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# Use of Caffeinated Drinks for Stress in Medical Students

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## ABSTRACT

**Background:** Academic stress is common in medical training and may influence health behaviors, including the use of caffeinated beverages to sustain alertness and cope with demanding study schedules. **Objective:** To determine the prevalence and patterns of caffeinated drink consumption, perceived effectiveness for stress management, adverse effects, and the association between academic stress and caffeine use for stress management among medical students. **Methods:** This cross-sectional observational study was conducted from September to October 2025 among 241 MBBS students at a teaching hospital in Multan, Pakistan. A structured self-administered questionnaire assessed demographics, caffeinated drink use, timing and frequency, academic stress and symptoms, intentional use for stress management, perceived effectiveness on a 5-point scale, alertness, and side effects. Associations were evaluated using chi-square tests, with effect estimates reported as risk ratios and odds ratios. **Results:** Most participants consumed caffeinated drinks (83.0%), primarily tea (65.5% of consumers). Academic stress was reported by 78.4%. Caffeine was used specifically for stress management by 39.0%, with moderate perceived effectiveness (mean  $3.15 \pm 0.92$ ). Stressed students were more likely to use caffeine for stress management than non-stressed students (46.0% vs 13.5%;  $p < 0.001$ ). While 74.7% reported increased alertness, 46.9% reported side effects. **Conclusion:** Caffeinated drinks are widely used among medical students, and academic stress is strongly associated with using caffeine for stress management despite moderate perceived benefit and frequent adverse effects, supporting targeted education and institutional stress-reduction strategies. **Keywords:** caffeine; stress management; medical students; cross-sectional study; Pakistan

## Keywords

pediatric nursing; medication safety; administration errors; nursing practice; Pakistan; cross-sectional study.

## INTRODUCTION

Medical education is consistently characterized as a high-demand training environment in which sustained academic workload, frequent assessments, and performance pressure contribute to substantial psychological distress among students, with downstream effects on learning, wellbeing, and professional development (1-5). Alongside stress-related outcomes such as anxiety, depressive symptoms, and burnout, disturbed sleep and fatigue are commonly reported in student populations, particularly during periods of intense academic activity, and these symptoms may amplify perceived stress and impair coping capacity (2-6). Within this context, students often adopt readily available, socially acceptable coping behaviors to maintain wakefulness and concentration, including the consumption of caffeinated beverages (7).

Caffeine is the most widely used psychoactive stimulant worldwide and exerts its principal acute effects by antagonizing adenosine receptors, producing increased alertness and short-term improvements in vigilance and certain aspects of cognitive performance (8-10). Despite these perceived benefits, caffeine use is not uniformly benign; dose, timing, individual sensitivity, and concurrent stress may influence whether caffeine improves functioning or contributes to adverse neurobehavioral effects, including anxiety symptoms, sleep disruption, palpitations, and problematic use patterns (7-8). Experimental and epidemiological evidence indicates that caffeine taken later in the day can meaningfully impair sleep onset and quality, potentially creating a reinforcing cycle in which sleep loss increases subsequent caffeine intake, which then further worsens sleep (7-8).

Among students, beverage choice and consumption patterns vary by culture, access, and affordability, with tea commonly embedded in routine social and dietary practices in South Asia, while soft drinks, coffee, and energy drinks contribute additional sources of caffeine with differing dose profiles and co-ingredients (4-15). Prior work has described caffeine consumption patterns in student groups and medical trainees, but comparatively fewer studies have focused on caffeine intake as an intentional strategy for stress management, particularly in South Asian medical schools where both stress burden and caffeine accessibility are high (2-3). Furthermore, while caffeine may be perceived as a practical method for coping with academic demands, emerging evidence suggests that caffeine-related stimulation may also interact with psychological distress and stress physiology, potentially intensifying symptoms that students seek to alleviate (9-11).

Accordingly, the present study addressed a clinically and educationally relevant gap by quantifying the prevalence and patterns of caffeinated drink consumption among Pakistani medical students and by examining whether students who report academic stress are more likely to use caffeinated drinks specifically for stress management, alongside perceived effectiveness and adverse effects (12). Using a cross-sectional approach, we framed the question around a defined population of undergraduate medical students, the exposure of caffeinated drink use for stress management, and the outcomes of academic stress experience, perceived effectiveness, and self-reported side effects. The primary research objective was to determine

the prevalence of caffeinated drink consumption and to evaluate the association between academic stress and caffeinated drink use for stress management, with secondary objectives assessing patterns of use, perceived alertness, perceived effectiveness, and adverse effects.

## MATERIALS AND METHODS

A cross-sectional observational study was conducted among MBBS students at Nishtar Medical University and Hospital, Multan, Pakistan, from September to October 2025. The study was designed to estimate the prevalence and patterns of caffeinated drink consumption and to evaluate associations between academic stress experience and the intentional use of caffeinated drinks for stress management within the same time window, consistent with the strengths and limitations inherent to cross-sectional designs (21). All currently enrolled MBBS students who were willing to participate and provided consent were eligible for inclusion.

Participants were recruited using an in-class and/or campus-based approach during the study period, and participation was voluntary. Data were collected through a structured, self-administered questionnaire delivered electronically with embedded informed consent. The instrument captured demographic characteristics (age, gender, year of study, and living situation), caffeinated drink consumption status (consumer vs non-consumer), primary beverage type (tea, soft drinks, coffee, energy drinks), consumption frequency (rarely, once daily, twice daily), and timing/motivation of consumption (daily habit, during exams, when stressed, during study). Academic stress was assessed as a binary self-report of experiencing academic stress (yes/no) and further characterized by a checklist of commonly reported stress-related symptoms (anxiety, sleep disturbance, headache, fatigue, negative thinking), reflecting established symptom domains described in medical student wellbeing literature (1-5). Use of caffeine for stress management was captured as a binary variable (yes/no), and perceived effectiveness among those endorsing use for stress management was measured on a 5-point Likert scale, summarized as a mean score with standard deviation and categorical distribution. Self-reported outcomes after caffeine intake included perceived alertness (yes/no) and adverse effects (yes/no), consistent with known caffeine-related sleep and neuropsychiatric effects (7-12). The primary exposure for inferential analysis was “use of caffeinated drinks for stress management” (yes/no), and the primary outcome was “academic stress experience” (yes/no). The principal association was evaluated using Pearson’s chi-square test, with effect size quantified using the phi coefficient for the 2×2 table, and association magnitude reported as both risk ratio and odds ratio with 95% confidence intervals to improve interpretability for educational and health decision-making (16). Given the observational design, potential confounding by demographic factors was assessed descriptively and planned for categorical comparisons using chi-square testing; analyses were performed using SPSS version 27 with two-sided significance set at  $p < 0.05$ . Missing data were handled by complete-case analysis for each variable as exported from the questionnaire dataset, preserving denominators for each table as appropriate. Ethical approval was obtained from the Institutional Ethical Review Board of Nishtar Medical University and Hospital (Ref: 14500), and all participants provided electronic informed consent prior to questionnaire completion.

## RESULTS

A total of 241 medical students participated (mean age  $21.0 \pm 1.6$  years; range 17–29 years). Most participants were male (73.9%,  $n=178$ ), third-year students constituted 59.3% ( $n=143$ ), and the majority resided in hostels (76.8%,  $n=185$ ), as summarized in Table 1.

*Table 1. Demographic characteristics of participants (N=241)*

Characteristic	n	%
Age (years), mean $\pm$ SD	21.0 $\pm$ 1.6	—
Age range (years)	17–29	—
Male	178	73.9
Female	63	26.1
Year 1	36	14.9
Year 2	38	15.8
Year 3	143	59.3
Year 4	24	10.0
Hostel	185	76.8
Home	54	22.4
Rented	2	0.8

*Table 2. Caffeinated drink consumption patterns*

Variable	n	%
Uses caffeinated drinks	200	83.0
Does not use	41	17.0
Beverage type		
Tea	131	65.5
Soft drinks	40	20.0
Coffee	19	9.5
Energy drinks	10	5.0
Consumption frequency		
Rarely	55	27.5
Once daily	72	36.0
Twice daily	73	36.5
Timing / motivation		
Daily habit	92	46.0
During exams	46	23.0
When stressed	37	18.5
During study	25	12.5

Overall, 83.0% (n=200) reported consuming caffeinated drinks. Tea was the predominant beverage (65.5%, n=131 of consumers), followed by soft drinks (20.0%, n=40), coffee (9.5%, n=19), and energy drinks (5.0%, n=10). Consumption frequency among consumers was distributed as twice daily (36.5%, n=73), once daily (36.0%, n=72), and rarely (27.5%, n=55). The most common timing/motivation was daily habit (46.0%, n=92), followed by consumption during exams (23.0%, n=46), when stressed (18.5%, n=37), and during study (12.5%, n=25), shown in Table 2. Academic stress was reported by 78.4% (n=189). Anxiety was the most frequently reported symptom (32.8%, n=79), followed by sleep disturbance (20.7%, n=50), headache (18.7%, n=45), fatigue (17.4%, n=42), and negative thinking (10.4%, n=25), summarized in Table 3.

Table 3. Academic stress experience and symptoms (N=241)

Variable	n	%
Experiences academic stress	189	78.4
Does not experience academic stress	52	21.6
Anxiety	79	32.8
Sleep disturbance	50	20.7
Headache	45	18.7
Fatigue	42	17.4
Negative thinking	25	10.4

Only 39.0% of all participants (n=94) reported using caffeine specifically for stress management. Among these (n=94), the mean perceived effectiveness score was  $3.15 \pm 0.92$  on a 5-point scale, with most respondents rating caffeine as moderately effective (43.6%, n=41) or very effective (29.8%, n=28), as shown in Table 4. Regarding perceived acute effects and adverse outcomes in the full sample, 74.7% (n=180) reported feeling more alert after caffeine intake and 46.9% (n=113) reported experiencing side effects (Table 5).

Table 4. Perceived effectiveness of caffeine for stress management (n=94)

Effectiveness rating	n	%
Not effective	4	4.3
Minimally effective	16	17.0
Moderately effective	41	43.6
Very effective	28	29.8
Extremely effective	5	5.3
Mean $\pm$ SD (5-point scale)	3.15 $\pm$ 0.92	—

Table 5. Self-reported alertness and adverse effects after caffeine (N=241)

Outcome	n	%
Feels more alert after caffeine	180	74.7
Reports side effects	113	46.9

Table 6. Association between academic stress and caffeine use for stress management (N=241)

Academic stress	Uses caffeine for stress n (%)	Does not use caffeine for stress n (%)	Total	Effect estimates	p-value
Yes (n=189)	87 (46.0)	102 (54.0)	189	RR 3.42 (95% CI 1.69–6.93); OR 5.48 (95% CI 2.35–12.78)	<0.001
No (n=52)	7 (13.5)	45 (86.5)	52	$\chi^2 = 16.84$ ; phi = 0.26	
Total	94	147	241		

A statistically significant association was observed between academic stress experience and using caffeine for stress management ( $\chi^2 = 16.84$ ,  $p < 0.001$ ). Among stressed students, 46.0% (87/189) used caffeine for stress management compared with 13.5% (7/52) among non-stressed students, corresponding to a risk ratio of 3.42 (95% CI 1.69–6.93) and an odds ratio of 5.48 (95% CI 2.35–12.78). The effect size for this 2x2 association was moderate (phi = 0.26). These results are presented in Table 6.

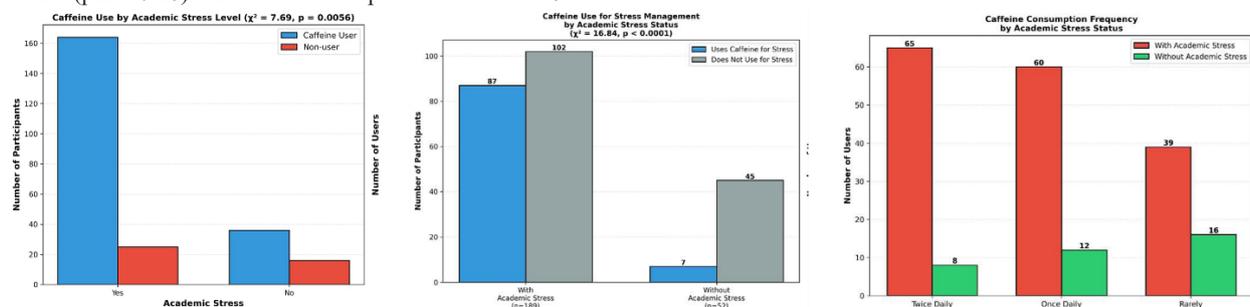


Figure 1 Figure. Association of academic stress with caffeine-related behaviours among medical students: (A) overall caffeine use by academic stress level, showing higher prevalence of caffeine consumption among stressed students; (B) use of caffeine specifically for stress management by academic stress status, demonstrating a statistically significant association ( $\chi^2 = 16.84$ ,  $p < 0.0001$ ); and (C) caffeine consumption frequency stratified by academic stress status, indicating more frequent daily use among students experiencing academic stress.

## DISCUSSION

This study demonstrates a high prevalence of caffeinated drink consumption among medical students, with more than four out of five participants reporting use, aligning with the broader understanding that medical training environments are associated with elevated psychological burden and

behavioral adaptations aimed at sustaining performance (1-5). The predominance of tea as the primary beverage is consistent with regional dietary norms and the accessibility of tea relative to other caffeinated products, and it plausibly reflects both cultural preference and affordability-driven selection rather than a deliberate choice based on caffeine dose awareness (4-16). The observed pattern of frequent daily consumption and increased use during examination periods is consistent with evidence that students employ stimulants to offset fatigue and extend study time during high-demand intervals (2).

A key finding is the strong association between academic stress and using caffeine specifically for stress management, with stressed students demonstrating substantially higher uptake of this coping behavior. While caffeine may be perceived as beneficial for alertness and task engagement through adenosine receptor antagonism, its role as a stress-management tool is more ambiguous because stimulation can overlap with anxiety symptomatology and exacerbate arousal-related distress, especially in individuals already under psychological strain (8-12). In the present sample, perceived effectiveness was moderate on average, which is consistent with the concept that caffeine may improve vigilance and subjective energy without reliably improving stress coping in a durable way, and that perceived relief may be short-lived or context-dependent (10).

The coexistence of high self-reported alertness and a substantial burden of side effects suggests that students may be trading short-term gains for potentially meaningful adverse outcomes. Sleep disruption is particularly salient because randomized trials and systematic reviews indicate that caffeine consumption near bedtime impairs sleep onset and sleep quality, and chronic sleep disturbance may intensify perceived stress and cognitive inefficiency, thereby prompting further caffeine use and reinforcing a maladaptive cycle (7-8). Neuropsychiatric literature similarly indicates that caffeine can contribute to anxiety symptoms and, in susceptible individuals, exacerbate panic-related experiences, which may be especially relevant in a population already reporting high anxiety prevalence (12-13). In addition, physiological stress responses to caffeine exposure, including cortisol stimulation across waking hours, may interact with academic stress physiology and contribute to distress persistence in habitual users (11). The association observed here should therefore be interpreted as behaviorally meaningful and potentially clinically relevant, even though causality cannot be inferred due to cross-sectional sampling (21).

From a preventive and educational standpoint, these findings support the need for student wellness approaches that address both upstream academic stressors and downstream coping behaviors. Given that energy drinks and certain coffee preparations can contain high caffeine doses and may be combined with other stimulants, awareness of cumulative daily intake and individual sensitivity is critical, and population-level guidance has emphasized prudent consumption limits and risk awareness (15-16). At the institutional level, curricular and support interventions aimed at improving student mental health—particularly those integrating systems-level changes and accessible wellness programming—have demonstrated benefit in medical education contexts (18). Structured mindfulness-based approaches have also shown reductions in stress-related outcomes in medical and premedical student populations, supporting implementation as part of broader wellbeing strategies rather than relying on stimulant use as a coping surrogate (19-20). The present findings, therefore, justify integrating evidence-based stress management and sleep hygiene interventions into medical school policy while simultaneously providing targeted education on responsible caffeine use and recognition of adverse effects.

This study has limitations that should temper interpretation. The single-institution design may limit generalizability to other Pakistani medical schools with different academic cultures or beverage availability. Self-reported measures introduce recall and social desirability bias, and caffeine exposure was not quantified in milligrams, limiting dose–response inference despite the relevance of dose and timing to sleep and anxiety outcomes (7-12). Future longitudinal work could better clarify temporal directionality between stress, caffeine initiation/escalation, sleep disruption, and psychological symptoms, and could incorporate objective exposure estimation and standardized stress instruments to strengthen inference, consistent with prior longitudinal approaches in medical student stress research (21-22).

## CONCLUSION

Caffeinated drink use was highly prevalent among Pakistani medical students, with tea as the dominant source, and academic stress affected the majority of participants; students experiencing academic stress were substantially more likely to use caffeine specifically for stress management despite only moderate perceived effectiveness and a considerable frequency of self-reported side effects, supporting the need for institutional wellness initiatives that promote evidence-based stress management and sleep-supportive strategies alongside education on safe and responsible caffeine consumption.

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