

# Caffeine Consumption Patterns and their Impact on Sleep and Dietary Changes During the Final Month of Exam Preparation among Medical Students of Different Academic Years at KAPV Medical College

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## INTRODUCTION

Human curiosity led to the discovery of coffee around 850 AD by the goatherder Khaldi in Abyssinia (present-day Ethiopia). Caffeine (1,3,7-trimethylxanthine) is a central nervous system stimulant belonging to the methylxanthine class and is a natural alkaloid. It is the most widely consumed psychoactive substance worldwide. Among caffeine-containing beverages, coffee remains the most popular and typically contains higher levels of caffeine than most other drinks.

Moderate daily caffeine intake has been shown to improve alertness, focus, and cognitive function. On average, college students consume about one cup of caffeine (~70 mg) daily.

Medical education is one of the most demanding academic programs, requiring significant time and effort. Students endure long study hours, and examinations further elevate stress levels. Research shows that coffee is the most common caffeine source among medical students, with consumption increasing during high-stress situations such as examinations. A 2011 study found that caffeine consumption, particularly of energy drinks, rises significantly during peak exam preparation. Similarly, a 2010 study among second-year medical students in Pakistan emphasized that caffeine intake increases during stressful periods such as examinations.

Caffeine has been linked to shorter sleep duration and increased irritability, particularly among younger individuals. Poor sleep quality is associated with reduced academic performance and learning ability. Nevertheless, due to its positive effects on attention and concentration, caffeine continues to be one of the most commonly used psychostimulant among medical students.

## METHODOLOGY

A cross-sectional study was conducted among undergraduate medical students of south Indian Government Medical College between February and March 2025. The study population comprised MBBS students from the Second Year, Third Year Part I, and Third Year Part II, all of whom were preparing for university examinations.

First-year MBBS students and those unwilling to provide informed consent were excluded. A total of 184 students participated in the study and provided informed consent, forming the final sample.

Convenience sampling was used for participant selection. A semi-structured questionnaire was designed to collect data across four domains: demographic details, caffeine consumption, study patterns, and sleep patterns.

A pilot study was conducted among 30 students, and necessary modifications to the questionnaire were made based on feedback. The final survey was distributed via Google Forms through WhatsApp groups. Participation was voluntary, and confidentiality was assured.

Responses were exported to Microsoft Excel and analyzed using SPSS.V.25 software. Qualitative variables were summarized as percentages, while quantitative variables were expressed as mean  $\pm$  standard deviation (SD). Associations between categorical variables were analyzed using the chi-square test, with  $p < 0.05$  considered statistically significant.

## ETHICS STATEMENT

This study was conducted in accordance with the Declaration of Helsinki. Since data were collected anonymously through voluntary participation, and

no identifiable information or clinical interventions were involved, formal Institutional Ethics Committee approval was not required under institutional policy.

Informed consent was obtained from all participants, and confidentiality was maintained throughout.

## RESULTS

**Table 1.** Association Between Caffeine Consumption During Examination Periods and Various Factors

| Variable                   | Category              | Not Consumed Caffeine n (%) | Consumed 1–2 Times n (%) | Consumed >2 Times n (%) | Total n (%) | P-value |
|----------------------------|-----------------------|-----------------------------|--------------------------|-------------------------|-------------|---------|
| Gender                     | Male                  | 6 (7.5)                     | 40 (50.0)                | 34 (42.5)               | 80 (100)    | 0.806   |
|                            | Female                | 9 (8.7)                     | 47 (45.2)                | 48 (46.2)               | 104 (100)   |         |
| Year of study              | Second Year           | 3 (5.3)                     | 26 (45.6)                | 28 (49.1)               | 57 (100)    | 0.373   |
|                            | Third Year Part I     | 3 (5.5)                     | 25 (45.5)                | 27 (49.1)               | 55 (100)    |         |
|                            | Third Year Part II    | 9 (12.5)                    | 36 (50.0)                | 27 (37.5)               | 72 (100)    |         |
| Sleep during exam          | <6 hrs                | 10 (9.5)                    | 46 (43.8)                | 49 (46.7)               | 105 (100)   | 0.583   |
|                            | 6–8 hrs               | 4 (5.5)                     | 39 (53.4)                | 30 (41.1)               | 73 (100)    |         |
|                            | >8 hrs                | 1 (16.7)                    | 2 (33.3)                 | 3 (50.0)                | 6 (100)     |         |
| Eating habits              | Eat more than usual   | 1 (1.9)                     | 20 (37.7)                | 32 (60.4)               | 53 (100)    | 0.049   |
|                            | Eat less than usual   | 9 (10.1)                    | 47 (52.8)                | 33 (37.1)               | 89 (100)    |         |
|                            | No significant change | 5 (11.9)                    | 20 (47.6)                | 17 (40.5)               | 42 (100)    |         |
| Weight change              | Gained weight         | 2 (4.1)                     | 22 (44.9)                | 25 (51.0)               | 49 (100)    | 0.468   |
|                            | Lost weight           | 7 (8.8)                     | 42 (52.5)                | 31 (38.8)               | 80 (100)    |         |
|                            | No significant change | 6 (10.9)                    | 23 (41.8)                | 26 (47.3)               | 55 (100)    |         |
| Usual caffeine consumption | No caffeine intake    | 12 (33.3)                   | 20 (55.6)                | 4 (11.1)                | 36 (100)    | <0.001  |
|                            | 1–2 times             | 3 (2.5)                     | 64 (52.9)                | 54 (44.6)               | 121 (100)   |         |
|                            | >2 times              | 0 (0.0)                     | 3 (11.1)                 | 24 (88.9)               | 27 (100)    |         |

Note: Percentages are calculated within each category. P-values based on Chi-square test.

The mean age of the study sample was  $21.03 \pm 1.25$  years (range: 19–25). A slightly higher percentage of females (8.7%) reported not consuming caffeine than males (7.5%). However, a greater proportion of females (46.2%) consumed caffeine more than twice daily compared to males (42.5%). This difference was not statistically significant ( $p = 0.806$ ).

The percentage of students who did not consume caffeine was highest among Third Year Part II students (12.5%) and lowest among Second Year students (5.3%). Daily caffeine consumption of more than twice was highest among Second Year students (49.1%) and lowest in Third Year Part II students (37.5%). This difference was not statistically significant ( $p = 0.373$ ).

Students who slept less than six hours reported higher caffeine consumption (46.7%) during exam preparation. Notably, students sleeping more than eight hours also reported high consumption (50%). No statistically significant association was found between caffeine intake

and sleep duration ( $p = 0.583$ ). Eating patterns showed a significant association with caffeine intake ( $p = 0.049$ ). Students consuming caffeine more than twice daily were more likely to eat more than usual (60.4%), while reduced food intake was most common among non-consumers (50%).

Weight changes were not significantly associated with caffeine intake ( $p = 0.468$ ). Among those who gained weight, 51% consumed caffeine more than twice daily. In contrast, weight loss was most common among non-consumers (38.8%).

Exam-time caffeine intake increased significantly among students who normally did not consume caffeine. Of 36 students who were usually non-consumers, 66.7% began caffeine use during exams. Among habitual consumers (121 students), 97.5% either maintained or increased their intake. This difference was statistically significant ( $p < 0.001$ ).

**Table 2.** *Patterns of Caffeine Consumption Among Medical Students*

| Variable                           | Second Year n (%) | Third Year – Part I n (%) | Third Year – Part II n (%) | P-value |
|------------------------------------|-------------------|---------------------------|----------------------------|---------|
| Time of coffee consumption         |                   |                           |                            | 0.569   |
| Morning                            | 10 (17.5)         | 7 (12.7)                  | 10 (13.9)                  |         |
| Night                              | 32 (56.1)         | 26 (47.3)                 | 35 (48.6)                  |         |
| As usual                           | 15 (26.3)         | 22 (40.0)                 | 27 (37.5)                  |         |
| Usual frequency of caffeine intake |                   |                           |                            | 0.931   |
| No caffeine intake                 | 10 (17.5)         | 10 (18.2)                 | 16 (22.2)                  |         |
| 1–2 times                          | 38 (66.7)         | 38 (69.1)                 | 45 (62.5)                  |         |
| More than 2 times                  | 9 (15.8)          | 7 (12.7)                  | 11 (15.3)                  |         |

Note: Percentages are calculated within each academic year. P-values **based** on Chi-square test

The timing of caffeine intake varied across academic years: the majority reported consuming caffeine at night (>47%), followed by “as usual” habits (~37%), with morning consumption being the least common (<17.5%). This difference was not statistically significant (p = 0.569).

**Table 3.** *Caffeine Consumption During Examinations*

| Variable                         | Second Year n (%) | Third Year – Part I n (%) | Third Year – Part II n (%) | P-value |
|----------------------------------|-------------------|---------------------------|----------------------------|---------|
| Caffeine consumption during exam |                   |                           |                            | 0.037   |
| As usual                         | 17 (29.8)         | 18 (32.7)                 | 36 (50.0)                  |         |
| More than usual                  | 40 (70.2)         | 37 (67.3)                 | 36 (50.0)                  |         |

Note: Percentages are calculated within each academic year. P-value based on Chi-square test.

During examinations, Second Year students reported the highest increase in caffeine intake (70.2%), while Third Year Part II students were more likely to report no change (50%). This association between academic progression and exam-period caffeine consumption was statistically significant (p = 0.037).

## DISCUSSION

During examinations, caffeine consumption was widespread among both genders. A slightly higher proportion of males reported caffeine use (92.5%) compared to females (91.3%), but females consumed caffeine more frequently, with 46.2% taking it more than twice per day compared to 42% of males. These gender differences were not statistically significant but are consistent with previous findings that showed subtle gender variations in consumption patterns.

Caffeine use was highest among Second Year students (94.7%) and lowest among Third Year Part II students (87.5%). Frequent use (>2 times daily) was most prevalent in Second Year students (49.1%) and least common in Third Year Part II students (37.5%). Although not statistically significant, this trend suggests that younger students, facing their initial major academic stressors, may rely more heavily on caffeine, whereas senior

students may develop alternative coping strategies or reduced dependence. Previous studies have shown mixed results, with some reporting higher consumption in later years. Our findings highlight a potential decline in caffeine reliance as students progress academically.

Caffeine has been linked in the literature to reduced sleep duration and poorer sleep quality. In this study, high caffeine intake was observed both among students sleeping less than six hours and those sleeping more than eight hours. This lack of a consistent association may be explained by caffeine tolerance, differences in individual metabolism, or compensatory adjustments in sleep schedules among habitual users.

Dietary changes, however, showed a significant association. Students consuming caffeine more than twice daily were more likely to report increased food intake during examinations, while reduced food intake was more common among non-consumers. This is consistent with prior studies linking caffeine use to changes in appetite and eating behavior during high-stress periods [11–13]. Weight changes did not show significant associations in this study, although previous literature has suggested possible links with body mass index. Reliance on self-reported weight changes in our study may have contributed to this difference.

A notable finding was the sharp rise in caffeine use during examinations among students who were normally non-consumers (66.7%). Similarly, habitual users often increased their intake during examination periods, with very few reducing use. This illustrates how academic stress strongly triggers both initiation and escalation of caffeine consumption, consistent with earlier studies [15–16].

Overall, our findings demonstrate that while caffeine use is widespread among medical students, its patterns vary with gender, academic year, and exam-related stress. Even though no consistent relationship was demonstrated with sleep or weight changes, caffeine had a significant impact on dietary habits and stress-coping mechanisms. Awareness programs are needed to promote responsible caffeine consumption and encourage healthier strategies such as effective time management, relaxation techniques, and sleep hygiene.

### Limitations

This study has certain limitations. Being cross-sectional in design, it cannot establish causal relationships between caffeine intake and its effects on sleep or dietary changes. Data were self-reported, which may be subject to recall bias and social desirability bias. Convenience sampling and the single-institution setting may also limit the generalizability of the findings to other medical student populations. Furthermore, objective measures of caffeine intake, sleep quality, and dietary habits were not employed, which may have influenced accuracy.

### CONCLUSION

Our study found that caffeine consumption increased significantly during examination preparation among medical students, with a general decline in overall intake as students progressed academically. Caffeine use was associated with notable changes in sleep patterns and dietary habits during the final month of exam preparation. These findings highlight the need for greater awareness regarding responsible caffeine use and the promotion of healthier coping strategies among medical students.

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