DOI: https://doi.org/10.54393/df.v6i4.191

DIET FACTOR
Journal of Nutritional & Food Sciences
https://www.dietfactor.com.pk/index.php/df
ISSN (E): 2789-8105, (P): 2789-8091
Volume 6, Issue 4 (Oct-Dec 2025)

Original Article

OPEN ACCESS

The Prevalence of Iron Deficiency Anemia in Relation to Tea and Coffee Consumption Among Female University Students

Maham Jawad[1], Mahin Jawad[1], Nazia Koser[2*], Nisar Hussain Shah[3], Yasmin Din[2] and Hina Younis[4]

[1]Department of Diet and Nutritional Sciences, University of Lahore, Pakistan
[2]Department of Pharmacy, The University of Lahore, Pakistan
[3]Bahaudin Zakariya University, Multan, Pakistan
[4]University of Barcelona, Spain

ARTICLE INFO

Keywords:
Tea, Iron Deficiency Anemia, Prevalence, Questionnaire, Dietary Supplements

How to Cite:
Jawad, M., Jawad, M., Koser, N., Shah, N. H., Din, Y., & Younis, H. (2025). The Prevalence of Iron Deficiency Anemia in Relation to Tea and Coffee Consumption Among Female University Students: Tea, Coffee, and Iron Deficiency in Female Students. DIET FACTOR (Journal of Nutritional and Food Sciences), 6(4), 09-13. https://doi.org/10.54393/df.v6i4.191

***Corresponding Author:**
Nazia Koser
Department of Pharmacy, The University of Lahore, Pakistan
hafiza.nazia@dnsc.uol.edu.pk

Received Date: 15th August, 2025
Revised Date: 11th October, 2025
Acceptance Date: 22nd October, 2025
Published Date: 31st December, 2025

ABSTRACT

Tea consumption has been linked to iron deficiency anemia in several clinical trials. Lifestyle and dietary habits are important diagnostic considerations in this type of disease, and the consumption of caffeine-containing beverages can play a significant role. **Objectives:** To assess the prevalence of iron deficiency in relation to tea or coffee consumption among female university students. **Methods:** This cross-sectional study was conducted with 150 female students from the University of Lahore, selected via purposive sampling. Data were collected using a structured questionnaire comprising 25 items related to iron deficiency, dietary habits, and tea/coffee consumption patterns. **Results:** All participants reported regular consumption of tea or coffee. Key findings indicated that 88 (58.7%) participants experienced headaches when not consuming these beverages, 141 (94%) consumed them frequently, and 41 (27.3%) reported a constant desire to consume them. Notably, 49 (32.7%) felt tired without tea/coffee, and only 31 (20.7%) consumed these beverages with a meal. Furthermore, 27 (18%) participants reported feeling anemic, and 97 (64.7%) consumed dietary iron supplements less than 1-2 times daily. Common triggering factors after consumption included anxiety (71.3%), digestive issues (53.3%), and irregular menstrual cycles (98%). **Conclusions:** The study concludes that regular consumption of tea or coffee, particularly with meals, is a leading factor associated with iron deficiency risk among female university students. A notably low intake of dietary iron supplements further exacerbates the prevalence of iron deficiency anemia (IDA) in this population.

INTRODUCTION

Iron deficiency anemia (IDA) represents a major global health challenge, characterized by reduced hemoglobin levels and red blood cell counts that fail to meet physiological needs. As the most prevalent form of anemia, IDA arises when insufficient iron availability compromises hemoglobin synthesis, impairing oxygen transport and manifesting in symptoms such as fatigue, weakness, and shortness of breath [1, 2]. The global scope of iron deficiency is staggering, affecting approximately one-third of the world's population [3]. The World Health Organization estimates that nearly two billion people worldwide are anemic, with iron deficiency responsible for approximately 50% of these cases [4, 5]. Regional disparities are pronounced, with the highest prevalence rates observed in South Asia and Central and West Africa. In Pakistan, the National Nutrition Survey (2011-2012) revealed alarming rates of IDA, affecting 40-70% of children under five years and 18.1% of non-pregnant women of reproductive age [6, 7]. The consequences of untreated IDA are profound and far-reaching, including reduced

DOI: https://doi.org/10.54393/df.v6i4.191

cognitive function, compromised growth and development, diminished work capacity, and overall impaired quality of life [8]. While iron deficiency prevention strategies include consumption of iron-rich foods and vitamin C to enhance absorption [8], certain dietary components can significantly inhibit iron uptake. Among these, tea and coffee present particular concern due to their widespread consumption and potent inhibitory properties [9]. These beverages contain polyphenols, primarily tannins and oxalates, that bind dietary iron and form insoluble complexes, reducing absorption by up to 39% when consumed with meals. The effect is particularly pronounced for non-heme iron from plant sources, though heme iron from animal products is also affected [10, 11]. In Pakistan, tea consumption is deeply embedded in cultural practices, with approximately 91% of the population preferring tea over other beverages, while coffee consumption averages 0.8 kg per person annually [12, 13]. The tradition of consuming tea with meals is particularly concerning from a nutritional perspective, as this timing maximizes the inhibitory effect on iron absorption [14]. Recent evidence confirms that tea consumption with meals reduces iron absorption, while coffee consumption exceeding three cups daily has been linked to iron deficiency in pregnant women [15, 16]. Despite the high prevalence of both tea consumption and iron deficiency in Pakistan, limited research has explored this relationship within the specific context of female university students. This population represents a vulnerable group due to their reproductive age and potential for increased iron demands. With black tea consumption in Pakistan projected to increase from 172,911 tons in 2022 to 250,755 tons by 2027, understanding the impact of this dietary habit on iron status becomes increasingly urgent [13].

This study addresses this knowledge gap by investigating the prevalence of iron deficiency in relation to tea and coffee consumption patterns among female university students in Pakistan, providing evidence to inform targeted interventions and nutritional education programs. This study aimed to assess the prevalence of iron deficiency in relation to tea or coffee consumption among female university students.

METHODS

This cross-sectional study was conducted among 150 female students at the University of Lahore to assess the prevalence of iron deficiency in relation to tea and coffee consumption. Study was conducted from January 2023 to June 2023. Ethical consent was obtained from University of Lahore, and prior written informed consents were taken from all the study participants. The sample size was calculated using an online sample size calculator. Participants were selected using a purposive sampling technique, with inclusion criteria encompassing healthy females aged 18-30 years who consumed a minimum of half a cup of tea or coffee daily. Exclusion criteria included unwillingness to participate, non-consumption of tea or coffee, age outside the specified range, and presence of any diagnosed medical condition. Data were collected through a structured questionnaire designed to gather information on demographic characteristics, tea and coffee consumption patterns, dietary habits, and potential symptoms related to iron deficiency. The collected data were analyzed using SPSS version 24.0.

RESULTS

All of the participants consume tea or coffee regularly in their diet (Table 1).

Table 1: Consumption of Tea or Coffee Regularly in the Dietaracteristics of the Study Participants (n=460)

Sr. No.	Consumption of Tea or Coffee Regularly in the Diet of the Respondent	Frequency (%)
1	Yes	150 (100%)

Past 4 weeks, consumption of coffee or tea with a meal among female university students. Out of 150 participants, 31 consume tea or coffee with a meal, 71 sometimes consume tea or coffee with a meal, and 48 don't consume tea or coffee with a meal (Table 2).

Table 2: Consumption of Tea or Coffee with a Meal During the Past Four Weeks Among Female University Students

Sr. No.	Past 4 Weeks, Consumption of Coffee or Tea with a Meal	Frequency (%)
1	All of the time	31 (20.7%)
2	Some of the time	71 (47.3%)
3	None of the time	48 (32.0%)
4	Total	150 (100.0%)

Out of 150 participants, 27 participants feel anemic, 48 sometimes feel anemic, and 75 don't feel anemic (Table 3).

Table 3: Frequency of Feeling Anemic During the Past Four Weeks Among Female University Students

Sr. No.	Past 4 Weeks, Feel Anemic	Frequency (%)
1	All of the time	27 (18.0%)
2	Some of the time	48 (32.0%)
3	None of the time	75 (50.0%)
4	Total	150 (100.0%)

Out of 150 participants, 106 know that excessive consumption of tea or coffee may lead to iron deficiency, whereas 44 don't think of it (Table 4).

DOI: https://doi.org/10.54393/df.v6i4.191

Table 4: Awareness Regarding the Effect of Excessive Tea or Coffee Consumption Leading to Iron Deficiency Among Female University Students

Sr. No.	Excessive Consumption of Tea or Coffee May Lead to an Iron Deficiency in the Respondent	Frequency (%)
1	No	44 (29.3%)
2	Yes	106 (70.7%)
3	Total	150 (100.0%)

Out of 150 participants, 55 use iron supplements, whereas 95 don't use iron supplements (Table 5).

Table 5: Use of Iron Supplements Among Female University Students

Sr. No.	Use of an Iron Supplement	Frequency (%)
1	No	95 (63.3%)
2	Yes	55 (36.7%)
3	Total	150 (100.0%)

As the result shows, after consumption of tea or coffee out of 150, 107 respondents feel anxiety, 122 respondents feel insomnia, 80 respondents experience digestive issues, 79 respondents feel addiction, 127 respondents experience rapid heart rate, 98 respondents do not feel fatigue, 90 respondents do not experience headache, 76 respondents feel dehydrated, 147 respondents experience irregular menstrual cycle (Figure 1).

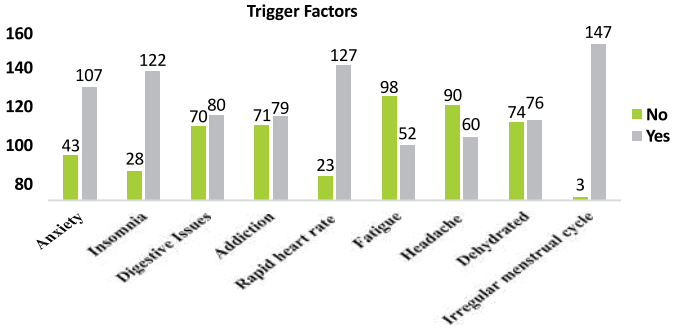

Figure 1: Distribution of Trigger Factor After Consuming Tea or Coffee Among Female University Students

Out of 150 participants, 97 consume a dietary supplement of iron less than 1-2 times daily, whereas 20 consume 2-3 times daily (Figure 2).

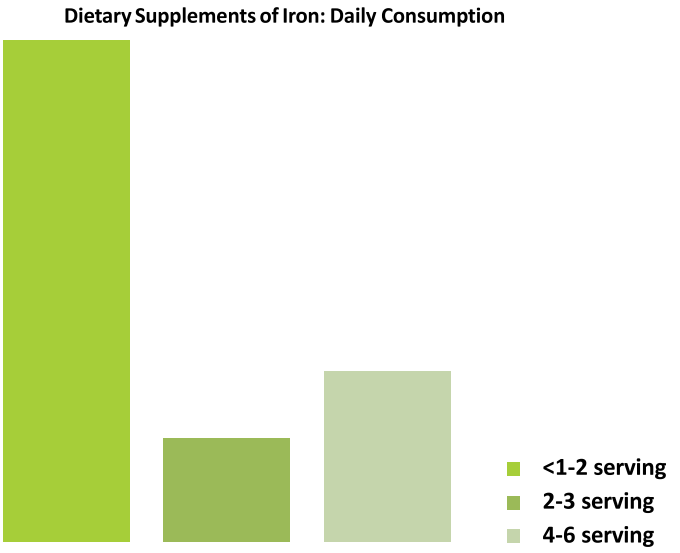

Figure 1: Daily Consumption of Dietary Supplement of Iron

DISCUSSION

The findings of this study demonstrate a strong association between regular tea and coffee consumption and indicators of iron deficiency among female university students in Pakistan. These results align with recent international evidence. A previous study reported that reproductive-aged women who regularly consumed tea or coffee had a 1.7-fold higher risk of iron deficiency compared to non-consumers [17]. Furthermore, our observation that 68% of participants consumed these beverages with meals (sometimes or always) is concerning, as an earlier study found that tea intake even one-hour post-meal significantly inhibits iron absorption, though less than concurrent consumption [18]. The low prevalence of iron supplement use (36.7%) among our participants is a major contributor to iron deficiency and mirrors and aligns with previous findings, where inadequate iron supplementation was also a key risk factor for anemia [19]. The high frequency of self-reported anemia symptoms (50%) corresponds with evidence of higher anemia prevalence among tea-drinking pregnant women compared to non-tea drinkers [20]. Moreover, the remarkably high rate of menstrual irregularities (98%) following tea or coffee consumption aligns with recent endocrinological research suggesting that elevated polyphenol intake may influence estrogen metabolism and menstrual cyclicity [21]. This study has some limitations. Self-reported data may be subject to recall and social desirability bias, and the cross-sectional design limits causal inference. Moreover, purposive sampling restricts generalizability to all female university students. Despite these limitations, the findings highlight the need for nutritional education on the timing of tea and coffee intake and the importance of iron supplementation. Future

DOI: https://doi.org/10.54393/df.v6i4.191

longitudinal and intervention studies using biochemical assessments are recommended to clarify the relationship between beverage consumption and iron status.

CONCLUSIONS

In conclusion, the high prevalence of regular tea and coffee consumption, particularly with meals, is significantly associated with iron deficiency risk among female university students. The widespread practice of consuming these beverages alongside meals, combined with insufficient iron supplementation, exacerbates the population's vulnerability to iron deficiency anemia. These findings underscore the critical need for targeted nutritional education programs to promote safer consumption habits and improve iron intake. Addressing these modifiable dietary factors is essential for reducing the burden of iron deficiency in this demographic.

Authors Contribution

Conceptualization: NK
Methodology: MJ[1], MJ[2]
Formal analysis: MJ[1], HY
Writing review and editing: MJ[1], NHS, YD, HY

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

All the authors declare no conflict of interest.

Source of Funding

The author received no financial support for the research, authorship and/or publication of this article.

REFERENCES

[1] García-Casal MN, Pasricha SR, Sharma AJ, Peña-Rosas JP. Use and Interpretation of Hemoglobin Concentrations for Assessing Anemia Status in Individuals and Populations: Results from a WHO Technical Meeting. Annals of the New York Academy of Sciences. 2019 Aug; 1450(1): 5–14. doi: 10.1111/nyas.14090.

[2] Yıldız TK, Yurtay N, Öneç B. Classifying Anemia Types Using Artificial Learning Methods. Engineering Science and Technology, an International Journal. 2021 Feb; 24(1): 50–70. doi: 10.1016/j.jestch.2020.12.003.

[3] Chaparro CM, Suchdev PS. Anemia Epidemiology, Pathophysiology, and Etiology in Low- and Middle-Income Countries. Annals of the New York Academy of Sciences. 2019 Aug; 1450(1): 15–31. doi: 10.1111/nyas.14092.

[4] Sundararajan S, Rabe H. Prevention of Iron Deficiency Anemia in Infants and Toddlers. Pediatric Research. 2021 Jan; 89(1): 63–73. doi: 10.1038/s41390-020-0907-5.

[5] Habib MA, Black K, Soofi SB, Hussain I, Bhatti Z, Bhutta ZA, *et al.* Prevalence and Predictors of Iron Deficiency Anemia in Children under Five Years of Age in Pakistan: A Secondary Analysis of National Nutrition Survey Data 2011–2012. PLOS One. 2016 May; 11(5): e0155051. doi: 10.1371/journal.pone.0155051.

[6] Habib MA, Raynes-Greenow C, Soofi SB, Ali N, Nausheen S, Ahmed I, *et al.* Prevalence and Determinants of Iron Deficiency Anemia among Non-Pregnant Women of Reproductive Age in Pakistan. Asia Pacific Journal of Clinical Nutrition. 2018 Jan; 27(1): 195–203.

[7] Alzaheb RA, Al-Amer O. Prevalence of Iron Deficiency Anemia and Its Associated Risk Factors among Female University Students in Tabuk, Saudi Arabia. Clinical Medicine Insights: Women's Health. 2017 Nov; 10: 1179562X17745088. doi: 10.1177/1179562X17745088.

[8] Al-Alimi AA, Bashanfer S, Morish MA. Prevalence of Iron Deficiency Anemia among University Students in Hodeida Province, Yemen. Anemia. 2018; 2018(1): 4157876. doi: 10.1155/2018/4157876.

[9] Lee D, Jung W, Shin DW. Association of Coffee or Green Tea with Ferritin or Hemoglobin in Premenopausal Women. Korean Journal of Family Medicine. 2023 Mar; 44(2): 87–92. doi: 10.4082/kjfm.22.0133.

[10] Delimont NM, Haub MD, Lindshield BL. Impact of Tannin Consumption on Iron Bioavailability and Status: A Narrative Review. Current Developments in Nutrition. 2017 Feb; 1(2): 1–2. doi: 10.3945/cdn.116.000042.

[11] Rahman MA, Rahman MS, Aziz Rahman M, Szymlek-Gay EA, Uddin R, Islam SM. Prevalence and Factors Associated with Anemia in Women of Reproductive Age in Bangladesh, Maldives, and Nepal: Evidence from Nationally Representative Survey Data. PLOS One. 2021 Jan; 16(1): e0245335. doi: 10.1371/journal.pone.0245335.

[12] Hayat K, Iqbal H, Malik U, Bilal U, Mushtaq S. Tea and Its Consumption: Benefits and Risks. Critical Reviews in Food Science and Nutrition. 2015 Jun; 55(7): 939–954. doi: 10.1080/10408398.2012.678949.

[13] Bowen S, Hussain M. Shared Culture and Heritage along the Belt and Road: A Study of Pakistani Tea. Journal of Development and Social Sciences. 2024 Feb;5(1):668-81.

[14] Fan FS. Iron Deficiency Anemia due to Excessive Green Tea Drinking. Clinical Case Reports. 2016 Oct; 4(11): 1053–1055. doi: 10.1002/ccr3.707.

DOI: https://doi.org/10.54393/df.v6i4.191

[15] Milman N T. A Review of Nutrients and Compounds Which Promote or Inhibit Intestinal Iron Absorption: Making a Platform for Dietary Measures That Can Reduce Iron Uptake in Patients with Genetic Hemochromatosis. Journal of Nutrition and Metabolism. 2020; 2020(1): 7373498. doi: 10.1155/2020/7373498.

[16] Jamnok J, Sanchaisuriya K, Sanchaisuriya P, Fucharoen G, Fucharoen S, Ahmed F, *et al.* Factors Associated with Anemia and Iron Deficiency among Women of Reproductive Age in Northeast Thailand: A Cross-Sectional Study. BMC Public Health. 2020; 20(1): 1–8. doi: 10.1186/s12889-020-8248-1.

[17] Shah T, Warsi J, Laghari Z. Tea Drinking and Its Co-occurrence with Anemia in Pregnant Females. Rawal Medical Journal. 2020 Jan; 45(1): 163–166.

[18] Ahmad Fuzi SF, Koller D, Bruggraber S, Pereira DI, Dainty JR, Mushtaq S. A One-Hour Interval between a Meal Containing Iron and Tea Consumption Attenuates the Inhibitory Effects on Iron Absorption: A Controlled Trial in Healthy UK Women Using a Stable Iron Isotope. The American Journal of Clinical Nutrition. 2017 Dec; 106(6): 1413–1421. doi: 10.3945/ajcn.117.161364.

[19] Miller CH. Investigating Factors that Influence the Success of Micronutrient Interventions for the Prevention and Treatment of Iron Deficiency in Women of Reproductive Age (Doctoral dissertation, Carleton University). 2024.

[20] Ryblom H, Hast R, Hellström-Lindberg E, Winterling J, Johansson E. Self-perception of Symptoms of Anemia and Fatigue Before and After Blood Transfusions in Patients with Myelodysplastic Syndromes. European Journal of Oncology Nursing. 2015 Apr 1; 19(2): 99-106.

[21] Michel R, Hazimeh D, Saad EE, Olson SL, Musselman K, *et al.* Common Beverage Consumption and Benign Gynecological Conditions. Beverages. 2024: 10(2): 33. doi: 10.3390/beverages10020033.