ORIGINAL ARTICLE

Association of Caffeine Intake and Stress among University Students

Aqsa Nadeem[1], Faran Khan[2], Afifa Tanweer[1], Saba Nadeem Dar[1], and Mahrukh Tariq[3]

ABSTRACT

Objectives: The primary objective of the study was to determine the relationship between caffeine intake and stress among university students. While the secondary objective of the study was to find how the type and amount of caffeine consumption affects university students.

Methodology: A cross sectional study was conducted in which 154 undergraduate students of University of Management and Technology of ages 17 to 26 years were targeted. Questionnaires were administered using an interview-based technique, incorporating the Perceived Stress Scale—one of the most widely used psychological tools for assessing stress perception—and a measure to evaluate caffeine consumption by calculating the number of caffeine servings per week.

Results: The study highlighted the stress score according to which, 15% of the respondents had low intensity of stress, 66% had moderate intensity of stress, and 19% students were in the high stress category. We analyzed their caffeine consumption and the results indicated that 82% students had low consumption of caffeine, 14% were having moderate amounts of caffeine and only 4% students had high consumption of caffeine. Out of all caffeinated products, the most consumed caffeinated drink amongst the undergraduate male (WHY MALE) students of UMT was tea (43% responded 5-6 times/week), while coke/ carbonated beverages (38% responded 2-3 times/week) and milk chocolate bars (36% responded 4 times/week) followed at second and third place. The Pearson correlation coefficient between stress scores and caffeine intake is -0.007. This value is very close to zero, indicating almost no linear relationship between stress and caffeine

Conclusion: The study concluded that there is no relation between stress and caffeine intake.

Keywords: Anxiety, caffeine, caffeinated beverages, depression, stress

How to cite: Nadeem A, Khan F, Tanweer A, Dar SN, Tariq M. Association of caffeine intake and stress among university students. Ann Jinnah Sindh Med Uni. 2024; 11(1):35-39.

DOI: https://doi.org/10.46663/ajsmu.v11i1.35-39

INTRODUCTION

We live in a society where mental health problems are not recognized as issues requiring social change, leading to widespread nervousness, discomfort, and stress. In a society where education is increasingly emphasized, students face constant pressure, whether related to exams or basic assessments, which leads to deteriorating eating and drinking habits. As a result, students become more prone to unhealthy consumption patterns, particularly an increased intake of caffeine, with Pakistan being considered a country highly susceptible to excessive caffeine consumption[25].

National Institute of Health (NIH) describes stress as a feeling of emotional or physical tension that induces frustration, anger or nervousness. Stress can be induced due to any reason or any event that builds up tension, anxiety and frustration in one's body. It is a natural response of our body to a particular stressor[1,2]. There are various factors that act as stressors in an undergrad's life such as academics, peers and social issues, any major changes or events such as leaving the university or getting a job, lack of sleep, financial issues and others. In any stressful conditions, our body releases a flood of hormones including adrenaline and cortisol. The release of these hormones increases heart rate and breathing rate, contracts muscles, raises blood pressure and sharpens senses. Stress also acts as a causative factor in many diseases, as it interacts with the disease and furthers worsens the disease. As a result of prolonged stress, our body starts showing different symptoms such as headache, aches and pains, heartache, insomnia, digestive problems, weakened immune system, depression, panic attacks, anxiety, sadness, and changing eating patterns[3,4].

Assistant Professor[1]/Lecturer[2]/Teaching Assistant[3], University of Management & Technology, Lahore, Pakistan

Correspondence: Aqsa Nadeem, Assistant Professor, University of Management & Technology, Lahore, Pakistan

Email: faaraankhn@gmail.com

Submitted: June 09, 2024
Revised: May 31, 2025 **Accepted:** June 20, 2025

Caffeine, on the other hand, is a natural stimulant that blocks adenosine which is also a neurotransmitter that relaxes the brain and prevents tiredness. Its main effect is on the brain. It is naturally found in leaves and fruits of some plants. It is also present in coffee, green and black tea, soft drinks, energy drinks, cocoa chocolate bars, energy bars. Increased consumption of caffeine poses many negative health effect as it increases the release of cortisol in our body which is a hormone that is naturally released in our body in stress. This hormone further causes many negative effects such as increasing weight, endocrine diseases such as diabetes, cardiovascular diseases such as arrhythmias, mood swings and others.[5,6] Approximately 80% of the world population consumes caffeine every day, with a daily intake of upto 200 mg, equivalent to around three espresso cups per day.[7] According to FDA, healthy adults can consume caffeine up to 400mg/ day safely. Beyond this amount, caffeine can cause anxiety, difficulty in sleeping, addiction, heart problems, digestive problems, increased blood pressure, increased heart rate, and persistent fatigue and tiredness.[8]

Different people consume caffeine in different forms. Office workers, doctors, engineers, businessmen, merchants and homemakers consume caffeine to prevent tiredness and fatigue.[9] Athletes and sports persons drink caffeine to enhance their performance whereas adolescents, teenagers and many adults, drink caffeinated beverages for their distinctive taste and the ability to boost energy[2-4].

People consume caffeine in various ways such as coffee, tea, energy drinks, carbonated beverages, and chocolates. In Pakistan, tea is the most popularly consumed caffeinated drink in all age groups and nearly all members of households drink it as daily ritual. Majority of the people consume tea without knowing that it is a source of caffeine too. Surprisingly, increased consumption of chocolate exposes individuals to excess caffeine so toddlers and adolescents who consume chocolate as a healthy snack are actually imparting negative effects on their health. Another study revealed that intake of caffeine was causing anxiety and depression in secondary school children. These observed effects on mental health were distinct in children, being more dominant in male children[10-12].

The primary objective of the study was to determine the relationship between caffeine intake and stress among university students. While the secondary objective of the study was to find how the type and amount of caffeine consumption affects university students.

METHODOLOGY

IRB/ERC Approval:

The study was conducted after obtaining approval from the Research Ethics Committee of the University of Management & Technology, vide reference number RE-111-2023. Consent of the respondents was taken before taking them on board. The identity of the study participants was kept confidential and used solely for generating results of the research.

It was a cross sectional study. The study method was quantitative because the study correlates the relation between stress and caffeine consumption. The study used a non-probability sampling technique that is convenience sampling of 154 undergraduate students of University of Management & Technology, University of Health Sciences, University of Veterinary & Animal Sciences, Uiversity of South Asia.

Sample size was calculated to be 154 by using the formula and parameters given below.

$n = [t^2 * p (1 – p)]/ m$

[Where n = sample size, t = confidence level - 95 % (1.96), p = Estimated prevalence – 88.5% (0.885) and m= Error -5% (0.05)]

The inclusion criteria included undergraduate students between ages 17 to 26 years of age and without any known illnesses

The Exclusion criteria included students below 17 years or having any illness or inborn errors Self-structured questionnaire was used for conducting online survey. It consisted of four parts:

1. Demographics
2. Perceived stress scale--American Sociological Association
3. Self-designed questionnaire
4. Food frequency questionnaire

Demographical part included Age, weight and height, a perceived stress score of American Sociological Association including questions that helped analyze people with low stress score between 0–13 points, moderate stress score between 14–26 points or high stress score between 27–40 points. Self-structured questionnaire included serving sizes of different products. The last section contained a questionnaire about food frequency for a week. This included questions regarding the frequency of the consumption of caffeinated products in particular serving sizes during the previous week which helped us analyze if the consumption of caffeine was low, moderate or high in

the respondents. Respondents were informed about the objective and they responded voluntarily. Data was collected online through Google Forms, respondents were reached through social media, and data was recorded on an MS Excel sheet.

In this study, SPSS V22 software was used for data analysis. The study applied bivariate correlation to find the relation between variables (stress and caffeine).

RESULTS

The study had 154 participants. The body mass index (BMI) of 61% participants was normal while 27% were overweight, and 12% were found to be grade-I obese. None of the participants was underweight.

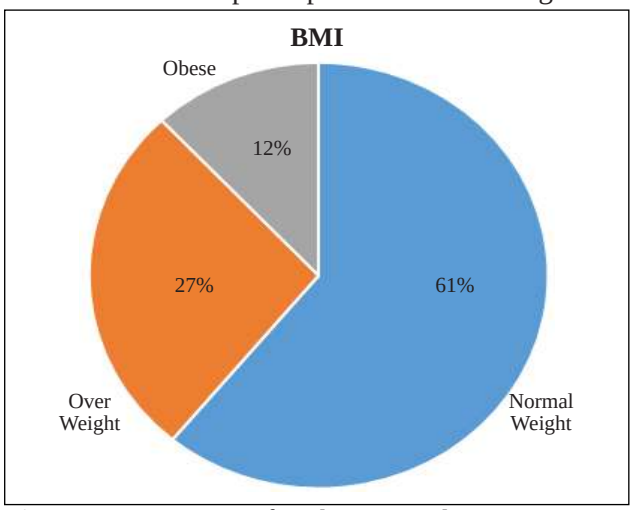

Figure 1: Percentages of students according to BMI (normal, overweight and obese)

Figure 2 shows that the stress score of 66% participants is moderate, 19% have high stress score, while 15% have low stress score. The scoring is based on Low= 0-13 (stress score), moderate 14-26 (stress score) and High=27-40 (stress score)

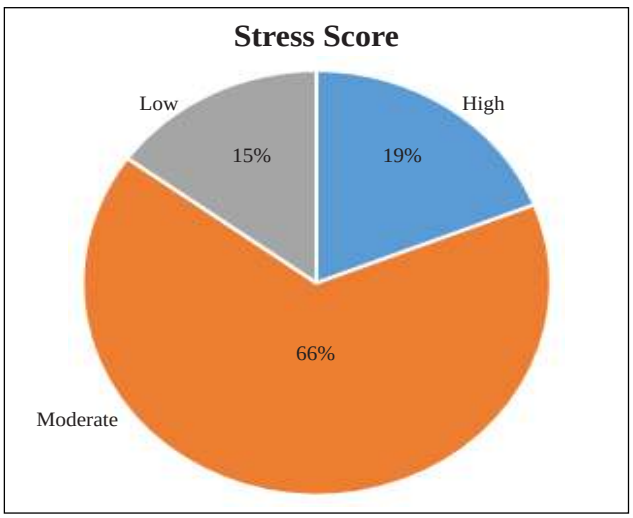

Figure 2: Percentages of students according to Stress Score (High, Moderate and Low)

Figure 3 represents weekly recall frequency of caffeinated products. According to this data, it can be interpreted that majority of participants had black tea (74.68%), green tea (50.65%), regular coffee/espresso (72.08%), instant coffee (68.83%), brewed coffee (81.1%) and filtered coffee (86.36%) 0 times/week in their previous week, whereas the majority of participants had milk tea/chai (42.86%) 5-6 times/week.

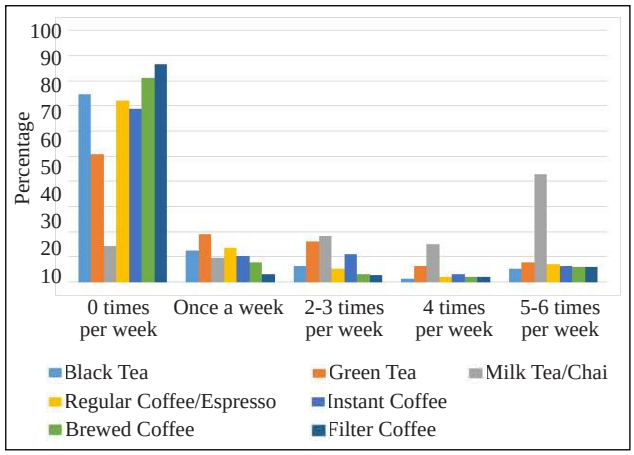

Figure 3: Caffeinated Beverages Intake in a Week

According to this data, 16.44% students had black tea, 32% students has green tea, 62.15% had milk tea/chai, 18.15% had espresso, 20.24% had instant coffee, 12.22% had brewed coffee, 8.87% had filter coffee, 19.16% had cold brewed coffee, 42.58% had coke, 19.81% had diet coke, 27.40% had sting, 20.12% had red bull, 24.81% had chocolate shake, 31.20% had milk chocolate and 15.18% had dark chocolate during the previous week. So, the consumption of milk tea/chai, coke and milk chocolate was more as compared to other caffeinated products.

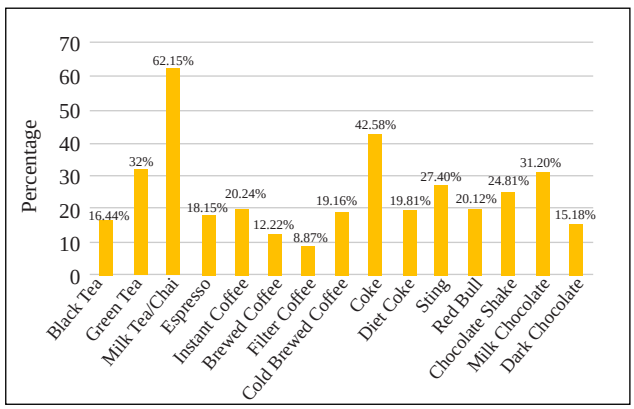

Figure 4: Frequencies of Caffeinated Product

The Pearson correlation coefficient between stress scores and caffeine intake is -0.007. This value is very close to zero, indicating almost no linear relationship between stress and caffeine intake in this dataset. The

significance (2-tailed) value for this correlation is 0.929. This p-value is much greater than the standard threshold of 0.05, meaning the correlation is not statistically significant. In other words, the observed relationship could easily be due to chance.

There is no meaningful or statistically significant relationship between stress scores and caffeine intake in this dataset.

The very weak negative correlation (-0.007) suggests that, if anything, higher caffeine intake is very slightly associated with lower stress, but this association is negligible and not statistically significant.

Table 1: Correlations Between Stress and Caffeine Intake

		Stress Score	Caffeine Intake
Stress Score	Pearson Correlation	1	-.007
	Sig. (2-tailed)	154	.929
	N		154
Caffeine Intake	Pearson Correlation	-.007	1
	Sig. (2-tailed)	.929	
	N	154	154

DISCUSSION

Caffeine is the most widely used substance around the world. This study was conducted on different universities students (both private & government), wherein the majority reported its use in the form of coffee, tea, soda, and energy drinks. Caffeine consumption was found to be prevalent among students. This study analyzed the stress score in students, quantity and frequency of caffeinated products in the previous week as well as the relation between stress and caffeine consumption. Among 154; 29 students were classified to be in high stress, 102 were found to be in moderate stress and 23 students were in low stress (fig. 2). In a study of college students in the United States, total mean of caffeine consumption was 159mg/day for whole student population and total mean of regular students for both males and females was 173mg/day. Majority of the students were regularly consuming soda, coffee and tea[11]. However, this study targeted students between the ages of 17 and 26 years and the total mean consumption of caffeine among students was 708.5 mg/week.[12] Majority of students were not consuming caffeinated products regularly. In the previous week, they were mostly consuming tea, coke, green tea and milk chocolate. As many as 62.15% students were consuming tea, 42.58% were consuming coke, 32% were consuming green tea and 31.2% were consuming milk chocolate.

In a survey from University of Lahore, Pakistan on caffeine intake among 185 students with 52 males students and 133 females, the benefits and hazardous effects of caffeine were examined.[10,17] Products containing caffeine consumed by students were tea 62.4% and soft drinks (52.8%). Lowest consumption rate was observed for coffee 41.6%[13]. This study has some similarities with our study. In this study, 62.15% students were consuming tea and less than 50% were consuming coffee. The lowest consumption rate was that of filtered coffee 8.87%, brewed coffee 12.22%, dark chocolate 15.18%, and espresso 18.15% . Total 47.52% students were consuming energy drinks out of whom 27.4% were consuming Sting and 20.12% were consuming other energy drinks.

Another study suggested that caffeine consumption may be associated with stress but in this study there is no correlation between stress and caffeine consumption.[12] Another research found negative correlation between stress and caffeine.[14,15] This study found no correlation between caffeine and stress. The study done by Conway did not report significant correlation between stress and caffeine consumption.[13] Similarly Josue L et al also reported that there is no correlation between caffeine and stress that is also seen in our study. A research was conducted in Mumbai on consumption of caffeine which was associated with appetite and stress[16-22]. They found negative association of caffeine with appetite but no significant association with stress which is also substantiated by this study. Participants found caffeine to be helpful for its properties of helping in remaining wakeful, enhanced study hours, being able to concentrate, being better able to socialize as evident from the data given in the results. This could be due to the fact that caffeine does have some beneficial CNS stimulatory effects[23,24].

CONCLUSION

Through the analysis regarding caffeine consumption and stress, the study concluded that mostly students were consuming milk tea, cola drinks, and milk chocolate. Most of the students were found to be in moderate stress. Some were found to be in high stress, but their caffeine consumption was low and moderate. So, there is no significant relation of intake of caffeine in students with stress. Based on this data, caffeine intake does not appear to have a meaningful impact on stress levels.

Funding: Nil

Conflict of interest: Authors declare that there is no conflict of interest

Authors' Contributions: AN: Designed the study, analyzed the data, wrote the manuscript, and approved the final version **FK:** Designed the study, analyzed the data, wrote the manuscript, and approved the final version **AT:** Designed the study and approved the final manuscript **SND:** Analyzed the data, wrote the manuscript, and approved the final manuscript **MT:** Collected the data and approved the final manuscript.

REFERENCES

1. Alabbad MH, AlMussalam MZ, AlMusalmi AM, Alealiwi MM, Alresasy AI, Alyaseen HN, et al. Determinants of energy drinks consumption among the students of a Saudi University. J Family Community Med. 2019;26(1):36-44. https://doi.org/10.4103/jfcm.jfcm_42_18
2. Alafif N, Al-Rashed A, Altowairqi K, Muharraq A. Prevalence of energy drink consumption and association with dietary habits among governmental university students in Riyadh. Saudi J Biol Sci. 2021;28(8):4511-5.https://doi.org/10.1016/j.sjbs.2021.04.050
3. Preedy VR, Patel V, editors. Coffee in health and disease prevention. Elsevier; 2024.
4. Driver EM, Gushgari A, Chen J, Halden RU. Alcohol, nicotine, and caffeine consumption on a public US university campus determined by wastewater-based epidemiology. Sci Total Environ. 2020;727:138492. https://doi.org/10.1016/j.scitotenv.2020.138492
5. Dwaidy J, Dwaidy A, Hasan H, Kadry S, Balusamy B. Survey of energy drink consumption and adverse health effects in Lebanon. Health Inf Sci Syst. 2018;6:1-8. https://doi.org/10.1007/s13755-018-0056-y
6. El-Nimr NA, Bassiouny SH, Tayel DI. Pattern of caffeine consumption among university students. J High Inst Public Health. 2019;49(3):154-61. https://dx.doi.org/10.21608/jhiph.2019.56579
7. Samoggia A, Rezzaghi T. The consumption of caffeine-containing products to enhance sports performance: an application of an extended model of the theory of planned behavior. Nutrients. 2021;13(2):344. https://doi.org/10.3390/nu13020344
8. Reyes CM, Cornelis MC. Caffeine in the diet: country-level consumption and guidelines. Nutrients. 2018;10(11):1772. https://doi.org/10.3390/nu10111772
9. Oglesby LW, Amrani KA, Wynveen CJ, Gallucci AR. Do energy drink consumers study more? J Community Health. 2018;43:48-54. https://doi.org/10.1007/s10900-017-0386-8
10. Hassan U. Prevalence and awareness of caffeine consumption among the medical students. Prof Med J. 2020;27(12):2763-8. https://doi.org/10.29309/TPMJ/2020.27.12.4631
11. Jahrami H, Al-Mutarid M, Penson PE, Al-Islam Faris ME, Saif Z, Hammad L. Intake of caffeine and its association with physical and mental health status among university students in Bahrain. Foods. 2020;9(4):473. https://doi.org/10.3390/foods9040473
12. Kale LB, Reddy KJ. A study on caffeine consumption and its association with stress and appetite among call centre employees in Mumbai city, India. Int J Community Med Public Health. 2017;4(3):835-40. https://doi.org/10.18203/2394-6040.ijcmph20170768
13. Khalil M, Antoun J. Knowledge and consumption of caffeinated products by university students in Beirut, Lebanon. Clin Nutr ESPEN. 2020;37:213-7. https://doi.org/10.1016/j.clnesp.2020.02.014
14. Mahoney CR, Giles GE, Marriott BP, Judelson DA, Glickman EL, Geiselman PJ, et al. Intake of caffeine from all sources and reasons for use by college students. Clin Nutr. 2019;38(2):668-75. https://doi.org/10.1016/j.clnu.2018.04.004
15. Patrick Y, Lee A, Raha O, Pillai K, Gupta S, Sethi S, et al. Effects of sleep deprivation on cognitive and physical performance in university students. Sleep Biol Rhythms. 2017;15:217-25. https://doi.org/10.1007/s41105-017-0099-5
16. Pighi M, Pontoni G, Sinisi A, Ferrari S, Mattei G, Pingani L, et al. Use and propensity to use substances as cognitive enhancers in Italian medical students. Brain Sci. 2018;8(11):197. https://doi.org/10.3390/brainsci8110197
17. Afroz MN, Kamal S, Ishfaque S. The effects of caffeinated beverage consumption on the sleep habits and lifestyle of medical students in public and private medical universities in Karachi, Pakistan. Preprints. 2020. https://doi.org/10.20944/preprints202011.098.v1
18. Scott ER. Indirect and interactive effects of climate and herbivory on tea metabolites [dissertation]. Tufts University; 2020.
19. Temple JL. Trends, safety, and recommendations for caffeine use in children and adolescents. J Am Acad Child Adolesc Psychiatry. 2019;58(1):36-45. https://doi.org/10.1016/j.jaac.2018.06.030
20. Vercammen KA, Koma JW, Bleich SN. Trends in energy drink consumption among US adolescents and adults, 2003–2016. Am J Prev Med. 2019;56(6):827-33. https://doi.org/10.1016/j.amepre.2018.12.007
21. Maqsood U, Zahra R, Latif MZ, Athar H, Shaikh GM, Hassan SB. Caffeine consumption & perception of its effects amongst university students. InProceedings. 2020;34(4):46-51.https://doi.org/10.47489/p000s344z770mc
22. Zhang Y, Xiong Y, Dong J, Guo T, Tang X, Zhao Y. Caffeinated drinks intake, late chronotype, and increased body mass index among medical students in Chongqing, China: a multiple mediation model. Int J Environ Res Public Health. 2018;15(8):1721. https://doi.org/10.3390/ijerph15081721
23. Food and Agriculture Organization (FAO). Food Safety and Standards in Pakistan. Rome: FAO; 2019. https://www.fao.org/food-safety/en/
24. Nasir SA, Nasir GA, Usman A, Rehman RU, Fatima T, Nasir SA, Aftab SN, Ali M. Prevalence and pattern of caffeine consumption among university students-A cross-sectional study. Pak J Med Health Sci. 2018 Jul 1;12(3):983-6. https://pjmhsonline.com/2018/july_sep/pdf/983.pdf