# Does Drinking Coffee and Tea Affect to the Hemoglobine Level on Women of Reproductive Age at Tengger ? – A Preliminary Research

***Minarni Wartiningsih[1], Tatas Hardo Panintingjati Brotosudarmo [2*)] May Fanny Tanzilia [3], David Sukardi Kodrat[4], Tri Astuti Sugiyatmi[5]***

*[1]Departement of Public Health School of Medicine, Universitas Ciputra Surabaya*
*[2]Departement of Food Technology, Universitas Ciputra Surabaya*
*[3]Departement of Clinical Pathology School of Medicine, Universitas Ciputra Surabaya*
*[4]Magister Management School of Business and Management, Universitas Ciputra Surabaya*
*[5]Departement of Midwivery, Universitas Borneo Tarakan*
*Corresponding Email:* ***** tatas.brotosudarmo@ciputra.ac.id

**About the Author**

1. 1st Author : Dr. Minarni Wartiningsih, dr., M.Kes, FISPH., FISCM.
Affiliation : Departemen of Public Health, School of Medicine Universitas Ciputra Surabaya
Mailing address : CitraLand CBD Boulevard, Made, Kec. Sambikerep, Kota Surabaya, Jawa Timur, 60219, Indonesia
Email of author : Minarni.wartiningsih@ciputra.ac.id
Orcid ID : 0000-0001-9954-4670
Google Scholar URL : https://scholar.google.com/citations?user=_86iW2gAAAAJ&hl=en
Phone number : 0857-3376-1825

2nd Author : Tatas Hardo Panintingjati Brotosudarmo, Dipl.Chem., Ph.D., MRSC
Affiliation : Department of Food Technology, Universitas Ciputra Surabaya.
Mailing address : CitraLand CBD Boulevard, Surabaya, Jawa Timur 60219, Indonesia
Email of author : tatas.brotosudarmo@ciputra.ac.id
Orcid ID : https://orcid.org/0000-0002-8219-3293
Google Scholar URL : https://scholar.google.com/citations?user=-bN4PCyuCxEC&hl=id
Phone number : 082141490052

3rd Author : May Fanny Tanzilia
Affiliation : Departement of Clinical Pathology, School of Medicine Universitas Ciputra Surabaya
Mailing address : Jl. Sukolilo Dian Regency Jl Makmur 3/8 Surabaya
Email of author : dr.mayfannytanzilia@gmail.com
Orcid ID :
Google Scholar URL :
Phone number :+62 896-1188-8385

4th Author : Dr. David Sukardi Kodrat, MM., CPM., CRME
Affiliation : Magister Management, SBM, Universitas Ciputra Surabaya
Mailing address : CitraLand CBD Boulevard, Surabaya, Jawa Timur 60219, Indonesia
Email of author : david.kodrat@ciputra.ac.id
Orcid ID : https://orcid.org/0000-0003-2974-9528
Google Scholar URL : https://scholar.google.com/citations?user=gGTJU-oAAAAJ&hl=en
Phone number : 081330360084

5th Author : Dr. dr. Tri Astuti Sugiyatmi, M.PH
Affiliation : Department of Midwifery, Faculty of Health Sciences, Universitas Borneo Tarakan
Mailing address : Jl. Perumans Kampung 4 RT 4 No 40 Tarakan

Email of author : triastuti@borneo.ac.id
Orcid ID : 0000-0002-8702-6910
Google Scholar URL : https://scholar.google.com/citations?hl=id&user=sen-SYYAAAAJ
Phone number : 08125811966

***ABSTRACT***

*Drinking coffee and tea is a habit of the people of Tengger, East Java, Indonesia, including the women. The polyphenol content in coffee and tea, such as caffeine and tannin, is thought to be one of the factors that can inhibit the absorption of iron in the body. Polyphenols can bind to iron ions to produce compounds that are not useful and will be excreted from the body. So the excessive consumption of polyphenols is thought to cause a decrease in hemoglobin levels wichh indicates anemia. This research was conducted using the cross sectional method and processed using the SPSS application. The result showed that 94% of respondents consumed coffee, 96% consumed tea and 93% consumed coffee and tea every day. In general, the result showed that women of childbearing age with a high frequency of drinking coffe or tea without a mixture had a tendency to have relatively lower hemoglobin levels, compared to those who consumed coffee or tea with a mixture. Menawhile, data related to the habit of drinking coffee and tea without mixture shows relatively lower hemoglobin levels, compared to drinking coffee and tea with a mixture.*

Keywords: Drinking coffee and tea, frequency of drinking coffee and tea, anemia

***ABSTRAK***

*Minum kopi dan teh merupakan kebiasaan masyarakat Tengger, Jawa Timur, Indonesia, termasuk para perempuannya. Kandungan polifenol dalam kopi dan teh, seperti kafein dan tannin, diduga merupakan salah satu faktor yang dapat menghambat penyerapan zat besi dalam tubuh. Polifenol dapat berikatan dengan ion besi menghasilkan senyawa yang tidak berguna dan akan dieksresikan dari tubuh. Sehingga konsumsi polifenol berlebih diduga menyebabkan penurunan kadar hemoglobin yang mengindikasikan kondisi anemia. Penelitian ini dilakukan dengan metode cross sectiona dan diolah menggunakan aplikasi SPSSl. Hasil penelitian didapatkan bahwa 94% responden mengkonsumsi kopi, 96% mengkonsumsi teh dan 93% mengkonsumsi kopi dan the setiap harinya. Secara umum didapatkan hasil bahwa perempuan usia subur dengan frekuensi kebiasaan minum kopi atau teh tanpa campuran yang tinggi memiliki kecenderungan kadar hemoglobin yang relatif lebih rendah, dibandingkan dengan mereka yang mengonsumsi kopi atau teh dengan campuran. Sedangkan data terkait dengan kebiasaan minum kopi dan teh tanpa campuran, menunjukan kadar hemoglobin yang relatif lebih rendah, dibandingkan dengan minum kopi dan the dengan campuran.*

*Kata kunci: Minum kopi dan teh, frekuensi minum kopi dan teh, anemia*

## INTRODUCTION

Anemia is a health problem that often occurs among women in the developing countries (Wieringa et al., 2016)**.** Based on the data provided by the World Health Organization (WHO) in 2019, the global prevalence of anemia in women aged 15-49 years who are not pregnant is 29.9%, while in pregnant women it is 36.5% (WHO, 2021). The group more susceptible to anemia is women than men in all age groups. Anemia is a health problem that contributes to increased mortality and morbidity (Chaparro & Suchdev, 2019).

Anemia is a condition where the lack of function of red blood cells (RBC) causes a lack of ability to carry oxygen, thus causing complications in various organs of the body. Red blood cells contain hemoglobin (Hb) which functions as a binder of oxygen ($O_2$) and carbon dioxide ($CO_2$) in the body. Oxygen is a source of electrons and ATP synthesis from the lungs to body tissue, while $CO_2$ is

the result of catabolic processes in the tissue from the periphery to the lungs to be exhaled. $CO_2$ gas can be transported in RBC by Hb through the reaction of the amino groups of the Hb chain and the formation of carbaminohemoglobin. However, most of the $CO_2$ in circulation is transported as bicarbonate ions ($HCO_3$-) in the $CO_2$-catalyzed carbonic anhydrase reaction with $H_2O$, followed by deprotonation of $H_2CO_3$ in water. (Diederich et al., 2017).

Hemoglobin is the most abundant cytoplasmic protein contained in RBC so that the amount of levels must be maintained. Red blood cells contain oxygen molecules bound to Hb and iron carriers to Hb. According to WHO, anemia is characterized by a hemoglobin level of less than 13 g/dL in men and less than 12 g/dL in women. Conditions like this cause the body's physiological needs not to be met due to a decrease in oxygen delivery to the body's tissues. Even in iron deficiency anemia causes development and brain function is hampered (Chaparro & Suchdev, 2019).

The causes of anemia are multifactorial. In women of childbearing age, anemia can occur due to iron loss through heavy bleeding due to menstruation, genetic disorders, malnutrition, other chronic diseases, and sociodemographics such as education level, occupation, to inadequate availability of nutritious food or wrong eating patterns such as lack of nutritious food intake (Astuti, 2023). Whereas in pregnant women there is an increase in the need for iron for the growth and development of the fetus so that it is susceptible to anemia (Nguyen et al., 2006).

Anemia causes problems in pregnancy, childbirth, lactation and immunity. In pregnancies with anemia, there is a risk of impaired fetal growth, premature birth, low birth weight, and even infant death (Kefiyalew et al., 2014) (Sartika et al., 2021). In several other studies, anemia causes stunting, namely abnormal growth characterized by height below minus two standard deviations. Stunting does not only occur in children, but can also occur in adolescents. The long-term consequences of stunting in adolescents are having short stature, low IQ levels, and even poor reproduction (Wayan et al., 2020).

Anemia can occur if there is a decrease in iron absorption which causes a decrease in hemoglobin levels so that it is unable to carry oxygen to body tissues (Coad et al., 2014). One of the inhibitors of iron absorption by the body is coffee. In Dasa and Abera's research, it is stated that coffee contains phenolic compounds which can reduce iron absorption. In the digestive system, food or drinks that contain phenolic compounds will reduce absorption in the intestine. However, mixing with coffee, such as milk, can maintain iron from being dialyzed (Dasa & Abera, 2022). In another study, it was stated that in the formation of hemoglobin, there is a bond between apoferritin and Fe ions in the digestive tract, and transferrin bonds with Fe ions in the circulatory system. However, polyphenolic compounds in coffee and tea are reported to be binder competitors, where tannins which bind to Fe ions are useless compounds and will be excreted from the body. (Piskin et al., 2022).

Drinking coffee has become a lifestyle and habit of the Tengger people. The Tengger tribe is one of the tribes that has religious tolerance and has strong adherence to carrying out customs, be it social customs or with the religion they adhere to. This causes the social changes that occur in the Tengger community to be not very significant. The Tengger people have a habit of serving daily dishes and at special occasion ceremonies, both related to custom or related to religion, life cycle or social. Drinks served include coffee (Maryani et al., 2021).

Based on a preliminary survey conducted by researchers, 94% of women of childbearing age in the Tengger community have a habit of drinking coffee. Only 6% of women of childbearing age do not have the habit of drinking coffee. This shows that women of childbearing age have a risk of anemia due to the culture of drinking coffee in the Tenggerese Society. Previous research stated that the habit of consuming coffee can reduce serum ferritin levels or iron reserves in the body. If this happens, it can be suspected of causing iron deficiency anemia (Sung et al., 2018) (Agoons et al., 2021). Based on the explanation above, the purpose of this study was to determine the effect of drinking coffee on hemoglobin levels in women of childbearing age in the Tengger community.

## METHOD

The method used in this research is descriptive analytics, cross sectional study. The research began with a preliminary survey conducted in July, and data collection during August-September 2023. The study population was women of childbearing age in Wonosari village, Pasuruan. The sample is respondents with the following inclusion criteria: women, aged 15-49 years and willing to be respondents. The sampling technique used is systematic random sampling. Wonosari Village consists of 7 hamlets. Each hamlet is taken at random from the data at the village hall proportionally according to the number of hamlet residents until it reaches the sample size. The instrument used was a questionnaire. The data collection activity was preceded by an explanation, signing of the informed consent and filling out the questionnaire. Furthermore, capillary blood was taken to check hemoglobin levels using the Point Of Care Testing method with the Fora GCHB meter. Primary data sources were obtained from questionnaires and measuring blood levels, while secondary data were data obtained from the village hall. Data analysis was carried out with SPSS 27 software. The ethical test of this research was carried out by the Ethics Commission of Universitas Ciputra Surabaya with No. 072/EC/KEPK-FKUC/VII/2003.

## RESULT AND DISCUSSION

The research was conducted on 193 respondents who were women of childbearing age aged 15-49 years in Tengger, East Java, Indonesia. The research results describe the behavior and habits of the Tengger people who are accustomed to consuming coffee and tea in their daily activities and social activities.

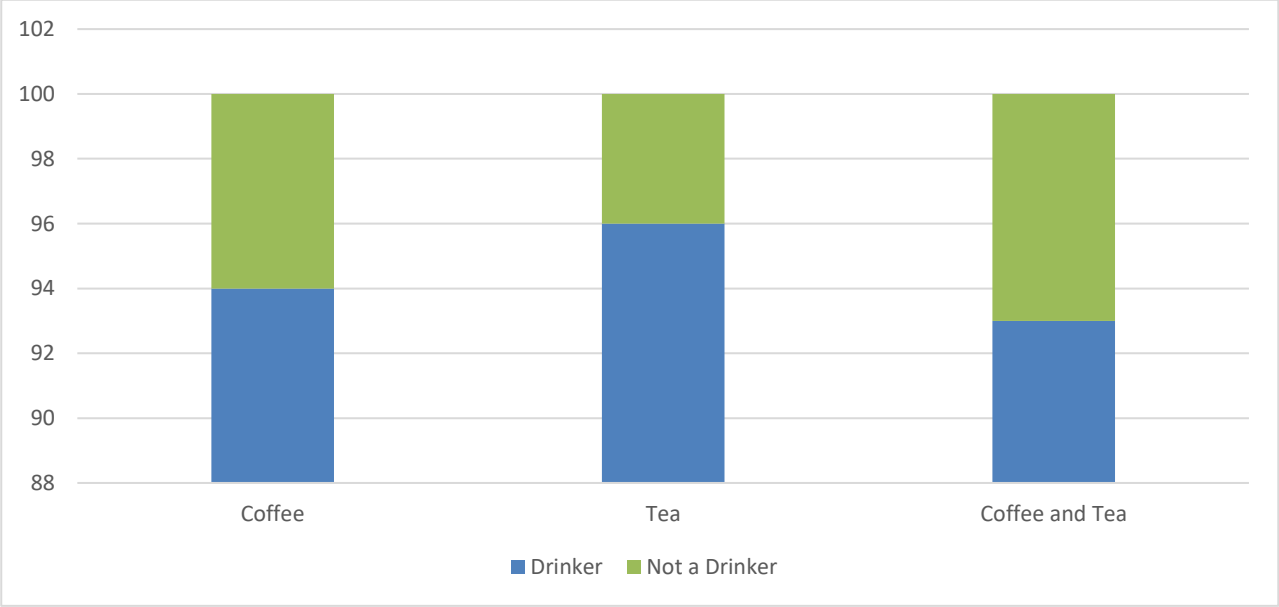


Figure 1. Percentage of coffee, tea or coffee and tea drinkers among women of childbearing age in the Tengger tribe community

Figure 1 shows that a total of 181 respondents (94%) have the habit of drinking coffee every day and 12 respondents (6%) do not have the habit of drinking coffee every day. A total of 185 respondents have the habit of drinking tea every day (96%), while 8 respondents (4%) do not have the habit of drinking tea every day. A very significant number was also found in the percentage of

respondents who had the habit of drinking coffee and tea every day, namely 179 respondents (93%) compared to 14 respondents who were not used to drinking coffee and tea every day (7%).

The results of this research are in line with the results of research previously conducted by Maryani, et al, which reported the habits and traditions of the Tengger tribe community for serving coffee dishes in daily activities, traditional ceremonies, religious ceremonies, or social activities (Maryani et al., 2021). Likewise with the habit of drinking tea is every day. Tea is one of the drinks that is often consumed by people in Indonesia in general and in East Java in particular. The habit of drinking tea has become a lifestyle and tradition that is deeply rooted in Indonesia. Drinking tea is often done in the morning before activities, in the afternoon when gathering with family, or as a treat for guests and as an accompaniment to snacks, even the habit of drinking tea along with meals is often done by people in Indonesia, especially East Java (Mariani D. Y. & Rejamardika Y. N., 2013; Waani Andreas et al., 2014).

Furthermore, the respondents can be classified into 2 categories, namely respondents who had the habit of drinking pure coffee without mixtures and respondents who had the habit of drinking coffee with other additives such as milk, creamer, ginger, herbs, lemongrass, cinnamon, etc.

**Tabel 1.**
**Average hemoglobin levels based on habit and frequency of drinking coffee**

| Intensitas | Mixture | Mean | Std. Deviation | N |
|---|---|---|---|---|
| 2 times | Unmix | 14.088 | .7511 | 8 |
| | Mix | 15.654 | 2.2859 | 28 |
| | Total | 15.306 | 2.1401 | 36 |
| More than 3 times | Unmix | 14.286 | 1.2889 | 71 |
| | Mix | 14.400 | 1.5657 | 74 |
| | Total | 14.344 | 1.4330 | 145 |
| Total | Unmix | 14.266 | 1.2430 | 79 |
| | Mix | 14.744 | 1.8668 | 102 |
| | Total | 14.535 | 1.6375 | 181 |

The research results shown in Table 1 describes that among the 181 respondents who had the habit of drinking coffee every day, there were 36 respondents who drank coffee twice a day with or without a mixture of other ingredients. This respondents had a mean hemoglobin (Hb) level of 15.306 ± 2.1401 g/dL. While the 8 Respondents who drank coffee twice a day without a mixture had an average Hb level of 14.088 ± 0.7511 g/dL. Furthermore the 28 respondents who drank coffee twice a day mixed with other ingredients had an average Hb level of 15.654 ± 2.2859 g/dL. A total of 145 respondents who drank coffee more than three times a day with or without a mixture of other ingredients had a mean Hb level of 14,344 ± 1.4330 g/dL, 71 of them drank coffee without a mixture of other ingredients with a mean Hb level of 14,286 ± 1.2889 g/dL and 74 respondents who drank coffee mixed with other ingredients had an average Hb level of 14.400 ± 1.5657 g/dL.

The Table 1 shows that respondents who have the habit of drinking unmixed coffee twice a day have lower Hb levels compared to those whose frequency is 3×, namely from 14,088 to 14,286 g/dL. Meanwhile, respondents who had the habit of drinking coffee mixed twice a day had higher HB levels compared to those whose frequency was 3×, namely from 15,654 to 14,400 g/dL. Even though hemoglobin levels are still above the minimum hemoglobin limit for women of childbearing age, respondents who rarely drink unmixed coffee a day have lower Hb levels than respondents who rarely drink mixed coffee, who have high Hb levels.

This condition is known as Hemochromatosis, which means that the iron level in the body is very high (Maduratna et al., 2022). Iron that accumulates in the body's organs will trigger diseases such as heart failure. This study shows that the frequency of drinking coffee without a mixture and with a mixture has a different impact on Hb levels, even though it is still above the standard, it will

have an impact on decreasing the delivery of oxygen to the body's tissues, thus making the exchange of $O_2$ and $CO_2$ between tissues and blood unbalanced. (Sundari et al., 2021)

**Tabel 2.**
**Average hemoglobin levels based on habit and frequency of drinking tea**

| | Mixture | Mean | Std. Deviation | N |
|---|---|---|---|---|
| 1 time | Unmix | 11.333 | 1.3577 | 3 |
| | Total | 11.333 | 1.3577 | 3 |
| 2 times | Unmix | 14.067 | .2309 | 3 |
| | Mix | 15.654 | 1.7927 | 24 |
| | Total | 15.478 | 1.7623 | 27 |
| More than 3 times | Unmix | 13.847 | 1.2926 | 55 |
| | Mix | 14.686 | 1.5504 | 101 |
| | Total | 14.390 | 1.5148 | 156 |
| Total | Unmix | 13.734 | 1.3683 | 61 |
| | Mix | 14.872 | 1.6374 | 125 |
| | Total | 14.499 | 1.6405 | 186 |

The habit and frequency of drinking tea for the Tengger people in this study can be observed in the Table 2. A total of 186 respondents had a habit of drinking tea every day. The majority of respondents (156 people) drank tea >= 3×/day with or without a mixture, had a lower average Hb level (14,390 ± 1.5148 g/dL) than respondents who only drank tea twice a day with or without a mixture (15,478 ± 1.7623). Respondents who drank tea twice a day without mixtures had lower Hb levels (14.067 ± 0.2309) than those with mixtures (15.654 ± 1.7927), as well as respondents who drank tea >= 3×/day without mixtures Lower Hb (13.847 ± 1.2926 g/dL) than that with the mixture (14.686 ± 1.5504).

**Tabel 3. Average hemoglobin levels based on habits and frequency of drinking both coffee and tea**

| | Mixture | Mean | Std. Deviation | N |
|---|---|---|---|---|
| Less than 4 times | Unmix | 12.90000 | . | 1 |
| | Mix | 15.27600 | 2.253568 | 25 |
| | Total | 15.18462 | 2.256669 | 26 |
| More than equals 4 times | Unmix | 14.02857 | 1.171216 | 28 |
| | Mix | 14.49762 | 1.538127 | 126 |
| | Total | 14.41234 | 1.485896 | 154 |
| Total | Unmix | 13.98966 | 1.169049 | 29 |
| | Mix | 14.62649 | 1.693623 | 151 |
| | Total | 14.52389 | 1.634795 | 180 |

A total of 180 respondents who drank coffee and tea were grouped into 2 groups, namely 26 respondents who drank coffee and tea <= 4×/day and as many as 154 respondents who drank > 4×/day (Table 3). The average Hb level of respondents who drank coffee and tea was 14.52389 ± 1.634795 g/dL. The average Hb level in respondents who drank coffee > 4×/day without mixture was lower (14.02857 ± 1.171216 g/dL) than those who drank coffee <= 4×/day without mixture (12.9 g/dL).

Table 3 shows that respondents who have the habit of rarely drinking coffee and unmixed tea a day have higher Hb levels compared to those who often drink coffee and tea, namely from 12,900 to 14,028 g/dL. However, respondents who had the habit of rarely drinking mixed coffee and tea a day had lower HB levels compared to those who frequently, namely from 15,276 to 14,497 g/dL.

This shows that rarely drinking pure coffee and tea without a mixture will result in lower HB levels than when you often drink coffee and tea without a mixture.

The average hemoglobin levels in the results of this study tend to be higher than in the general population of women of childbearing age. This can be understood Tengger is located in the highlands and it has been known that the levels of hemoglobin in populations reside in the highlands area are higher than populations in the lowlands. Living in a highland area will cause a condition of oxygen deficiency known as hypoxia, because the partial pressure of oxygen is reduced and the acclimatization process occurs as the body's response mechanism. The acclimatization process results in an increase in hemoglobin levels as an effort to adapt to low oxygen conditions (Waani Andreas et al., 2014). Based on this consideration, in this study, in general, it was found that the average hemoglobin levels in women of childbearing age in Tengger could be categorized within the normal limits.

The incidence of decreasing hemoglobin levels below the normal value (reference value) based on WHO criteria was not found in the results of this study, but the results of this study showed that respondents who had the habit of drinking coffee and tea every day had a lower average hemoglobin level compared to respondents who did not. Habit of drinking coffee and tea occurs every day. Decreased hemoglobin levels or what is better known as anemia is caused by various factors. One of the factors that can influence is deficiency of nutritional intake containing iron, folic acid and vitamin B12. Nutrient intake rich in iron can be found in food sources of animal protein such as meat which is the main source of iron. If the content of the daily food consumed is lacking in these substances, there is a risk of anemia.

Another possibility that can affect is impaired iron absorption. One of the causes of impaired iron absorption is because there are substances that inhibit iron absorption, such as coffee and tea. Various studies state that consuming coffee and tea can affect the absorption of iron contained in food. The habit of drinking coffee and tea every day can reduce hemoglobin levels and result in anemia. This is due, among other things, to the substances contained in coffee and tea. Caffeine which is the main polyphenol component contained in coffee can inhibit the absorption of iron in the body and is a risk factor for anemia. Caffeine works by binding to receptors in the body that regulate iron absorption. In addition, caffeine also increases urine production so that it can accelerate the release of iron from the body, thus consuming coffee in excessive amounts can affect the incidence of anemia. Drinking too much coffee or drinking coffee for a long period of time has the potential to cause iron deficiency and cause anemia (Gunec Cagri Baris, 2023) .

The type of coffee you drink also has an influence on reducing Hb levels. The caffeine content contained in pure coffee (black coffee) is known to be higher than the caffeine content in other types of coffee, including when added to a mixture of other ingredients. Research by Elfariyanti, et al (2020) which was conducted on the people of Banda Aceh reported that the type of coffee affects the decrease in hematocrit levels and thus increases the risk of anemia. Coffee that comes from pure coffee beans has a higher caffeine content than coffee that is mixed with other ingredients such as rice and corn. Elfariyanti, et al.'s research also analyzed the effect of the temperature of the water used in brewing coffee on the caffeine content in coffee. The higher the temperature during the steeping process, the higher the caffeine content obtained. The best water temperature for brewing coffee is 195°F to 205°F or 90°C to 96°C (Elfariyanti et al., 2020).

The habit of drinking tea every day is also believed to have an effect on decreasing hemoglobin levels. The tannin content in tea can bind the iron consumed. Tea has a tannin content of 7 – 15% which is a strong antigen that gives tea a distinctive taste, namely tart or astringent and can precipitate protein on the surface of cells so that excessive consumption of tannin can cause problems with protein absorption, including the main source of iron, most of which comes from protein. (Yushananta et al., 2021).

Polyphenolic compounds in most types of tea, especially black tea, have an antioxidant role which, when oxidized, can bind various minerals such as iron (Fe), zinc (Zn) and calcium (Ca), causing decreased absorption of iron. The ability of polyphenolic compounds to inhibit iron absorption in the digestive tract varies depending on the type of polyphenolic compounds consumed,

the amount and duration of consumption of polyphenols. According to various studies, the types of polyphenolic compounds consumed have different effects on iron absorption. Cheng TO's research states that green tea does not inhibit iron absorption in the duodenum. A similar study was also reported by Kubota, et al that there was no inhibitory effect on iron absorption in the duodenum and proximal jejunum by regularly consuming green tea (Gunec Cagri Baris, 2023). A body that is deficient in iron will affect the formation of red blood cells and hemoglobin, causing anemia. This is because iron is one of the raw materials needed for the formation of red blood cells and hemoglobin. The tannin content in tea has the potential to reduce iron absorption by up to 80% (Septiawan & Sugerta, 2015). Other literature states that the tannin content in black tea can reduce the absorption of non-heme iron if consumed together by 74 – 95%. (Yushananta et al., 2021). Diniatik's research (2007) concluded that the tannin content in green tea (1,440%) was higher than the tannin content in black tea (0.99%) (Diniatik et al., 2007). The thickness of the tea can also affect hemoglobin levels in the blood. The thicker the tea, the higher the tannin content, thus it can be concluded that tea consumed without a mixture of other ingredients has a higher effect in causing a decrease in hemoglobin levels compared to tea consumed without a mixture of other ingredients (Yushananta et al., 2021).

Impaired absorption of iron occurs especially if coffee or tea is consumed together with consuming foods that contain iron. The combination of food absorbed by the digestive tract greatly affects the absorption of iron. Iron absorption can be increased by consuming foodstuffs such as ascorbic acid (vitamin C), meat, fish and poultry. These food ingredients can counteract the inhibitory effect of iron absorption caused by food ingredients that inhibit iron absorption such as coffee and tea. Based on this, individuals with low iron intake and high intake of substances that inhibit iron absorption have the potential to experience anemia. Food composition affects the absorption of iron in the body (Gunec Cagri Baris, 2023). For example, consuming orange juice with meals can increase iron absorption. There was a significant inhibition of iron absorption when consuming tea together with rice, potato and onion soup even though it was accompanied by consumption of 100 mg of ascorbic acid. The amount of ingredients that increase and inhibit iron absorption greatly determines the final result of iron absorption. Consuming tea together with rice, potatoes and onion soup will significantly inhibit iron absorption (Nelson M. & Poulter J., 2004). Research by Rosander, et al. reports that iron absorption is greatly influenced by the combination of foods at mealtime. The study was conducted by analyzing the iron content of 0.17 mg in foods made from rice flour, cornstarch and black beans. When these foods were consumed together with vitamin C which was in the form of pure ascorbic acid weighing 50 mg or cauliflower 125 mg, there was an increase in iron absorption to 0.41 mg or 0.58 mg, respectively. In contrast to this condition, when consumed together with drinking tea, there will be a significant decrease in iron absorption (Diniatik et al., 2007).

The risk of impaired absorption of iron caused by consuming coffee and tea can be minimized by adjusting the time between eating and drinking coffee or tea, thus it is not recommended to consume coffee or tea with meals. Consuming coffee one hour before meals does not interfere with iron absorption in the digestive tract. Conversely, if you consume coffee one hour after eating, it can affect the absorption of iron the same as when consuming coffee at the same time as eating. Hurrell and Reddy's research reported that the levels of polyphenols in tea determine the ability to inhibit iron absorption. If a person has risk factors for anemia, then consuming tea is recommended one hour before eating and not consuming tea at the same time as eating (Gunec Cagri Baris, 2023). The results of this study also showed that patients who drank coffee and tea more than three times a day had a lower average hemoglobin level compared to respondents who only drank coffee and tea twice a day. The frequency of drinking coffee and tea is one of the factors that also affects the decrease in hemoglobin levels. The more often you consume coffee and tea every day, the higher the risk of decreased hemoglobin levels (Gunec Cagri Baris, 2023). According to SNI 01-7152-2006 the maximum limit for consuming caffeine is 150 mg/day or 50 mg/serving (Elfariyanti et al., 2020) (Wahdah et al., 2023)

## LIMITATION OF THE STUDY

One of the limitations of this study is that there is no data explaining the time between drinking coffee or tea and eating time in the Tenggerese, therefore it cannot be analyzed further in more detail with regard to some respondents, especially those who are consuming both coffee and tea. There is also no data explaining the habit of taking Fe supplements or intake of foods that contain iron, vitamins and minerals which play a role in the formation of red blood cells or hemoglobin which might offset the habit of drinking coffee and tea which have the potential to cause anemia. Furthemore the limitation of this study is that there is no data explaining the type of coffee and tea consumed.

## CONCLUSIONS AND SUGGESTIONS

The results of the study stated that there was an influence between the habit of drinking coffee and tea and decreasing hemoglobin levels in women of childbearing age in Tengger. The habit of drinking coffee and tea every day affects the decrease in hemoglobin levels, as well as the frequency of drinking coffee and tea. The more coffee and tea you drink every day, the greater the potential for a decrease in hemoglobin levels. The results of this research can be used as a consideration for local health services and community health centers in preventing the incidence of anemia in women of childbearing age in Tengger as well as a means of education or counseling on how to prevent anemia. Local communities can make efforts to prevent a decrease in hemoglobin levels by changing their habit of drinking coffee and tea regularly every day by reducing the amount and frequency of drinking coffee and tea, and not consuming coffee or tea with meals. It is hoped that this research can be a reference for further research in analyzing other nutrients that can influence a decrease in hemoglobin levels or the incidence of anemia. Proposed future research could be to identify and analyze the influence of the time of day you drink coffee and tea, the combination of foods, the type of coffee and tea you drink on the incidence of anemia.

## REFERENCES


Agoons, D. D., Agoons, B. B., Kaze, A. D., & Komanduri, S. (2021). Effect of Serum Ferritin on the Association Between Coffee Intake and Hyperuricemia Among American Women : The National Health and Nutrition Examination Survey. *The National Health and Nutrition Examination Survey*, *13*(3). https://doi.org/10.7759/cureus.13855

Astuti, E. R. (2023). LITERATURE REVIEW : FAKTOR-FAKTOR PENYEBAB ANEMIA PADA REMAJA PUTRI LITERATURE REVIEW : FACTORS CAUSES ANEMIA IN. *JAMBURA JOURNAL OF HEALTH SCIENCE AND RESEARCH*, *5*(2), 550–561.

Chaparro, C. M., & Suchdev, P. S. (2019). Anemia epidemiology, pathophysiology, and etiology in low- and middle-income countries. *Annals of the New York Academy of Sciences*, *1450*(1), 15–31. https://doi.org/10.1111/nyas.14092

Coad, J., Pedley, K., Coad, J., & Pedley, K. (2014). Iron deficiency and iron deficiency anemia in women Iron defi ciency and iron defi ciency anemia in women. *Scandinavian Journal of Clinical & Laboratory Investigation*, *74*, 82–89. https://doi.org/10.3109/00365513.2014.936694

Dasa, F., & Abera, T. (2022). Factors Affecting Iron Absorption and Mitigation Mechanisms : A review International Journal of Agricultural Factors Affecting Iron Absorption and Mitigation Mechanisms : A review. *International Journal of Agricultural Science and Food Technology*, *4*(1), 24–30. https://doi.org/10.17352/2455-815X.000033

Diederich, L., Iv, T. C. S. K., Kuhn, V., & Kramer, C. M. (2017). Red Blood Cell Function and Dysfunction : *ANTIOXIDANTS & REDOX SIGNALING*, *26*(13), 718–742. https://doi.org/10.1089/ars.2016.6954

Diniatik, Soemardi Eddy, & Indri Khunaina. (2007). Perbandingan Kadar Flavonoid Total dan Tanin Total pada Teh Hijau dan Teh Hitam Camellia siniensis (I,,) O.K. *Pharmacy*, *05*(03).

Elfariyanti, Silviana Ernita, & Santika Mela. (2020). ANALISIS KANDUNGAN KAFEIN PADA KOPI SEDUHAN WARUNG KOPI DI KOTA BANDA ACEH. *Lantanida Journal*, *8*(1), 1–95. https://pixabay.com

Gunec Cagri Baris. (2023). A Mini Review on The Relationship Between Coffee And Tea Consumption And Iron Absorption in The Gut – Iron Deficiency Anemia. *Japan Journal of Clinical & Medical Research*, 1–3. https://doi.org/10.47363/JJCMR/2023(3)145

Kefiyalew, F., Zemene, E., Asres, Y., & Gedefaw, L. (2014). Anemia among pregnant women in Southeast Ethiopia : prevalence , severity and associated risk factors. *Biomed Central*, *7*(771), 1–8. https://doi.org/https://doi.org/10.1186/1756-0500-7-771

Mariani D. Y., & Rejamardika Y. N. (2013). Analisis Deskriptif tentang Gaya Hidup Minum Teh Masyarakat Surabaya di Hare and Hatter Cabang Surabaya Town Square. *Hospitally Dan Manajemen Jasa*, *1*(2), 450–457.

Maryani, T., Soekopitojo, S., & Kiranawati, T. M. (2021). Identifikasi Hidangan pada Upacara Kesempatan Khusus Suku Tengger di Desa Argosari Kecamatan Senduro Kabupaten Lumajang. *Jurnal Inovasi Teknik Dan Edukasi Teknologi*, *1*(3), 232–243. https://doi.org/10.17977/ UM068v1n3p232-243

Nelson M., & Poulter J. (2004). Impact of Tea Drinking on Iron Status in the UK : a Review. *Journal of Human Nutrition and Dietetics*, *17*(1), 43–54.

Nguyen, H. T., Ghevondian, N., & Jones, T. W. (2006). Neural-Network Detection of Hypoglycemic Episodes in Children with Type 1 Diabetes using Physiological Parameters. *2006 International Conference of the IEEE Engineering in Medicine and Biology Society*, 6053–6056. https://doi.org/10.1109/IEMBS.2006.259482

Piskin, E., Cianciosi, D., Gulec, S., Tomas, M., & Capanoglu, E. (2022). Iron Absorption : Factors , Limitations , and Improvement Methods. *American Chemical Societ*, *7*, 20441−20456. https://doi.org/10.1021/acsomega.2c01833

Sartika, A. N., Khoirunnisa, M., Meiyetriani, E., Ermayani, E., Pramesthi, I. L., & Nur Ananda, A. J. (2021). Prenatal and postnatal determinants of stunting at age 0–11 months: A cross-sectional study in Indonesia. *PLoS ONE*, *16*(7 July), 1–14. https://doi.org/10.1371/journal.pone.0254662

Septiawan, Y., & Sugerta, E. (2015). HUBUNGAN KEBIASAAN MINUM TEH DENGAN KEJADIAN ANEMIA PADA IBU HAMIL TRIMESTER II DI PUSKESMAS KOTABUMI II KABUPATEN LAMPUNG UTARA. *Jurnal Kesehatan*, *6*(2).

Sung, E. S., Choi, C. K., Kim, N. R., Kim, S. A., & Shin, and M.-H. (2018). Association of Coffee and Tea with Ferritin : Data from the Korean National Health and Nutrition Examination Survey ( IV and V ). *Chonnam Medical Journal*, 178–183. https://doi.org/doi.org/10.4068/cmj.2018.54.3.178

Waani Andreas, Engka J. N., & Supit S. (2014). KADAR HEMOGLOBIN PADA ORANG DEWASA YANG TINGGAL DI DATARAN TINGGI DENGAN KETINGGIAN YANG BERBEDA. *Jurnal E-Biomedik (EBM)*, *2*(2).

Wahdah, R., Sulistyaningsih, S., & Kurniawati, H. F. (2023). Evaluation of Getar Thala Innovation Program (Gerakan Tanggulangi Anemia Remaja dan Thalassemia) during the Covid-19 Pandemic. *Jurnal Aisyah : Jurnal Ilmu Kesehatan*, *8*(2). https://doi.org/10.30604/jika.v8i2.1675

Wayan, N., Tarini, D., Sugandini, W., & Sulyastini, N. K. (2020). Prevalence of Anemia and Stunting in Early Adolescent Girls. *Advances in Social Science, Education and Humanities Research*, *394*(Icirad 2019), 397–402.

WHO. (2021). *Anaemia in women and children*. https://www.who.int/data/gho/data/themes/topics/anaemia_in_women_and_children

Wieringa, F. T., Dahl, M., Chamnan, C., Poirot, E., Kuong, K., Sophonneary, P., Sinuon, M., Greuffeille, V., Hong, R., Berger, J., Dijkhuizen, M. A., & Laillou, A. (2016). The high prevalence of anemia in cambodian children and women cannot be satisfactorily explained by nutritional deficiencies or hemoglobin disorders. *Nutrients*, *8*(6). https://doi.org/10.3390/nu8060348

Yushananta, P., Anggraini, Y., Ahyanti, M., & Sariyanto, I. (2021). Anemia and its Associated Factors Among Women of Reproductive Age in Horticulture Area. *Jurnal Aisyah : Jurnal Ilmu Kesehatan*, *6*(2), 317–325. https://doi.org/10.30604/jika.v6i2.498