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A Comprehensive Survey Report on Caffeine Effect on Academic Performance

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ABSTRACT

Caffeine is consumed by students and is very common in different forms worldwide. While it has been researched to increase alertness and focus, it also imparts negative effects, such as disturbing a person's sleep cycle. **Objective:** To assess how much people are aware of drinks containing caffeine and also their consumption of it. **Methods:** This was based on a report of 100 university-going students aged between 17 to 28 years who are the potential subjects to assess how the consumption of caffeine affects academic performance. The data were collected from The University of Lahore students. **Results:** Caffeine consumption was widespread among university students (71%), mainly through tea. While most saw no impact on academics, 31.6% noted improvements, and 6.5% reported declines. Nearly half experienced sleep issues, and over a third reported side effects like anxiety. Despite high awareness, many noted peer over-reliance, with 40.7% open to healthier alternatives. **Conclusion:** caffeine use among students reflects a balance between perceived cognitive benefits and potential health risks. Its mixed effects suggest the need for greater awareness and informed decision-making. Social influences and habitual use further highlight the importance of education on healthier alternatives.

INTRODUCTION

Caffeine consumption among university students is a widespread phenomenon, primarily driven by the belief that it enhances attention and productivity [1]. However, this practice is coupled with potential negative health outcomes, creating a complex public health consideration [2, 3]. The consumption of caffeinated beverages has grown dramatically among young adults, who often justify their use as a means to increase mental vigilance, improve productivity, and enhance brain function, all of which can subsequently impact academic outcomes [4]. This central nervous system stimulant is found in a diverse range of products, including coffee, tea, soft drinks, and over-the-counter medications [5]. While moderate intake is common, consumption between 100-400 mg has been associated with adverse effects such as anxiety, tremors, and agitation [6]. Despite this, students frequently report using caffeine to cope with demanding academic situations, claiming it boosts alertness, attention span, and long-term memory [7]. The popularity of caffeine stems from its ability to combat fatigue, though this benefit often comes at the cost of sleep quality. Research indicates that caffeine consumption can reduce total sleep time by approximately 45 minutes and decrease sleep efficiency by 7%, necessitating careful timing of intake relative to bedtime [8]. Behavioral studies suggest that moderate caffeine consumption can reduce fatigue and improve

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vigilance, particularly in monotonous situations or during tasks requiring sustained attention [9]. However, the effects on complex cognitive tasks are less predictable and can be influenced by individual factors such as personality and time of day [10]. The impact is evident in student populations, with one study noting that caffeine consumption led to reduced sleep duration, negatively affecting concentration, even as it helped students feel more awake and alert [11]. Furthermore, increased caffeine use has been associated with heightened depressive and anxiety symptoms among university students, highlighting the need for further investigation into this relationship and the promotion of healthier alternatives [12]. The health implications of caffeine are dose-dependent. While it possesses antioxidant and anti-inflammatory properties that may offer protection against various diseases, long-term or excessive use is linked to adverse effects, including insomnia, migraines, and specific risks for vulnerable groups like pregnant women and adolescents [13]. The environmental impact of caffeine consumption is also noteworthy, with significant levels detected in water sources globally, posing potential risks to aquatic ecosystems [14]. Among university students, those in demanding fields like medicine are particularly prone to high caffeine consumption. They face unique pressures from rigorous academic workloads and clinical training, often leading to disrupted sleep patterns and elevated stress levels [15]. This makes caffeine an attractive, readily available aid for maintaining energy and alertness. The habitual use of caffeine in this demographic is especially concerning, as these future healthcare professionals' personal health behaviors may later influence the advice and care they provide to patients [16].

Despite the widespread consumption of caffeine among university students, there is limited research in Pakistan examining its dual effects on both academic performance and health. Most studies focus on either awareness or consumption patterns, while few explore the interplay between perceived cognitive benefits, sleep disturbances, and social influences. This gap highlights the need for a comprehensive evaluation of caffeine use and its implications on students' academic outcomes and overall well-being. This study aims to comprehensively explore the consumption patterns, perceived benefits, and associated risks of caffeine use among university students in relation to their academic performance.

METHODS

This cross-sectional study was conducted for three months from July to September 2024 to assess caffeine consumption patterns and their perceived effects among university students. Data were collected via a self-structured and pre-tested questionnaire, and ethical approval was obtained from the University Institute of Diet and Nutritional Sciences, The University of Lahore. Sample size calculation was done using Rao's online software. A total of 100 university going students were recruited using a non-probability convenience sampling method from multiple universities, including the University of Lahore (42%), University of Central Punjab (7%), University of Management and Technology (6%), Punjab University (4%), and Beaconhouse National University (1%). Inclusion criteria comprised university students aged 17–32 years who had a habit of caffeine consumption, and who voluntarily consented to participate, while individuals having caffeine allergy, from outside this age range, non-university students, and uncooperative respondents were excluded. The questionnaire consisted of four sections: demographic information, caffeine-related sleep disturbances, beliefs about caffeine-induced dehydration, and the perceived impact of caffeine on academic performance. All participants provided informed consent before completing the survey through online or offline modes. Data were entered and analyzed in SPSS version 24.0.

RESULTS

The survey reveals high caffeine prevalence (71%) among students, primarily consumed as tea. Despite most respondents (61.7%) perceiving no significant academic impact, a notable proportion reported caffeine-induced sleep disturbances (53.3%) and side effects like burnout (25.9%). This indicates a complex relationship where perceived short-term benefits for alertness coexist with significant health trade-offs, underscoring a need for targeted education on responsible consumption (Table 1).

Table 1: Caffeine Consumption and Perceived Effects Among University Students (n=100)

Variable	Category	Findings (%)
Age	17-20 Years	24.75%
	21-24 Years	70.4%
	25-28 Years	2.85%
	28+ Years	2%
Marital Status	Married	5.6%
	Unmarried	94.4%
Department	Medical and Allied Health	74.1%
	Other	25.9%
Residence	Day Scholar	81.5%
	Hostelite	18.5%

The caffeine consumption patterns of the participants are summarized, along with their preferred form, timing, and variations in use during stressful academic times. The majority of respondents (71%) said they drank caffeine, with

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tea accounting for the majority (69.2%), followed by coffee (21.2%) and other drinks including soda (9.6%). While a lower percentage reported drinking caffeine in the afternoon (13.9%), late at night (16.7%), or evening (28.7%), the majority (40.7%) preferred to use it in the morning. 35.2% of respondents said they used it more frequently during tests or deadlines, 16.7% said they used it occasionally, and 48.1% said they did not. Out of those studying at night, 24.1% always drank coffee, 29.6% occasionally, 12% infrequently, and 34.3% never. The majority (61.7%) reported no change, despite 31.6% of respondents believing caffeine enhances academic performance. Although 47.2% were ambivalent, about 35.8% agreed or strongly agreed that caffeine has academic benefits. While 45.4% were doubtful, one-fifth (20.4%) said it gives a competitive edge. Regarding classroom alertness, 28.3% of respondents said they always felt more aware after consuming caffeine, while 39.6% said they occasionally felt more alert. Furthermore, 40.7% of those surveyed said they had advised their peers to take caffeine. After consuming coffee in the evening, 46.7% of respondents reported having trouble falling asleep, and more than half (53.3%) reported having disturbed sleep. Caffeine has an impact on sleep patterns, according to half of the respondents (50%) who responded. The majority of individuals (52.8%) reported sleeping 6–8 hours on average, followed by 4–6 hours (27.3%), more than 8 hours (13.2%), and less than 4 hours (5.4%). Furthermore, after consuming large amounts of caffeine, 25.9% felt burnout or weariness, 25% occasionally reported it, and 49.1% reported no such effects (Table 2).

Table 2: Caffeine Consumption Habits among Study Participants

Variable	Category	Findings (%)
Consumption Habits	Caffeine Consumers	71%
Preferred Form:	Tea	69.2%
	Coffee	21.2%
	Other (Soda, etc.)	9.6%
Time of Day	Morning	40.7%
	Evening	28.7%
	Late Night	16.7%
	Afternoon	13.9%
Increased Use During Exams/Deadlines	Yes	35.2%
	Sometimes	16.7%
	No	48.1%
Use During Night Study Sessions	Always	24.1%
	Sometimes	29.6%
	Rarely	12%
	Never	34.3%
Perceived Effects on Academic Performance	Improves	31.6%
	No Change	61.7%
	Decreases	6.5%
Perceived Academic Benefits	Agree/Strongly Agree	35.8%
	Neutral	47.2%
	Disagree/Strongly Disagree	16.3%
Believe it Provides a Competitive Edge	Yes	20.4%
	No	34.3%
	Not Sure	45.4%
Alertness in Class	Always	28.3%
	Sometimes	39.6%
	Rarely	17%
	Never	15.1%
Have Recommended Caffeine to Peers	Yes	40.7%
	No	59.3%
Sleep and Health Impacts	Experience Disturbed Sleep	53.3%
	Difficulty Falling Asleep After Evening Intake	46.7%
	Agree Caffeine Intake Affects Sleep Patterns	50%
Average Sleep	<4 Hours	5%
	4-6 Hours	27.4%
	6-8 Hours	52.8%
	>8 Hours	13.2%
Experience Burnout/ Exhaustion After High Intake	Yes	25.9%
	Sometimes	25%
	No	49.1%
Awareness & Attitudes	Believe Caffeine Causes Dehydration	65.4%
Feel Guilt/Concern About Caffeine Use	Yes	19.4%
	No	80.6%
Actively Limit Caffeine Intake:	Yes	48.3%
	No	51.7%
Willing to Consider Healthier Alternatives	Yes	40.7%
	No	59.3%
Interested in Attending Seminar on Caffeine	Yes	66.7%
	No	33.3%

DISCUSSION

The findings of this study illuminate the complex and dualistic nature of caffeine consumption among university students in Pakistan. The high prevalence rate of 71% aligns closely with global trends reported in recent literature, reinforcing caffeine's status as a ubiquitous psychoactive substance in academic environments [17]. The overwhelming preference for tea (69.2%) as the primary vehicle for caffeine intake highlights a significant cultural and regional consumption pattern, distinguishing this cohort from Western populations where coffee is typically dominant [18]. A central finding of this research is the discrepancy between perceived academic benefit and measurable outcome. While a combined 35.8% of students agreed that caffeine offered academic benefits, the largest group (61.7%) reported no significant change in their actual academic performance. This perception-reality gap was supported by Yasmeen et al. which concluded that while caffeine reliably enhances subjective

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feelings of alertness and concentration, its effect on complex cognitive tasks and long-term academic grades is often negligible or inconsistent [19]. The small but notable percentage of students (6.5%) who reported a decline in performance underscores the risk of adverse effects like anxiety and burnout, which can ultimately undermine academic success. The significant sleep disturbances reported by our participants (53.3% experiencing disturbed sleep, 46.7% having difficulty falling asleep after evening intake) present a critical public health concern. These results are consistent with the mechanistic understanding that caffeine, as an adenosine receptor antagonist, directly disrupts sleep architecture [4]. A recent longitudinal study by Alqawasmi et al. specifically among medical students, found that nocturnal caffeine use was a stronger predictor of poor sleep quality than academic stress alone, creating a vicious cycle where students use more caffeine to combat fatigue induced by caffeine-related sleep loss [6]. This is further evidenced by our data showing that 24.1% of students always consume caffeine during all-night study sessions. Furthermore, an interesting awareness gap was observed. A majority of students (65.4%) correctly identified caffeine's dehydrating effect, demonstrating general health knowledge. However, this awareness does not appear to translate into proactive behavioral change, as 41.7% do not actively limit their intake, and a substantial portion continue to consume it in the late evening. This suggests that knowledge alone is insufficient to modify habits driven by academic pressure and peer influence, the latter being evident from the 40.7% who have recommended caffeine to peers. This social reinforcement of caffeine use has been identified as a key factor in normalizing its consumption among student populations [20]. The strong interest (66.7%) in attending a seminar on caffeine and academic health indicates a clear opportunity for university health services and student affairs departments to intervene. Educational campaigns should move beyond simply listing caffeine's effects and instead focus on practical strategies for responsible use. This includes promoting caffeine curfews, highlighting healthier alternatives for energy management (e.g., brief naps, physical activity), and integrating time-management and stress-reduction workshops into student orientation programs. Future research should employ longitudinal designs with objective measures of caffeine intake and academic records to better understand the causal pathways.

This study is limited by its cross-sectional design and reliance on self-reported data, which may introduce recall bias and prevent establishing causal relationships. Future research should employ longitudinal designs with larger, more diverse student populations and include objective measures of caffeine intake and academic performance. Additionally, investigating intervention strategies and promoting healthier alternatives could provide practical solutions to mitigate the adverse effects of caffeine while enhancing student well-being.

CONCLUSIONS

In conclusion, caffeine use among university students is a multifaceted issue characterized by a trade-off between perceived short-term cognitive benefits and tangible negative impacts on sleep and well-being. While students turn to caffeine as a tool to meet academic demands, its unregulated use can paradoxically hinder performance through sleep disruption and side effects. A proactive, educational approach that empowers students with strategies for sustainable energy management is crucial to fostering a healthier academic environment.

Authors' Contribution

Conceptualization: MA, AD
Methodology: AD, LK
Formal analysis: NZ, MAR, AK
Writing and Drafting: NZ, MAR, AK
Review and Editing: NZ, MAR, AK, NZ, MA, AD, LK

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

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