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COMPARISON OF INTAKE OF MORINGA LEAF AND GREEN BEANS AS AN ALTERNATIVE TO INCREASE HEMOGLOBIN LEVELS OF PREGNANT WOMEN WITH ANEMIA

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KEYWORDS
Moringa Leaves, Green Beans, Hemoglobin, Pregnant Women, Systematic Review

ABSTRACT
Anemia is a "potential danger of mother and child". According to Riskedas (2018) anemia prevalence of pregnant women increased within 5 years from 37.1% to 48.9%. The biggest cause of anemia in pregnancy is iron deficiency anemia. One of the causes is lack of pregnant women get iron tablet (SF) less than 90 tablets and have not consume iron tablets correctly and continuously. Improving iron status can be done with non-pharmacological therapy, including the consumption of moringa and green beans. To compare the effectiveness of Moringa leaves and green beans on hemoglobin levels in pregnant women. Search for articles through the databases of Google Schoolar, Science Direct, PubMed, Elsevier (SCOPUS), Medline using Boolean operators (AND and OR). The research inclusion criteria were : Studies with randomized controlled trial (RCT) or quasi experiment design from 2015 to 2020, research participants were pregnant women, the intervention given was Moringa leaves or green beans. The results of the measurement of hemoglobin levels. Eighteen studies met the eligibility criteria and were analyzed. Moringa leaves were more effective in increasing the hemoglobin level of pregnant women with Standardized Mean Different (SMD) by 0.10 compared to green beans (SMD 0.10; CI 93% = -0.38 to 0.58; p<0.00001). Moringa leaves are more effective in increasing hemoglobin levels of pregnant women than green beans.

INTRODUCTION

The highest percentage of causes of maternal death is bleeding (38%) both during pregnancy and postpartum due to anemia (Statistik, 2014). Anemia is a "potential danger of mother and child" during pregnancy which means it is potentially dangerous for mother and child. This is due to the low red blood cells that bind oxygen in the blood so that the work of the organs in the body is not optimal. The result of low red blood cells is a lack of oxygen intake (Banhidy et al., 2011). The fetus in pregnant women will also be affected due to lack of oxygen that is channeled with blood through the umbilical cord (Prawirohardjo, 2014). Therefore, serious attention is needed to overcome anemia (Manuaba, 2010; Manuaba et al., 2010).

According to Riskesdas (2018), the anemia rate in pregnant women in Indonesia has increased from 37.1% to 48.9% in the last 5 years. One of the causes is the lack of pregnant women who get blood added tablets (TTD) less than 90 grains and pregnant women do not consume TTD appropriately and continuously (Dewantoro & Muniroh, 2017; Wiradnyani et al., 2013).

Anemia in pregnant women is physiological because during pregnancy there is an increase in blood volume (*hypervolemia*). *Hypervolemia* is the result of an increase in the volume of plasma and erythrocytes (red blood cells) in the body, but this increase is

unbalanced, that is, the increase in plasma volume is much greater, giving the effect that the hemoglobin concentration decreases from 12 g / 100 ml^3. In addition, at 10-36 weeks gestation there is blood thinning or hemodilution. which is useful to relieve heart performance (Wiknjosastro, 2015).

Improving iron status can also be done with two kinds of approaches, namely pharmacological and non-pharmacological. The provision of pharmacological therapy includes the provision of blood enhancer supplementation or better known as ferrossus sulfas (Fe) (Organization, 2011). Non-pharmacological therapy can use food ingredients that refer to a healthy diet with balanced nutrition in accordance with the needs of the body. Foods that contain complex components such as iron, vitamin C, protein, vitamin B6, and vitamin b12 to support Ferossus sulfas are Moringa leaves and green beans.

Moringa leaves contain important nutrients such as iron 28.2 mg / 100 g (25 times more than spinach, 3 times more than almonds), protein 27.1 gr, vitamin C 220 mg, and B6 3.32 mg (Arisman, 2004). Based on research by Madukwe (2013), Moringa leaf powder per 100 mg has a composition of iron 19.42 mg and vitamin C 18.72 mg (Madukwe et al., 2013). Estiyani (2017) stated that supplements containing 250 mg Moringa leaf flour significantly improved blood profiles (hemoglobin, hematocrit, erythrocytes, and platelets) in postpartum mothers with consumption of 2x1 / day for 14 days (Estiyani et al., 2017).

RESEARCH METHOD

Literature Search Strategy

The search for articles in this study was carried out by searching the Google Scholar, Proquest, Science Direct, PubMed, Elsevier (SCOPUS), Medline databases from 2015 – 2020 using the PRISMA method. Article search results using keywords: moringa oleifera and/or hemoglobin of pregnant women, Vigna radiata and/or hemoglobin of pregnant women, mungbean and /or hemoglobin of pregnant women, green bean and /or haemoglobin of pregnant women, increase hemoglobin during pregnancy, moringa and/or hemoglobin of pregnant women, moringa leaves and/or hemoglobin of pregnant women, green beans and/or hemoglobin of pregnant women and synonyms of keywords related to moringa oleifera and/or mungbean increase hemoglobin

Data Extraction

Researchers extract articles using inclusion criteria and exclusion criteria and conduct screening to prevent duplication of articles.

RESULTS AND DISCUSSION

Result

The results of 18 studies that met the criteria for *systematic literature review* obtained the results of 4 Randomized Control Trial (RCT) studies, 2 experimental studies, 12 quasi-experimental studies. Analysis of 18 articles obtained 2 studies with insignificant results, namely with (pvalue <0.058) and mutivariate analysis results R2: 0.231 in moringa leaf articles, while in green bean articles obtained 1 study with insignificant results, namely with (p value: 0.452).

The research obtained in this literature study to be able to find out whether it has an influence between variables is known by calculating the *effect size* using the Revman 5.4 application. *Effect size* is used in decision making in the comparison of moringa leaf and mung bean article groups. *Effect size* is divided into *fixed effect* and *standard mean different* (SMD). Both *effect sizes* are used depending on the heterogeneity of the article (I2). For *the acquisition of effect size* can be seen in the *following Forest Plot* image:

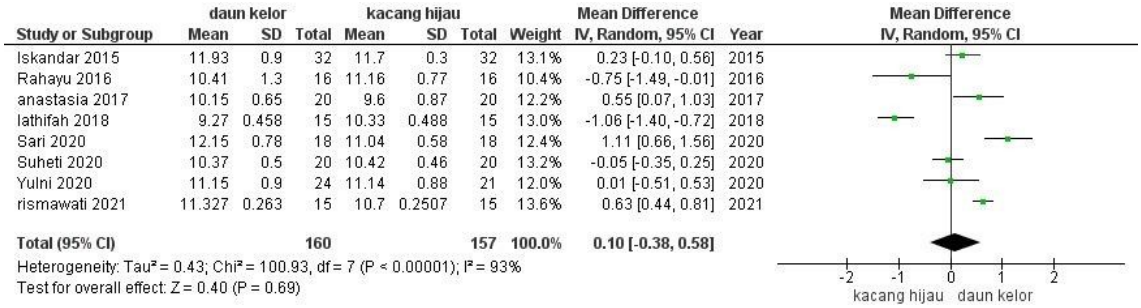

Figure 1. Forest Plot

Based on the results of analysis using RevMan 5.4 software, it is known that there is high heterogeneity between experiments with one another (I2 = 93%; P<0.00001) so that the Random Effect Model (REM) is used. Moringa leaf intervention was able to increase hb levels with Standardized Mean Different (SMD) by 0.10 compared to green beans (SMD 0.10; CI 95% = -0.38 to 0.58; p<0.00001).

Article distribution can be used to visually detect the possibility of publication bias. Interpretation of funnel plot results shows no publication bias characterized by: 1. Symmetrical plot shape on the right and left sides, 2. Balanced distance between plots, 3. SE value< 0.5. The funnel plot image in this study shows that there is no publication bias. It is characterized by symmetry of the right and left sides of the plot. On the right side there are 4 circles and on the left side there are 4 circles.

The description of the funnel plot in this study can be seen in the following figure :

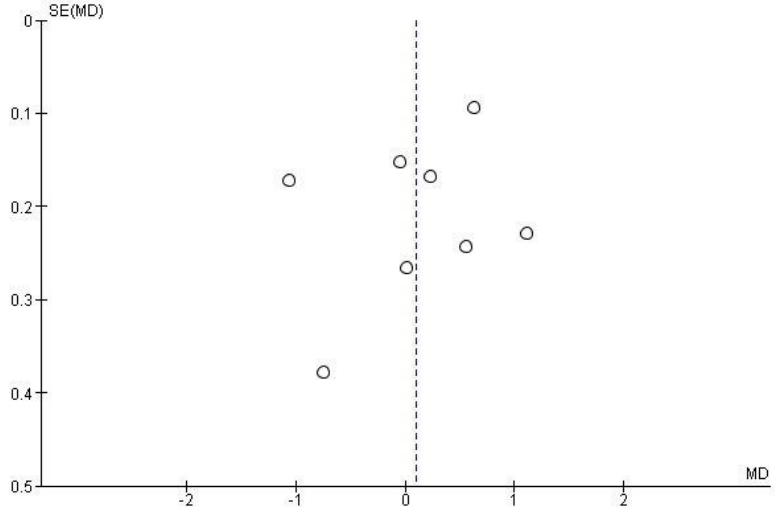

Figure 2 Funnel Plot

The journals in this literature review are carried out in several regions in Indonesia. Both from Sumatra, Java, Sulawesi to Maluku. Starting from 1 journal from Banten Province (Tangerang), 1 journal from West Java Province (Bekasi), 4 journals from Central Java Province (Ungaran, Pekalongan, Semarang, Temanggung), East Java (Pasuruan), 2 journals from Lampung Province (Bandar Lampung Tanggamus), 1 journal from Bengkulu Province, 1 journal from Kepri Province, 5 journals from South Sulawesi Province (Makassar, Gowa, Jeneponto, Luwu, Takalar), 1 journal from Central Sulawesi Province (Donggala), and 1 journal from Maluku.

Discussion

Hematological changes in pregnant women occur due to changes in maternal blood volume that begin to increase early in pregnancy as a result of changes in osmoregulation and the renin-angiotensin system, leading to sodium retention and an increase in body water. During pregnancy, blood volume increases up to 45%, while the volume of red blood cells only increases up to 30%. This difference in increase can lead to "physiological anemia" during pregnancy, with an average hemoglobin level of 11.6 g/dl and a hematocrit of 35.5%. Additionally, from weeks 10 to 36 of pregnancy, there is blood dilution or hemodilution, which is beneficial for easing the workload on the heart. Hemodilution results in a decrease in hemoglobin and ferritin levels in the blood.

Antenatal care (ANC) is health services for pregnant women provided by professionals from the first trimester until the postpartum period. One of the minimum ANC service standards is "provide iron tablets for routine consumption." However, a study by Wiradnyani (2015) reported that 73% of pregnant respondents experienced nausea and vomiting after taking iron tablets, leading them to discontinue their iron tablet consumption (Hamzah & Yusuf, 2019).

There are two types of therapies to increase hemoglobin levels: pharmacological and non-pharmacological. Commonly used pharmacological therapies in Indonesia include ferrous sulfate, iron tablets, or blood booster tablets (TTD). Non-pharmacological therapy studied by the researcher includes moringa leaves and green beans .

Moringa leaves, from the Moringaceae family originating in India, can grow in tropical and subtropical climates due to their robust adaptive abilities (Fiantis, n.d.). The nutritional content of moringa leaves depends on soil conditions such as texture, moisture, nutrients, and pH. These leaves contain minerals and vitamins, with iron at 60.5 mg, protein at 26.3 g, vitamin C at 200 mg, and vitamin B6 at 3.32 mg, according to Estiyani (2017). Moringa leaves also contain antioxidants, mainly in the form of tannins, steroids, triterpenoids, flavonoids, saponins, anthraquinones, and alkaloids.

Various processing techniques were used in the articles, including moringa leaf extract capsules (Iskandar et al., 2015; Nurdin et al., 2018; Rahayu, 2016; Suriati & Abdullah, 2020; Yulni et al., 2020), moringa leaf powder capsules (Rismawati et al., 2021), moringa juice (Suheti et al., 2020), and moringa biscuits (Astuti & Rochmaedah, 2020). The duration of moringa administration ranged from 7 days to 90 days (Krisnadi, 2015).

Green beans (*Vigna radiata L.*). Green beans have the characteristics of being relatively tolerant of water-deficient conditions, and their growth cycle is short (70 days or more). Green bean plants can grow and develop well depending on the elements of soil, moisture, water, and how to plant in a country (Sitohang et al., 2018). In line with the previous statement, soil type also affects plant growth. Soil conditions in Indonesia are mostly fertile soil (Sari et al., 2020). The content in 100 grams of green beans contains 6.7mg iron, 22.2g protein, 6 mg vitamin C, 124 mg calcium and 326 mg phosphorus, which is useful for strengthening the bone skeleton, as well as 19.7-24.2% protein and 5.9-7.8% iron (Yuliana et al., 2020). The highest content of green beans is found in the epidermis so it is required to boil it first, besides that green beans also contain phytate of 2.19%. Phytate which functions to inhibit iron absorption so it is recommended to soak green beans before processing them (Novelia et al., 2020). Green bean seeds that have been boiled or processed have high digestibility and low flatulence (Astawan, 2009). In addition, green beans also contain antinutrients in the form of hemagglutinin which can clot red blood cells and are toxic (Asiyah et al., 2017; Mustakim, 2014). Technique of processing green beans into mung bean juice or juice, pudding (Aulia et al., 2018; Choirunissa & Manurung, 2020; Jannah & Puspaningtyas, 2018; Retnorini et al., 2017). The duration of giving to these articles is 7 days. 2 weeks, 20 days. There are dosage differences in each article,

namely 1 cup/ day, 2 cups/day, 250cc/day, 2x500cc (Kurniasih et al., 2017; Misra & Marliah, 2019, 2019; Soehartono et al., 2017).

Analysis of the demographic picture of various regions in the article there are differences in race/ethnicity/ethnicity/tradition. Mongoloid and Melanesoid races are races living in Indonesia. Genetic polymorphism in each race is different, including as a determinant of iron absorption. Genetic polymorphisms for anemia can be seen through blood specimens to see the HFE alleles p.C282Y and p.H63D. The p.C282Y allele is not found in Asians and Hispanics/Melanesians/Negroids so iron deficiency anemia is common in Asian and Hispanic/Melanesian/Negroid women (Barton et al., 2020). According to research from Diddana (2019), one of the factors that affect the diet and nutritional status of pregnant women is ethnicity. Along with various tribes there are also various kinds of traditions (Diddana, 2019).

All journals with Moringa leaf and green bean interventions in pregnant women analyzed can be concluded that when viewed from the significance, mean and standard deviation values as well as the effect size of Moringa leaves are more effective in increasing hemoglobin levels in pregnant women compared to green bean interventions with SMD values of 0.10; CI 93% = -0.38 to 0.58; $p<0.00001$). This is influenced by the nutritional content, growing area, soil type, climate / season / weather, environment, race / ethnicity / tribe / tradition in each journal, differences in the length of intervention, differences in doses given, processing techniques, consumption of certain drugs / foods / drinks so that they have the potential to increase hemoglobin levels in pregnant women.

CONCLUSION

All the existing articles, there are 18 articles that are in accordance with the research. Moringa leaf in take is more effective than green beans to increase hemoglobin levels in anemic pregnant women.

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