THE EFFECT OF CONSUMPTION OF KELAKAT (MORINGA AVOCADO) COOKIES ON HEMOGLOBIN LEVELS IN THIRD TRIMESTER PREGNANT WOMEN AT THE SOUTH CIMAHI COMMUNITY HEALTH CENTER

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ABSTRAK *:* PENGARUH KONSUMSI KUE KELAHI (*Moringa Avocado*) TERHADAP KADAR HEMOGLOBIN IBU HAMIL TRIMESTER III DI PUSKESMAS CIMAHI SELATAN

Latar Belakang: Anemia merupakan masalah kesehatan terbesar di masyarakat dan dunia, terutama pada wanita hamil. Kondisi ini memiliki dampak yang sangat buruk bagi kesehatan ibu dan janin. Salah satu kebijakan pemerintah untuk mengatasi hal ini adalah dengan memberikan suplemen tablet Fe selama kehamilan. Selain itu, upaya dilakukan untuk memenuhi kebutuhan zat besi selama kehamilan dengan mengonsumsi makanan yang kaya zat besi seperti Moringa dan Avocado.

Tujuan: Untuk menentukan pengaruh Kukis Kelakat terhadap kadar hemoglobin pada wanita hamil trimester III di Pusat Kesehatan Masyarakat Puskesmas Cimahi Selatan.

Metode: Studi ini menggunakan metode kuantitatif dengan desain quasi-eksperimental dan pendekatan dua kelompok pra-tes–pasca-tes. Studi dilakukan di Puskesmas Cimahi Selatan dengan populasi wanita hamil trimester III. Sampel terdiri dari 20 orang yang dipilih melalui sampling purposif, terdiri dari 10 orang di kelompok intervensi (diberikan kue kelakat + Fe) dan 10 orang di kelompok kontrol (diberikan Fe saja). Intervensi dilakukan selama 14 hari, dipantau melalui grup WhatsApp, dan kadar hemoglobin dievaluasi setelah intervensi menggunakan alat pengukur Hb. Analisis data menggunakan uji t.

Hasil: Hasil analisis menunjukkan nilai rata-rata peningkatan kadar hemoglobin (Hb) pada kelompok intervensi sebesar 0,42 gr/dl, sedangkan pada kelompok kontrol sebesar 0,73 gr/dl. Hasil tersebut tidak menunjukkan perbedaan yang signifikan, namun peningkatan kadar Hb pada kelompok intervensi lebih tinggi sebesar 0,38 gr/dl dibandingkan dengan kelompok kontrol. Nilai sig pada kelompok intervensi p-value 0,000 dan kelompok kontrol 0,035 dengan nilai ≤ 0,05.

Kesimpulan: Hasil penelitian menunjukkan bahwa preparat daun moringa memiliki manfaat signifikan dalam meningkatkan kadar hemoglobin pada wanita hamil pada trimester ketiga. Konsumsi rutin ekstrak daun moringa dan alpukat dapat membantu memenuhi kebutuhan zat besi, meningkatkan status gizi, dan mencegah risiko anemia selama kehamilan. Oleh karena itu, ekstrak daun moringa dan alpukat dapat direkomendasikan sebagai intervensi nutrisi tambahan yang aman, terjangkau, dan efektif untuk meningkatkan kadar hemoglobin pada wanita hamil, serta dapat digunakan sebagai alternatif suplemen zat besi dalam program perawatan antenatal.

Kata kunci: Hemoglobin, Kukis Daun Kelor dan Alpukat, Wanita Hamil

ABSTRACT

Background: Anemia is the biggest health problem in the community and the world, especially in pregnant women, this condition has a very bad impact on the health of the mother and fetus. One of the government policies to overcome this is by supplementing Fe tablets during pregnancy. In addition, efforts are made to meet iron needs during pregnancy by consuming foods that contain high iron such as Moringa and Avocado.

Purpose: To determine the effect of Kukis Kelakat on Hemoglobin Levels in Trimester III Pregnant Women in South Cimahi Community Health Center.

Methods: This study used a quantitative method with a quasi-experimental design and a two-group pretest–posttest approach. The study was conducted at the South Cimahi Community Health Center with a population of pregnant women in their third trimester. The sample consisted of 20 people determined by purposive sampling, consisting of 10 people in the intervention group (given kelakat cookies + Fe) and 10 people in the control group (given Fe only). The intervention was carried out for 14 days, monitored through a WhatsApp

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group, and hemoglobin levels were evaluated after the intervention using an Hb checker. Data analysis used the t-test.

Results:The results of the analysis obtained an average value of increasing Hb levels in the intervention group of 0.42 gr / dl, in the control group of 0.73 gr / dl. The results showed no difference, but the difference in the increase in the intervention group was 0.38 gr / dl greater than the control group.The sig value in the intervention group p-value 0.000 and control group 0.035 with a value ≤ 0.05.

Conclusion: The results of the study show that moringa leaf preparations have significant benefits in increasing hemoglobin levels in pregnant women in their third trimester. Regular consumption of moringa leaf and avocado preparations can help meet iron requirements, improve nutritional status, and prevent the risk of anemia during pregnancy. Therefore, moringa leaf and avocado preparations can be recommended as a safe, affordable, and effective additional nutritional intervention to increase hemoglobin levels in pregnant women, and can be used as an alternative to iron supplements in antenatal care programs.

Keywords: Hemoglobin, Moringa And Avocado Cookies, Pregnant Women

INTRODUCTION

Pregnancy is the time it takes from fertilization to birth of a baby, usually 280 days, which is equivalent to 40 weeks or 9 months 7 days. It is calculated in three stages: the first trimester starts from fertilization, followed by the second trimester, and ends with the third trimester (Morsa Khansa Aulia et al., 2023) . During pregnancy, physiological changes occur that are related to the metabolic and circulatory systems in the body (Desyani Ariza et al., 2023).

These physiological changes trigger anemia in pregnant women due to an imbalance in circulation in the body which can cause a decrease in hemoglobin levels (Harna et al., 2020) . The protein in the body that is rich in iron and functions as a transporter of oxygen from the lungs to all body tissues is hemoglobin (Adriani & Fadilah, 2023) . According to WHO, when hemoglobin levels fall in cases of pregnancy to the normal limit of ≤11 gr/dl, it can be confirmed that the mother has anemia. Meanwhile, the Center for Disease Control and Prevention defines anemia in mothers in the first and third trimesters as Hb levels ≤11 gr/dl, in the second trimester Hb ≤10.5 gr/dl, and postpartum with Hb ≤10 gr/dl (KEMENKES, 2022).

Anemia is the biggest health problem faced by society and the world, especially for pregnant women who are iron deficient. Lack of iron from food, increased demand for food sources to make more red blood cells for the needs of mother and baby, as well as changes in blood and bone marrow during pregnancy are some of the causes of anemia during pregnancy (T Hartati & S Sunarsih, 2021) . The impact of this condition can cause various risk complications during pregnancy, including miscarriage, bleeding, low birth weight (LBW) babies, uterine atony, uterine inertia, and placental retention (Rukmana et al., 2023) . Based on data from the World Health Organization in 2019, the worldwide prevalence of anemia in pregnant women reached 36.5% (WHO, 2021).

Based on data from the Indonesian Ministry of Health in 2019, the prevalence of anemia in pregnant women in this country is still quite high, reaching 48.9%. In West Java, anemia affected 85.82% of mothers in 2019, but this number fell to 53.24% of mothers in 2020. Pregnant women with anemia (Open Data Jabar, 2021). This figure shows that anemia is a serious health problem in Indonesia, with a prevalence rate that is still approaching the threshold for a serious public health problem (*Severe Public Healt Problem*) i.e. more than 40% (KEMENKES, 2022). According to data from the Cimahi City Health Service, the total number of pregnant women experiencing anemia in 2021 was 275, in 2022 the number was 455, this data has increased in the last 2 years, namely around 24.71% (Dinkes Kota Cimahi, 2022).

Anemia has a very bad impact on the mother and fetus, such as abortion, premature labor, prolonged labor, postpartum hemorrhage, shock, and the risk of infection in the postpartum period (Laturake et al., 2022) . In Indonesia, the maternal mortality rate (MMR) in 2022 is 205 deaths for every 100,000 live births. Based on statistics *Maternal Perinatal Death Notification* (MPDN) in 2021, the main causes of maternal death include infection (10.4%), bleeding (27.3%), and eclampsia (37.1%). All pregnant women are at risk of postpartum hemorrhage, which is the most common cause of maternal death. 68-73% of postpartum hemorrhage that results in maternal death occurs in the first 24 hours after the baby is born, 82-18% in the first week, and 82-18% in the second week. Anemia in pregnant women is a risk factor for postpartum hemorrhage (Kemenkes RI, 2021)

One of the factors causing anemia in pregnant women is ignorance of the demands placed on the fetus during pregnancy. Pregnant women should not underestimate the need for iron, because low iron consumption increases the risk of anemia, thereby inhibiting fetal growth and development (Nurhaida & Rostinah, 2021).

Apart from age and gestational age, other factors that may influence the incidence of anemia in pregnant women include parity, level of education regarding the impact of pregnant women, and maternal compliance in taking iron supplements. Anemia is more common in mothers who are too young or too old because they need more iron throughout the early years to support the growth and development of the fetus and mother. Chronic disorders such as diabetes mellitus, hypertension, anemia, and other conditions are more common in pregnancies over 35 years and can ultimately increase the chances of pregnancy (Nurhaida & Rostinah, 2021)

A pregnant woman needs about 1,000 mg of iron. Specifically, 200 mg is needed to replenish lost body fluids, 300 mg for fetal needs, and 500 mg to increase the number of red blood cells. The amount of iron needed during pregnancy varies depending on gestational age; during the first trimester, the amount required is less (0.8 mg/day), whereas throughout the second and third trimesters, the amount required increases rapidly to 6.3 mg/day. This occurs due to blood volume increasing gradually in the first trimester and reaching its peak in the second and third trimesters. Pregnant women are more likely to experience anemia in the third trimester of pregnancy because this is when the body needs more iron and nutrients. The fetus needs iron stores and food sources for itself as postnatal supplies (Ramadani Rizqa, 2022).

The government's efforts to overcome anemia in pregnant women are focused on providing pharmacology, namely blood supplement (Fe) tablets. Currently, around 85% of pregnant women at the national level have been given Fe. However, there are still many pregnant women who do not consume Fe tablets up to 90 tablets, because they experience side effects such as discomfort in the upper stomach, nausea, vomiting and diarrhea, so anemia is still often experienced by pregnant women (Angraini et al., 2023).

Non-pharmacological administration starts from diet, which is very important for pregnant women. Efforts to meet iron needs during pregnancy, namely consuming foods that contain high levels of iron from plant and animal sources (Gunawan et al., 2023). One of the plant-based food ingredients, namely Moringa and avocado, contains high levels of iron as an alternative natural ingredient that can have an influence in treating anemia in pregnant women. Moringa leaves have been researched and are believed to increase hemoglobin (Hb) levels in pregnant women (Hikmah et al., 2021) . Based on research, consuming avocados can also increase HB levels in pregnant women after being given intervention for 14 days (Tri Putri Ageng Utami et al., 2020).

Moringa leaves (Moringa oleifera) are one of the most widely grown food ingredients in Indonesia, this plant is easy to obtain and easy to grow in the home garden. Apart from that, Moringa leaves and powder are sold widely throughout Indonesia. Benefits and properties of the Moringa plant (*Moringa Oleifera*) contains protein and iron which can overcome the problem of Chronic Energy Deficiency (CED) and anemia in pregnant women (Rufaindah et al., 2023) . The nutritional value of Moringa leaves includes 1,077 mg calcium, 0.9 mg fiber, 6 mg iron, and 5.1 g protein. Moringa leaves that are dried and ground into flour can increase their nutritional value, providing 25 times more iron than spinach leaves. Iron is very important for the production of hemoglobin (Hb). So after consuming Moringa with a high iron content, it is easily digested by the body, and can increase hemoglobin levels (Adistiya Pramono et al., 2021).

Avocados are plants that grow well in Indonesia and other tropical climates. Avocados are easy to get and the avocado plant is still a garden plant. West Java, East Java, parts of Sumatra, South Sulawesi and Nusa Tenggara are avocado producing areas. The 0.9 mg of iron contained in avocados helps the body produce red blood cells, increases oxygen flow throughout the body, and prevents and treats anemia. This is due to the high vitamin C content in avocados which helps the production of erythrocytes which function to accelerate the body's production of hemoglobin by absorbing iron minerals from the mucosa of the small intestine and transporting them to the bloodstream and bone marrow. . Pregnant women can increase Hb levels and erythrocyte counts effectively by consuming avocados for 14 days (Tri Putri Ageng Utami et al., 2020).

There are various kinds of processed forms of Moringa such as extract capsules, soup, juice and Moringa flour which can be processed into various types of cakes, one of which is cookies (Satiya et al., 2022). Cookies are a type of food that is quite popular; Pregnant women can eat it because it tastes crunchy. If natural ingredients are added to cookies during the production process and

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can improve health, then cookies are considered functional food. Avocados and moringa leaves are two authentic delicacies that are rich in health-promoting nutrients and can increase hemoglobin levels. Apart from that, the food fiber and protein content in the cookies produced is quite high because they are made from flour, eggs and milk which makes the texture crunchy, easy to consume and can be absorbed by the body (Asvelia, 2023).

In research conducted by (Rufaindah et al., 2023) with the title "The effect of Moringa brownies on the Hb levels of pregnant women in Pandanmulyo Village, Tajinan District." It is known that the hemoglobin levels of pregnant women are influenced by consuming brownies made from Moringa leaves. Before receiving the moringa brownies, the intervention group's median score was 9 (7–12), but increased to 11 (11–12). It can be concluded that giving brownies containing moringa has an impact on increasing HB levels in pregnant women.

Previous research conducted by (Amelia et al., 2021) Concluded that giving avocado juice affects hemoglobin levels. After seven days, the study findings showed substantial changes in hemoglobin levels before and after treatment with avocado consumption, which involved consuming 100 grams of avocado juice and 100cc of water every day. In the group that consumed avocado, the average hemoglobin level rose to 12.4 gr/dl.

The results of the preliminary study showed that there was an increase in anemia in third trimester pregnant women in the South Cimahi area. In the 2021-2022 data, there has been an increase in the last 2 years and the report was obtained by accumulating data from every health center in Cimahi City by the City Health Office Cimahi. Based on this data, there are the most patients at the South Cimahi Community Health Center who experience anemia in third trimester pregnant women, namely in 2021 there are 64, and in 2022 there will be 176 who experience anemia. Based on the initial survey on November 27 2023, in the South Cimahi Community Health Center area there is data that from 2023 to October there were 534 third trimester visits by pregnant women, and 42 pregnant women who experienced anemia, on average showed mild anemia in the Community Health Center area. South Cimahi.

RESEARCH METHODS

This study used a quantitative method with a non-equivalent control group quasi-experimental design with a pretest–posttest approach. The study was conducted at the South Cimahi Community Health Center on pregnant women in their third trimester, with a total sample of 20 respondents selected through purposive sampling. The sample consisted of 10 respondents in the intervention group who were given kelakat cookies + Fe and 10 respondents in the control group who were only given Fe. The intervention lasted for 14 days with monitoring through a WhatsApp group, while hemoglobin levels were measured before and after the intervention using the “Easy Touch GCHb” device. Data collection was carried out using observation sheets and SOP instruments. Data analysis included univariate and bivariate analysis, with Shapiro-Wilk normality test and t-test to examine the effect of kelakat cookie consumption on hemoglobin levels in pregnant women in their third trimester. Significance was determined based on a p-value < 0.05 to reject the null hypothesis (Ho) and accept the alternative hypothesis (Ha) according to the references of (Riyanto Agus, 2022) and (Sugiyono, 2022).

RESULTS

Univariate Analysis

Based on table 1 above, it can be seen that from the 10 research respondents, the results obtained for hemoglobin levels before the intervention were given were the lowest or minimum value of 11.1, the highest or maximum hemoglobin level of 12.5, the mean or average value of 11,830, and standard deviation of 0.4296. The resulting value of hemoglobin levels after the intervention was given was the lowest or minimum value of 11.4, the highest or maximum hemoglobin level was 13.1, the mean or average value was 12,250, and the standard deviation was 0.5061.

Table 1
Hemoglobin levels in pregnant women before and after consuming kelakat cookies and Fe tablets in the intervention group

Hemoglobin Levels	N	Min	Max	Mean	Std. Deviation
Pre Test Intervention	10	11.1	12.5	11.830	.4296
Post Test Intervention	10	11.4	13.1	12.250	.5061

Source: Primary Data, 2024

Table 2
Hemoglobin levels in pregnant women before and after consuming Fe tablets in the control group

Hemoglobin Levels	N	Min	Max	Mean	Std. Deviation
Pre Test Control	10	8.3	14.0	11.140	1.6821
Post Test Control	10	10.6	14.4	11.870	1.3614

Sumber : Data Primer, 2024

Based on table 2 above, it can be seen that from the 10 research respondents, the results obtained for hemoglobin levels before the intervention were given were the lowest or minimum value of 8.3, the highest or maximum hemoglobin level of 14.0, the mean or average value of 11,140, and the standard deviation is 1.6821. The resulting value of hemoglobin levels after the intervention was given was the lowest or minimum value of 10.6, the highest or maximum hemoglobin level was 14.4, the mean or average value was 11.870, and the standard deviation was 1.3614.

Bivariate Analysis

This analysis was to determine the effect of two groups, namely the intervention group was given kelakat cookies and Fe tablets, then the control group was given Fe tablets which were consumed for 14 days. This bivariate analysis begins with a data normality test using *Shapiro Wilk* It was found that the results after being given intervention in the intervention group were 0.954 and the control group was 0.074 which was significantly greater than (p>0.05), it can be concluded that the data was normally distributed. Because the data is normally distributed, this research can be continued using the T Test to analyse research data.

Table 3
Effect of Consuming Kelakat Cookies and Fe Tablets on increasing Hb Levels in the intervention group

Data	N	x ± SD	P
Pre-Test Intervention Group	10	11.83 ± 0.429	0.000
Post-Test Intervention Group	10	12.25 ± 0.506	

Source: Primary Data, 2024
**Pairet Sample Test*

The Sig Hb value of pregnant women in the Pre-Test and Post-Test intervention groups was 0.000, less than 0.05. The average value of increasing Hb levels is 0.42 gr/dl. Based on these results, there are significant differences in each treatment, thus it can be decided that Ha is Accepted and H0 is Rejected.

Table 4
Effect of Fe Tablet Consumption on Increasing Hb Levels in the Control Group

Data	N	x ± SD	P
Pre-Test Intervention Group	10	11.14 ± 1.682	0.035
Post-Test Intervention Group	10	11.87 ± 1.361	

Source: Primary Data, 2024
**Pairet Sample Test*

The Sig Hb value of pregnant women in the Pre-Test and Post-Test control groups was 0.035, which was smaller than 0.05. The average value of increasing Hb levels was 0.73 gr/dl. Based on these results, there are significant differences in each treatment. Thus, it can be decided that Ha is accepted and H0 is rejected.

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Table 5
The Differences in Avarage Hb Levels After the Experiment in the intervention and Control Groups

Peningkatan kadar Hb	N	x ± SD	Lower – Upper	P
Intervention Group	10	12.25 ± 0.506	-0.58 ± 1.34	0.425
Control Group	10	11.87 ± 1.36	-0.62 ± 1.38	

Sumber : Data Primer, 2024
**Independen t-Test*

Based on the results of the analysis in table 4.5, it shows that there was no difference in the increase in Hb levels after being given the intervention, whether the intervention group was given kelakat cookies and Fe tablets, and the control group was given Fe tablets with a P value of 0.425. However, the difference in Hb increase in the intervention group was 0.38 gr/dl, lower than the control group.

DISCUSSION

Haemoglobin levels in pregnant women before and after consuming kelakat cookies and Fe tablets in the intervention group

Changes in haemoglobin levels in the intervention group, the value of haemoglobin levels before being given kelakat cookies and Fe tablets was an average of 11.83, while after being given kelakat cookies and Fe tablets the average was 12.25.

These results are consistent with other research conducted by Nua et al on how well Moringa Biscuits (Bi-kelor) work in increasing haemoglobin levels in anaemic pregnant women in 2020. The average haemoglobin level of pregnant women increased, based on univariate and bivariate analysis. According to Nua et al. 2020, the statistical test findings showed a p value of 0.000≤0.005, indicating that pregnant women who used Bikelor may have higher haemoglobin levels (Nua et al., 2020).

The use of Moringa leaves (Moringa Oleifera) is a substitute that can help overcome nutritional deficits, especially iron deficiency anaemia. Eating foods rich in iron and vitamin C every day can help pregnant women who experience anaemia. To ensure pregnant women get enough iron and do not experience anaemia due to iron deficiency, Moringa leaves are consumed orally to increase iron absorption in the body, this helps the pregnancy run better (Susiyanti et al., 2021).

Avocados are rich in nutrients which are very beneficial for pregnant women, because they can increase haemoglobin and erythrocyte levels. Pregnant women can reduce the risk of various problems by avoiding anaemia during pregnancy. Eating avocados which are rich in iron and copper compounds can help the body produce more red blood cells, avoid anaemia, and overcome any problems that may arise due to anaemia during pregnancy (Feriyal, 2019).

Haemoglobin levels in pregnant women before and after consuming Fe tablets in the control group

Haemoglobin levels in the control group changed; after administering kelakat cookies and Fe pills, the average haemoglobin level was 11.87, compared to the previous average of 11.14.

Haemoglobin levels were measured at 12.8 g/dL in the first trimester, 11.5 g/dL in the second trimester, and 10.1 g/dL in the third trimester. According to this research, the third trimester is when anaemia most attacks pregnant women because the fetus needs nutrition and iron reserves for itself at this time, and the mother's own iron needs will increase in this trimester compared to when she was not pregnant (Ramadani Rizqa, 2022)

Maternal health during pregnancy is one of the factors that influences the absorption of iron pills. Vitamin C can increase the body's ability to absorb iron through food. However, there are a number of foods that can inhibit iron absorption, including chocolate, tea, coffee, and anything containing milk or calcium. The duodenum, the first part of the small intestine, is responsible for iron absorption. Haemoglobin levels increase in response to increased levels of iron in the blood, which occurs when absorption is successful. Increasing haemoglobin levels during pregnancy is very important for the health of the mother and fetus, as it helps recovery from anaemia. To avoid or cure anaemia in pregnant women, it is important to know what variables influence iron absorption and consume foods that help the body absorb iron (Fitria et al., 2021)

This research is in line with research by Syari and colleagues in 2023 which used 38 pregnant women as respondents and studied the

efficacy of Fe pills in increasing haemoglobin levels in pregnant women. Research findings show an average difference in Hb levels of 1.5% ± 0.57 gr% between before and after Fe pill treatment. The statistical test results obtained a p value = 0.00, which shows that Fe pills have an impact on the haemoglobin levels of pregnant women (Satiya et al., 2022)

The Effect of Consuming Kelakat Cookies and Fe Tablets on Increasing Hb Levels in the Intervention Group

Based on the results of data processing, it was found that in the intervention group there was an effect of consuming kelakat cookies (moringa avocado) + Fe tablets on increasing haemoglobin levels in pregnant women in the third trimester with a significant value of 0.000 with (value <0.05). Where the results after being given intervention for 14 days showed that there was a change in the increase in haemoglobin levels after being given kelakat cookies compared to before being given kelakat cookies. This is because consuming processed food based on vegetables or fruit such as Moringa leaves and avocado which contain high levels of iron can help increase the haemoglobin levels of pregnant women and can prevent anaemia.

Kelakat Cookies contain 8.745% Protein, 56.915% Carbohydrates, 15.145% Fat, 11.92% water, 2.31% ash, 11.34% Fe. 1 cookie weighing 20 grams contains 0.4 mg iron. The content of Avocado jam in 100 grams of avocado contains Protein 0.9 dr, Fat 6.5 gr, Carbohydrates 7.7 gr, Energy 85cal, Iron 0.9 mg, Vitamin A 080.0 mcg, Vitamin C 13 mg, Acid Folate 81 mg, Calcium 10.00 mg, Water 84.30 mg. Processed moringa and avocado such as extract capsules, soup, juice and moringa flour which can be processed into various types of cakes, one of which is cookies (Ajijul Jana et al., 2021).

The increase in haemoglobin levels in pregnant women was due to respondents regularly consuming kelakat cookies and Fe tablets for 14 days. Take Fe tablets regularly during pregnancy according to the direction of the health worker/midwife. In this study, consuming kelakat cookies and Fe tablets is also supported by the nutritional intake consumed daily by pregnant women, namely a number of foods containing protein and high in iron, which will help increase haemoglobin levels in pregnant women in the third trimester. In addition, following the researchers' directions, pregnant women who took part in this trial routinely consumed 3 kelakat cookies and 1-2 Fe pills every day for 14 days. Due to the high iron content in avocados and Moringa leaves, pregnant women's bodies absorb more iron during pregnancy.

This research is in line with research by Rufaindah et al. from 2023 which looked at how the Hb levels of pregnant women were affected by Moringa brownies in Pandanmulyo Village, Tajinan District. This research involved 20 pregnant women as respondents. Research findings show that giving brownies made from moringa to pregnant women has an impact on their Hb levels (Rufaindah et al., 2023).

According to previous research regarding the effect of giving avocados (*Persea Americana*) and honey on the haemoglobin levels of third trimester pregnant women with anaemia at the Setiabudi District Health Center, South Jakarta in 2023. Research findings show that the average change in haemoglobin levels before and after the intervention is statistically significant. Research findings show that pregnant women in the third trimester can benefit from consuming avocado and honey to increase haemoglobin levels (Silferia & Situmorang, 2023).

The iron content in Moringa oleivera leaves is quite high. In fact, 28.2 mg of iron is found in 100 grams of Moringa leaf flour. Grinding dried moringa leaves (indoors) increases their nutritional value fivefold, except for vitamin C, which remains the same. When water evaporates from fresh heated Moringa leaves, it releases bound nutrients, which are then more abundant in dried Moringa leaves. Moringa is not only rich in iron, but it is also a good source of protein, which the body uses to absorb more iron. The nutritional iron is the main element in the formation of Haemoglobin (Hb). So after consuming Moringa with a high iron content, it is easily digested by the body, and can increase haemoglobin levels (Nua et al., 2020).

Avocados provide 0.9 mg of iron, which helps the body produce red blood cells, improves oxygenation throughout the body, and helps treat and prevent anaemia. Avocados also contain vitamin A which can help prevent anaemia by helping the production of red blood cells through its interaction with the mineral Fe. Avocados are also a good source of vitamin C. By accelerating the absorption of iron minerals from the small intestinal mucosa, vitamin C plays an important role in erythrocyte production. This mineral is then transported to the bone marrow through circulation, where it ultimately helps produce haemoglobin in the body (Tri Putri Ageng Utami et al., 2020).

Effect of Fe Tablet Consumption on Increasing Hb Levels in the Control Group

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The results of data processing were obtained by the control group, namely consuming Fe tablets with a significant value of 0.035 (value < 0.05). It can be concluded that the results after the intervention was given showed that there was a change in the increase in haemoglobin levels in third trimester pregnant women after being given Fe tablets which were consumed 1-2x a day for 14 days. The number of anaemia in pregnant women in the control group before being given the intervention was 5 people, and after being given the intervention it was 4 people.

Fetal growth increases a woman's need for iron during pregnancy. Iron requirements during the first trimester range from 30–40 mg for fetal and red blood cell needs, and 1–1.2 mg per day for basal loss. During the second trimester a person's iron requirement is around 5 mg per day, with an initial loss of 0.8 mg per day. In addition, they need 300 mg of iron for red blood cells and 115 mg for fertilization. Daily iron requirements during the third trimester are approximately 5 mg, with an initial loss of 0.8 mg. In addition, 150 mg of red blood cells and 223 mg of conception are needed (Fajrin & Erisniwati, 2021)

Iron (Fe) tablets are in sugar-coated form and contain 0.400 mg of folic acid and 60 mg of elemental iron (found as ferrous sulfate, ferrous fumarate, or ferrous gluconate). This supplement is given to pregnant women to help produce haemoglobin (Hb) in the blood and avoid iron deficiency anaemia during pregnancy (Ministry of Health, 2013). For pregnant women, to maintain healthy red blood cells, maintain oxygen circulation, and increase the metabolism of other nutrients, iron is very important (Chendriany et al., 2021).

Vitamin C intake, which can increase iron absorption from food, and any illnesses the mother has while pregnant can impact how well her fetus absorbs iron pills. A number of foods can inhibit the body's capacity to absorb iron, including dairy products, tea, coffee, chocolate and foods high in calcium. The duodenum is where iron absorption occurs. If absorption goes smoothly, Fe levels in the blood will increase, thereby increasing haemoglobin levels in the blood (Sari, 2020).

Differences in Average Hb Levels After the Experiment in the Intervention and Control Groups

The results showed that there was no significant difference in the increase in Hb levels after the intervention between the control group given Fe tablets and the intervention group given kelakat cake and Fe tablets (P=0.425). After comparing the two groups, we found that both experienced higher improvements, with no visible differences. The difference between the two groups in terms of haemoglobin increase was 0.42 gr/dl lower in the intervention group.

Anemia during pregnancy is caused by iron deficiency, which can be caused by inadequate food intake, poor reabsorption, and other reasons. Pregnant women have a much greater need for iron and vitamins than non-pregnant women. Considering the negative impact of iron deficiency on the mother and fetus, it is recommended that all pregnant women take iron supplements, especially those who suffer from anaemia. The body is unable to effectively absorb all the iron pills ingested. Therefore, Moringa leaves can help the absorption of iron as well as possible because of its high iron and vitamin content. The increase in haemoglobin levels in pregnant women varies depending on the nutrients (such as protein and vitamin C) consumed daily. This nutrient helps with haemoglobin production and iron absorption.

The iron (Fe) content in Moringa (Moringa Oleivera) leaves is relatively high. In fact, the iron concentration at 28.2 mg/100 g of Moringa leaf flour was even greater. Except for vitamin C which cannot stand drying and grinding, the nutritional value of Moringa leaves can increase many times. When water evaporates from heated fresh Moringa leaves, it releases latent nutrient bonds, thereby increasing the nutrient content of the dry leaves. One way to overcome malnutrition, especially iron deficiency anaemia, is to consume Moringa leaves or what is scientifically known as Moringa olive oil (Isnainy et al., 2020).

Limitations

1. The daily nutritional intake of pregnant women for 14 days in the intervention and control groups was not studied
2. Not testing the content again due to limited research time

CONCLUSION

Based on the results of a study on the effect of kelakat cookie consumption on hemoglobin levels in pregnant women in their third trimester at the South Cimahi Community Health Center in 2023, it can be concluded that the intervention group that received kelakat cookies and iron tablets experienced an increase in hemoglobin levels from an average value of 11.83 g/dL in the pre-test to 12.25 g/dL in the post-test. In the control group that only received iron tablets, hemoglobin levels also increased from an average value of 11.14 g/dL in

the pre-test to 11.87 g/dL in the post-test. The results of the Paired Sample Test in the intervention group showed an average increase of 0.42 g/dL with a significance value of 0.000 (<0.05), so the research hypothesis was accepted and proved that the consumption of kelakat cookies together with iron tablets had an effect on increasing hemoglobin levels. In the control group, the average increase of 0.73 g/dL with a significance value of 0.035 (<0.05) also showed that the administration of iron tablets had an effect on increasing hemoglobin levels. However, a comparison analysis of the two groups showed no significant difference in hemoglobin level increase between the intervention group and the control group, with a p-value of 0.425. In addition, the difference in hemoglobin level increase in the intervention group (0.38 g/dL) was lower than that in the control group.

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