator of assessing global nutrition (Tadesse et al., 2021). A pregnant woman with anemia is determined by the level of Hb. Haemoglobin (Hb) is an active substance that determines the transport of nutrients and oxygen from the maternal blood circulation to the fetus.

When a person's hemoglobin level drops below an acceptable level, it is called anemia (Natekar et al., 2022), (Gupta et al., 2019), in pregnant women hemoglobin levels are less than 11.0 g/dl in the first and third trimesters or hemoglobin levels are less than 10.5 g/dl in the II trimester. The need for *iron content (Fe)* is about 800 mg. The need consists of 300 mg needed for the fetus and 500 grams

to add masa maternal hemoglobin. Excess of about 200 mg can be excreted through the intestines, skin, and urine. In pregnant women's diet, every 100 calories can produce as much as 8-10 mg Fe. For the calculation of eating as much as 3 times, with calories as much as 2500 cal can produce 20-25 mg of iron every day. Thus, the need for Fe (iron) is still lacking in pregnant women so that they require additional intake in the form of iron tablets and adequate nutritional intake. Disadvantages will

In this study intervention, it was carried out for 90 days, this was a consideration for researchers considering the period of red blood cell formation, so that it could observe the relationship between the food intake of pregnant women accompanied by tuna cookies and the Hb levels obtained. This is in line with the results of Thalib's research which states that fish-based biscuits have an effect on increasing heomoglobin levels (Talib et al., 2021), (Manggul et al., 2021). Therefore, PMT to pregnant women combined with fortification is an effort to improve nutrition more effectively (Husein, 2016). The selection of cookies was chosen as an additional food because the moisture content of biscuits is low and biscuits have a dry texture and generally biscuits are widely liked by the public. In addition, biscuits are served in small portions and can be given frequently for interlude food for pregnant women (Roifah et al., 2019).

Limitations:

This research needs to be developed on respondents in other regions besides West Papua considering the specificity and general nutritional status of pregnant women in each region.

Conflik of interest

There is no conflik of interest in this study

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