

Mini Review
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A Mini Review on The Relationship Between Coffee And Tea Consumption And Iron Absorption In The Gut – Iron Deficiency Anemia

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ABSTRACT

This mini-review study was conducted to illustrate the relationship (s) between coffee and tea consumption and iron absorption in the gut – iron deficiency anemia. Due to their polyphenol type and content, black tea and coffee consumption was found to significantly increase the risk of iron deficiency anemia, whereas green tea consumption had no effect on how well iron was absorbed by the duodenum part of the small intestine. For critically ill patients, it is advised to wait at least an hour between meals and the consumption of tea or coffee in order to stop the advancement of iron deficiency anemia caused by polyphenols. It is also recommended to consume enhancers (ascorbic acid, meat, fish, and poultry, as prevalent in most industrialized nations) with black tea and coffee to counter the adverse effects of their polyphenols.

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Introduction

Both coffee and tea are among the top two non-alcoholic drinks consumed globally. Whereas coffee is favored in Europe and the Americas, tea is more popular in Asia. While per capita income does affect the current coffee consumption pattern, it does not affect tea consumption. Religion had a role in the early stages of the development of both tea and coffee, even though this has very little effect on either beverage today. The factors at the national level have influenced the bigger patterns. The United Kingdom is the only European country where tea is more popular than coffee. Elsewhere in Europe, coffee is the most popular beverage [1]. Green tea, made from unfermented *Camellia sinensis* leaves, and black tea, made from completely fermented *Camellia sinensis* leaves, are the two most prevalent types of tea. Tea is known to have substantial benefits as an antioxidant, anti-inflammatory, antibacterial, anticarcinogenic, neuroprotective, antihypertensive, and food that may decrease cholesterol and increase thermogenesis. However, there are still debates over the benefits and drawbacks of drinking tea. This study aims to shed light on the link between consuming green tea, black tea, and coffee and iron absorption insufficiency in the duodenum and proximal jejunum, often known as iron deficiency anemia, despite the many health benefits associated with drinking these beverages [2].

Background

The inability to absorb iron from food primarily contributes to iron deficiency, a global health crisis. Anemia, which means “bloodlessness” in Greek, is whence we get the term “anemia.” Having a hemoglobin level (in males) below 13.5 g/dL or a hematocrit (in men) below 41.0%, or a red blood cell (RBC) count (in women) below 36.0% constitutes anemia. In daily

clinical practice, hemoglobin and hematocrit are more prevalent terminology than RBC count. The bottom of the normal range varies across demographic categories, including race/ethnicity, gender, and age [3].

According to the WHO, iron deficiency anemia is the most frequent nutritional deficiency not only in developing countries but also in developed countries as well. The estimated global prevalence is almost one-fourth of the world population, affecting 1.62 billion people according to research completed in 2009 [3-6]. It predominantly can be seen in preschool-aged children and pregnant women than healthy adults. Women of reproductive age have not seen a decline in the worldwide prevalence of anemia since 2000, while the prevalence among pregnant women has declined somewhat over that time [7]. Even in 2019, anemia affected about 30% of the population. This demonstrates an approximately 5% rise in iron deficiency anemia over the last decade. In other words, the number of patients suffering from iron deficiency anemia rapidly increases by approximately half a percent per year [6].

Polyphenols and phytic acid are the primary obstacles that prevent iron absorption from dietary sources. Tea and coffee are both rich sources of polyphenols, a chemical that acts as a potent barrier to the absorption of non-heme iron [8]. Beverages have a diverse assortment of polyphenol structures, ranging from the phenolic acid chlorogenic acid found in coffee to the monomeric flavonoids seen in herb teas like green tea and the complex polyphenol polymerization products observed in black tea [4].

Discussion

The capacity of coffee and tea to inhibit iron absorption (Fe) is inversely related to the total amount of polyphenols present in both beverages. In comparison to a water control meal, drinks containing 20-50 mg total polyphenols per serving lowered iron (Fe) absorption from the bread meal by 50-70%, while beverages containing 100-400 mg total polyphenols per serving decreased Fe absorption from the bread meal by 60-90%. The degree to which polyphenols prevent iron absorption in the gut might vary depending on the kind of polyphenol and the amount of polyphenol [9].

An iron-depleting beverage like tea may limit iron absorption by as much as 64 percent, whereas a cup of coffee only reduces absorption by 39 percent after a hamburger lunch. Iron absorption from ferric sodium EDTA (NaFeEDTA) was similarly reduced in a test when no dietary items were present. In agreement with Morck et al [10], Hallberg and Rossander also experimented that iron absorption is blocked more with tea intake than coffee. Iron absorption decreases when tea (62%) or coffee (35%) is served with meals [11]. Furthermore, black tea was shown to be more inhibitive than herbal tea, as reported by Hurrell and Reddy [9].

Even after controlling for factors such as age, BMI, education, smoking status, alcohol consumption, amount of physical activity, hypertension, diabetes mellitus, and daily iron intake, women in Korea are more likely to have low blood ferritin levels than males. On the other hand, for the same group, green tea consumption is not correlated with serum ferritin levels. Consistently, Cheng TO also supports green tea consumption does not inhibit iron absorption in the duodenum. No inhibitory effect of green tea on iron absorption in the duodenum and proximal part of the jejunum was recognized, according to Kubota et al [12-14].

However, iron absorption boosters (ascorbic acid, meat, fish, and poultry, as prevalent in most industrialized nations) can counteract the inhibitory effects against iron absorption caused by plant components in vegetables, tea, and coffee (e.g., polyphenols, phytates). As a result, only people with low heme iron intakes, low enhancing factor intakes, and significant inhibitor intakes (such as coffee and black tea) would have problems with iron deficiency anemia. Another research conducted in the North West Province of South Africa found no association between black tea drinking and iron deficiency anemia in 1605 healthy people aged 15 to 65. Adequate consumption of boosting factors in healthy persons may account for the possibility of false-negative findings in certain tests, as compared to the intake of inhibitors like coffee and black tea [15].

Because in Morocco, anemic women had a 2-fold greater fractional iron absorption from wheat flour-based meals without tea than healthy women. Even in iron deficiency anemia, when iron absorption is dramatically upregulated, the inhibition of tea polyphenols on iron absorption cannot be reversed by providing fortificant iron as ferric sodium EDTA (NaFeEDTA). There is growing evidence that the overall meal composition greatly impacts the body's ability to absorb iron from specific dietary components [16]. For instance, orange juice greatly improves the absorption rate of iron from eggs, which is otherwise relatively low [9]. The consumption of orange juice led to higher iron absorption (105 percent) There was a significant inhibition of absorption ($t = 6-74$, $p = 0-001$) when tea was consumed with rice along with potato and onion soup, even though 100 mg of ascorbic acid was present [17]. In addition, the dosage of enhancers and inhibitors, tea and coffee, is also possibly necessary because Disler and Lynch

suggest that when tea was drunk with rice along with potato and onion soup, there was a significant inhibition of absorption. Iron absorption was found to be normal when the foods indicated above were cooked, which suggests that cooking methods may also be connected to iron absorption in the digestive tract. This suggests that the process of boiling the meal may provide some protection against the harmful effects of polyphenols [18].

As evidence for this claim, Morck and Lynch proposes that a concentration-dependent dynamic characterizes the association between coffee consumption and iron deficiency anemia. When consumed exactly one hour before a meal, coffee has no impact on the body's ability to absorb iron. However, when consumed exactly one hour after a meal, coffee impeded absorption to the same degree as when consumed concurrently [10].

Hurrell and Reddy found that all drinks were strong inhibitors of iron absorption, regardless of overall polyphenol concentration. Nelson et al. conducted a review in the United Kingdom in 2022. They found that if you're in danger of iron deficiency, you should wait at least an hour after eating before drinking tea, but that healthy individual don't need to limit their tea consumption. Several studies show that tea consumption correlates with decreased non-haem iron absorption [9].

Conclusion

As a result, the Zijp and Korner report suggests (when in a high-risk group) that you drink your tea in the middle of the day rather than with your meal and pair it with some dietary boosters like ascorbic acid or meat, fish, or chicken. In conclusion, it is generally accepted that black tea is the primary inhibitor of iron absorption in Western people, with coffee coming in second, and no definitive evidence of herbal green tea-induced iron deficiency anemia in Asian people [4]. This topic requires further investigation.

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