Buletin Kedokteran & Kesehatan Prima
Vol.5 No.1 (2026)
DOI: 10.34012/bkkp.v5i1.8114

ORIGINAL ARTICLE

The relationship between coffee consumption habits and body mass index among medical students

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ABSTRACT

Background: Obesity is a growing global health concern with increasing prevalence among young adults. Coffee consumption, particularly among medical students experiencing high academic stress, may influence body mass index (BMI) through various metabolic mechanisms. However, the relationship between different types of coffee and BMI remains inconclusive. This study aimed to analyze the relationship between coffee consumption habits (frequency and type of coffee) and BMI among medical students at Universitas Prima.

Methods: A quantitative study with a cross-sectional design was conducted in 2025. The sample comprised 87 medical students selected through simple random sampling from a population of 675 students. Data were collected using structured questionnaires assessing coffee consumption patterns (type and frequency) and self-reported weight and height for BMI calculation. BMI was classified according to WHO criteria: underweight (<18.5 kg/m²), normal (18.5-24.9 kg/m²), overweight (25-29.9 kg/m²), and obese (≥30 kg/m²). Coffee consumption was categorized by type (Americano vs. milk coffee) and frequency (1-2 times/week vs. >3 times/week). Data were analyzed using univariate and bivariate analyses with non-parametric tests.

Results: Milk coffee was more popular than Americano among both male (72.1%) and female (89.6%) students. Among obese students, 100% consumed milk coffee, while underweight students showed the highest preference for Americano (37.5%). Students with normal BMI predominantly consumed coffee 1-2 times weekly (69.8%), while obese students showed higher consumption frequency (>3 times/week: 20%). Normality tests showed non-normal distribution of BMI data ($p<0.001$ for both coffee type and frequency). Bivariate analysis revealed no significant association between coffee type and BMI ($p=0.220$) or between consumption frequency and BMI ($p=0.578$).

Conclusion: Coffee consumption habits, including type and frequency, were not significantly associated with BMI among medical students at Universitas Prima. BMI appears to be influenced by multiple interacting factors beyond coffee consumption alone. Further research with larger samples and consideration of confounding variables such as physical activity, dietary patterns, and sleep quality is warranted.

Keywords: coffee consumption, body mass index, medical students, Americano, milk coffee

Introduction

The World Health Organization (WHO) reported that in 2022, approximately 2.5 billion adults worldwide were overweight, with 890 million classified as obese. In Indonesia, obesity prevalence among adults has steadily increased over the past five years, rising from 10.5% in 2007 to 14.8% in 2013, and significantly to 21.8% in 2018.[1,2] Obesity serves as a key indicator for type 2 diabetes mellitus risk, with body mass index (BMI) being the standard measurement tool—higher BMI values correlate with increased

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diabetes risk. Multiple factors influence adult BMI, including physical inactivity, unhealthy dietary patterns, stress levels, smoking, and alcohol consumption.[3]

Stress represents a significant factor affecting BMI. Stress is a condition where individuals experience feelings of pressure as a response to physical or emotional situations.[4] The prevalence of academic stress among Indonesian students is notably high, ranging from 36.7% to 71.6% across various studies measuring stress levels. Under stressful conditions, individuals typically seek coping mechanisms, with coffee emerging as a popular choice among adults, particularly university students.[4–7]

Coffee is frequently selected as a stress-relieving beverage because its caffeine content stimulates the central nervous system, enhancing the release of neurotransmitters such as dopamine and serotonin that improve mood. Additionally, coffee consumption rituals associated with relaxation and social interaction provide psychological comfort, making coffee a common coping strategy for emotional pressure.[8–10] Coffee consumption prevalence in Indonesia continues to rise, with the International Coffee Organization (ICO) reporting domestic consumption reaching a record 4.8 million bags (60 kg per bag) in the 2020/2021 period, positioning Indonesia as the world's fifth-largest coffee consumer. This trend continued through 2023/2024 with an estimated 4.79-4.8 million bags or approximately 288,000 tons, driven by café culture and urban youth populations.[11–13]

Coffee contains various bioactive compounds, with caffeine as the primary alkaloid (1-2% dry weight in Robusta beans, 0.8-1.4% in Arabica). Caffeine (1,3,7-trimethylxanthine) stimulates the central nervous system, increases lipolysis and thermogenesis.[14] Polyphenols (5-10% dry weight), including flavonoids and phenolic acids, act as potent antioxidants, inhibiting LDL oxidation and obesity-related inflammation. Chlorogenic acid (CGA, 6-11% in green Robusta beans) inhibits intestinal glucose absorption and adipocyte differentiation.[15,16]

Coffee is consumed in various forms, with Americano and milk coffee being the two most popular variants.[17,18] These beverages differ substantially in nutritional content, potentially affecting metabolism and body composition, particularly body fat mass. Americano, consisting of espresso diluted with hot water, contains minimal calories when consumed without added sugar or milk. According to United States Department of Agriculture (USDA) data, one cup of unsweetened Americano contains less than 5 calories and provides negligible fat, protein, or carbohydrates.[19] This makes Americano relatively neutral regarding daily energy intake, especially when consumed without additives.[19,20]

Conversely, milk coffee typically includes added sugar and milk, significantly increasing caloric content. Previous research demonstrated that coffee with added sugar and milk can contain 100-200 calories per serving, depending on milk type and sweetener amount. This added sugar contributes to increased total daily energy intake, which, when not balanced with adequate physical activity, can lead to body fat accumulation. Consumption data also indicates that younger age groups tend to prefer coffee with milk and sugar compared to Americano.[21,22] Based on this background, this study aimed to investigate the relationship between coffee consumption habits and Body Mass Index among medical students at Universitas Prima.

Method

This quantitative study employed a cross-sectional design and was conducted at the Faculty of Medicine, Universitas Prima Indonesia, Medan, from October to December 2025. The study population comprised all 675 medical students at the university. Using the Slovin formula with a 10% margin of error, a required sample size of 87 students was calculated, and these participants were subsequently selected utilizing a simple random sampling technique.

Primary data were collected through structured questionnaires completed by the respondents to assess both independent and dependent variables. The independent variables focused on coffee consumption habits, specifically categorizing the type of coffee consumed—comparing Americano (espresso with hot water containing minimal calories) against milk coffee (which includes added milk and/or sugar). The questionnaire also measured the frequency of consumption, classified as rare (1-2 times per week) versus frequent (more than 3 times per week), alongside the overall duration of the coffee consumption habit. For the dependent variable, anthropometric data including weight and height were self-reported to determine the Body Mass Index (BMI). BMI was calculated using the standard formula of weight in kilograms divided by height in meters squared and was subsequently categorized according to World Health Organization (WHO) classifications into underweight (<18.5 kg/m²), normal (18.5-24.9 kg/m²), overweight (25.0-29.9 kg/m²), and obese (≥30.0 kg/m²).

Finally, the collected data were analyzed using SPSS software. Univariate analysis was performed initially to describe the frequency distribution of respondent characteristics and the study variables. Following appropriate normality testing, which indicated a non-normal distribution of the data, bivariate analysis was conducted using non-parametric tests to examine the associations between the coffee consumption variables and BMI.

Results

A total of 87 medical students participated in this study. Table 1 presents the distribution of respondent characteristics by coffee type and BMI category.

Table 1. Distribution of respondent characteristics by coffee type

Characteristic	Americano n (%)	Milk Coffee n (%)	Total n (%)
Sex			
Male	12 (27.9)	31 (72.1)	43 (100)
Female	5 (10.4)	43 (89.6)	48 (100)
BMI Category			
Underweight	3 (37.5)	5 (62.5)	8 (100)
Normal	13 (20.6)	50 (79.4)	63 (100)
Overweight	1 (6.7)	14 (93.3)	15 (100)
Obese	0 (0)	5 (100)	5 (100)

Table 1 shows that milk coffee was substantially more popular than Americano among both male and female students. Among male students, 72.1% consumed milk coffee compared to 27.9% who consumed Americano. Among female students, 89.6% consumed milk coffee while only 10.4% consumed Americano. Notably, all obese students consumed milk coffee, representing 100% of that category, while underweight students showed the highest preference for Americano at 37.5%. Among students with normal BMI, 79.4% consumed milk coffee compared to 20.6% who consumed Americano.

Table 2. Distribution of coffee consumption frequency by BMI category

BMI Category	1-2 times/week n (%)	>3 times/week n (%)	Total n (%)
Underweight	5 (62.5)	3 (37.5)	8 (100)
Normal	44 (69.8)	19 (30.2)	63 (100)
Overweight	12 (80.0)	3 (20.0)	15 (100)
Obese	3 (60.0)	2 (40.0)	5 (100)
Total	64 (73.6)	23 (26.4)	87 (100)

Table 2 demonstrates that most respondents consumed coffee 1-2 times per week, accounting for 73.6% of the total sample. Students with normal BMI predominantly consumed coffee at this lower frequency, with 69.8% reporting consumption 1-2 times weekly. Among obese students, 60.0% consumed coffee 1-2 times weekly while 40.0% consumed coffee more than 3 times weekly, representing the highest proportion of frequent consumption among all BMI categories.

Table 3. Normality test results for BMI by coffee type and frequency

Variable	Normality Test (p-value)
BMI by Coffee Type	<0.001
BMI by Consumption Frequency	<0.001

Table 3 shows that BMI data were not normally distributed across either coffee type or consumption frequency categories, with p-values less than 0.001 for both variables. This non-normal distribution necessitated the use of non-parametric tests for bivariate analysis.

Table 4. Correlation between coffee consumption variables and BMI

Variable	p-value
Coffee Type and BMI	0.220
Consumption Frequency and BMI	0.578

Table 4 presents the results of bivariate analysis examining associations between coffee consumption habits and BMI. The analysis revealed no statistically significant association between coffee type and BMI,

with a p-value of 0.220. Similarly, no significant association was found between consumption frequency and BMI, with a p-value of 0.578.

Discussion

This study investigated the relationship between coffee consumption habits and Body Mass Index (BMI) among medical students. Despite identifying distinct consumption patterns, the study found no significant association between these habits and BMI.

Milk coffee proved significantly more popular than Americano, consumed by 72.1% of male and 89.6% of female students. This preference likely reflects the cultural normalization of sweetened beverages and café culture in urban Indonesia. Furthermore, all obese students in the sample consumed milk coffee, which typically contains added sugars and fats. Conversely, underweight students showed the highest preference for Americano at 37.5%, suggesting a potential link between caloric coffee additives and weight, or a conscious choice of lower-calorie options among those managing their weight.[23,24] Regarding frequency, the majority of respondents (73.6%) consumed coffee one to two times per week. While 40.0% of obese students consumed coffee more than three times weekly compared to 30.2% of normal-weight students, this difference was not statistically significant.[24]

Statistically, there was no significant association between BMI and either coffee type ($p = 0.220$) or consumption frequency ($p = 0.578$), aligning with several previous regional studies on medical students. This lack of significance can be attributed to several factors. The broad categorization of "milk coffee" encompasses preparations with vastly different caloric loads, from low-fat milk to heavily sweetened condensed milk, which can obscure potential associations. Additionally, the modest thermogenic effects of caffeine and chlorogenic acid are likely insufficient to impact BMI without controlling for total caloric intake and physical activity.[23–25] The significant non-normal distribution of BMI data ($p < 0.001$) further reinforces that weight regulation is influenced by complex, multifactorial interactions, including genetics such as CYP1A2 polymorphisms, overall diet, and lifestyle.[24]

These findings imply that coffee consumption alone is unlikely to be a primary determinant of weight status among medical students. Consequently, weight management interventions should utilize comprehensive approaches targeting overall diet, physical activity, sleep, and stress, rather than focusing narrowly on coffee habits. Nevertheless, nutritional education regarding the hidden calories in sweetened coffee remains important. The study does present several limitations, primarily its cross-sectional design which precludes causal inferences. Other constraints include the use of self-reported anthropometric data that can introduce measurement bias, an inability to detect small effect sizes due to sample size constraints, a lack of quantification for added sugars and fats in the coffee, and unmeasured confounding variables such as sleep quality, stress levels, and total dietary intake.

Conclusion

In conclusion, this study demonstrates that there is no statistically significant association between coffee consumption habits, including both the type of coffee and the frequency of intake, and the Body Mass Index of medical students at Universitas Prima Indonesia. Despite the lack of statistical significance, distinct consumption patterns emerged, notably a strong preference for milk coffee across the student body and a tendency for obese individuals to exclusively consume these sweetened coffee variants. These findings underscore that while caloric beverages contribute to overall energy intake, coffee consumption in isolation is not a primary determinant of weight status within this demographic, highlighting the complex and multifactorial nature of weight regulation.

Based on these findings, it is recommended that university health and wellness programs prioritize comprehensive lifestyle interventions rather than focusing solely on specific beverage restrictions. Medical students, as future healthcare professionals, should receive targeted nutritional education regarding the hidden calories in popular sweetened coffee preparations to support informed, healthier dietary choices. For future research, investigators should employ longitudinal study designs to better establish causality and capture the long-term metabolic effects of coffee consumption. Subsequent studies must also quantify the specific amounts of added sugars and fats in coffee beverages and rigorously control for critical confounding variables, including total daily caloric intake, physical activity levels, sleep quality, and academic stress, to provide a more accurate and holistic understanding of weight dynamics among young adults.

References

1. Ayuningtyas D, Kusuma D, Amir V, Tjandrarini DH, Andarwati P. Disparities in Obesity Rates among Adults: Analysis of 514 Districts in Indonesia. Nutrients. 2022 Aug 14;14(16):3332.
2. Kementerian Kesehatan Republik Indonesia. Riset Kesehatan Dasar 2018 (2018 Basic Health Research). Jakarta; 2018.
3. Shaikh R. Socioeconomic Status, Smoking, Alcohol use, Physical Activity, and Dietary Behavior as Determinants of Obesity and Body Mass Index in the United States: Findings from the National Health Interview Survey. Int J MCH AIDS. 2015;4(1).
4. Ilias NF, Mohamed Fuad NSK, Muhamad Zamani NIZ. Stress level and body composition among gender. Malaysian J Sport Sci Recreat. 2021 Sep 15;17(2):298–314.
5. Hijriana F, Sianturi FE, Rizky NM, Siregar RR, Fadilah PM, Manullang S. Tingkat Stress Akademik Mahasiswa Prodi Statistika Angkatan 24 dan Coping Mechanismnya yang Efektif di Universitas Negeri Medan. J Ris Rumpun Ilmu Pendidik [Internet]. 2025 Jun 19;4(2):333–46. Available from: https://prin.or.id/index.php/JURRIPEN/article/view/5640
6. Setyarini KI, Makaba S, Hasmi H, Bouway DY, Tingginehe RM, Anggai MM. Revealing Academic Stress in Medical Students of Cenderawasih University, Jayapura, Papua Province, Indonesia. Formosa J Sci Technol. 2024 Aug 15;3(8):1727–38.
7. Zamroni Z. Academic stress and its sources among first year students of islamic higher education in Indonesia. Int J Innov Creat Chang. 2019;5(4).
8. Magalhães R, Picó-Pérez M, Esteves M, Vieira R, Castanho TC, Amorim L, et al. Habitual coffee drinkers display a distinct pattern of brain functional connectivity. Mol Psychiatry. 2021 Nov 20;26(11):6589–98.
9. Alasmari F. Caffeine induces neurobehavioral effects through modulating neurotransmitters. Saudi Pharm J. 2020 Apr;28(4):445–51.
10. Dajero BK, Dag-um | Ian Justin, Flores DJ, Barete M, Taja-on E. Coffee Culture and Mental Health: A Qualitative Exploration of Perceptions and Experiences of Coffee Enthusiast. Asia Pacific J Educ Technol Psychol Soc Sci. 2025;1(1):1–24.
11. Shi Z, Luan J, Zhang Y, Wang G, Mei C, Chen L, et al. Exploring the Impact and Mechanisms of Coffee and Its Active Ingredients on Depression, Anxiety, and Sleep Disorders. Nutrients. 2025 Sep 24;17(19):3037.
12. Bilal M, Achmad N. Analysis Of The Effect Of Service Quality, Brand Trust And Perceived Quality On Customer Loyalty With Customer Satisfaction As An Intervening Variable. Paradigma [Internet]. 2023 Aug 8;20(2):232–46. Available from: http://jurnal2.unismabekasi.ac.id/index.php/paradigma/article/view/7035
13. Agustin D, Fachri H. Influence of Product, Promotion, And Store Atmosphere on Repurchase Intention at Sessama Coffee Shop in Pontianak City With Customer Satisfaction as An Intervening Variable. Dinasti Int J Econ Financ Account. 2025 Mar 7;6(1):640–50.
14. Van Schaik L, Kettle C, Green R, Irving HR, Rathner JA. Effects of Caffeine on Brown Adipose Tissue Thermogenesis and Metabolic Homeostasis: A Review. Front Neurosci. 2021 Feb 4;15.
15. Chen W. Exploring the Health Benefits of Coffee Bioactive Components and Their Mechanisms. Theor Nat Sci. 2025 May 15;110(1):44–9.
16. Angelino D, Tassotti M, Brighenti F, Del Rio D, Mena P. Niacin, alkaloids and (poly)phenolic compounds in the most widespread Italian capsule-brewed coffees. Sci Rep. 2018 Dec 14;8(1):17874.
17. Wierzejska RE, Gielecińska I. Evaluation of the Caffeine Content in Servings of Popular Coffees in Terms of Its Safe Intake—Can We Drink 3–5 Cups of Coffee per Day, as Experts Advise? Nutrients. 2024 Jul 23;16(15):2385.
18. Li Y, Zhao D, Li W, Yu X, Zhang X, Shi J, et al. Novel Insights into Milk Coffee Products: Component Interactions, Innovative Processing, and Healthier Product Features. Foods. 2025 Nov 25;14(23):4043.
19. Emadi RC, Kamangar F. Coffee's Impact on Health and Well-Being. Nutrients. 2025 Aug 5;17(15):2558.
20. Poole R, Kennedy OJ, Roderick P, Fallowfield JA, Hayes PC, Parkes J. Coffee consumption and health: umbrella review of meta-analyses of multiple health outcomes. BMJ. 2017 Nov 22;j5024.
21. Hastuti VN, Anwar K, Astuti AP. Association Between Coffe Drinking Frequency and Sugar Intake with Adolescents Nutritional Status. J Glob Nutr. 2025 May 1;5(1):521–32.
22. Henn M, Glenn AJ, Willett WC, Martínez-González MA, Sun Q, Hu FB. Changes in Coffee Intake, Added Sugar and Long-Term Weight Gain - Results from Three Large Prospective US Cohort Studies. Am J Clin Nutr. 2023 Dec;118(6):1164–71.
23. Putri ADS, Margawati AM, Purwanti R, Syauqy A, Zaimatussoleha C. Coffee consumption habits with the addition of added ingredients correlated with obesity among females students in Semarang. AcTion Aceh Nutr J. 2023 Sep 21;8(3):339.
24. Kamali R, Srinidhi S, Purna GS, Devi GM, Keerthana R, Elangovan S. Knowledge, attitude and practices towards consumption of caffeine containing drinks among medical college students in Chennai. Int J Community Med Public Heal. 2023 Dec 30;11(1):182–7.
25. Tucker LA, Beltran F. Use of caffeine in 19,660 randomly selected U.S. adults: the role of overweight and obesity. Front Nutr. 2025 Jun 25;12.