The effect of consuming seaweed on hemoglobin levels of pregnant women

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Abstract.
Anemia of pregnancy is a condition of pregnant women with hemoglobin levels less than 11gr/dl in the first and third trimesters and less than 10.5gr/dl in the second trimester. Hemoglobin (Hb) is a red pigmented protein found in red blood cells. Increasing Hb can be done by using Seaweed, because seaweed contains iron, minerals, B complex vitamins, protein and others. The purpose of this study was to analyze the effectiveness of seaweed consumption on increasing Hb levels in pregnant women. This research is a Quasy Experiment research with one group pretest-posttest design. Respondents were 10 pregnant women with anemia in Tarakan City, where samples were taken by purposive sampling. The Hb of pregnant women before being given seaweed was the majority 9.21 g/dl, the lowest Hb was 7 g/dl and the highest was 9.8 g/dl. The Hb of pregnant women after being given seaweed was the majority 10 g/dl, the highest Hb was 12.7 g/dl and the lowest was 7 g/dl. The results showed p value <0.0001 (p<0.05) with a change in the mean before being given the intervention from 8.94 g/dl to 10.93 g/dl after being given the intervention. Thus, seaweed is very effective in increasing Hb levels in anemic pregnant women.

Keywords: *Anemia, Seaweed, Pregnancy*

I. INTRODUCTION

Anemia is a medical condition in which the number of red blood cells or hemoglobin is less than normal. Anemia that occurs in pregnancy is a condition of pregnant women with hemoglobin levels of less than 11gr/dl in the first and third trimesters and less than 10.5gr/dl in the second trimester. Hemoglobin in red blood cells has a role to bind and distribute oxygen from the lungs throughout the body. Hemoglobin also binds to and carries carbon dioxide from body tissues to the lungs. Thus, the increase in oxygen demand in pregnant women is closely related to the role of hemoglobin. Normal hemoglobin (Hb) conditions in pregnant women will support pregnant women to be able to meet the oxygen needs of their fetus (1). Anemia is an indirect cause of death that continues to stalk mothers who are facing pregnancy (2).WHO reports that the prevalence of pregnant women worldwide who experience anemia is 41.8%. In Indonesia, the rate of anemia in pregnant women is still quite high. Based on the results of Riskesdas 2018 data, the percentage of anemia in pregnant women has increased over the last 5 years, namely from 2013 to 2018. At Riskesdas in 2013 it was 37.15% while the results of Riskesdas 2018 have reached 48.9% so it can be concluded for 5 In recent years the problem of anemia in pregnant women has increased by 11.8%. From the 2018 data, the number of pregnant women who experienced the most anemia at the age of 15-24 years was 84.6%, aged 25-34 years was 33.7%, aged 35-44 years was 33.6%, and aged 45 -54 years by 24% (3).

The cause of pregnant women experiencing anemia, among others, is caused by a lack of iron which is a constituent component of hemoglobin. Another cause of anemia in pregnant women is the occurrence of blood thinning or hemodilution that occurs at 28-32 weeks of gestation. Haemodilution is the process of thinning the blood so that the baby's nutrition can be fulfilled and ease the work of the heart. Thus the blood volume of pregnant women will increase. The increase in blood volume is greater in the increase in blood plasma. The number of red blood cells and hemoglobin does not have a balanced increase with blood plasma. This makes the concentration of red blood cells in the blood decrease so that the Hb value also decreases (4).Complications of anemia in pregnant women can cause molahidatidosa, hyperemesis gravidarum, antepartum bleeding, KPD. The danger during labor is that the first and second stages last a long time. The main complication of 75% of maternal deaths is postpartum hemorrhage. While the impact that can arise on the fetus is the occurrence of impaired fetal growth, abortion, premature birth and low birth weight

(5).Efforts to reduce the rate of anemia in pregnant women are by giving 90 tablets of iron supplements during pregnancy and fulfilling nutritional intake (6). Pregnant women in addition to consuming iron tablets, need to be supported by a nutritional pattern that contains several compounds needed in the synthesis of hemoglobin (7).

One of the foods that contain iron is seaweed. Seaweed (Eucheuma sp) is one of the foodstuffs that contains several intermediate compounds needed in the synthesis of hemoglobin such as iron, protein and vitamin B complex. Seaweed is a macroscopic algae that lives in water. Like other algae, seaweed does not have true roots, stems and leaves. The whole part of the seaweed is called the thallus. There are thallus in seaweed that is unbranched and branched with properties ranging from soft, hard (covered with lime), like cartilage, to fibrous. Seaweed can be processed into various kinds of snacks such as juice, jelly, fresh drinks, cakes, nuggets, meatballs and so on.According to the results of Mutiara 2021 research, there was a significant increase in hemoglobin in pregnant women after consuming seaweed along with giving Fe tablets than pregnant women who only took Fe tablets without seaweed. The majority of pregnant women's hemoglobin before being given seaweed was only 8.9gr/dl after being given seaweed increased to 12.7gr/dl (Rahmi, 2018). The purpose of the study was to determine the effect of consumption of seaweed (eucheuma sp) on increasing hemoglobin levels of pregnant women in the first trimester with anemia (2). Seaweed production in Tarakan City is very abundant, therefore the utilization of existing and easily available natural potential is deemed necessary as an effort to prevent and reduce the incidence of anemia in Tarakan City (8).

II. METHODS

This type of research uses quantitative methods by using Quasy Experiment research with one group pretest-posttest design. The population of this study were pregnant women who had low or below normal hemoglobin levels (<11 g/dl). The sampling technique in this study is a nonprobability sampling technique with the type of purposive sampling is based on certain considerations made by the researcher himself based on the characteristics or characteristics of the population that have been previously known. The sample in this study were 10 pregnant women with Hb levels below 11 g/dl.

The types of data used are primary data and secondary data. Data collection tools using digital Hb and observation sheets. The procedure for collecting data for each respondent is as follows:

1. The first day of checking the Hb level of pregnant women (pretest) and giving seaweed which is processed into juice to pregnant women every day for 7 days
2. The eight day to check the Hb of pregnant women (posttest).

The variables used in this study were hemoglobin levels in pregnant women and seaweed. The data processing used is editing, coding, data entry, data cleaning and analyzing. The analysis used is Univariate and Bivariate analysis. Univariate analysis in this study was used to obtain an overview of the frequency distribution of Haemoglobin before and after treatment. While the bivariate analysis in this study was to analyze the effectiveness of seaweed consumption in increasing hemoglobin levels in anemic pregnant women before and after being treated with a non-parametric test, namely the Wilcoxon test which was used to analyze the results of paired observations from two different data or not. Statistical test obtained p value <0.05, then Ho is rejected. The data is processed with the SPSS application.

III. RESULT AND DISCUSSION

Respondents in this study were pregnant women who had met the inclusion criteria as many as 10 people. The following is the distribution of respondents characteristics which are presented in the table below :

Table 1. Distribution of Respondents Based on Characteristics

Variabel	n	%
Age		
< 20 years old	3	30
20-35 years old	5	50
≥ 35 years old	2	20
Paritas		

Primipara	3	30
Multipara	7	70
Mother's Nutritional Status		
Normally	4	40%
KEK	6	60%

Based on table 1, it shows that there are 5 pregnant women aged 20-35 years (50%), many parity, namely mothers with multipara as many as 7 pregnant women (70%) and nutritional mothers with KEK as many as 6 pregnant women (60%). Based on the results of many age studies in this study, pregnant women aged 20-35 years. Women of childbearing age tend to suffer from anemia because women experience menstruation every month, and this will be exacerbated if iron intake from daily food is low. Women of childbearing age who suffer from iron deficiency anemia will get sick easily because their immune system is low so their work productivity is low. The ideal age of the mother in pregnancy is in the age group of 20-35 years and at that age there is less risk of pregnancy complications and has a healthy reproduction. This is related to the biological and psychological conditions of pregnant women. On the other hand, in this age group, biological development, namely reproduction, is not optimal. In addition, pregnancy in the age group above 35 years is a high-risk pregnancy. Pregnant women over the age of 35 are also prone to anemia. This causes the body's power to begin to decrease and it is easy to get various infections during pregnancy.

Based on parity characteristics, there were 12 pregnant women with multiparity parity (40%). Pregnant women who give birth more than 3 times are high-risk pregnancies because the more often they give birth, the more they lose blood and iron stores. The more children born, the higher the risk of anemia. Parity is one of the important factors in the incidence of iron anemia in pregnant women. Women who often experience pregnancy and childbirth are increasingly anemic because they lose a lot of iron, this is because during pregnancy women use iron reserves in their bodies.Parity is the number of babies born to a mother, both live births and stillbirths. The risk of the mother experiencing anemia in pregnancy is one of the causes for the mother who often gives birth and in subsequent pregnancies the mother does not pay attention to good nutrition during pregnancy. number of births (parity), the higher the incidence of anemia.Based on the nutrition of pregnant women, it was found that the incidence of anemia in pregnant women was greater in pregnant women with SEZ or LILA. This shows that poor nutritional intake is the cause of malnutrition in pregnant women and also the high incidence of anemia in pregnant women. One of the factors that cause anemia is due to the lack of iron intake in the food consumed every day which is characterized by a hemoglobin (Hb) level below normal.Past nutritional status can affect health conditions in the present and in the future. Women should receive special attention because later they will give birth to children. Nutritional status of women will greatly affect the nutritional status of children tomorrow. The nutritional status of adult women is determined by nutritional adequacy during adolescence.

According to Supariasa, Bakri, and Fajar (2016) nutritional status assessment can be carried out directly and indirectly, namely: first, direct nutritional status assessment, namely anthropometry, physical examination such as clinical, biochemical, and biophysical symptoms. Anthropometric method is a method of assessing nutritional status which is commonly used from a nutritional point of view. According to Widya (2014) there are several ways that can be used to determine the nutritional status of pregnant women, including direct and indirect assessment of nutritional status. Direct assessment of nutritional status includes monitoring weight gain during pregnancy, measuring LILA to determine whether a person has CED and measuring hemoglobin (Hb) levels to determine whether the mother is suffering from nutritional anemia. Indirect assessment of nutritional status is a survey of food consumption, vital statistics, and ecological factors. Food consumption survey is an indirect method of determining nutritional status by looking at the amount and type of nutrients consumed.The nutritional status of pregnant women is one of the indicators in measuring the nutritional status of the community. If the nutritional input for pregnant women from food is not balanced with the body's needs, there will be a nutritional deficiency. Lack of nutrients and the low level of health of pregnant women are still very vulnerable, this is indicated by the high maternal mortality rate caused by bleeding due to nutritional anemia and KEK during pregnancy.

Nutritional status is a factor that exists at the individual level, a factor that is directly influenced by the amount and type of food intake and infectious conditions. It is also interpreted as a person's physical

condition which is determined by one or a combination of certain nutritional measures. Assessment of nutritional status can be done in four ways, namely clinically, biochemically, anthropometrically and food consumption surveys.Iron is a mineral found in red blood cells (hemoglobin) and is used to carry oxygen from the lungs throughout the body. If iron intake is lacking, blood hemoglobin will decrease and anemia occurs. Reduced iron in the diet as a result of not eating foods rich in iron or the body's inability to absorb the iron consumed (for example, because there is impaired absorption in the intestines). The need for iron is increased due to pregnancy itself, in addition to the production of maternal red blood cells, iron is needed for the formation of red blood cells in the fetus. Therefore, iron supplementation during pregnancy is very necessary. For example, foods rich in iron are red meat/poultry, eggs, green leafy vegetables (such as spinach and broccoli), nuts and seeds, tofu and tempeh.

The results of Univariate and Bivariate analysis obtained the following results :

Eksperimen	N	Mean	P Value
Pre test	10	9.21 gr/dl	0.0001
Post Test	10	10.93 gr/dl	

Based on table 2 above, the results of the Wilcoxon test on the value of the effectiveness of seaweed consumption to increase hemoglobin levels in anemic pregnant women were obtained with a p value of 0.0001 ($p < 0.05$) with a change in the mean before being given an intervention (pre test) 9.21 g/ dl to 10.93 g/dl after being given an intervention (post test), and the difference in the increase in Hb of pregnant women is 1.72 g/dl so it can be concluded that consuming seaweed has an effect on increasing hemoglobin in anemic pregnant women.Based on statistical analysis in this study, it was found that consuming seaweed for seven days could increase Hb levels by 1.72 g/dl in anemic pregnant women. The increase in Hb levels was quite high compared to previous studies of 1.45 g/dl. The results of univariate analysis showed that the majority of pregnant women's hemoglobin before being given seaweed was 9.4 g/dl (30%) with the lowest Hb 7.4 g/dl (3.3%). The majority of pregnant women's hemoglobin after being given seaweed was 10.2 g/dl (20%) with the highest Hb being 12.2 g/dl (3.3%).The bioavailability of substances contained in seaweed is around 2-10% higher compared to vegetables, because the content of phytic acid in seaweed that can interfere with iron absorption is very little (Yuniarti et al., 2016). The results of previous studies showed that there was an effect of consumption of seaweed (Eucheuma sp) on the increase in hemoglobin levels with a p value of 0.004 ($p < 0.005$) with changes in Hb levels before and after being given seaweed of 1.45 gr/dl.

The seaweed used is Eucheuma Sp. Eucheuma Sp is a seaweed that can stabilize the number of red blood cells, white blood cells, and hemoglobin. In addition, Seaweed serves to reduce the side effects of inhibiting the production of blood cell-producing cells (Uluwiyatun et al., 2015). Based on statistical analysis in this study, it was found that consuming seaweed for seven days could increase Hb levels by 1.72 g/dl in anemic pregnant women. The increase in Hb levels was quite high compared to previous studies of 1.45 g/dl. Researchers argue that consuming seaweed can overcome the problem of anemia in pregnant women.In this study, researchers can conclude that seaweed has an effect on increasing hemoglobin levels in anemic pregnant women because seaweed has a variety of good content to increase the Hb levels of pregnant women, so that pregnant women who have low Hb will experience an increase and pregnant women do not feel sick. anxious and afraid of the situation during pregnancy and in the future delivery process.The results of this study are not different from the research conducted by Rifa, (2018) which describes the results that the Hb of pregnant women before being given seaweed was the majority 8.9 g/dl, the lowest Hb was 7 g/dl and the highest was 9.8 g/dl. The Hb of pregnant women after being given seaweed was the majority 10 g/dl, the highest Hb was 12.7 g/dl and the lowest was 7 g/dl. The final result of statistical test obtained p value of 0.002 <0.05, so it is proven that there is an effect of seaweed consumption on increasing hemoglobin levels. Seaweed contains vitamins B6 and B12 which are needed in the synthesis of hemoglobin. Vitamin B6 and amino acids and glycine in the initial reaction of heme formation. Vitamin B6 and vitamin B12 are required for the synthesis of globin.

Furthermore, the interaction between heme and globin will produce hemoglobin. Regular consumption of seaweed has an effect on increasing hemoglobin levels in anemic patients. According to the researcher's assumption, this non-pharmacological treatment of anemia needs to be applied to pregnant

women who experience anemia, in addition to ingredients that are easy to obtain, consuming them in the long term of course also does not have a bad effect on the health of pregnant women and also on the fetus they contain.Until the time of delivery, pregnant women need about 40 mg of iron per day or twice the needs of non-pregnant conditions. The need for iron in pregnant women is different at each gestational age, in the first trimester it increases from 0.8 mg/day to 6.3 mg/day in the third trimester. The need for iron is very striking increase. The results of this study are also in line with research conducted by Ayuni and Rishel (2021), regular consumption of seaweed has an effect on increasing hemoglobin levels in anemic patients. In pregnant women who experience anemia, in addition to ingredients that are easily obtained, consuming them in the long term certainly does not have a bad influence on the health of pregnant women and also on the fetus they contain.

Thus, the need for iron in the second and third trimesters cannot be met from food alone, even though the food eaten is of good quality and bioavailability of iron is high, but iron must also be supplied from other sources in order to be sufficient. The addition of iron during pregnancy is approximately 1000 mg, because it is absolutely necessary for the fetus, placenta and increase in maternal blood volume. Part of this increase can be met by iron stores and an adaptive increase in the percentage of iron absorbed.Regarding the Provision of Blood Supplementary Tablets for pregnant women According to Riskesdas (2013), there are only 33.3% of pregnant women who consume a minimum of 90 TTD during pregnancy (Health Research and Development Agency of the Indonesian Ministry of Health, 2013). A formative study conducted in the Community-Based Health and Nutrition Program (PKGBM) area in 2014 showed that only 54.5% of pregnant women consumed 90 iron tablets given to them the average iron tablets received and consumed by pregnant women in the first trimester was 32 and 25, in the second trimester it was 39 and 30, and in the third trimester it was 37 and 26. The most common reason given by pregnant women not to take the full recommended dose of TTD was side effects. To increase the full consumption of iron tablets, it is necessary to provide health education with the support of appropriate Communication, Information and Education (KIE) materials for health workers. According to the Minister of Health of the Republic of Indonesia. No. 88 (2014) blood-added tablets are tablets given to women of childbearing age and pregnant women. For women of childbearing age, it is given once a week and once a day during menstruation and for pregnant women it is given every day during pregnancy or a minimum of 90 tablets.

IV. CONCLUSION

The conclusion in this study was that the Hb level of pregnant women before being given seaweed was 8.9 g/dl. The lowest Hb is 7 gr/dl and the highest is 9.8 gr/dl. The Hb of pregnant women after being given seaweed was the majority 10 g/dl, the highest Hb was 12.7 g/dl and the lowest was 7 g/dl. The results showed p value <0.0001 ($p<0.05$) with a change in the mean before being given the intervention from 9.21 g/dl to 10.93 g/dl after being given the intervention. Thus, seaweed is very effective in increasing Hb levels in anemic pregnant women. It is recommended for pregnant women to seek information independently about the content of seaweed and also the process of processing seaweed as an effort to increase Hb levels. This research can provide information as the development of knowledge about seaweed in an effort to increase Hb levels of anemic pregnant women.

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