Original Article

Caffeine Consumption Patterns Among Medical Students: Implications for Health Education and Academic Performance

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Abstract

Background: Caffeine is one of the most widely consumed stimulants worldwide, frequently used by students to manage academic stress and prolonged study hours. Among medical students, who face intense schedules and significant academic pressures, caffeine consumption is particularly prevalent. **Methodology:** This study examines caffeine consumption patterns among medical students at Kirkuk University, focusing on their motivations, consumption habits, and awareness of potential health impacts. A survey conducted among 110 students revealed that the majority consume caffeine daily, with coffee and tea being the most popular choices. Key motivators for caffeine use include staying awake to study and enhancing alertness, though many students reported limited awareness of safe consumption levels and potential health risks associated with high intake. **Results:** Results indicated a high rate of caffeine dependency among participants, with many experiencing symptoms of withdrawal, such as headaches and irritability, and a lack of active tracking of their caffeine intake. These findings underscore the need for educational interventions within medical curricula to promote awareness and guide students toward healthier coping strategies for managing academic demands. Integrating health education into caffeine use, stress management, and self-care into medical education could reduce caffeine reliance and enhance students' overall well-being and academic performance. **Conclusion:** The study highlights the importance of holistic health education in medical training, advocating for a curriculum that empowers students to make informed lifestyle choices, supports sustainable stress management, and fosters long-term health awareness.

Keywords: Caffeine Consumption, Health Education, Academic Stress, Self-care in Education, Behavioral Awareness.

Introduction

Caffeine Consumption in Academic Settings

Caffeine, as one of the most prevalent psychoactive stimulants globally, plays a central role in the lives of individuals seeking to enhance mental alertness and stave off fatigue.[1,2] Derived from natural sources like coffee beans, tea leaves, cocoa beans, and kola nuts, caffeine is also manufactured synthetically and widely included in a range of beverages and dietary supplements.[3] Its ability to temporarily stimulate the central nervous system by blocking adenosine receptors in the brain has made caffeine a popular substance across cultures and demographics.[4] Known for its effects in enhancing wakefulness, improving cognitive performance, and increasing attention span, caffeine is often relied upon to

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counter the physical and mental fatigue associated with demanding routines and sleep deprivation.[5]

The most common high-use groups for caffeine include university students, particularly those studying in the intensively demanding fields of medicine.[6] Unique to medical students are the demands, ranging from coping with intensive theoretical coursework, at the same time as hands-on clinical training and academic workload, to continuous assessments.[7] These challenges have further frequently promoted a long study hour, a disturbed sleep pattern, and high levels of stress, which are fertile ground for resorting to caffeine use as an easy and accessible prop for sustaining wakefulness and energy. In straightforward terms, studies have found there are sources of caffeine such as coffee, tea, energy drinks, and so forth that become regular tools for medical students in trying to meet the ever-growing demands of their busy schedules.[8]

While moderate caffeine consumption is associated with a number of cognitive benefits, including improved memory and faster information processing, excessive and habitual intake carries considerable risk.[9] These include ill health effects like insomnia, tachycardia, anxiety, and indigestion.[10] Furthermore, the use of caffeine as a coping aid against academic stress may induce withdrawal symptoms identified in cases of reduced intake, which may be very disruptive to the good performance and concentration of students academically.[11] Moreover, the development of habitual caffeine use among medical students is particularly concerning, since these individuals represent future healthcare providers whose health practices might subsequently affect their clinical guidance to patients.[12]

Given the potential health effects of heavy consumption and the increased academic pressure on students following a medical curriculum, the prevalence and motives of using caffeine, along with the knowledge regarding health and caffeine use, should correspond and be assessed.[13] These can be helpful in shaping health education within medical training programs in such a way that a student can be equipped to appraise and make the right decisions concerning caffeine use.[14] Educators and curriculum designers have an opportunity to address caffeine dependency risks and promote healthier, more sustainable coping mechanisms for managing academic pressures.[15] This research aims to examine caffeine consumption among medical students as both a reflection of academic lifestyle challenges and a focal point for enhancing health education, ultimately fostering a balanced approach to well-being in the context of professional development.

Problem Statement

Caffeine is increasingly being used among medical students in the high demands of their academic programs.[16] While caffeine can help improve alertness and energy temporarily, habitual intake and excessive consumption can result in dependence and a variety of health complications, which may impact students in both performance and well-being.[8] Furthermore, since medical students will also become healthcare professionals, their personal health behaviors could influence their ability to counsel patients about a healthy lifestyle.[17] Preliminary findings suggest that many students are unaware of safe caffeine consumption limits and the potential health impacts of overuse, indicating a gap in health education regarding the responsible use of stimulants.[18] Addressing this issue is vital to foster healthier academic coping mechanisms and to prepare students to serve as informed role models in healthcare.

Research Objective

investigate the pattern of caffeine intake - frequency and preferred sources - among Kirkuk University medical students and the reasons that underlie caffeine intake. The investigation also attempts to evaluate the awareness of students about the health implications of caffeine consumption, including adverse health effects related to high consumption, dependence, and withdrawal. By identifying key consumption behaviors and awareness gaps, the study aims to provide evidence-based recommendations for educational interventions. These insights can support the development of health education modules within medical curricula, equipping students with the knowledge and tools to manage academic stress effectively and promote well-being in their personal and professional lives.

Literature Review

The relationship between caffeine consumption and academic performance, particularly among students in high-stress fields like medicine, has been a subject of growing research interest.[19] Studies have shown that caffeine, as a central nervous system stimulant, is often used to enhance alertness, increase cognitive function, and combat the physical effects of sleep deprivation.[20] Medical students, given their rigorous academic and clinical schedules, are especially prone to high caffeine intake as a coping strategy for managing stress and fatigue.[21] However, while moderate caffeine use may offer short-term benefits, the long-term effects and risks associated with dependency and high consumption levels raise important health concerns.[9] Research highlights that excessive caffeine use can lead to withdrawal symptoms, dependency, and other adverse effects that may impact both physical health and academic outcomes.[22]

In Table 1, a systematic review of related studies on caffeine consumption, dependency, and its health impacts is presented, summarizing findings from research focused on student populations and medical training environments. This table provides a comprehensive overview of past research on caffeine's physiological and psychological effects, motivations behind student caffeine use, and educational implications.

Table 1: Summary of Related Studies on Caffeine Consumption Patterns, Health Impacts, and Educational Implications Among Medical Students.

Reference	Year	Study Objective	Methodology/Tools Used	Key Findings
Plumber *et al.*[23]	2021	Systematic review of stimulant usage, focusing on cognitive enhancement among medical students.	Systematic review and analysis of stimulant use, including caffeine and amphetamines.	Stimulant use, especially coffee, is prevalent among medical students. Misuse can lead to negative side effects; healthy enhancement methods are recommended.
Isa *et al.*[24]	2021	Investigate the impact of caffeine consumption on mental health among medical students.	Cross-sectional study with data from online questionnaires.	High prevalence of depression (9.2%) and anxiety (16.8%) among medical students; no significant association between caffeine intake and mental health.
Rajaseharan *et al.*[25]	2021	Assess caffeine dependence among medical interns at a tertiary teaching hospital.	Cross-sectional descriptive study with pre-tested, self-administered questionnaires.	Coffee is the preferred caffeinated product; 19.35% of interns show caffeine dependence. Self-awareness is key to preventing caffeine addiction.
Looby *et al.*[26]	2021	Explore how stimulant expectation impacts caffeine's effects on mood and cognition.	Randomized study with self-reported mood/drug effects and cognitive assessments.	Expecting a stronger stimulant (e.g., Adderall) intensifies caffeine's mood and cognitive effects.
Stachyshyn *et al.*[27]	2021	Investigate caffeine consumption habits and related risks among tertiary students in New Zealand.	Survey using a validated caffeine consumption questionnaire (CaffCo).	Most students consume caffeine; one-third consume above safe levels. Public health initiatives needed to address excessive intake.
Musharraf *et al.*[28]	2022	Assess caffeine consumption trends and perceptions of addiction among medical students.	Cross-sectional study using a web-based, self-made questionnaire.	94% of students consume caffeine; 42.3% consider themselves addicted. Awareness of adverse effects is critical.
Galhardo *et al.*[29]	2022	Quantify and analyze caffeine intake and its effects among medical students in Brazil.	Prospective observational cross-sectional study with self-administered questionnaires.	Most students consume caffeine moderately; high intake linked to anxiety, stomach issues, and tachycardia.
Tahir *et al.*[30]	2022	Examine correlation between caffeine use and academic performance among medical students.	Descriptive cross-sectional study using a self-administered questionnaire.	High caffeine consumption among students; moderate use linked to better academic performance in specific modules.
Pereira *et al.*[31]	2022	Assess prevalence and factors associated with psychostimulant (including caffeine) use among health students.	Observational cross-sectional study with semi-structured questionnaire.	Majority of students use psychostimulants, mainly caffeine, to enhance academic performance; highlights need for awareness of safe use.
Idris *et al.*[32]	2022	Investigate caffeine's impact on academic performance during exams among medical students at NBU.	Cross-sectional analytical study with self-administered questionnaire distributed on social media.	High caffeine consumption (92.2%) among students; students believe caffeine boosts study hours and GPA.
Samaha *et al.*[33]	2023	Investigate correlation between caffeine addiction and stress among medical students.	Cross-sectional study using SPSS for analysis.	High academic stress linked with caffeine withdrawal symptoms; institutional support is recommended.
Veronica *et al.*[34]	2023	Examine correlation between caffeine intake and sleep quality among students.	Cross-sectional study using PSQI and Spearman test for correlation.	No significant correlation found; majority of students had poor sleep quality.
Idoko *et al.*[35]	2023	Assess prevalence and effects of substance use, including caffeine, on academic performance.	Cross-sectional study with self-administered structured questionnaires.	Caffeine is the most abused substance; substance use shows no significant effect on academic performance.
Nasir *et al.*[36]	2023	Analyze the effect of caffeine on sleep quality among medical students.	Observational cross-sectional study using CCQ and PSQI.	High caffeine intake correlates with reduced sleep quality.
Mahmood *et al.*[37]	2024	Assess cardiovascular and behavioral effects of energy drink consumption among students.	Cross-sectional study with closed-ended questionnaire.	High prevalence of energy drink use; linked to tachycardia, elevated BP, and aggression. Public health initiatives recommended.
Gangwal *et al.*[38]	2024	Explore caffeine use trends, effects, and determinants among medical students.	Cross-sectional online survey among MBBS students.	High prevalence (85.7%) with common side effects like gastritis, insomnia, and anxiety.
Dahlawi *et al.*[39]	2024	Study caffeine use's association with academic performance among medical students.	Cross-sectional study using Google Forms.	No association found; primary prevention of excessive caffeine consumption recommended.
Azzaz and Elshaer[40]	2024	Investigate impact of Arabic coffee on academic performance among Saudi students.	Survey analyzing motives and performance correlation.	Moderate consumption may improve performance; excessive intake may harm academics.
Al Shawi *et al.*[41]	2024	Assess caffeine use and associated effects among medical students in Anbar.	Cross-sectional study with convenience sample.	Common caffeine use; no significant association between intake and adverse effects.

The compiled research on caffeine consumption among medical students reveals several recurring themes and gaps in understanding the full scope of caffeine's impact on this population. Studies have consistently documented high prevalence rates of caffeine use among medical students globally, identifying caffeine as a common stimulant for managing academic stress, enhancing alertness, and combating fatigue. Research also highlights significant health implications, including dependence, withdrawal symptoms, sleep disturbances, and potential cardiovascular risks, particularly with excessive intake. While some studies have examined the correlation between caffeine intake and academic performance, results are mixed, with most findings indicating little to no direct impact on performance outcomes. Additionally, certain studies focus on caffeine consumption patterns and health risks, yet only a few address the knowledge and awareness of safe consumption limits and healthy coping strategies within this population. Our study contributes to this field by examining not only the consumption patterns and health impacts of caffeine among medical students but also focusing on the gap in health awareness and educational interventions related to caffeine use. By assessing knowledge, attitudes, and practices surrounding caffeine, our work aims to provide a comprehensive understanding of both behavioral trends and the students' self-awareness of caffeine-related health risks. Unlike previous studies, this research emphasizes the potential for educational initiatives within medical training to promote healthier coping mechanisms and responsible caffeine use, supporting both student well-being and long-term professional development as future healthcare providers. This study fills a crucial gap by linking caffeine use with educational implications, advocating for targeted health education in medical curricula that encourages self-care and balanced lifestyle choices among medical students.

METHODOLOGY

Study Design

This study employed a descriptive cross-sectional design to determine the prevalence and patterns of caffeine consumption among medical students at Kirkuk University. It aimed to gather quantitative data on students' caffeine intake, preferences, and awareness regarding caffeine-related health risks.

Participants

The study targeted male and female medical students from all six academic stages at Kirkuk University, ranging in age from 18 to 24 years. A total of 110 students participated in the study. Participants were selected based on their

enrollment in the medical program and willingness to provide informed consent.

Data Collection

Data was collected through an online survey distributed over a 10-week period from January to April 2024. The survey consisted of 18 questions covering various aspects of caffeine consumption, including:

1. Types of caffeine products consumed (e.g., coffee, tea, energy drinks).
2. Frequency and quantity of caffeine intake.
3. Reasons for consumption, including academic and social factors.
4. Awareness of caffeine's potential side effects and withdrawal symptoms.
5. Any self-reported health issues potentially related to caffeine intake.

The survey also included demographic questions to capture data on age, gender, and academic stage.

Data Analysis

Survey responses were organized and analyzed using descriptive statistics. Variables such as frequency of caffeine intake, types of beverages consumed, and awareness levels were measured and expressed as percentages. Knowledge regarding safe caffeine consumption was graded into categories (good, moderate, and poor) based on students' responses to specific questions related to recommended limits and health effects. Statistical analysis provided insights into the general caffeine consumption behaviors among students and their correlation with demographic factors.

Results

The study surveyed a total of 110 medical students at Kirkuk University, consisting of 64.5% female (71 students) and 35.5% male (39 students), as shown in Table 2. This table provides an overview of the demographic characteristics of the respondents, highlighting the fact that a significant proportion of participants (40%) are 22 years old as shown in Table 3, with a large concentration of students (60.9%) in their fourth academic stage as shown in Table 4. This demographic distribution is essential for contextualizing the caffeine consumption patterns observed, as age and academic stage can influence lifestyle choices and stress management strategies. Additionally, the majority being in an advanced stage of medical education likely reflects a group facing heightened academic pressures, which may drive reliance on stimulants like caffeine. By establishing a clear demographic profile, Table 2, 3 and 4 offers a foundational understanding of the sample population, which informs the interpretation of subsequent data on caffeine consumption behaviors.

Table 2: Demographic Distribution of Respondents by Gender.

Gender	Number of Respondents	Percentage
Male	39	35.45%
Female	71	64.5%

Table 3: Age Distribution of Respondents.

Age	Number of Respondents	Percentage
18	1	0.9%
19	3	2.7%
20	8	7.2%
21	33	30%
22	44	40%
23	18	16.3%
24	3	2.7%

Table 4: Academic Stage Distribution of Respondents.

Stage	Number of Respondents	Ratio
1	1	0.9%
2	3	2.7%
3	8	7.2%
4	33	30%
5	44	40%
6	18	16.3%

Figure 1 illustrates that most respondents consume caffeine regularly, with 53.6% consuming it daily and 41.8% occasionally. Only a small fraction of participants (4.6%) reported they were not consuming caffeine at all. This distribution reflects a high prevalence of caffeine use among medical students, likely driven by academic pressures and the need for sustained alertness. The substantial percentage of daily and occasional consumers suggest that caffeine has become an integral part of the students' routines, possibly as a coping mechanism to manage academic demands and fatigue. This pattern aligns with findings from other studies that show high caffeine use among students in intensive study fields.

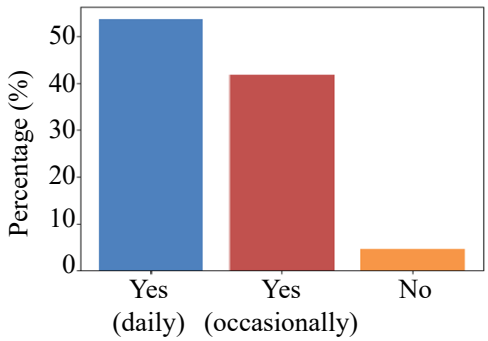

Figure 1: Caffeine Consumption Frequency Among Respondents.

Coffee is the most popular caffeinated product among respondents, with 74.5% of students reporting it as their primary source of caffeine. This is followed by tea, consumed by 60.9% of participants. Other caffeine sources, such as chocolate (28.2%), soda (14.5%), and energy drinks (8.2%), are less frequently chosen. Caffeine pills are the least common choice, used by only 3.6% of respondents. These findings, as illustrated in Figure 2, suggest that students tend to rely on traditional caffeinated beverages, such as coffee and tea, likely due to their accessibility and cultural acceptance.

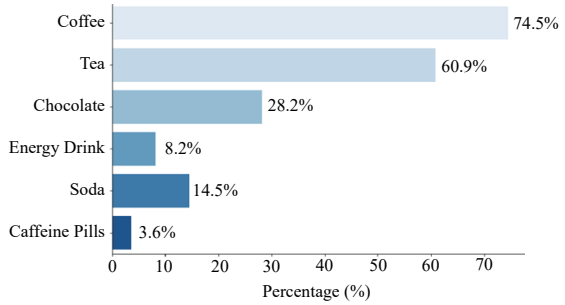

Figure 2: Preferred Sources of Caffeine Among Respondents.

The primary reasons for caffeine consumption among respondents include preventing sleep (58.2%) and taste preference (56.4%). Other common motivations include enhancing mood (47.3%), increasing energy (46.4%), and improving concentration (40.9%). Social reasons, such as "hanging out," were cited by 32.7% of students, while only a minimal 0.9% indicated caffeine use based on a health professional's recommendation. These findings, as shown in Figure 3, suggest that students predominantly consume caffeine to manage sleep patterns and improve focus, with enjoyment of taste being an additional significant factor.

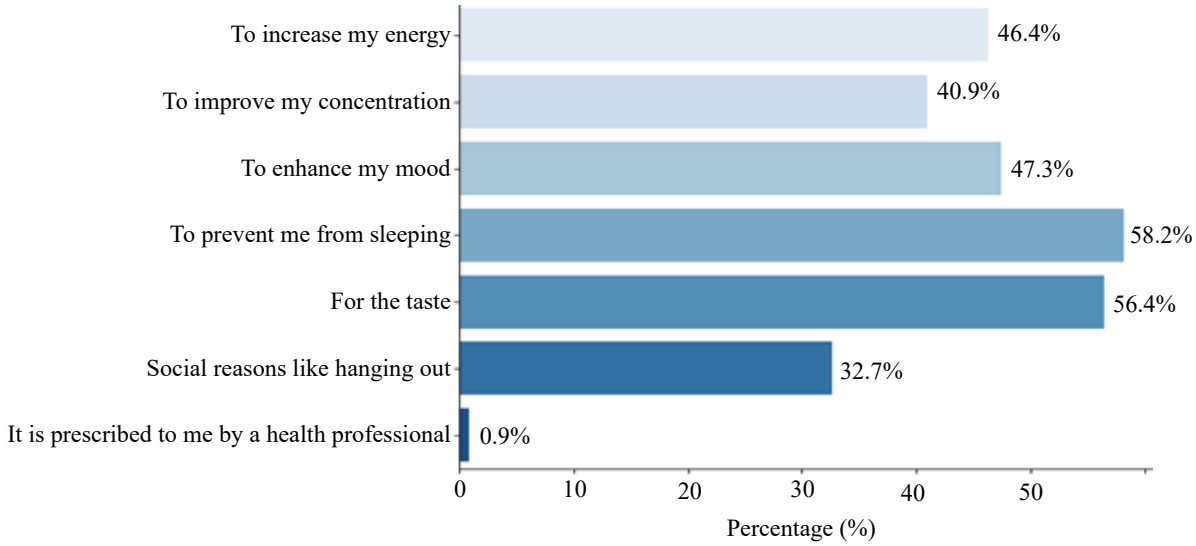

Figure 3: Reasons for Consuming Caffeine.

The timing of caffeine consumption among respondents is evenly distributed across different times of day. The evening is the most preferred time, with 29.1% of participants consuming caffeine during this period, followed closely by the morning (27.3%) and night (26.4%). The afternoon is the least popular time for caffeine intake, with only 17.3% of respondents choosing to consume caffeine then. This distribution, as shown in Figure 4, indicates a tendency for caffeine consumption later in the day, which may be linked to students' efforts to sustain energy levels for evening studies or social activities.

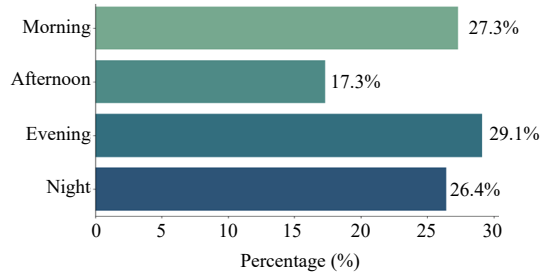

Figure 4: Preferred Time of Caffeine Consumption.

As illustrated in Figure 5, most respondents (57.5%) reported that they do not actively track their caffeine intake. However, 14.2% of participants expressed interest in starting to monitor their consumption in the future. A smaller portion of students currently use tracking methods, with 8.5% utilizing a mobile app and another 8.5% keeping a written log. Additionally, 9.4% of respondents mentally track their caffeine intake, while only 1.9% monitor their intake informally by observing the number of caffeinated beverages they consume. These findings indicate that structured tracking of caffeine intake is generally uncommon among students.

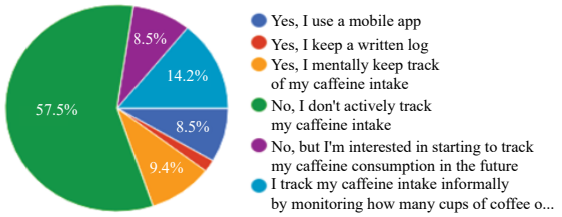

Figure 5: Methods of Tracking Caffeine Consumption.

The pie chart shown in Figure 6 illustrates the distribution of respondents' average sleep duration. The largest portion of participants, 35.5%, reported sleeping between 6 to 7 hours per night, followed by 22.7% who sleep 5 to 6 hours. Approximately 20% of respondents reported getting 7 to 8 hours of sleep, while 10.9% sleep between 8 to 9 hours. A smaller segment, represented by the blue slice, indicates those who sleep less than 5 hours, and

an even smaller proportion (not explicitly shown) sleeps more than 9 hours. These findings suggest that most respondents experience moderate sleep duration, with a notable portion getting less than the recommended 7 to 8 hours per night, potentially affecting overall well-being and alertness.

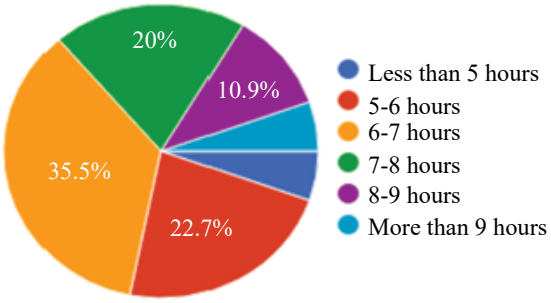

Figure 6: Methods of Tracking Caffeine Consumption.

The bar chart shown in Figure 7 illustrates respondents' awareness of caffeine's impact on health. A majority, 53.3%, indicated they are not aware of the effects of caffeine, while 26.2% expressed awareness. Another 20.6% were unsure of caffeine's potential impact. This distribution suggests a need for greater education on the effects of caffeine, as over half of the respondents lack awareness of its implications.

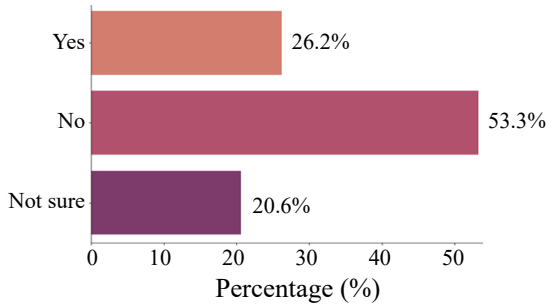

Figure 7: Awareness of Caffeine's Impact on Health Among Respondents.

The various signs and symptoms reported by respondents following caffeine consumption are shown in Figure 8. The most common responses were palpitations and "none of the following," each reported by 32.7% of participants. Other frequently reported symptoms include heartburn (25.5%), sleeplessness (23.6%), and headaches (15.5%). Less common symptoms reported by a small fraction of respondents include nausea (17.3%), anxiety (12.7%), breathlessness (10.9%), and vomiting (4.5%). Rarely mentioned symptoms, each reported by 0.9% of participants, include shaking, mood swings, constipation, tremor, tinnitus, and colon pain. These findings indicate that while some respondents experience noticeable symptoms, a significant portion does not report adverse effects from caffeine consumption.

The chart in Figure 9 illustrates the awareness levels among students regarding the daily caffeine intake limit for adults. The majority, 62%, indicated awareness of the recommended limit, while 38% were unaware. This suggests that a significant portion of students understand safe caffeine consumption limits, although a sizable minority may benefit from further education on the topic.

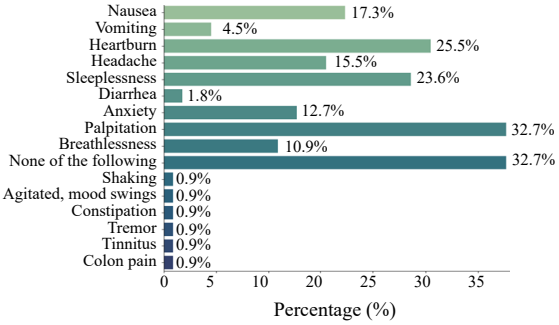

Figure 8: Signs and Symptoms Experienced After Caffeine Consumption.

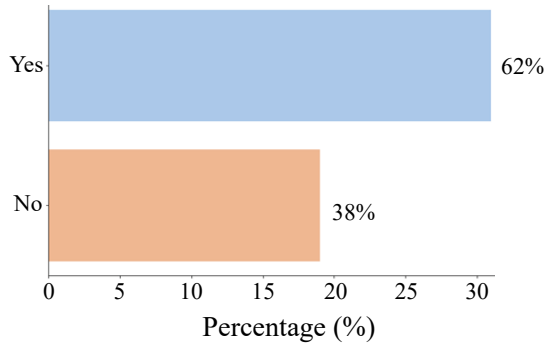

Figure 9: Awareness of Students on Daily Caffeine Limit for Adults.

Additionally, as shown in Figure 10, only 4.5% of respondents reported being affected by caffeine-related diseases, while the vast majority, 95.5%, indicated no adverse health effects related to caffeine consumption. These finding highlights that, despite widespread caffeine use, most students do not report any significant health issues attributed to caffeine, although awareness of consumption limits remains essential to prevent potential health risks.

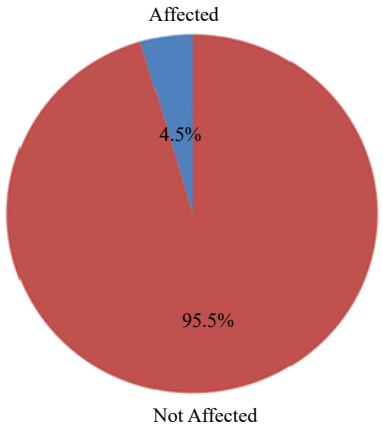

Figure 10: Caffeine-Related Diseases Impact Among Students.

Discussion

The findings of this study provide important insights into caffeine consumption habits, awareness, and health-related outcomes among students. Most students (as seen in Figure 9) demonstrated an awareness of the recommended daily caffeine limit for adults, with 62% aware and 38% unaware. However, despite this awareness, most respondents continue to consume caffeine regularly, driven by factors such as the need to increase energy, improve concentration, and enhance mood. This reliance on caffeine for academic and social purposes highlights the importance of caffeine in the daily routines of many students, which aligns with previous studies indicating high caffeine consumption rates among college students. Interestingly, while caffeine is widely used, its health impacts appear to be minimal for the majority, as shown in Figure 10. Only 4.5% of respondents reported caffeine-related health issues, while 95.5% did not experience any significant negative effects. This suggests that, although caffeine is consumed frequently, most students do not report adverse health effects. However, this could also indicate a lack of awareness or recognition of mild symptoms, as caffeine-related issues such as anxiety, sleeplessness, and headaches (Figure 8) are often normalized in a college setting.

Regarding the symptoms experienced post-caffeine consumption, Figure 8 highlights palpitations, sleeplessness, and heartburn as some of the more commonly reported issues. These symptoms align with known effects of caffeine, particularly in high doses, which can overstimulate the nervous system and disrupt normal sleep patterns. Given that 32.7% of respondents reported no symptoms, it may suggest that individual tolerance levels vary or that students have adapted to caffeine's effects over time.

These findings have significant implications for health education and awareness campaigns. While caffeine can be a helpful stimulant, especially for students balancing demanding schedules, over-reliance and lack of awareness about its effects could lead to long-term health issues. Educational institutions may benefit from implementing informational sessions about the safe use of caffeine, recognizing withdrawal symptoms, and understanding individual tolerance levels.

However, this study has several limitations, including its reliance on self-reported data, which may be subject to bias or underreporting of symptoms. Future studies should consider more objective measures, such as tracking caffeine intake and its physiological effects over time. Further research could also explore the relationship between caffeine consumption, academic performance, and mental health to provide a comprehensive understanding of caffeine's role in student life.

Conclusion

This study sheds light on the caffeine consumption habits, awareness levels, and associated health effects among students. The findings reveal that caffeine is widely consumed by students, primarily to enhance energy, concentration, and mood. Despite a general awareness of the recommended daily caffeine limits, a significant portion of students continue to consume caffeine regularly, often without structured tracking of intake. Although only a small percentage reported caffeine-related health issues, symptoms such as palpitations, sleeplessness, and headaches were frequently experienced among users, suggesting potential impacts on students' well-being.

Most students do not expect withdrawal symptoms if they reduce or stop caffeine intake, indicating a lack of awareness about caffeine dependence and its effects. This gap in understanding underscores the importance of educating students about the potential risks associated with over-reliance on caffeine, including the development of tolerance and withdrawal symptoms.

Future Work

Future research could explore the direct relationship between caffeine consumption and academic performance, as well as mental health outcomes among students. Longitudinal studies tracking caffeine intake over time, combined with physiological and psychological assessments, would provide deeper insights into how caffeine impacts student life. Additionally, investigating interventions that promote safe and moderate caffeine consumption could be beneficial. Educational programs focusing on caffeine awareness, healthy study habits, and alternative methods for maintaining energy and focus could serve to mitigate the risks associated with high caffeine intake in student populations.

Declaration of Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper. This study was conducted independently, and the authors affirm that there are no personal, financial, or other relationships that could be perceived as influencing the results and interpretations presented in this paper.

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