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Patterns of caffeine consumption among medical undergraduates in Secunderabad, Telangana, India

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Abstract:

BACKGROUND: Caffeine products are increasingly found in a wide range of products that abuse of the substance may be unnoticed. Introduction of new energy drinks has led to an increase in consumption of caffeine in the last few decades. Caffeine is a cognitive booster and has physically enhancing effects, leading to its higher consumption across various age groups. The objective of this study was to determine patterns of caffeine consumption and to determine the knowledge and awareness of side effects and safety limits of caffeine consumption among medical undergraduate students.

MATERIAL AND METHODS: A cross-sectional study was conducted from December 2021 to February 2022 in the Department of Community Medicine at a tertiary care institute, Secunderabad, Telangana, India, among 560 medical undergraduate students of all academic years. A predesigned, pretested, semistructured questionnaire was administered.

RESULTS: The mean age of the study population was 19.09 years, and female preponderance (61.2%) was noted. The average self-reported caffeine consumption was 151.3 mg/day. The average caffeine consumption was found to be higher among males (174 mg/day) as compared to females (137 mg/day). The average consumption of caffeine during exam time was higher than the daily ceiling limit, >300 mg/day, in 38.1% of students, which was statistically significant ($P = 0.015$).

CONCLUSIONS: Caffeine consumption during times of stress increased among medical students, which is an unfavorable sign as the majority of the times, medical students in future have to deal with physically and emotionally stressful situations during work hours.

Keywords:

Caffeinated beverages, caffeine consumption, medical students

Introduction

Caffeine acts as a mental and physical stimulator and is the most common psychoactive drug which is consumed by college students all over the world. Consumption of caffeine speeds up the respiratory rate, heart rate, thoughts, and actions. People consume caffeine for physical endurance and most importantly for increased and improved mental activity. Caffeine products are increasingly found in a wide range of products that abuse of the substance may be unnoticed. Over the past few decades, the introduction of new energy

drinks has led to an increase in consumption of caffeine. Previous literature was found to report improved memory, faster locomotor speed, improved academic performance during exams, and vigilance in performing tasks as the reasons for behind caffeine consumption.^[1]

A variety of everyday foods and beverages contain caffeine, which includes coffee, tea, soft drinks, energy drinks, chocolate, and pain-relieving and migraine medication. Previous studies reported that one cup (approximately 240 ml of volume) of caffeinated coffee has ± 137 mg/cup of caffeine and a cup of decaffeinated coffee has ± 2 mg/cup of caffeine. The caffeine content

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in one cup of tea is around ± 47 mg and ± 46 mg/340 ml in caffeinated soft drinks. The recent category of food products, that is, energy drinks, contains up to 80 mg/can of caffeine and caffeinated chocolates; nonbeverage foodstuff and medications have roughly around ± 7 mg/200 g of caffeine.^[2,3]

A recent study conducted among medical students of Dow university has shown that 94% of medical students consume caffeine daily.^[4] Another study conducted among medical students of the University of Jordan reported that the prevalence of consuming at least one type of caffeinated beverage was 98.4%.^[5] A study conducted in Kanchipuram district of South India among medical students also replicated similar results in which 98% of students were caffeine consumers on a regular basis. Almost 72% of students consumed 199 mg/day, 23.3% consumed 399 mg/day, and 2.7% consumed 400 mg/day.^[6] A study conducted in Chennai by Edward *et al.*^[7] also showed that 97% of medical students were low-category caffeine consumers and 3% were moderate-category consumers. However, the consumption of caffeine increased during exam days. Medical students are at a higher risk of excessive caffeine consumption due to the vast curriculum and humungous syllabus in each professional year, which requires longer and continuous study hours. Medical students are subjected to regular academic tests in the form of internal assessments and university examinations, which makes them prone to stress. A study among the medical students of first and second professional years reported that 49% of medical students used caffeinated products as it helped them to cope with the academic stress.^[8]

Most medical students consume caffeine to stay awake, alert, and achieve higher levels of concentration while studying. The adverse effects of caffeine like headache, palpitations, anxiety, and insomnia are often overlooked by the college students due to limited knowledge or due to momentary better ergogenic effects of caffeine.^[9]

From the previous literature, it is evident that caffeine consumption is higher among medical students and that there is a need to create awareness about safety limits of caffeine and also the possible side effects of excessive caffeine consumption among medical students. Hence, this study was undertaken to determine patterns of caffeine consumption among medical undergraduate students and to determine the knowledge and awareness of side effects and safety limits of caffeine consumption among study subjects.

Material and Methods

Study design and setting

A cross-sectional study was conducted in the Department of Community Medicine at a public tertiary care institute,

Secunderabad, Telangana, India, among medical undergraduate students (Bachelor of Medicine and Bachelor of Surgery – MBBS).

Study participants and sampling

There are a total of 200 medical undergraduates with intake every academic year in the present teaching hospital/tertiary care institute. There will be a total of 800 medical undergraduate students of all professional years at this tertiary care institute. All efforts were taken to ensure a higher number of students take part in the study. Students who have given informed consent were taken. Two extra attempts were made for the students who were absent on first contact of data collection for each professional year. Students who were absent for 3 consecutive days of data collection could not be a part of a study. A total of 560 medical undergraduates of all academic/professional MBBS years have participated in the study. The participation rate of study subjects was 70%, which aims to achieve sufficient power to detect meaningful differences and ensure generalizability of findings. The study was conducted for a duration of 3 months from December 2021 to February 2022.

Data collection tools and technique

A predesigned, pretested, semistructured questionnaire was administered to the study subjects after obtaining informed consent. Data regarding consumption of caffeine on a daily basis, knowledge on daily ceiling limit, caffeinated products, consumption pattern during exams, statutory label awareness of products they consume, and awareness of side effects were collected. The questionnaire was semistructured as it had both open- and closed-end questions. Open-ended questions were used to obtain demographic information and caffeine consumption data, and closed-ended questions were used to obtain information of caffeinated beverage knowledge and awareness. The content validity of the questionnaire was established by subject experts and by conducting pilot study among 50 medical undergraduate students of all professional years. These students were excluded from the final results. The internal consistency coefficients indicated acceptable reliability of the tool (Cronbach's $\alpha = 0.75$).

Data entry and analysis

The collected data were entered and analyzed using MS Excel and SPSS Software, Statistical Package for Social Sciences (v. 21). Descriptive statistics were expressed in percentages, and test of significance, that is, Chi-square test, was applied to compare proportions and a significance level of $P < 0.05$ was considered.

Ethical consideration

Institutional Ethics Committee approval (Rc.No. IEC/GMC/2021/03/36) was obtained before the start of

the study. Written informed consent was obtained from all the study participants before administering the questionnaire. Personal data or identification data of study participants were not collected to ensure confidentiality. Unique identifiers were generated for each data collection sheet to ensure smoother entry of data and analysis.

Results

A total of 560 participants aged between 17 and 22 years participated in the study. The mean age of the study population was 19.09 years. Around 32.7% were 18 years old, 26% were 20 years old, and 24.5% were 19 years old. Almost 9.2% were 21 years old, 5.3% were 17 years old, and 2.3% were 22 years of age. Table 1 shows 42.5% were hostellers and 57.5% were day scholars.

In this study, female preponderance (61.2%) was seen. Males accounted only for 38.8% of study subjects. Figure 1 depicts that majority (47%) were from 1st Professional year.

In this study, all the study participants were consuming caffeine on a daily basis. The average self-reported caffeine consumption was 151.3 mg/day. The average caffeine consumption was found to be higher among males (174 mg/day) as compared to females (137 mg/day).

In this study, it was observed that maximum caffeine consumption was among 22-year-old students (164.5 mg/day) followed by 19-year-old students (160.4 mg/day) [Figure 2].

It was observed that study subjects who started consuming caffeinated beverages at a younger age had higher average daily consumption of caffeine in the present times [Figure 3]. In this study, it was also observed that males had higher levels of knowledge about caffeine and caffeinated products (energy drinks, soft drinks, chocolate, medication, etc.) as compared to females. It was also found that students consumed excessive amounts of caffeine and caffeinated products during examinations, implying higher stress and anxiety during exams led to higher consumption of caffeine. The average consumption of caffeine during exams was more than the daily ceiling limit, that is, >300 mg/day among a majority (38.1%) of students. This difference in caffeine consumption was found to be statistically highly significant (Chi-square value = 5.85; $P = 0.015$) [Figure 4].

Table 1: Distribution of study subjects as per their residential status

Residential status of study subjects	Frequency (%)
Hostellers	238 (42.5%)
Day scholars	322 (57.5%)
Total	560 (100)

In this study, 64.4% of total subjects and 67.1% of females and 60.1% of males did not read the statutory

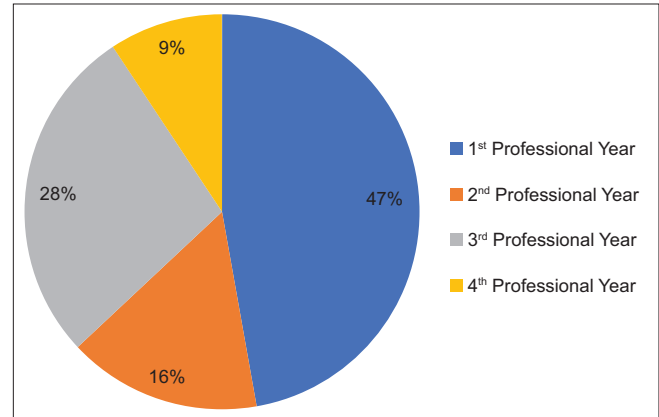


Figure 1: Distribution of study subjects as per their year of study (%)

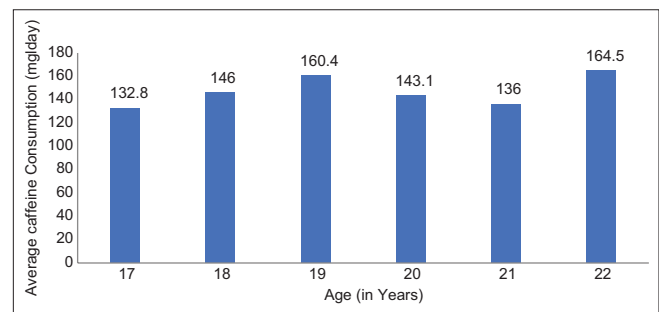


Figure 2: Variation in average caffeine consumption (mg/day) with age

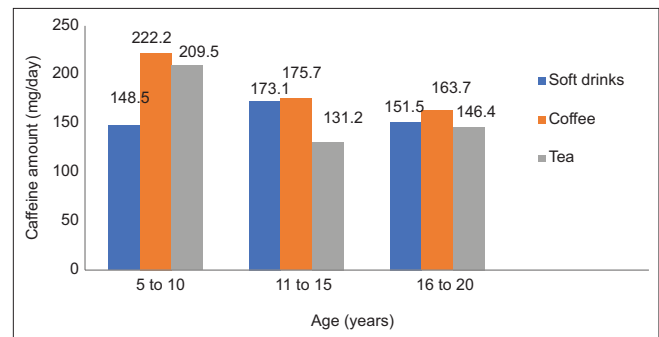


Figure 3: Caffeine consumption vs age of starting

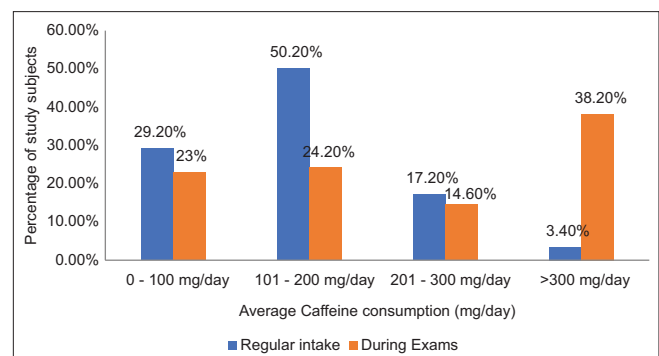


Figure 4: Caffeine consumption - Regular intake vs exams time

label and the difference was found to be statistically not significant (Chi-square value – 1.736; $P = 0.18$). It was also found that 58% of total study subjects and 55.2% of females and 62.4% of males did not have any knowledge about side effects of caffeine consumption. The difference in knowledge across gender was found to be statistically not significant (Chi-square value – 1.717; $P = 0.19$).

Almost 80.4% of the female study subjects and 86.4% of male study subjects did not have knowledge/awareness about the daily ceiling dose of caffeine. The difference was found to be statistically not significant as almost 82.7% of total study subjects did not have awareness about the daily ceiling dose of caffeine (Chi-square value – 2.05; $P = 0.15$).

Discussion

Caffeine is one of the widely used beverage globally as it is a neurostimulator. Caffeine is found in many drinks such as tea, coffee, chocolate, soft drinks, and energy drinks, which are regularly consumed in day-to-day life. Students often reach out for these drinks before a sports event or a long study session as this stimulator gives physical drive for completion of activity. Medical students are at greater risk of dependency of caffeine because of their extensive curriculum which needs to be completed in limited time frame and it requires longer levels of mental and physical functioning.

The mean age of the study population was 19.09 years, and female preponderance (61.2%) was observed. This finding concurred with a study by Afroz MN *et al.*,^[10] in which a majority (44.3%) were 20–21-year-old and 79.4% were female study subjects.

In this study, all the study participants were consuming caffeine on a daily basis. The average self-reported caffeine consumption was 151.3 mg/day, and the consumption was higher among males (174 mg/day) as compared to females (137 mg/day). This could be due to more adrenaline drive and higher social gatherings among male students, which is leading to increased consumption of caffeinated products.

This finding concurred with a study by Afroz MN *et al.* and Rios LJ *et al.*, in which caffeine consumption was greater among males and differed with a study by Malinauskas BM *et al.*, in which caffeine and caffeinated product consumption was higher among females.^[8,10,11]

It was observed that study subjects who started consuming caffeinated beverages at a younger age had higher average daily consumption of caffeine in the present times, which concurred with a study by Kharaba Z *et al.*,^[12] in which dependency symptoms were

noted among students who started caffeine consumption early in their adolescence.

It was also found that the average consumption of caffeine during exams was more than the daily ceiling limit, that is, >300 mg/day, among a majority (38.1%) of students. Excess consumption during examinations could be due to higher stress and anxiety, leading to higher consumption of caffeine. This difference in caffeine consumption was found to be statistically highly significant ($P < 0.01$).

The present study findings were similar to a study by Malinauskas BM *et al.*^[11] and Khan MS *et al.*,^[4] in which 50% of study subjects reported excess/extra consumption of energy drinks while studying for exams or working on major projects.

This finding differed with a study conducted in Serbia among adolescents, in which a majority of the students consumed caffeine for leisure and peer pressure and as a habit.^[13]

In this study, 64.4% of total subjects did not read the statutory label and 58% of total study subjects did not have any knowledge about side effects of caffeine consumption. This finding was similar to a study by Najlaa F *et al.*,^[14] in which 48.6% did not have correct knowledge about side effects of caffeine. Similar findings were reported by Kharaba Z *et al.*,^[12] in which around 1/3rd of study participants had poor knowledge of caffeine-related products and their side effects.

Conclusions

Caffeine consumption was found to be in high prevalence among medical students (100%), and the average caffeine consumption was found to be higher among males (174 mg/day) than females (137 mg/day). The average consumption of caffeine increases during exams, and those who began caffeinated beverage consumption at a young age consume more quantities at present. Very few students were aware of presence of caffeine in migraine medication, chocolate, and chocolate-based foods. The overall knowledge and awareness about caffeinated products were found to be low among medical students (58%). There is a need for sensitization of medical students about the harmful effects of caffeine and alternate management systems of life like yoga and meditation for stress management.

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Conflicts of interest

There are no conflicts of interest.

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