

The Effect of Spinach Consumption on the Incidence of Anemia in Pregnant Women

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ABSTRACT

Pregnant women are one of the groups most vulnerable to nutritional problems such as anemia. Anemia is an abnormality in the number of erythrocytes that carry oxygen into the body and are insufficient to meet the organism's needs. This study aims to determine the effect of spinach consumption on the incidence of anemia in pregnant women. This type of research is a *Quasi Experiment* using the *One Group Pretest Posttest design*, which was carried out at the Lamongan Health Center on July 01 - August 30, 2022. The population in this study was pregnant women who had their pregnancy checked from July 01 - August 30, 2022, as many as 186 people. The sampling technique is non-probability *sampling* using *purposive sampling*. Data analysis using univariate and bivariate analysis. Bivariate analysis was performed with the normality test using the *Shapiro-Wilk* test and statistical tests using *the paired T-test*. The results of this study obtained *paired T-test Sig (2-tailed)* 0.000. The p-value is $0.000 < 0.05$, so it can be concluded that spinach consumption has a significant effect on the incidence of anemia in pregnant women.



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1. Introduction

The pregnancy period is part of an important stage for women, because it will determine the quality of human resources in the future. Child development is determined since the fetus from the womb [9]. Pregnant women are one of the groups most vulnerable to nutritional problems such as anemia [8], [16]. Anemia is a disorder in the number of erythrocytes that carry oxygen into the body and is not sufficient to meet the needs of the organism [16] and increased plasma fluid during pregnancy which causes hemodilution [19]. To establish the diagnosis of anemia, it can be seen from low hemoglobin (Hb) levels, namely Hb levels < 11.00 g% in the I, III trimesters, and in third trimesters Hb levels < 10.5 g% in the second trimester [13]. Based on the severity of anemia, it is classified as mild anemia if the Hb is 9-10 g/dl, moderate anemia if the Hb level is 7-8 g/dl, and severe anemia if the Hb level is lower than < 7 g/dl [4], [14].

Anemia is a global public health problem that affects both developed and developing countries [16]. According to the World Health Organization (WHO) has reported that 56% of pregnant women with anemia occur in developing countries [9], [20] and about 40% of the incidence of anemia affects pregnancy

worldwide. In fact, almost a third is associated with increased maternal mortality with the highest cause due to postpartum hemorrhage. Anemia of pregnancy also increases perinatal mortality, premature birth, pre-eclampsia, low birth weight (LBW), small for gestational age (SGA), live births, cesarean delivery [2], [17], [19], while the health of children and mothers is one of the indicators of the sustainable development goals or SDGs 2030, where the goal is to reduce maternal mortality globally [19].

The most contributing factor to the onset of anemia is iron deficiency [16]. Iron requirements increase from 2.5mg/day in the first few weeks of pregnancy to 6.6mg/day in the next trimester [15]. It is generally assumed that 50% of anemia cases are caused by iron deficiency caused by low iron intake or poor iron absorption [16]. For this reason, iron tablet supplementation programs for pregnant women have been established as the main program to control anemia in pregnancy in many countries. Pregnant women are recommended to take iron tablets every day and consume at least 90 tablets during pregnancy up to 42 days after delivery, with doses of 30-60 mg iron/day and 0.25 mg/day [9], however, iron tablets are often associated with a very high incidence of gastrointestinal side effects, poor adherence to consumption. New evidence reports that oral iron consumption increases serum hepcidin which causes a decrease in absorption, further decreasing efficacy [2] so that non-pharmacological efforts are needed to meet iron needs by utilizing natural ingredients derived from green vegetables such as spinach [5]. Spinach is a plant that is very easy to find in Indonesia, the price is relatively cheap so it is often used as processed food, even widely used for health [12]. Green spinach is good for the body because it is a source of iron which plays a role in the formation of hemoglobin [21]. Spinach (*Amaranthus sp*) is considered the king of vegetables because of its high nutritional content. Spinach contains lots of vitamins A, B and C, besides that spinach contains many important mineral substances such as calcium, phosphorus and iron. The iron content in every 100 grams of spinach is 3.9 grams [10], [12], [18]. For this reason, it is necessary to know more about the effect of spinach consumption on the incidence of anemia in pregnant women.

2. Methods

This type of research is a Quasi Experiment using the One Group Pretest Posttest design, which was carried out at the Lamongan Health Center on July 01 - August 30, 2022. The population in this study was pregnant women who had their pregnancy checked from July 01 - August 30, 2022, as many as 186 people. The sampling technique is non-probability sampling using purposive sampling. As for Inclusion criteria: pregnant women in the second trimester, pregnant women who carry out antenatal care at the Lamongan Health Center, pregnant women in the second trimester who experience mild anemia with levels (9-10 g/dl of hemoglobin), pregnant women who are willing to be respondents, pregnant women with physiological conditions, without complications and congenital disease. The number of samples obtained following the criteria of as many as 62 people. The instruments in this study include EasyTouch (GcHb) along with SOPs for measuring respondents' Hb levels, SOPs for making processed spinach for standardization and research checklist sheets containing schedules and checklists for spinach consumption. The flow of this research is that pregnant women in the subject of this study are checked for Hb using Easy touch. Pregnant women are instructed to consume spinach as much as 800-1500 grams/day, which can be consumed in the form of processed foods such as juice, vegetables, pudding and other preparations for 10 days. Regularly, the formation or synthesis of hemoglobin takes approximately 7-10 days. After the intervention was carried out for 10 days in the treatment group, the hemoglobin level of pregnant women was measured again on the 11th day to determine the Hb level after the intervention. Data analysis consisted of univariate and bivariate analyses. Bivariate analysis was performed with the normality test using the Shapiro-Wilk test and statistical tests using the paired T-test.

3. Results and Discussion

3.1 Univariate Analysis

Characteristics of respondents in this study include: AGE, education, parity, and occupation. The description of the distribution of the characteristics of the respondents in this study is as follows:

Table 1. Respondent Characteristics

General Characteristics	N	%
Age		
< 20 years	4	6.5
20-35 years old	43	69.3
>35 years old	15	24.2
Education		
SD	0	0
Junior High School	9	14.5
Senior High School	38	61.3
PT	15	24.2
parity		
Primipara	23	37
Multipara	39	63
Work		
IRT	31	50.0
Self-employed	24	38.7
civil servant	7	11.3

Based on table 1 shows that most of the respondents are in the age range of 20-35 years, with high school education, multigravida and most of them are housewives.

Table 2. Hemoglobin Levels of Pregnant Women in the Second Trimester after consuming spinach

Hemoglobin Level (gr/dl) (posttest)	N	%
No Anemia (>10.5gr/dl)	51	82.3
Mild Anemia (9-10 gr/dl)	8	12.9
Moderate Anemia (7-8 g/dl)	3	4.8
Severe Anemia (<7 g/dl)	0	0
Total	62	100

Based on table 2 shows most of the respondents after consuming spinach did not experience anemia.

3.2 Bivariate Analysis

Table 3. Shapiro - Wilk Normality Test Results

Hemoglobin levels	Shapiro-Wilk Sig
Before consuming spinach	0.608
After consuming spinach	0.375

The results of the data normality test with *Shapiro-wilk* can be concluded that before consumption of spinach sig value 0.6 0 8 and after consumption of spinach sig value 0.3 7 5, the value of sig shows > 0.05 then the data is normally distributed.

Table 4. Test results paired T-test

Hemoglobin levels	<i>sig</i> (2-tailed)
Hemoglobin levels Before consuming spinach - Hemoglobin Levels After consuming spinach	0.000

The results of the *paired T-test* in table 4 show *Sig (2-tailed)* 0.000. The p-value is $0.000 < 0.05$, so it can be concluded that there is a significant effect of spinach consumption on the incidence of anemia in pregnant women.

Based on the results of this study, it was found that of the 62 respondents who experienced mild anemia after the intervention to consume spinach, 51 of them no longer had anemia or their hemoglobin levels were normal. Anemia is a condition that shows the level of hemoglobin (Hb) in the blood is less than normal [11]. Hemoglobin is a component of red blood cells that functions to distribute oxygen throughout the body, if hemoglobin is reduced then the body's tissues lack oxygen. Hemoglobin consists of iron-containing material called heme and globulins. There are about 300 hemoglobin molecules in one red blood cell. Each hemoglobin molecule has four enhancement sites for oxygen. The oxygen bound in hemoglobin is called oxyhemoglobin. Hemoglobin levels can be checked using a digital hemometer (*easy touch*) [11]. The value of hemoglobin levels is a parameter used to determine the occurrence of anemia [7].

The main cause of anemia in pregnancy is iron deficiency anemia which is the most common type of anemia in the world, the incidence of anemia in pregnant women occurs in all countries, both underdeveloped, developing and developed countries [5]. Iron deficiency anemia is a chronic symptom with a hypochromic state (low hemoglobin concentration), microcytic caused by a lack of iron supply in the body. Iron deficiency can be caused by lack of nutritional intake, impaired iron absorption or loss of iron more than iron absorption, resulting in increased iron needs in pregnant women [13]. The need for iron increases, especially in the second trimester because there is an increase in the need for the fetus conceived by the mother. The need for iron during pregnancy doubles from the need before pregnancy because during pregnancy the blood volume increases by 50%, so more iron is needed to form hemoglobin which plays an important role in fetal and placental growth [10] because iron is an element that is very important to form red blood cells or hemoglobin [3]. Iron is needed to prevent anemia or lack of red blood cells. Iron is useful for increasing blood cells that carry oxygen throughout the body so that it can prevent anemia. Prevention and management of anemia due to iron deficiency in the body can be fulfilled through the consumption of Fe tablets or through fulfilling iron needs from food sources that are consumed every day [21]. Food sources that have a high iron content come from green vegetables, one of which comes from spinach [13]. Spinach is a vegetable that has a high iron content which is suitable for consumption for people with anemia. The function of iron is to form red blood cells, so that if the production of red blood cells in the body is sufficient, the hemoglobin level will be normal. The natural iron content found in spinach that is consumed with the right and proper processing will increase the Hb levels of pregnant women. Spinach also contains vitamin C which has an important role in iron absorption [21].

The results of statistical tests in this study obtained value = 0.000, value < 0.05, so there is a significant effect of spinach consumption on the incidence of anemia in pregnant women. The results of this study are in line with Anggreini's research, 2014, that green spinach can increase hemoglobin levels in anemic rats [1]. Spinach is one of several complementary therapies that can be used to help pregnant women increase hemoglobin levels so that it can be an alternative to prevent anemia in pregnancy [6]. Prevention and treatment of anemia in pregnancy is very important due to the impact that can be caused, namely micro and macro impacts. Macro effects are easy fatigue, weakness, shortness of breath, palpitations, nausea, pale face, decreased immune system, pale eyes, headaches and fainting, while for macro effects it can cause abortion, premature birth, uterine inertia, uterine atony, shock, infection both during delivery and after delivery, low birth weight babies. For this reason, it is very important that efforts are needed to increase the hemoglobin level of pregnant women other than through the administration of iron tablets, which can be combined or replaced with the use of complementary therapies derived from natural ingredients such as spinach [13]. The natural Fe content found in green spinach consumed with correct and appropriate processing will increase the Hb levels of pregnant women [21].

4. Conclusions and Suggestions

This study concludes that spinach consumption has a significant effect on the incidence of anemia in pregnant women with the results of the paired T-test Sig (2- tailed) 0.000. P-value 0.000 < 0.05. The suggestion in this study is that pregnant women are expected to be able to prevent anemia from an early age through the intake of food consumed daily with high iron content, such as spinach.

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