RED GUAVA JUICE AND IRON SUPPLEMENTATION ON PREGNANT WOMEN'S HEMOGLOBIN LEVEL

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Background: Administering iron tablets (Fe) is one of the measures implemented to prevent anemia. Guava, a fruit abundant in vitamin C, possesses the ability to enhance the absorption of Fe in the human body. The objective of this research is to analyze the impact of providing Fe tablets in conjunction with guava juice on the elevation of Hb levels in pregnant women at the South Tangerang Region Health Center. **Methods:** This study employed a quasi-experimental two group pre-post design. The sample consisted of 30 pregnant women in their third trimester who were diagnosed with anemia and were divided into two groups: the treatment group and the control group. Purposive sampling was utilized as the sampling technique. Data analysis involved Independent T-test. **Results:** The outcomes demonstrated a significant disparity in the elevation of Hb levels resulting from the administration of Fe tablets combined with guava juice compared to the sole administration of Fe tablets, with a p-value of 0.000. **Conclusion:** Consequently, the findings indicate that the administration of Fe tablets in conjunction with guava juice exerts an influence on the elevation of Hb levels in pregnant women. Therefore, it is advisable for pregnant women with anemia to consume Fe tablets along with guava juice

keyword : Haemoglobin, Anemia, Fe tablets, Guava juice, Pregnant women

INTRODUCTION

Anemia poses a pervasive challenge on a global scale, impacting nations across the spectrum of development. A staggering number exceeding 1.6 billion individuals worldwide grapple with the burden of anemia (El-Kholy *et al.*, 2023). Anemia represents a prevailing global issue in the realm of public health, wherein a notable proportion of women in reproductive age, pregnant adult females, as well as children under the age of 5, suffer from anemia. This predicament is particularly severe in low-and middle-income countries (LMICs) (Poojar *et al.*, 2017; Bone *et al.*, 2022; Shi *et al.*, 2022; Araujo Costa and de Paula Ayres-Silva, 2023). The prevalence of anemia among women and children presents a worldwide public health issue that remains unsettled. The consequences of anemia in this particular demographic are not solely detrimental to their

well-being, but also exert a negative impact on the future's human capital (Wirawan and Nurrika, 2022).

Anemia is a pathological state characterized by a diminished quantity of red blood cells or a decreased concentration of hemoglobin within said cells, resulting in an inadequate capacity to transport oxygen, thereby failing to satisfy the physiological demands of the organism (Lebso, Anato and Loha, 2017; Bukhari *et al.*, 2022; Lema and Seif, 2023). Anemia is a hematological disorder characterized by hemoglobin (Hb) levels falling below predetermined thresholds established by a diverse and varied global population [4, 5]. In the case of females, the reference range for Hb levels ranges from 12 to 16 g/dL (Araujo Costa and de Paula Ayres-Silva, 2023).Gestational anemia has been correlated with adverse maternal and neonatal birth consequences such as preeclampsia, maternal fatality, insufficient birth weight, small size relative to gestational age, premature birth, stillbirth, and perinatal and neonatal mortality (Smith *et al.*, 2019; Kang *et al.*, 2023). Numerous investigations have analyzed numerous factors that disturb the condition of anemia during pregnancy. The determinants, encompassing the age of the mother, place of residence, level of education, visits for prenatal care, time interval between pregnancies, consumption of iron-rich foods, dietary habits, intake of micronutrients, diversity of dietary intake, administration of iron supplements, infection caused by parasites, and the number of pregnancies, have been recorded as factors associated with the development of anemia during pregnancy (Fite, Assefa and Mengiste, 2021).

Approximately 50% of anemia cases occurring during pregnancy on a global scale can be ascribed to a deficiency of iron (Utari *et al.*, 2017; Yadav *et al.*, 2019; Davidson *et al.*, 2023; Traore *et al.*, 2023). The condition of pregnancy renders pregnant women more prone to experiencing iron deficiency due to the elevated demands for iron (Davidson *et al.*, 2023). Iron deficiency is the predominant etiology of anemia in the context of pregnancy, wherein there is an insufficiency of iron to generate

sufficient quantities of hemoglobin. Consequently, a diminished hemoglobin concentration frequently signifies reduced iron stores (Lema and Seif, 2023). During the gestation period, there is a significant increase in blood volume. The human body requires substantial quantities of iron to facilitate the production of hemoglobin. Insufficient iron levels can lead to the development of anemia, subsequently resulting in a reduction in the oxygen transportation capacity by hemoglobin. This, in turn, leads to a persistent oxygen insufficiency in both the mother and the developing fetus. To meet the physiological requirements at the conclusion of pregnancy, it is recommended that pregnant women receive iron supplements (Chunaeni, Lusiana and Martanti, 2020).

To mitigate and manage anemia in mothers in the postpartum period, a governmental initiative involves the provision of iron tablets commencing from pregnancy and continuing until the postpartum phase for a duration of one month. During this particular period, the majority of individuals afflicted with anemia acquire their iron supplementation by means of the ingestion of Fe tablets (Nurhasanah *et al.*, 2021).

The findings of a recent examination of the health profile of Indonesia have revealed a significant deficiency in the adherence to the consumption of IFA (Iron and Folic Acid) supplements among expectant mothers. Nevertheless, a considerable number of individuals decline the consumption of Fe tablets due to the occurrence of adverse reactions such as nausea, vomiting, and the presence of a dark-hued fecal matter (Utari *et al.*, 2017; Hardimarta, Yuniarti and Aini, 2018; Nurhasanah *et al.*, 2021). The primary reason for this lack of compliance stems from the adverse reactions that accompany the consumption of IFA supplements, such as feelings of nausea, abdominal discomfort, and constipation. These negative side effects tend to manifest themselves sooner and more evidently than the positive effects, which include the elevation of hemoglobin and iron levels in both the maternal body and the developing fetus (Utari *et al.*, 2017). Administering iron tablets in conjunction with other micronutrients

proves to be a more efficacious approach in elevating hemoglobin levels owing to its propensity to enhance the body's assimilation of iron. Thus, it is imperative to combine iron supplementation with other micronutrients such as vitamin C. Vitamin C is recognized for its impact on iron metabolism (Mayasari and Febrinasari, 2023).

Pregnant women are advised and encouraged to incorporate into their diet nourishing foods in the form of vegetables or fruits, which possess an elevated iron content as well as vitamins that facilitate a more expedited absorption of iron. Nonpharmacological therapy might make use of readily available vegetables and fruits. Guava is a fruit that can raise Hb levels in pregnant women (Nurhasanah *et al.*, 2021). The red guava (*Psidium guajava*) fruit is rich in iron, vitamin C, amino acids (tryptophan, lysine), calcium, phosphorus, sulfur, vitamin A, and vitamin B1. A mere 100 grams of guava yields an impressive 87 milligrams of vitamin C. Furthermore, this fruit encompasses numerous mineral varieties that effectively deter an array of ailments, as well as sustain physical well-being. Vitamin C has the ability to enhance the absorption of non heme iron by up to four times or 2% -20%. Specifically, guava harbors potassium and iron, both of which promote heightened levels of hemoglobin. Furthermore, red guava also contains antioxidant compounds such as flavonoids and carotenoids, including beta carotene, lycopene, beta cryptoxanthin, and polyphenols (Hardimarta, Yuniarti and Aini, 2018; Yunita *et al.*, 2020). As an antioxidant, βcarotene functions to capture free radicals, particularly peroxyl radicals and hydroxyl radicals. When free radicals attack the erythrocyte membrane, it disrupts the fluidity of the cell membrane, leading to lysis and even cell death. Consequently, this results in a decrease in the quantity of erythrocytes and hemoglobin levels. Moreover, β-carotene works in synergy with vitamins C and E (Hardimarta, Yuniarti and Aini, 2018). Therefore, the research objective was to compare the consumption of iron tablets combined with red guava juice and iron tablets only on the hemoglobin levels in

pregnant women in the Tangerang Regency.

METHOD

This study employed a quasi-experimental design with a pretest-posttest without control group. The pretest involved measuring the levels of hemoglobin in pregnant women before administering an intervention of iron tablets with red Psidium guajava (experiment group 1) or iron tablets only (experiment group 2). The posttest, on the other hand, measured the levels of hemoglobin in pregnant women on the seventh day after receiving the intervention. The population of interest in this study consisted of all pregnant women in their second and third trimester in the Tangerang Regency during March 2023. A total of 30 of pregnant women who had been diagnosed with anemia were included in the study with the inclusion criteria encompassed pregnant women afflicted with anemia, as determined by the outcomes of anamnesis, physical assessment conducted by midwives, and laboratory examinations, wherein the hemoglobin level was found to be less than 11 g/dL. The sample was divided into two groups: group 1, with 15 respondents given iron tablets and red Psidium guajava, and group 2, with 15 respondents given iron tablets. The first group received red guava juice and ingested ferrous tablets by consuming 250 ml of red guava juice and iron tablets daily in both the morning and evening. The second group only received iron tablet twice a day in both the morning and evening.

The results of homogeneity and normality tests revealed that the data were homogeneous with a significance level of <0.05, indicating that the data were normally distributed for the examination of hemoglobin before and after the administration of iron tablets and red Psidium guajava and before and after the administration of iron tablets. Bivariate analysis was conducted to examine differences in hemoglobin levels of pregnant women before and after the intervention. The paired T test, were used for hypothesis testing because the data were normally distributed for both experiment groups. This study has been approved by The Health Research Ethics

Commission (KEPK) of Universitas Indonesia Maju, with the registered number of 3970/Sket/Ka-Dept/RE/UIMA/III/2023.

RESULT AND DISCUSSION

Table 1. The Effect of Consuming Iron Tablets On Pregnant Women Before And After (Experiment Group 2).

Variable	*n*	Hemoglobin Level Measurement (g/dL)				p-Value
		Mean	Median	Min-Max	95% CI	
Pre-Intervention	15	9.653	9.700	8.9-10.8	9.344-9.963	0.000
Post-intervention	15	10.7	10.800	9.8-11.7	10.379-11.021	

The examination of two variables is a valuable tool in determining the comparison between the hemoglobin level before and after treatment. This type of analysis is performed using the paired t-test. According to Table 2, there is an observed increase in the average hemoglobin level of pregnant women in the experiment group 1 before and after consuming guava juice and iron tablet for a duration of 7 days, with an average difference of 1.047 g/dL and a p-value of 0.000. A p-value less than 0.05 indicates a significant increase in the hemoglobin level of pregnant women with anemia after consuming guava juice and iron tablets for 7 days.

Table 2. The Effect of Consuming Iron Tablets and Psidium Guajava On Pregnant Women Before And After (Experiment Group 1).

Variable	*n*	Hemoglobin Level Measurement (g/dL)				p-value
		Mean	Median	Min-Max	95% CI	
Pre-Intervention	15	9.533	9.500	8.7-10.3	9.244-9.822	0.000
Post-intervention	15	12.687	12.700	11.6-13.7	12.394-12.980	

Table 2 shows that it is evident that the average hemoglobin level among pregnant women in the experimental group 2 exhibited a

notable increase both prior to and subsequent to the intake of iron tablets over a duration of 7 days. The observed average difference amounted to 3.154 g/dL, while the corresponding p-value was determined to be 0.000. A p-value below the threshold of 0.05 signifies a substantial rise in the hemoglobin level of anemic pregnant women following the intake of iron tablets for a period of 7 days

The impact of the ingestion of red guava juice in conjunction with iron tablets on the levels of hemoglobin, as demonstrated in this study, revealed the discrepancy in the average value between the measurements taken prior to and subsequent to the consumption of guava fruit. The consumption of red guava juice in combination with iron tablets led to an elevation in the levels of hemoglobin in pregnant women, and this elevation was deemed to be statistically significant. The observed average difference of Hb level amounted to 3.154 g/dL in the experiment group 1 before and after consuming guava juice and iron tablet for a duration of 7 days, whereas the average difference of Hb level in the experiment group 2 was 1.047 gr/dL, slightly lower which than group 1. In the previous study, it was found that there were significant differences in erythrocyte levels in the treatment group by administering guava juice and iron tablet and control group by administering iron tablets only with a p-value of 0.001 (Nurhasanah *et al.*, 2021).

Based on the findings of the preceding study, it was ascertained that the mean Hb concentration exhibited an elevation of 1.947 units after the treatment in the intervention cohort, yielding a p-value of 0.000. This observation indicates that the administration of iron tablets in conjunction with guava juice had a discernible impact on the augmentation of Hb levels. Conversely, the control group experienced a marginal increase of 0.087 units in Hb concentration, corresponding to a p-value of 0.255 (Rahmadani *et al.*, 2020). A prior investigation has reported a rise in hemoglobin levels of 2.44 g/dl following the administration of guava juice. In a separate study, conducted on adolescent females, it was observed that the consumption of red

guava juice resulted in an increase of 0.6 g/dl in hemoglobin levels, with a statistically significant p-value of less than 0.05 (Mayasari and Febrinasari, 2023).

The findings from a previous investigation also demonstrate that the ingestion of Fe tablets alongside a daily consumption of 100 grams of guava in the form of juice, twice a day (once in the morning and once in the evening) for a consecutive period of 14 days, can result in an augmentation of hemoglobin levels in pregnant women who suffer from anemia. This is due to the fact that a pregnant mother necessitates an intake of 85 mg of vitamin C on a daily basis, and as it turns out, 100 grams of guava contains 87 mg of this essential vitamin. Consequently, this proves to be effective in facilitating the enhancement of iron absorption in pregnant women, subsequently leading to an increase in Hb levels for those who are anemic (Ristica and Afni, 2021).

The administration of Ferrous (Fe) tablets in combination with guava juice has the potential to augment the hemoglobin (Hb) levels of mothers suffering from anemia, owing to the fact that the absorption of iron is profoundly influenced by the presence of vitamin C in the body (Rahmadani *et al.*, 2020; Ristica and Afni, 2021). Guava extract encompasses Vitamin C, which is assimilated by the small intestine via active transport through diffusion. Vitamin C, which engenders intricate bonds with iron, is both soluble and effortlessly absorbed by bodily organs. The conversion of inorganic compounds of iron in the form of Ferri (Fe3+) to Ferro (Fe2+) will be even more pronounced in instances where the stomach's pH is more acidic. Vitamin C is capable of heightening acidity levels, thereby facilitating an increase in iron absorption by as much as 30% (Rahmadani *et al.*, 2020).

Guava fruit encompasses substances that possess the capability to augment the levels of hemoglobin in the bloodstream, which include iron, vitamin C, vitamin A, copper, and phosphorus (Yunita *et al.*, 2020). Guava juice, when administered in adequate doses, has the potential to enhance the iron reserves within the human body. This improvement in iron reserves subsequently leads to an

increase in the production levels of Hemoglobin. It is worth noting that this enhancement can be attributed to the process of iron transportation by the blood transferrin, which facilitates its delivery to the bone marrow and various other bodily components. In the spinal cord, iron is utilized to generate hemoglobin. The formation of red blood cells and hemoglobin within the bone marrow necessitates the presence of certain precursors, namely iron, vitamin C, vitamin B12, cobalt, and hormones. Consequently, this process results in an elevation in the quantity of erythrocytes and hematocrit levels. Hence, by consuming red guava juice, it is anticipated that the erythrocyte index will be enhanced and the incidence of anemia, particularly iron deficiency anemia in adolescent women, will be mitigated (Hardimarta, Yuniarti and Aini, 2018)

CONCLUSION AND SUGGESTION

It was ascertained that the mean Hb concentration exhibited an elevation after administration of iron tablets in conjunction with guava juice to the pregnant women. The daily consumption of red guava juice in conjunction with iron tablets for a duration of two weeks has a beneficial impact on the elevation of haemoglobin levels. It is recommended that pregnant women incorporate into their diet incorporate regular intake of iron tablets and red guava juice, as a means to augment Hb levels and deter the onset of anemia.

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