

The Rationale of Caffeine Consumption and Its Symptoms During Preparatory and Non-preparatory Days: A Study among Medical Students

S. Shree Lakshmi Devi^{1*}, S.C. Abilash² and S. Basalingappa³

¹Department Of Pharmacology, Shri Satya Sai Medical College and Research Institute, Nellikuppam, Kanchipuram Dist, India.

²Department Of Pathology, Shri Satya Sai Medical College and Research Institute, Nellikuppam, Kanchipuram Dist, India.

³Department Of Pharmacology, Dm Wayanad Institute Of Medical Science, Wayanad, Kerala, India.

*Corresponding author E-mail: drshree20@gmail.com

<http://dx.doi.org/10.13005/bpj/1476>

(Received: 10 February 2018; accepted: 28 April 2018)

Caffeine is the most widely used pharmacologically active substance in the world. Medical students are more prone for consumption of caffeine drinks and they are posed for high stress and heavy study hours. The study was postulated in order to know the reasons, circumstances under which students consume caffeine and the symptoms that they face due to caffeine consumption. The current study is a cross sectional study. The participants were selected on the basis of inclusion and exclusion criteria. About 150 students participated in the study. Self-assessment questionnaire was distributed among the willing students. The data was collected and statistically analysis was done. The study showed that majority of medical students were low consumers of caffeine during regular days whereas during exam days the amount of consumption shifts more towards moderate intake category. Commonest reason and circumstance behind caffeine intake was to keep them more alert and to study for exam. The symptom they faced often was loss of sleep and during exam days, other CNS related effects were also noted. The future healthcare relies on today's medical students who are in a responsible position to provide complete education to the community about the consequences of consuming caffeine drinks. For which the students should be aware of caffeine's implication on one's health. Medical students must be postulated to various awareness programs about alternative nutrients filled diet for their long lasting health benefits.

Keywords: Caffeine, Medical Students, Circumstance, Symptom.

Human curiosity has led way for the discovery of coffee around 850AD by Goatherder name Khaldi in Abyssinia located in Upper Egypt. Through the ages the delight search for stimulants has been rewarded by the discovery of coffee bean (*Coffea arabica*) in Arabia, the tea leaf (*Thea sinensis*) in China, the Kola nut (Theo-

bromo cacao) in Mexico and other plant source of caffeine¹.

Caffeine is the widely used pharmacologically active substance in the world². Caffeine is consumed in different forms such as tea, coffee, soft drink and energy drinks. Caffeine consumption is popular among people because of its unique

ability to enhance mood and alteress³, to increase exercise capacity, to increase wakefulness and mental alertness⁴.

Medical student's life begins with regular tests, internal exam preparation and all throughout medical course the students are subjected to excessive stress, majorly due to sleepless working hours. Medical students have to put forth extra effort beyond their mental threshold and physical stress to show progress in their exams. The consumption of caffeinated drinks is one of the coping strategies used by medical students to manage their academic stress⁵. Study among first and second year students at the university of Puerto Rico Medical Sciences campus reported that 49% of them believed caffeinated products were useful for coping up with academic stress⁶.

Although caffeine consumption is related to psychiatric and substance use disorders, studies have showed that their associations were not casual⁷. On contrary one study showed a near causal relationship between the use of energy drink and hospitalisation among patient with mental illness⁸. Caffeine causes high anxiety level among moderate and high level caffeine consumers⁹ whereas the positive effect of caffeine was shown by low level consumers like they reduced anxiety and elevated the mood^{10,11,12}.

However there are adequate studies and data's to give pharmacological information about the source of caffeine and their consumption modalities, little is known in regard to symptoms faced by caffeine consuming medical students and

their belief about their conventions.

Aims and Objectives

The study was postulated to obtain:

- 1) The different categories of caffeine intake
- 2) The reason and circumstances of caffeine intake
- 3) Symptoms experienced due to caffeine

METHODOLOGY

Study design

It is a cross-sectional study. The study was approved by institutional ethical committee, DM Wayanad institute of medical science. The study was conducted among second M.B.B.S students at DM Wayanad institute of medical science, Kalpetta, Wayanad, Kerala. The sample selection was done based on Inclusion and Exclusion criteria's.

Exclusion criteria: Fresher's (I&II semester medical students), clinical students, interns, residents, physicians, nurses and technicians.

Inclusion criteria: III, IV and V semester medical students, male and female.

The fresher's were excluded from the study as they were exposed to multiple environmental factors like new friends, home-sick, sudden lack of parental guidance, new cuisine style,..etc. Hence their reason and circumstances for caffeine consumption may be in aspects high lightening the environmental factors. Clinical students are excluded as they are facing more stress and workload. They have to promisingly balance

Table 1. Reason Behind Caffeine Consumption

S. No	Reason Behind Caffeine Consumption	Frequency	Percentage (%)
1	Feel More Alert	70	62.50
2	Awake In The Morning	59	52.68
3	Combat Drowsiness	36	32.14
4	To Concentrate While Studying	32	28.57
5	To Deal With Daily Stress	9	8.04
6	Deal With Depression	4	3.57
7	To Relax & Calm	34	30.36
8	Combat Headache	52	46.43
9	For Better Mood	40	35.71
10	Control Weight	3	2.68
11	Like The Taste	30	26.79
12	Other	10	8.93

Fig. 1. Categorisation Of Caffeine Consumption

Caffeine Consumption Category	Frequency Of Consumption On Regular Day	Frequency Of Consumption On Sunday/Holidays	Frequency Of Consumption On Study Holidays	Frequency Of Consumption During Exams	Consumption On Regular Day %	Consumption On Sunday/Holidays %	Consumption On Study Holidays %	Consumption During Exams %
Low Intake 199mg/Day	108	109	88	87	72.00	72.67	58.67	58.00
Moderate Intake 200-399mg/Day	35	32	46	51	23.33	21.33	30.67	34.00
High Intake 400mg/Day	4	6	13	9	2.67	4.00	8.67	6.00

the knowledge on both theoretical and clinical skills. The interns, residents, physicians, nurses and technicians were excluded as they may be more pressurised due to hectic duty hours and their personal family issues. Thus in order to study the effect of caffeine in mediocre type of students; III, IV and V semester medical students were selected.

Procedure

About 150 medical students participated in the study (n=150). A brief introductory presentation was given to students about the rationale and implementation of the study. All the students who were willing to participate were included in the study. The data was collected by self- assessment questionnaire available in English. In order to avoid any bias students were asked to fill the questionnaire after fourth semester examination during Pharmacology session. The participating students were allowed to ask questions on matters those were unclear. Yousif *et al* and Josue *et al* studies were used as a prototype for analysing and framing the questions in the questionnaire.

The questionnaire was divided into four sections:

- a) Questions 1-5: represented the demographic data section which included the age, sex and location of the students
- b) Questions 6: perceived the amount of caffeine consumed, in accord to the frequency and type of caffeinated drinks consumed daily.
- c) Questions 7-8: indicated the reasons and circumstances of caffeine intake. There were about 12 choices for the reason and various

Fig. 2. Circumstances For Caffeine Intake

S. no	Circumstances For Caffeine Intake	Frequency	Percentage %
1	Not Enough Sleep	14	12.5
2	Study For Exam	78	69.6
3	Driving	19	17.0
4	Having Headache	63	56.3
5	At Work	17	15.2
6	Exercising/Playing	5	4.5
7	Doing Homework	10	8.9
8	Running Errands	0	0.0
9	Out With Friends	58	51.8
10	At Restaurant	50	44.6
11	In Class	11	9.8
12	Others	4	3.6

circumstances for caffeine consumption. The students were to select more than one choice given in the questionnaire.

d) Questions 9-10: perceived the symptoms experienced by students. Ten different symptoms were given as choices and the students can select any number of options.

Data collection

The data’s were collected from the questionnaire and recorded manually. Data analysis was performed using IBM statistical package for social science (SPSS) software version 21.

RESULTS

A total of 150 students participated in the study. The age ranged from 19 to 23 years with the mean age of 21 years. Among the 150 students about 147(98%) were caffeine consumers and 3(2%) were non consumers of caffeine.

On categorising the students on the amount of caffeine consumption about 72 % (106) of them were low consumers, 23.33 % (35) were moderate consumers and 2.67 % (4) were high consumers during routine days. During exam days about 58% (87) were low consumers, 34 % (51) were moderate consumers and 4 % (6) were high consumers.

Reason behind caffeine consumption

The result showed that 70(62.50%) of

students consumed caffeine as they believed it makes them more alert and about 59 (52.68%) to keep them awake in the morning. The least number of students believed that caffeine helped them to control weight 3(2.65%) and to deal with depression 4(3.57%).

Circumstances for caffeine intake

The result showed that “studying for exam” were the commonest circumstance for caffeine intake about 78 (69.6%), the second common circumstance for caffeine consumption was to allay headache 63(56.3%) and “outing with friends” was about 50 (44.6%).

Symptoms

The results showed the various symptoms they faced during normal days and examination days.

(i) Normal days and regular holidays: the most common symptoms faced by students due to caffeine intake was loss of sleep 30(26.8%) and gastritis 15(13.4%).

ii) During exam days and study holiday: The most common symptoms present among caffeine consumers were nervousness 54(48.21%), loss of sleep 47(41.96%), palpitation 41(36.61%), confusion 29(25.89%) and gastritis 18(16.07%).

DISCUSSION

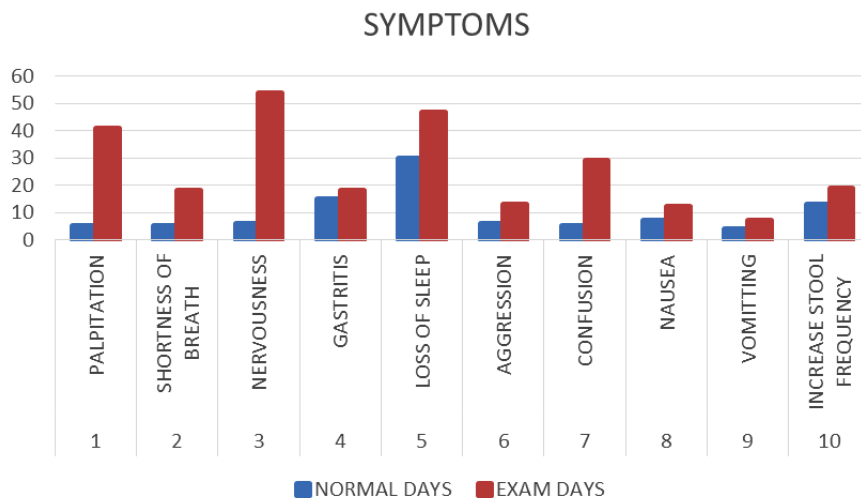


Fig. 3. Symptoms Presented By Caffeine Consuming Medical Students

Age old tradition and our assumption has made consumption of coffee, tea, energy drinks and soft drinks as a part of our meal system, whether the consumption assist the nutritional benefit or worsen the life state of individual is yet to be scrutinized. The general lack of research relating to the role of caffeinated drinks on the day to day activities among medical students is an area that the current paper will try to discuss.

Participation of female students outnumbered the male student with the ratio of 2.6:1.0. In the study the caffeine consumption system by students were divided into four sessions as: (a) consumption on regular days (b) consumption on regular holidays (c) consumption on study holidays and (d) consumption during examinations. Depending on the quantity of caffeine consumed the U.S Food and Drug administration (FDA) and American Medical Association has categorized it into three different categories (1) Low intake: consumption up to 199mg/d (2) Moderate intake: consumption of about 200-399mg/d (3) High intake: consumption more than 400mg/d. The study showed that majority of the students were in category I (low intake) during the session of regular days and holidays. During session of study holidays and exam days the students fell more into category II (moderate intake) and few in category III (high intake). Study by Kaplan *et al* showed that 250mg caffeine can cause elation in healthy volunteers and doses more than 400mg/d can increase irritability¹³. Evidences show that moderate doses of caffeine impair motor skills and may not be an adequate substitute for memory enhancement or to allay sleep¹⁴. At higher concentration caffeine acts as a diuretic agent and excess consumption can cause dehydration, headache and severe fatigue¹⁵. High caffeine consumers are subjected to decrease nutrient absorption and a slow rate of fluid absorption¹⁶.

The present study showed that the main reason behind caffeine consumption among students was to keep them more alert 62.5% and to keep them awake 52.68%. Caffeine has a special property of increasing the neurotransmission of mesopontine cholinergic neurons thus increasing alertness and reducing fatigue¹⁷. Adenosine inhibits cholinergic neurons resulting in a coupling mechanism that correlates caffeine and arousal;

thus acting as a proof for the role of caffeine in arousal mechanism.

The common circumstance for consumption of caffeine among students was “during exams” and “to reduce headache”. Other circumstances were outing with friends and at restaurants, most of the circumstances the students¹⁸ or even general population are left out without significant options. The commonly available drinks during outing or restaurants visit are coffee, tea, or ready to have caffeinated drinks like coca cola, pepsi.etc with caffeine as main ingredient¹⁹. The social scenario and narrow profitable marketing has diverted us towards the consumption of caffeinated drinks leaving behind the footprints of various hazards in the health of individuals²⁰.

The common symptoms presented were loss of sleep during normal days which drastically heightened during exam days. As the symptoms “loss of sleep” was presented during both normal days and exam days, exam related stress cannot be the substantiating reason behind the above symptoms. The study finding is similar to the study by Zeoyghnizen *et al* which showed that caffeine increases sleep latency¹⁶. Hicks *et al* study proved that caffeine reduces sleep duration¹⁷. Caffeine induced insomnia was suggested as research model for insomnia²¹. The other symptoms which peaked during examination days where nervousness, palpitation and confusion. From the study these symptoms are positively correlated to the increased frequency of caffeine consumption during exam days and to a greater extent can also be related to examination related stress. Study done by Haskell *et al* and Smith *et al* showed that lower dose of caffeine reduces anxiety and elevate mood^{22,23}. Another study by Smith *et al* proved that lower doses of caffeine can reduce risk of depression when compared to non-consumption population²⁴. Whereas high intake of caffeine can lead to a condition called as “caffeinism”. Study by Lara *et al* showed that symptoms like anxiety, nervousness, dysphoria, restlessness, agitation, rambling of thoughts and speech caused by caffeine intake are considered to mimic the clinical features of “mixed mood state”²⁵. Further study by Caykoylu *et al* and Dratcu *et al* supported the above finding and showed that caffeine interferes with patient recovery from bipolar disorder and manic type

mood episodes^{26,27}.

The future healthcare clearly relies on today's medical students who are in a responsible position to provide complete education to the community about the consequences of consuming caffeine drinks. For which the students should be aware of caffeine's implication on one's health.

The future healthcare clearly relies on today's medical students who are in a responsible position to provide complete education to the community about the consequences of consuming caffeine drinks. For which the students should be aware of caffeine's implication on one's health.

As medical students are posed to tremendous stress they should be sensitized with stress management workshops and awareness programs about alternative nutrients filled diet for their long lasting health benefits.

CONCLUSION

The study showed that consumption of caffeine among medical students was mainly to keep them alert in order to combat heavy working hours. The medical students were low consumers of caffeine. Whereas during the preparatory days consumption of caffeine ranged from moderate to high category. Though the high consumers represent a small percentage they should try to minimize the daily caffeine use.

ACKNOWLEDGEMENT

The authors herewith acknowledge Dean. Dr. Sheshagiri, DMWIMS and Mr. Arungopi, Statistician, Department of Community Medicine, DMWIMS for their continuous support and encouragement.

REFERNECES

1. Chou T. "Wake up and smell the coffee-Caffeine, coffee, and the medical consequences". *West J Med.*, **157**: 544-553 (1992)
2. Acheson KJ, Gremaud G, Meirim I, Montigon F, Krebs Y, Fay LB, *et al.* "Metabolic effects of caffeine in humans: Lipid oxidation or futile cycling?". *Am J Clin Nutr.*, **79**:40-46 (2004).
3. Ferre S . "An update in the mechanisms of the psychostimulant effects of caffeine". *J Neurochem.*, **105**: 1067-1079 (2008).
4. Smit HJ and Rogers PJ." Effects of energy drinks on mood and mental performance: Critical methodology". *Food Qual Prefer.* **13**: 317-326 (2002).
5. Lazarus RS." Coping theory and research: Past, present, and future". *Psychosom Med*; **55**:234-247 (1993).
6. Rios JL, Betancourt J, Pagan I, *et al.* "Caffeinated-beverage consumption and its association with socio-demographic characteristics and self-perceived academic stress in first and second year students at the University of Puerto Rico Medical Sciences Campus (UPRMSC)". *Puerto Rico Health Sci J.*, **32**: 95-100 (2013).
7. Kendler KS, Myers J and Gardner CO. "Caffeine intake, toxicity and dependence and lifetime risk for psychiatric and substance use disorders: An epidemiologic and co-twin control analysis". *Psychol Med.*, **36**: 1717-1725 (2006).
8. Chelben J, Piccone-Sapir A, Lanco L, *et al.* "Effects of amino acid energy drinks leading to hospitalization in individuals with mental illness". *Gen Hosp Psychiatry.*, **30**: 187-189 (2008).
9. Gilliland K and Andress D. "Ad lib caffeine consumption, symptoms of caffeinism, and academic performance". *Am J Psychiatry.*, **138**: 512-514 (1981).
10. Haskell CF, Kennedy DO, Wesnes KA, *et al.* "Cognitive and mood improvements of caffeine in habitual consumers and habitual nonconsumers of caffeine". *Psychopharmacology.*, **179**: 813-825 (2005).
11. Lieberman HR, Tharion WJ, Shukitt-Hale B, *et al.* "Effects of caffeine, sleep loss, and stress on cognitive performance and mood during U.S. Navy SEAL training". *Psychopharmacology.*, **164**: 250-261 (2002).
12. Smith AP." Effects of caffeine in chewing gum on mood and attention. *Hum Psychopharmacol.*, **24**: 239-247 (2009).
13. Kaplan GB, Greenblatt DJ, Ehrenberg BL, *et al.* "Dose-dependent pharmacokinetics and psychomotor effects of caffeine in humans". *J Clin Pharmacol.*, **37**: 693-703 (1997).
14. Malinauskas B M, Aeby VG, Overton RF *et al.* "A survey of energy drink consumption patterns among college students". *Nutr J.*, **6**(35) : 1-7 (2007).
15. Buxton C,Hagan JE. "A survey of energy drink consumption practices among student athletes in Ghana : Lessons for developing health education intervention programmes". *Sports Nutr Rev J.*, **9**(1): 1-8 (2012).
16. Zwyghuizen-Doorenbos, A., Roehrs, T.A., Lipschutz, L., Timms, V., Roth, T. "Effects of

- caffeine on alertness". *Psychopharmacology*, **100**: 36–39 (1990).
17. Hicks, R.A., Hicks, G.J., Reyes, J.R., Cheers, Y. "Daily caffeine use and the sleep of college students". *Bulletin of the Psychonomic Society*, **21**: 24–25 (1983).
 18. Seifert SM, Schaechter JL, Hershorin ER, *et al.* "Health effects of energy drinks on children, adolescents, and young adults". *Pediatrics*; **127**: 511–528 (2011).
 19. McLellan TM and Lieberman HR. "Do energy drinks contain active components other than caffeine?". *Nutr Rev.*, **70**: 730–744 (2012).
 20. Reissig CJ, Strain EC and Griffiths RR. "Caffeinated energy drinks- a growing problem. *Drug Alcohol Depend*"., **99**: 1–10 (2009).
 21. Alford, C., Bhatti, J., Leith, T., Jamieson, A., Hindmarch, I., "Caffeine-induced sleep disruption: effects on waking the following day and its reversal with an hypnotic". *Human Psychopharmacology Clinical and Experimental.*, **11**: 185–198 (1996).
 22. Haskell CF, Kennedy DO, Wesnes KA, *et al.* "Cognitive and mood improvements of caffeine in habitual consumers and habitual nonconsumers of caffeine". *Psychopharmacology.*, **179**: 813–825 (2005).
 23. Smith AP. "Effects of caffeine in chewing gum on mood and attention". *Hum Psychopharmacology.*, **24**: 239–247 (2009a).
 24. Smith AP (2009b) Caffeine, cognitive failures and health in a non-working community sample". *Hum Psychopharmacol.*, **24**: 29–34 (2009b).
 25. Lara DR. "Caffeine, mental health, and psychiatric disorders". *J Alzheimers Dis.*, **20**(Suppl. 1): S239–S248 (2010).
 26. Caykoylu A, Ekinici O and Kuloglu M. "Improvement from treatment-resistant schizoaffective disorder, manic type after stopping heavy caffeine intake: A case report". *Prog Neuropsychopharmacol Biol Psychiatry.*, **32**: 1349–1350 (2008).
 27. Dratcu L, Grandison A, McKay G, *et al.* "Clozapine-resistant psychosis, smoking, and caffeine: Managing the neglected effects of substances that our patients consume every day". *Am J Ther.*, **14**: 314–318 (2007).