

Effectiveness of Vitamin C and Vitamin B12 on Hemoglobin Levels in Pregnant Women in the Third Trimester

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ABSTRACT

Anemia in pregnant women is a condition of hb levels below normal, which is below 11 gr / dl. Cangkupan giving Fe in Kediri city has met the target of above 90% but still found pregnant women who have anemia. The goal of this study is to find out the effectiveness of Vitamin C and vitamin b12 against hemoglobin levels in pregnant women in the third trimester. This type of research is a pre-experimental study with two groups of pre post test designs with the population is a trimester III pregnant woman with anemia. The statistical test used is to use the paired T test and the unpaired T test.

Based on the results of the study found that there is an effect of Vitamin C on hemoglobin levels in pregnant women with a p value: 0.000 and there is an effect of vitamin B12 on hemoglobin levels in pregnant women with a p value: 0.002. From the results of the Unpaired T Test there is a significant difference between vitamin C and Vitamin B12 there are hemoglobin levels in pregnant women in the third trimester with a value of p value: 0.038. From the results of the study, it is expected that health workers can provide additional vitamins, especially vitamin C and Vitamin B12 for the absorption of Fe tablets in pregnant women to avoid anemia.

Keywords: Anemia, vitamins, pregnant women

Received : October 4nd 2021

Accepted : October 15rd 2021

Published : November 27th 2021

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INTRODUCTION

Pregnancy is the result of sperm cells meeting the egg that makes up the fetus, starting from the gestation period to the birth of the fetus that takes 9 months or 38 weeks (Walyani, 2015). Not all pregnant women in undergoing their pregnancy run smoothly, there are several things that cause pregnant women to experience complications during pregnancy, One of the things to watch out for during pregnancy is anemia in pregnancy. Anemia in pregnancy is a condition of the mother with haemoglobin levels below 11 gr% in the first and third trimesters. (Saifudin, 2011). Haemoglobin (Hb) is a protein in red cells that carries oxygen to other cells in the body. (Proverawati, 2015).

The results of Basic Health Research in 2018 stated that in Indonesia 48.9% of pregnant women have anemia. As much as 84.6% of anemia in pregnant women occurs in the age group of 15-24 years. (Kemenkes RI,2018) . . In East Java the number of pregnant women with anemia as much as 49.9%.

Kediri City Health Office reported the incidence of anemia during 2019 is quite high, namely from 250 pregnant women who suffered from anemia in the first quarter by 18.4%, Q2 by 16% and the third quarter by 27.6% (Kediri City Health Office, 2015). In medium-term development (RJPKM 2014-2019) the government has a target of reducing the prevalence of anemia of pregnant women from 37.1% to 28%. According to data from the Kediri city health office reported that in 2014 the number of pregnant women who had anemia was 250 people out of 5,225 people (4.78%), while in 2015 it was 217 people out of 4634 people (4.68%) so that the percentage of pregnant women who experienced a decrease of 0.1% (Kediri City Health Office, 2016). And in 2019 there were 3342 pregnant women and who had anemia as many as 675 people (20.19%) (Kediri City Health Office, 2019). According to data from the Kediri City Health Office reported that the incidence of pregnant women with hemoglobin levels <11 gr% in the city in 2015 there were a number of 217 cases (4.15%) of 5224 pregnant women. The results of a preliminary survey conducted in early 2021 in Kediri City in the city of 10 pregnant women who have anemia as much as 3 (30%).

The causative factor that affects hemoglobin levels <11 gr% in pregnant women is the lack of iron deficiency in the body, increasing the body's needs such as iron entering through insufficient food needs. Metabolism in the body is not balanced such as absorption, transportation, utilization, storage and production (Damia, 2012).

In an effort to reduce and prevent anemia in pregnant women, the government supplementation of Blood Added Tablets (TTD) with a dose of 1 tablet (60 mg Elemental Iron and 0.25 mg of folic acid) consecutively at least 90 days during pregnancy (Kemenkes RI, 2016). However, pregnant women with anemia in Indonesia are still quite high, based on data based on the results of Basic Health Research (Riskesdas) in 2013, there are still 37.1% of pregnant women who have anemia or pregnant women with hemoglobin levels less than 11 gr / dL (Kemenkes RI, 2013).

Iron absorption is greatly influenced by the availability of vitamin C in the mother's body. The role of vitamin C can help reduce ferri iron ($\text{Fe}3$).+It becomes ferrous ($\text{Fe}2$).+ in the small intestine so that it is easily absorbed, the reduction process will be greater if the pH in the stomach is increasingly acidic, Vitamin C can increase acidity so that it can increase iron absorption by 30% (Kumalasari, 2013). Iron absorption in the form of non-heme (supplements) can only be absorbed by the body about 1-6%, increasing fourfold when there is vitamin C (Asiyah, 2014). In addition to vitamin C it turns out that vitamin B12 also has an effect on hemoglobin levels in pregnant women as evidenced by research that the effect of vitamin B12 in both in the form of food and supplements (Sembiring, 2020) is also supported by Jarosław Krzywan et al. stated in his research that the concentration of B12 has an effect on the concentration of increased hemoglobin (Jarosław Krzywan et al, 2020).

From the description above vitamin B12 and Vitamin C play a role in the formation of hemoglobin, from the description above researchers are interested in conducting research on the Effectiveness of Vitamin C and Vitamin B12 on Hemoglobin Levels in Pregnant Women Trimester III.

METHODS

This type of research is a pre-experimental study with the design of two group pre post tests with the population is pregnant women in the third trimester with anemia. The sample in the study was 32.16 for the effect of vitamin C on hemoglobin levels and 16 for the effect of vitamin B12 on hemoglobin levels. Treatment is given vitamin C of 75 grams for 14 days and vitamin B12 by 4.5 mcg for 14 days. The statistical test used is to use the paired T test for influence tests and the unpaired T Test to see the effectiveness of vitamin C and vitamin b12 against hemoglobin levels in pregnant women in the third trimester.

RESULTS

1. General Data

1. Identify The Respondent's Characteristics By Age

Characteristics of respondents based on the age of pregnant women in the third trimester.

Table 1 Distribution of Characteristic Frequency of respondents based on the age of pregnant women in the third trimester

Age	Frequency	Percentage (%)
High risk (<20 or > 35 years)	9	28,1
Not high risk (20-35 years)	23	71,9
Sum	32	100

Table 1 can be interpreted that most of the 23 (71.9%) respondents with a non-high risk age (20-35 years).

2. Identify The Characteristics of Respondents Based on Education

Characteristics of respondents based on the education of pregnant women in the third trimester

Table 2 Distribution of Frequency Characteristics of respondents based on education of pregnant women in the third trimester

Education	Frequency	Percentage (%)
Primary education	6	18,8
Secondary education	23	71,9
College	3	9,4
Sum	32	100

Based on table 2 it can be interpreted that most of the 23 (71.9%) respondents with secondary education.

3. Identify Respondents' Characteristics By Work

Characteristics of respondents based on the work of pregnant women in the third trimester

Table 3 Distribution of Frequency Characteristics of respondents based on the work of pregnant women in the third trimester

Work	Frequency	Percentage (%)
Housewife	25	78,1
Self employed	0	0
Private employees	7	21,9
Civil servants	0	0
Sum	32	100

Based on table 3 it can be interpreted that most of the 25 (78.1%) respondents with Housewife

4. Identify Respondents' Characteristics Based on Parity

Characteristics of respondents based on the parity of pregnant women in the third trimester

Table 4 Distribution of Frequency Characteristics of respondents based on the parity of pregnant women in the third

Parity	Frequency	Percentage (%)
1-2	25	78,1
≥3	7	21,9
Sum	32	100

Table 4 can be interpreted that most of the respondents had 1-2 parity.

5. Identify The Respondent's Characteristics Based on Past Bleeding History

Characteristics of respondents based on the history of bleeding and pregnant women in the third trimester

Table 5 Distribution of Frequency Characteristics of respondents based on the history of bleeding of pregnant women in the third trimester

History of Past Bleeding	Frequency	Percentage (%)
There is a history of chronic disease.	2	6,3
There is no history of chronic disease	30	93,8
Sum	32	100

Table 5 can be interpreted as most of the 30 (93.8%) respondents with no history of past bleeding.

6. Identify The Respondent's Characteristics Based on a History of Chronic Diseases

Characteristics of respondents based on the history of chronic diseases of pregnant women in the third trimester

Table 6 Distribution of Characteristic Frequency of respondents based on history of chronic diseases of pregnant women in the third trimester

History of Chronic Diseases	Frequency	Percentage (%)
There is a history of chronic disease.	0	0%
There is no history of chronic disease	32	100%
Sum	100%	100%

Table 6 can be interpreted as all respondents have no history of chronic disease.

2. Special Data

1. Identify Hemoglobin Levels Before and After Vitamin B12 In Pregnant Women Trimester III

Identification of hemoglobin levels before and after the consumption of Vitamin B12 in pregnant women in the third trimester is as follows:

Table 7. Results of Analysis of Parametric Test Paired Sample T Test Before and After Consumption of Vitamin B12 in Pregnant Women Trimester III

Treatment	Mean	S.Devisa	S.Error	p value	N
Before consuming Vitamin B12	10,16	0,59	0,15	0,002	16
After consuming Vitamin B12	10,99	0,75	0,18		16
Difference	0,73			$\alpha = 0,05$	

Based on table 7 above shows that the number of respondents is 16 people. The average value (*mean*) of hemoglobin levels before taking Vitamin B12 is 10.16. While the average value (*mean*) after Vitamin B12 is 10.99. The mean difference between measurements before and after taking vitamin B12 is 0.73. The results of the *t test* statistical test obtained a value of $p\text{-value} = 0.002$ with $\alpha = 0.05$ then $p\text{ value} < \alpha$, which means there is an effect of Vitamin B12 on hemoglobin levels in Pregnant Women Trimester III.

2. Identify Hemoglobin Levels Before and After Vitamin C Consumption in Pregnant Women In Trimester III

The identification of hemoglobin levels before and after the consumption of vitamin C in pregnant women in the third trimester is as follows:

Table 8 Results of Parametric Test Analysis *Paired Sample T Test* Before and After Vitamin C Consumption in Pregnant Women Trimester III

Treatment	Mean	S.Devisa	S.Error	$p\text{ value}$	N
Before consuming Vitamin C	10,32	0,53	0,13	0,000	16
After consuming Vitamin C	11,74	1,19	0,30		16
Difference	1,42			$\alpha = 0,05$	

Based on table 8 above shows that the number of respondents 16 people, while the average value (*mean*) hemoglobin levels before taking vitamin C is 10.32. While the average value (*mean*) after taking vitamin C is 11.74. The mean difference *between* measurements before and after taking vitamin C was 1.42. The results of the statistical test *t test* obtained a value of $p\text{-value} = 0.000$ with $\alpha = 0.05$ then $p\text{ value} < \alpha$, which means there is an effect of vitamin C on hemoglobin levels in Pregnant Women Trimester III

3. Analyze the Effectiveness of Vitamin C and Vitamin B12 Against Hemoglobin Levels of Pregnant Women In The Third Trimester

To find out the Effectiveness of Vitamin C and Vitamin B12 against the hemoglobin levels of pregnant women in the third trimester, he conducted a parametric *Independent Sample T Test*.

Table 9. Results of analysis of Parametric Test *Independent Sample T Test* Effectiveness of Vitamin C and Vitamin B12 Against Hemoglobin Levels of Pregnant Women Trimester III

Group	Mean Difference	$p\text{ value}$	CI	
			Lower	Upper
Vitamin B12	-0,7562	0,038	-	-0,0439
			1,4686	
Vitamin C	-0,7562	0,040	-	-0,0375
			1,4750	

Based on table 9 Independent Sample T Test results show $p\text{ value} = 0.038$ with $\alpha = 0.05$ then $p\text{ value} < \alpha$, which means there is a significant difference between the increase in hemoglobin levels in the Vitamin C group and the Vitamin B12 group.

DISCUSSION

1. Identify Hemoglobin Levels Before and After Vitamin B12 In Pregnant Women Trimester III

Based on table 7 above shows that the number of respondents is 16 people. The average value (*mean*) of hemoglobin levels before taking Vitamin B12 is 10.16. While the average value (*mean*) after Vitamin B12 is 10.99. The mean difference between measurements before and after taking vitamin B12 is 0.73. The results of the *t test* statistical test obtained a value of $p\text{-value} = 0.002$ with $\alpha = 0.05$ then $p\text{ value} < \alpha$, which means there is an effect of Vitamin B12 on hemoglobin levels in Pregnant Women Trimester III.

Anemia is a condition that occurs when the body lacks red blood cells, lower than its normal limit. Because, every condition that occurs in the mother will also have an impact on the growth and

development of the fetus in the womb. If the mother is susceptible to disease, it is important to get treatment as soon as possible (Fadli, 2021).

This study is in line with research conducted by Sembiring in 2020 with the results of a link between taking vitamin b12 with haemoglobin, in the study showed pregnant women who took vitamin B12 had good levels of Haemoglobin (Sembiring, 2020). In addition, this study is also in line with research conducted by Rimawati in 2018 which stated that there was an influence between supplementation containing B12 and the increase in maternal haemoglobin. In her study also said that mothers who took supplementation increased levels of haemoglobin levels (Rimawati, 2018). According to Jarosław Krzywan'ski et al stated in his research that the concentration of B12 has an effect on the concentration of increased hemoglobin (Jarosław Krzywan'ski et al, 2020).

According to the researchers, there was a change in the number of 0.73 between before and after being given vitamin B12 supplements to pregnant women in the third trimester. This is because vitamin B12 contains cobalt which serves as DNA synthesis to keep the shape of the red blood cells in normal condition. Therefore, mothers need to take FE tablets with B12 supplements in accordance with the recommendations. Here vitamin B12 serves as a substance used as a support in the formation of red blood cells in the spine, if pregnant women have been given Fe and vitamin B12 supplementation then the presentation of red blood cells will be more maximal and can cause hemoglobin levels to increase and pregnant women do not have anemia.

2. Identify Hemoglobin Levels Before and After Vitamin C In Pregnant Women Trimester III

Based on table 8 above shows that the number of respondents 16 people, while the average value (mean) hemoglobin levels before taking vitamin C is 10.32. While the average value (mean) after taking vitamin C is 11.74. The mean difference between measurements before and after taking vitamin C was 1.42. The results of the t test statistical test obtained a value of $p\text{-value} = 0.000$ with $\alpha = 0.05$ then $p\text{ value} < \alpha$, which means there is an effect of vitamin C on hemoglobin levels in Pregnant Women Trimester III.

This is in line with Wirawan's research in 2015 which stated there is a meaningful influence on changes in hemoglobin levels with the administration of Fe tablets coupled with vitamin C, this is also in line with Asiyah's research (2014), that iron absorption in the form of non-heme (supplements) can only be absorbed by the body about 1-6% only, increasing fourfold if there is vitamin C. This is also in line with Agusmayanti research in 2020 which states there is an influence on vitamin C. hemoglobin levels in pregnant women (Agusmayanti, 2020).

Vitamin C plays an important role in the absorption of iron no heme, iron absorption can be increased by a driving factor one of which is vitamin C. Vitamin C acts as a strong dichancer in reducing ferri ions to ferrous ions, so it is easily absorbed in higher pH in the duodenum and small intestine (Ministry of Health, 2005).

According to researchers vitamin C is very influential in increasing hemoglobin levels because in the absorption of Fe it takes one of the substances to accelerate the absorption of Fe one of them is vitamin C. Vitamin C helps the absorption of Fe in the body so that hemoglobin levels can be absorbed maximally and pregnant women do not experience anemia.

3. Effectiveness of Vitamin C and Vitamin B12 Against Hemoglobin Levels of Pregnant Women Trimester III.

Based on table 9. Independent Sample T Test results show $p\text{ value} = 0.038$ with $\alpha = 0.05$ then $p\text{ value} < \alpha$, which means there is a significant difference between the increase in hemoglobin levels in the Vitamin C group and the Vitamin B12 group.

There is a significant difference between the increase in hemoglobin levels in the Vitamin C group and the Vitamin B12 group is indeed characterized by the role of the function of each different vitamin, in Sembiring's study in 2020 with the results there was a relationship between taking vitamin

B12 with haemoglobin, in the study showed pregnant women who took vitamin B12 had good haemoglobin levels (Sembiring, In addition, this study is also in line with research conducted by Rimawati in 2018 which stated that there is an influence between supplementation containing B12 and the increase in maternal haemoglobin. In her study also said that mothers who took supplementation increased levels of haemoglobin levels (Rimawati, 2018). According to Jarosław Krzywan'ski et al stated in his research that the concentration of B12 has an effect on the concentration of increased hemoglobin (Jarosław Krzywan'ski et al, 2020). While the role of vitamin C also plays a role in the formation of hemoglobin, this statement is in line with Wirawan's research in 2015 which states there is a meaningful influence on changes in hemoglobin levels with the administration of Fe tablets coupled with vitamin C, this is also in line with The Asiyah research (2014), that iron absorption in non-heme (supplement) form can only be absorbed by the body about 1-6%. Increased fourfold when there is vitamin C. This is also in line with Agusmayanti's research in 2020 which stated that there is an effect of vitamin C on hemoglobin levels in pregnant women (Agusmayanti, 2020).

Vitamin C plays an important role in the absorption of iron no heme, iron absorption can be increased by a driving factor one of which is vitamin C. Vitamin C acts as a strong dichancer in reducing ferri ions to ferrous ions, so it is easily absorbed in higher pH in the duodenum and small intestine (Ministry of Health, 2005).

This is in accordance with Kumalasari's theory (2013) that iron absorption is greatly influenced by the availability of vitamin C in the mother's body. The role of Vitamin C can help reduce ferri iron (Fe^{3+}) to ferrous (Fe^{2+}) in the small intestine so that it is easily absorbed, the reduction process will be even greater if the pH in the stomach is getting acidic, Vitamin C can increase acidity so that it can increase iron absorption by 30% (Kumalasari, 2013).

According to researchers, significant differences in supplementation are due to the function of each vitamin in the formation of hemoglobin is different. Vitamin B12 plays a role in the formation of Hemoglobin in DNA synthesis by maintaining the shape of red blood cells but vitamin C plays a role in helping reduce ferri iron (Fe^{3+}) to ferrous (Fe^{2+}) in the small intestine so that it is easily absorbed so that absorption is more maximal, but in good results vitamin C and vitamin B12 affect hemoglobin levels in pregnant women.

CONCLUSION

There is an effect of vitamin C on hemoglobin levels in pregnant women. There is an effect of vitamin B12 on hemoglobin levels in pregnant women. There is a significant difference between the administration of vitamin C and Vitamin B12 to hemoglobin levels..

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