

## The effect of *Katuk* leaf juice on hemoglobin levels among anemic pregnant women in Trimester II

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### ABSTRAK

**Latar Belakang:** Pada masa kehamilan anemia merupakan salah satu masalah yang paling sering dijumpai. Mengonsumsi daun katuk (*Sauropus androgynus*) merupakan salah satu solusi untuk menanggulangi kasus anemia

**Tujuan:** untuk mengetahui pengaruh daun katuk terhadap kadar hemoglobin pada ibu hamil trimester II dengan anemia di wilayah kerja Puskesmas Beber Kabupaten Cirebon.

**Metode:** Rancangan penelitian yang digunakan dalam penelitian ini adalah quasi experiment dengan desain pretest and posttest with control group design. Teknik pengambilan sampel keseluruhan dilakukan dengan teknik Non - probability sampling dengan metode accidental sampling. Total sampel dalam penelitian ini sebanyak 30 ibu hamil trimester II dengan anemia. Kelompok kontrol hanya mengonsumsi tablet Fe dan kelompok perlakuan mengonsumsi Fe kombinasi jus daun katuk. Uji statistik dalam penelitian ini menggunakan analisis paired T-test, Wilcoxon Sign Rank Test dan Independent T-Test.

**Hasil:** Pada penelitian ini ibu hamil anemia banyak dijumpai pada usia 20-35 tahun sedangkan untuk paritas ibu hamil dijumpai pada primigravida. Hasil penelitian rata-rata peningkatan kadar hemoglobin pretest dan posttest pada kelompok kontrol yaitu 9,86 mg/dL dan 9,90 mg/dL dan peningkatan kadar hemoglobin pretest dan posttest pada kelompok perlakuan 9,92 mg/dL dan 10,52 mg/dL. Artinya terdapat perbedaan kenaikan kadar hemoglobin pada kelompok perlakuan dengan selisih kedua kelompok sebesar 0,56 dan p-value = 0,00 <  $\alpha$  (0,05). hal ini menunjukkan ada pengaruh jus daun katuk terhadap kadar hemoglobin pada ibu hamil trimester II dengan anemia.

**Kesimpulan:** Terdapat pengaruh jus daun katuk terhadap kadar hemoglobin pada ibu hamil trimester II dengan anemia.

**KATA KUNCI:** katuk; anemia; ibu hamil

### ABSTRACT

**Background:** Anemia is one of the most common problems occurring during pregnancy. Consuming *katuk* leaf (*Sauropus androgynous*) can be an alternative to overcome cases of anemia.

**Objectives:** This study aims to determine the effect of *katuk* leaf on hemoglobin levels in anemic pregnant women in trimester II in the working area of Beber Public Health Center, Cirebon Regency

**Methods:** This research employed a quasi-experiment by utilizing a pretest-posttest with a control group design. The whole sampling technique was carried out using non-probability sampling with the accidental sampling method. The total sample in this research was 30 in their second trimester of pregnancy with anemia. The control group only consumed Fe tablets, and the treatment group consumed a combination of Fe and *katuk* leaf juice. The statistical test employed in this research were *paired T-test analysis*, *Wilcoxon Signed-Rank Test*, and *Independent T-Test*.

**Results:** Anemia was mainly found at the age of 20-35 years, whereas parity for pregnant women was mostly primigravida. The results showed that the control group's pretest and posttest average scores of hemoglobin levels were 9.86 mg/dL and 9.90 mg/dL, respectively. Meanwhile, the pretest and posttest average scores of hemoglobin levels in the treatment group were 9.92 mg/dL and 10.52 mg/dL, respectively. This indicates that there was an increase in hemoglobin levels in the treatment group. The difference between the two groups was 0.56 with a p-value of 0.00 <  $\alpha$  (0.05).

**Conclusions:** There is an effect of *katuk* leaf juice on hemoglobin levels in pregnant women in trimester II with anemia.

**KEYWORDS:** *katuk leaf; anemia; pregnant women*

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## INTRODUCTION

The success of maternal health programs can be assessed through Maternal Mortality Rate as the main indicator. In general, maternal mortality had shown a decrease during the 1991-2015 period, specifically from 390 in 1991 to 305 per 100,000 live births in 2015. Despite experiencing a decline in mortality rate, it did not meet the MDGs target which must be achieved at 102 per 100,000 live births in 2015. The family health program of the Ministry of Health recorded that there was 4,627 maternal death occurred in Indonesia in 2020. This number shows an increase compared to that in 2019 with 4,221 deaths. Bleeding was the main cause of death in 1,330 cases. One of the causing factors of bleeding is anemia in pregnancy (1).

Iron deficiency anemia in mothers can influence the growth and development of the fetus during and after pregnancy. Based on the Basic Health Research in 2018, 84.6% of anemia in pregnant women occurred in the 15-24 years age group. To prevent anemia, every pregnant woman is expected to take at least 90 iron tablets during gestation. In 2020, the provision of iron tablets to pregnant women in Indonesia reached 83.6%. This number increased compared to 2019, which was only 64%.

The need for iron in each trimester of pregnancy varies. Women in the first trimester of pregnancy require lower iron than those before pregnancy because they do not experience menstruation and the fetus also does not requires a lot of iron. The increasing need for iron will begin close to the second trimester. During this time, there is an increase in the number of red blood cells. Then, the number of red blood cells increases by 35% in the

third trimester, along with the increased need for iron by 450 mg. The increase in red blood cells is caused by the increased oxygen demand of the fetus. The absorption of iron can be increased by cobalt, inosine, methionine, vitamin C, HCL, succinate, and other acidic compounds. The acid will reduce ferric ions to ferrous ions and inhibit the formation of Fe complexes with insoluble food (2). Thus, as the gestational age of the mother increases, the risk of suffering from anemia becomes even greater if it is not balanced with a balanced diet and regular consumption of Fe (Herawati dan Astuti, 2010)

Numerous studies have been carried out to reduce cases of anemia by increasing hemoglobin levels. Lathifah dan Susilawati (2019) revealed that there is a significant effect of the consumption of red spinach juice combined with honey on the increase of hemoglobin levels in pregnant women. Another study conducted by Novianti, Asmariyah dan Suriyati (2019) argued that giving tempeh milk influences the hemoglobin levels of women in their third trimester of pregnancy.

Meanwhile, Suparmi *et al.*, (2016) stated that the chlorophyll content in *katuk* leaves can increase Hb and ferritin, which enables these leaves to be regarded as anti-anemia. Therefore, consuming *katuk* leaves (*Sauropus androgynus*) is one solution to overcome cases of anemia. *Katuk* leaves are widely known to the public as a multi-beneficial plant. The *katuk* leaf extract has also been utilized as a food product intended for breastfeeding mothers to smooth out and to increase breastmilk production. Besides possessing a laktagogum effect (smoothing milk secretion), *katuk* leaves also contain 185 mg of calcium, 3.1 mg of iron, and 1.2 grams of fiber. Iron levels in *katuk* leaves can be an alternative for

treating iron deficiency anemia. This is supported by previous study conducted by Antikawati, Wagiyono, and Purnomo (2017), which suggested that providing moringa leaf extract and *katuk* leaf extract as supplementation is effective in increasing the hemoglobin level of pregnant women with anemia.

Cirebon Regency is an area with 41.0% of >90 iron tablet consumption. This number, however, is still below the national coverage of iron tablet consumption. Various efforts have been carried out by the Cirebon District Health Office to improve maternal health, one of which is through the GEPRHAK Program. This program invites the community, especially families with pregnant and lactating mothers, to utilize their yards by planting *katuk* trees so that they can be consumed both during and after pregnancy to increase breastmilk production and quality. Despite possessing various benefits such as increasing milk production and hemoglobin levels, the GEPHRAK program has not evaluated the use of *katuk* leaves to treat anemic mothers. Therefore, this study aims to determine the effect of providing *katuk* leaf juice to increase hemoglobin levels in anemic pregnant women in their second trimester of pregnancy.

## MATERIALS AND METHODS

This is quasi-experimental research conducted to identify the effect of *katuk* leaf juice on changes in hemoglobin levels of anemic pregnant women in the second trimester of pregnancy. It was carried out in the working area of Beber Health Center in 2021. The current study employed a pre-posttest control group design. 30 respondents were involved in this study. They were obtained by using a non-probability sampling technique with an accidental sampling method from February 8 to February 27, 2021.

The respondents were grouped using the accidental technique. The first 15 samples who came to the Community Health Center or those that the researcher visited at their house were directly included in the treatment group. Meanwhile, 15 more people were included in the control group. All respondents took 60 mg of iron supplements/day, while the treatment group combined it with

25 g of *katuk* leaf juice for 14 days. The inclusion criteria were anemic pregnant women in the second trimester, consuming Fe, performing antenatal care (ANC), having  $\geq 23$  cm of mid-upper arm circumference (MUAC), and willing to be respondents. Meanwhile, the exclusion criteria were mothers with tuberculosis and upper respiratory tract infections (ARI). The dependent variable in this study was the hemoglobin level, while the independent variable was the Fe supplement and *katuk* leaf juice.

An observation checklist was employed as the research instrument to monitor the provision of *katuk* leaf juice and the consumption of Fe for 14 days given by the researcher. The monitoring was performed by reminding the control group to take Fe tablets through Whatsapp and visit the respondents' houses every 3 days. Data on Hb levels were obtained from Hb examination at the Beber Health Center laboratory. Hb examination was carried out twice, on day 1 and day 14. In this study, organoleptic tests were carried out on three pregnant women to determine the right *katuk* leaf juice recipe. The data collection was carried out by following the health protocol where researchers conducted rapid antigen tests. The research was conducted using gowns, gloves, masks, and hand sanitizers, and social distancing was also performed. This research has obtained an ethical clearance letter number 089/EC-KEPK/V/2021 from the Health Research Ethics Commission of the Tasikmalaya Health Polytechnic.

## RESULTS AND DISCUSSIONS

### Characteristics of the Research subjects

As can be seen in **Table 1**, most respondents (18 people or 18%) from the two groups in the working area of Beber Health Center were aged 20-35 years. Meanwhile, according to the parity, most respondents (16 people or 53%) from both groups were primigravida. Likewise, Rejeki and Huda (2014) also stated that the age range of 20-35 years is a productive age when women are more likely to suffer from anemia. Furthermore, Amini, Pamungkas, and Harahap (2018) argued that in theory, people at the

age of 20-35 years biologically have not reached optimal mental state, have unstable emotions, and have immature mentality. Therefore, it is easier for them to experience shocks, causing a lack of attention to nutritional fulfillment. Various factors influence each other and there is also a possibility that higher cases of anemia may occur in pregnant women of mature age (20-35 years).

Based on the parity, the respondents were dominated by primigravida (16 people or 53%). In contrast to this result, Desfaeza (2017) argued that the more frequent women undergo pregnancy and childbirth, the more iron will be lost, and the higher the chance of suffering from anemia. If someone has low iron reserves, every pregnancy and childbirth will deplete the body's Fe reserves which eventually leads to anemia in the following pregnancies. In general, the higher the parity of the mother, the higher the mothers' knowledge about good nutrition during pregnancy. The researcher assumes that this caused the discrepancy between the result of this study and that of the previous study. According to Notoatmadjo (2007), pregnant women's knowledge about nutrition is obtained through their eyes and ears and is also influenced by their education, experience, and age.

**Table 1. Characteristics of the Research Subjects**

Characteristics	N	%	Median/ Mean	Min-Max Std. Deviation
Age				
20-35 years	18	60	31.33	6.18
>35 years	12	40	28.67	6.46
Parity				
Primigravida	16	53	2.00	0.48
Multigravida	14	47	1.00	0.45

**Haemoglobin level before and after treatment in both groups**

Based on the Wilcoxon Sign-Rank Test result, the control group exhibited p value = 0.06 > 0.05 with an average difference of 0.04 (Table 2). It can be concluded that there was no significant difference in hemoglobin levels before and after the provision of Fe tablets to the control group. Meanwhile, the dependent-test result showed p value = 0.01 <0.05

with an average difference of 0.60. This finding suggests that there was an increase in hemoglobin levels before and after the provision of Fe tablets combined with *katuk* leaf juice in the treatment group.

In contrast to the result of the current study, Rizki, Lipoeto, and Ali (2018) found that there was a relationship between Fe tablet supplementation and the Hb level of pregnant women in the third trimester of pregnancy. Similarly, Ratih (2017) also analyzed the effect of iron (Fe) provision on the hemoglobin level of anemic pregnant women and found that iron (Fe) was able to increase hemoglobin levels in anemic pregnant women with a p-value < 0.05. The researcher assumes that the discrepancy between the result of this study and that of previous studies is due to the short intervention time. Another study also revealed that giving 60 mg of Fe supplementation/day could increase hemoglobin levels by 1 mg/dL/month (Ningrum, as cited in R. H. Ratih, 2017) .

The *dependent t-test* result showed that the average value of hemoglobin level in the treatment group before and after the intervention was 9.92 mg/dL and 10.52 mg/dL, respectively, with p-value = 0.014 < 0.05. It demonstrates that there was a more significant change in hemoglobin levels in pregnant women who were given *katuk* leaf juice. The results of this study were in line with that conducted by Antikawati, Wagiyo dan Purnomo (2017) on the effect of extra supplementation of moringa leaves and *katuk* leaves on the level of hemoglobin in anemic pregnant women. The result obtained 0.37 mg/dL average value of hemoglobin which indicates its' effectivity. Similarly, another study also analyzed the influence of *katuk* leaf infusion on hemoglobin levels in female Wistar rats (13). An experimental pre-posttest design using the Wilcoxon test was employed and the result showed a p-value of 0.000 which indicates that there was an increase in average hemoglobin level before and after treatment (10.69 mg/dL to 13.01 mg/dL).

**The effect of *katuk* leaf juice on the level of hemoglobin**

Table 3 demonstrates the results of the independent t-test. The mean value obtained in

**Table 2. The difference in average change of hemoglobin levels**

Variable		Mean/ Median	Min-Max Std. Deviation	P
Fe tablet	Before	9.8600	-	.063
	After	9.9000		
Fe tablet combined with <i>katuk</i> leaf juice	After	9.9200	.36450	.014

the control group (Fe tablets) was 0.04, while in the treatment group (Fe tablets combined with *katuk* leaf juice) it was 0.60. The difference between the two groups was 0.56 with p-value = 0.00 < (0.05) so that Ho was rejected and Ha was accepted. It indicates that there was an effect of *katuk* leaf juice on hemoglobin levels in anemic pregnant women in the second trimester.

*Katuk* leaves were selected in the study by referring to Suparmi et al., (2016) who stated that *katuk* leaves were regarded as anti-anemia because the chlorophyll from *katuk* leaves could increase Hb and ferritin. Therefore, consuming *katuk* leaves (*Sauropus androgynus*) can be a potential solution to overcome anemia. *Katuk* leaves have been known as a plant that is rich in benefits. *Katuk* leaf extract has also been used as a food product intended for lactating mothers to smooth and increase breast milk production. Besides, *katuk* leaves also contain a laktagogum effect (smoothing milk secretion), 185 mg of calcium, 3.1 mg of iron, and 1.2 grams of fiber. Iron levels in *katuk* leaves can be an alternative for treating iron deficiency anemia.

A similar study was conducted by Indriyani et al., (2019) entitled "The Effects Comparison of *Sauropus androgynus*, *Moringa oleifera* alone and in combination on iron deficiency in anemic rats." The results showed a p-value <0.05 which demonstrated that the combination of *Sauropus androgynus* (*katuk*) and *Moringa oleifera* (*moringa*) leaf extract was more effective against iron deficiency anemia in rats compared to the extract alone. *Sauropus androgynus* contains higher Fe than *Moringa oleifera*. The composition of minerals and vitamins contained in 100 g of fresh leaves of *Sauropus androgynus* was 8.8 mg of Fe, 543 mg of P, 771 mg of Ca, 5,600 mg of carotene, 0.50 mg of thiamine, 244 mg of vitamin C, and 0.21 mg of riboflavin. The combination of *Sauropus androgynus* leaves and *Moringa* leaves extract has

a synergistic effect on anemia and is an alternative to Fe supplementation. Besides having potential as an anti-anemia, research conducted by Majid and Muchtaridi (2018) showed that *katuk* or *Sauropus androgynus* contains many chemical compounds with pharmacological effects including antibacterial, anti-anemic, and anti-inflammatory.

Iron (Fe) is an essential microelement for the body. This mineral is mainly needed in hemopoiesis (blood formation), that is in the hemoglobin Hb syntessa. Iron is necessary for the production of hemoglobin. For pregnant women, iron plays a pivotal role in the formation and maintenance of red blood cells. A decrease in hemoglobin will cause a reduction of the oxygen concentration in the body which may lead to hypoxia for the mother and fetus (16).

The current study was conducted on pregnant women in the second trimester to reduce the aggravation of anemia in pregnant women in the third trimester. During pregnancy, anemia is likely to occur because pregnant women experience hemodilution (blood loss) with an increase in volume between 30% and 40%. Physiologically, hemodilution can reduce heart performance which increases during pregnancy and the peak is at 32 to 34 weeks of gestation. If the maternal hemoglobin level is around 11 mg/dL, hemodilution will result in anemia and the hemoglobin levels will decrease to 9.5-10 mg/dL (Amini, Pamungkas dan Harahap, 2018).

The *katuk* leaf juice used in this study was *katuk* leaves mixed with lemon. Lemon is a fairly good source of vitamin C. Lemons provide vitamins C, B6, potassium, and flavonoids. Iron and vitamin C form the iron-ascorbate complex which is soluble and can easily be absorbed by the body. The conversion of non-heme iron from ferric to ferrous will increase when the pH is more acidic. Vitamin C is able to create a more acidic environment and

improve iron absorption by 30% (17). Varney (2007) mentioned that to maximize iron absorption, it is recommended to take iron tablets between meals and consume fruits that provide vitamin C as they can help accelerate iron absorption and play a role in transferring iron in the blood, and mobilizing iron deposits, especially hemosiderin in the spleen.

In this study, the treatment group received Fe tablets combined with *katuk* leaf juice for 14 consecutive days. The *katuk* leaves consumed was only 25 grams per day to minimize the side effects of its excessive consumption such as temporary insomnia and breathing difficulty. The cause of these symptoms is predicted to be papaverine contained in *katuk* leaves, although several researchers argued that papaverine is not always present in *katuk* leaves. To reduce the side effects of *katuk* leaves, the consumption should be limited to small quantities (maximum 50 g per day) and it is not suggested to be consumed continuously for more than 3 months (18). Based on the interviews conducted after 14 days of intervention to 15 second-trimester pregnant women with anemia, all pregnant women did not have any complain regarding the side effects of *katuk* leaves consumption such as insomnia and breathing difficulty.

The present study was conducted for 14 days. This is in accordance with the previous research carried out by Putri (2017) which stated that the time used to see changes in hemoglobin was 7 days. Significant changes could be seen between the control and treatment groups with  $p\text{-value} = 0.026 < 0.05$ .

**Table 3. The Difference in the average hemoglobin levels**

Variable	N	Mean	Std. Deviation	P
Fe Tablet	15	.0400	-	0.000
Fe Tablet combined with <i>katuk</i> leaf juice	15	.6067	0.19445	

## CONCLUSIONS AND RECOMMENDATION

Pregnant women with anemia are highly found at the age of 20-35 years and the majority

are primigravida women. There was no significant difference in the average Hb levels in the control group but there was a significant difference in the average Hb levels in the treatment group. Giving *katuk* leaf juice can increase hemoglobin (Hb) levels in pregnant women in the second semester with anemia for 14 days. It is expected that Community Health Center will further promote the benefits of *katuk* leaves and how to process *katuk* leaves to the community, especially pregnant women.

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