IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

Human Journals
Research Article
October 2022 Vol.:25, Issue:3

Knowledge, Attitude, and Practice on Caffeine and Caffeinated Beverages Consumption among College Students

IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

Arul Prakasam K.C[*1], Glady Gloria Grant C.J[2], Aarthy P[3], Feba Shaji[3], Harish M[3], Azad VP[3]

1. Professor, JKKMMRF's Annai JKK Sampoorani Ammal College of Pharmacy, Komarapalayam, Tamil Nadu, India

2. Assistant Professor, JKKMMRF's Annai JKK Sampoorani Ammal College of Pharmacy, Komarapalayam, Tamil Nadu, India

3. Pharm D Intern, JKKMMRF's Annai JKK Sampoorani Ammal College of Pharmacy, Komarapalayam, Tamil Nadu, India

[Affiliated to the Tamil Nadu Dr.M.G.R. Medical University, Chennai, Tamil Nadu- 600032 India.

Submitted: 25 September 2022
Accepted: 30 September 2022
Published: 30 October 2022

Keywords: Caffeine, Caffeinated beverages, Students, Knowledge, attitude, practice.

ABSTRACT

Caffeine is a substance that is an alkaloid that belongs to the class of methylxanthines and it is a naturally occurring chemical stimulant said to be caffeine (1, 3, 7-trimethylxanthine). The caffeine chemical formula is C8-H10-N4-O2. The objective of the study is to study the impact of knowledge, attitude, and practice of caffeine and caffeinated beverages among students and to create awareness based on caffeinated beverages. The data collected were tabulated, analyzed, and interpreted using Standard statistical tools and Microsoft excels 2010. The statistical procedure was undertaken with the help of the statistical package Instat and prism version 6.0. The comparison with age was done by the Chi-Square test. The results show that 91.88% of students have knowledge about caffeine and 73.43% consume caffeine mostly from 18-21 years of age and only a few of them have no knowledge and they don't consume caffeine. The majority of the students 42.43% was thinking that caffeine consumption has increased over the years and believed that the consumption of coffee can get relief headaches but their level of caffeine consumption increased over the exam period. 36.53% were experiencing headaches when they suddenly stopped caffeine consumption and few of them said that they were experiencing side effects while taking caffeine. The results of the study are to the students need an awareness program to develop proper knowledge and also beneficial to prevent future health-related problems.

INTRODUCTION:

Caffeine is a psychoactive substance that is commonly consumed by both children and adults.[1] Caffeine is substance that is an alkaloid that belongs to the class of methylxanthines and it is a naturally occurring chemical stimulant said to be caffeine (1, 3, 7-trimethylxanthine). The caffeine chemical formula is C8-H10-N4-O2. Approximately 60 different plants contain caffeine as a naturally occurring alkaloid in varying amounts such as leaves, fruits, and beans. Dietary caffeine of the world's primary sources are yerba mate (Ilex paraguariensis), kola nut (Cola acuminate), tea leaves (Camelia Sinensis), cacao bean (Theobroma cacao), guarana berries (Paullinia cupana), and roasted coffee beans (Coffea Arabica and Coffea robusta) are the common sources of caffeine.[2] The caffeine content in these beverages is also found in cocoa, chocolate, and a variety of medications such as some pain relief formulations and dietary supplements (Excedrin, No-Doz).[3] Caffeinated products have become more popular among students because of daily work, homework, and activities, as well as socialization.[4] Caffeinated Beverages are one of the most consumed beverages by youngsters and adults due to their mentally stimulating effects. The consumption of caffeine can have many beneficial effects, and one of them is maximizing performance during exercise by delaying fatigue and increasing the length of time until exhaustion.[5] Additionally, it was found that caffeine consumption was associated with positive effects during verbal memory, visuospatial reasoning, and reaction time tasks, and these effects became stronger with increasing age.[6] In the brain, caffeine's main mechanism is acting as a non-selective antagonist of adenosine receptors. Caffeine acts as a stimulant, preventing drowsiness and restoring alertness.[7] A powerful antioxidant, polyphenol, in caffeine, helps prevent diseases. The responsibility of an antioxidant helps to reduce damage to body tissue and also helps with oxidation reactions. When compared to other drinks coffee contains a high content of antioxidants. Other antioxidants which are found in coffee are caffeic acid, melanoidins, and Chlorogenic acid. Other foods that contain antioxidants include tea, cocoa, and red wine. The antioxidant content of coffee is four times higher than tea.[8] Research has shown that caffeine has both positive and negative health effects on individuals because of its psychoactive properties.[1] Furthermore, some students tend to increase their caffeine consumption during examination periods to beat sleepiness and exhaustion, as well as maintain a good GPA.[9] Few people intake caffeinated products like coffee, energy drinks, espresso, and green tea, to boost their energy, feel alert, enhance their mood and work long shifts.[10] Due to their daily

academic workload, the students were exposed to academic stress.[11] Students commonly consume caffeinated beverages to cope with their overwhelming stressful situations.[12]

Due to its vasoconstricting and anti-inflammatory effects caffeine, it also used as an ingredient in prescription drugs and over-the-counter pain relievers. In addition to many health benefits of caffeine consumption such as better muscle recovery, boosted metabolism, increased focus, and improved mood, studies have demonstrated that caffeine consumption can enhance athletic performance.[13] One safe level of caffeine intake is 400 milligrams per day which is equal to 4 cups (945ml).[14] Health benefits can be obtained from moderate consumption of caffeine 200-300 mg per day.[1] The world's most popular beverage, caffeine is a chemical substance that passes through the blood-brain barrier and stimulates the nervous system by modulating the action of neurotransmitters and modulators, including dopamine and acetylcholine in different brain areas.[15] In the brain, caffeine absorbs and passes quickly, but it does not accumulate in the bloodstream or get stored in the body. Urine remains in the body for many hours after it has been consumed. Metabolism of caffeine in the liver (99%) is carried out by the cytochrome P450 oxidase enzyme system, especially by the CYP1A2 isoenzymes, into three subtypes of metabolites such as 3, 7- dimethylxanthine, 1, 7 – dimethylxanthine, and 1, 3- dimethylxanthine showing that caffeine has linear pharmacokinetics from 70 to 100 mg.[7] The objective of the study is to study the impact of knowledge, attitude, and practice of caffeine and caffeinated beverages among students and to create awareness based on caffeinated beverages.

MATERIALS AND METHODS:

Study procedure:

This cross-sectional prospective study was conducted among the students of Tamilnadu, Kerala, and Andhra Pradesh from May 2021 to October 2021 six months via online google forms. The data collection has done through a pre-designed questionnaire through online google forms. The Knowledge, Attitude, and practice questionnaire was taken from an article for which the corresponding author granted us copyright permission, and the questionnaire was slightly modified with the permission of the corresponding author. A questionnaire was prepared, which comprises the Demographic details, Knowledge, Attitude, and Practice of caffeine. The inclusion criteria of the study were including both male and female students and those who were willing to participate in our study, and above the age of 17 years. This study excludes the students who were mentally ill and those who were not having any facilities to

participate in our study. The links which proceed to the questionnaire are prepared and shared through various social media. Informed consent is obtained from the individuals who marked the 'yes ' option for the section detailing the consent. The overall sample size is 512 was collected after the complete filling of the form. After filling out the form at the end of the study the patient information leaflet was prepared in English and distributed to the concerning E-mail id of the participants to create awareness of caffeinated beverages among students. The Knowledge, Attitude, and practice questionnaire was taken from an article for which the corresponding author granted us copyright permission. This study was approved by Institutional Ethics Committee, JKKMMRF's Annai JKK Sampoorani Ammal College of Pharmacy with reference number EC/PHARM.D /2021-01.

Statistical analysis:

Only one participant per survey setting was used which restricted the participants from providing more than one response. The data collected were tabulated, analyzed, and interpreted using Standard statistical tools and Microsoft excels 2010. The statistical procedure was undertaken with the help of the statistical package Instat and prism version 6.0. The comparison with age was done by the Chi-Square test.

RESULTS:

This cross-sectional prospective study was conducted among students for around 6 months in and around Tamilnadu, Kerala, and Andhra Pradesh. The demographic details of 512 participants who have enrolled in our study are shown in table -1.

TABLE: 1 SOCIO-DEMOGRAPHIC DETAIL

Characteristics	Category	Frequency (N=512)	Percentage (%)
Age	18-21	271	52.92%
	22-24	186	36.32%
	Above 24	55	10.74%
Gender	Male	176	34.37%
	Female	336	65.62%
Educational status	UG	306	60%
	PG	186	36.30%
	Diploma	19	3.70%
State	Tamilnadu	267	52.10%
	Kerala	114	22.20%
	Andhra Pradesh	131	25.60%

TABLE: 2 KNOWLEDGE OF STUDENTS UNDER STUDY TOWARDS CAFFEINE AND CAFFEINATED BEVERAGES

Statement	Response	Age			Chi-Square	P-value
		18-21 (n=271)(%)	22-24 (n=186)(%)	>24 (n=55)(%)		
1. Do you know about caffeine?	Yes	249(91.88%)	183(98.38%)	48(87.27%)	10.887	<0.05
	No	22(8.11%)	4(2.15%)	6(10.9%)		
2. Do you consume caffeine?	Yes	199(73.43%)	132(70.96%)	40(72.72%)	0.4024	>0.05
	No	72(26.56%)	54(29.03%)	14(25.45%)		
3. Do you think drinking coffee is an addiction?	Yes	206(76.01%)	157(84.40%)	39(70.90%)	6.127	<0.05
	No	65(23.98%)	29(15.59%)	15(27.27%)		
4. Do you usually drink caffeinated beverages?	Yes	165(60.88%)	115(61.82%)	40(72.72%)	12.904	<0.05*
	No	38(14.02%)	17(9.13%)	10(18.18%)		
	Sometimes	68(25.09%)	54(29.03%)	4(7.27%)		
5. Which drinks will make you feel better?	Caffeinated drinks	182(67.15%)	136(73.11%)	30(54.54%)	6.179	<0.05*
	Non-caffeinated drinks	89(32.84%)	50(26.88%)	24(43.63%)		
6. Check all of the drinks below that you think may contain caffeine.	Tea and tea-based beverages	145(53.50%)	101(54.30%)	25(45.45%)	6.705	>0.05
	Coffee and coffee-based beverages	213(78.59%)	167(89.78%)	47(85.45%)		
	Carbonated soft drinks like Coca-Cola, Pepsi, etc.	132(48.70%)	99(53.22%)	28(50.90%)		

	Energy drinks	106(39.11%)	87(46.77%)	28(50.90%)		
	Bottled water	13(4.79%)	9(4.83%)	5(9.09%)		
	Dairy-based drinks	39(14.39%)	28(15.05%)	5(9.09%)		
	Canned juices like Tropicana, minute maid, Real, etc.	32(11.80%)	22(11.82%)	10(18.18%)		

Table 2 shows the knowledge of students under study about caffeine and caffeinated beverages. The present study shows that 91.88% of students have knowledge about caffeine and 73.43% consume caffeine mostly from 18-21 years of age and only a few of them have no knowledge and they don't consume caffeine. The majority of the students from the age category of 18-21 years i.e., 76.01% know that consumption of coffee is an addiction and 60.88% usually drink caffeinated beverages and 25.09% said sometimes. Overall 67.15% of students were feeling better when they consumed caffeinated beverages and only a few of them were feeling better while consuming non-caffeinated drinks. Knowledge the caffeine content drinks stated that 78.59% of 18-21 years said coffee and coffee-based beverages that may contain caffeine. Others said that 54.30% said tea and tea-based beverages, 53.22% said carbonated soft drinks, 39.11% said energy drinks, 4.79% said bottled water, 14.39% said dairy-based drinks, and 11.80% said canned juices. The majority of students from the age category of 18-21 years have more knowledge.

TABLE: 3 ATTITUDE OF STUDENTS UNDER STUDY TOWARDS CAFFEINE AND CAFFEINATED BEVERAGES

Statement	Response	Age			Chi-Square	P-value
		18-21 (n=271)(%)	22-24 (n=186)(%)	>24 (n=55)(%)		
1. What is the "safest amount" of caffeine per day?	600-800 milligrams	34(12.54%)	31(16.66%)	5(9.09%)	11.569	>0.05
	200-400 milligrams	97(35.79%)	55(29.56%)	13(23.63%)		
	1000-1500 milligrams	5(1.84%)	0	0		
	I don't know	136(50.18%)	100(53.76%)	36(65.45%)		
2. In general, why do you think caffeine consumption has increased over the years?	Stress	160(59.04%)	124(66.66%)	29(52.72%)	13.438	>0.05
	Work Tension	151(55.71%)	118(63.44%)	24(43.63%)		
	Tiredness	139(51.29%)	99(53.22%)	23(41.81%)		
	Alertness	56(20.66%)	47(25.26%)	9(16.36%)		
	Addiction	146(53.87%)	95(51.07%)	28(50.90%)		
	Mood Swing	79(29.15%)	65(34.94%)	15(27.27%)		
	None of these	32(11.80%)	11(5.91%)	10(18.18%)		
3. Do you believe intake of coffee can relieve your headache?	Yes	115(42.43%)	104(55.91%)	23(41.81%)	14.764	<0.05*
	No	50(18.45%)	16(8.60%)	13(23.63%)		
	May be	106(39.11%)	66(35.48%)	19(34.54%)		
4. Do you think that your caffeine intake is increased during exam time?	Yes	115(42.43%)	96(51.61%)	28(50.90%)	7.521	>0.05
	No	95(35.05%)	51(27.41%)	20(36.36%)		
	May be	61(22.50%)	40(21.50%)	6(10.90%)		

Table 3 shows that while checking the attitudes of the students have not aware of the safest about of caffeine per day. The majority of the students 42.43% was thinking that caffeine consumption has increased over the years and believed that the consumption of coffee can get relief headaches but their level of caffeine consumption increased over the exam period.

TABLE: 4 PRACTICE OF STUDENTS UNDER STUDY TOWARDS CAFFEINE AND CAFFEINATED PRODUCTS

Statement	Response	Age			Chi-Square	P-value
		18-21 (n=271)(%)	22-24 (n=186)(%)	>24 (n=55)(%)		
1. Which part of the day do you prefer to drink?	Early Morning	110(40.59%)	84(45.16%)	33(60%)	12.634	>0.05
	Mid-Morning	63(23.24%)	35(18.81%)	12(21.81%)		
	Afternoon	23(8.48%)	11(5.91%)	3(5.45%)		
	Lunch	9(3.32%)	3(1.61%)	2(3.63%)		
	Evening	163(60.14%)	138(74.19%)	33(60%)		
	Dinner	6(2.21%)	5(2.68%)	1(1.81%)		
	Night	36(13.28%)	20(10.75%)	4(7.27%)		
	All the above	19(7.01%)	12(6.45%)	3(5.45%)		
2. Could you go 2-3 days without caffeine?	Yes	220(81.18%)	142(76.34%)	46(83.63%)	2.188	>0.05
	No	51(18.81%)	44(23.65%)	9(16.36%)		
3. What problems have you experienced after suddenly stopping caffeine intake?	Headache	99(36.53%)	85(45.69%)	20(36.36%)	9.319	>0.05
	Fatigue	31(11.43%)	17(9.13%)	9(16.36%)		
	Low energy	68(25.09%)	43(23.11%)	16(29.09%)		
	Irritability	34(12.54%)	30(16.12%)	10(18.18%)		
	Anxiety	32(11.80%)	18(9.67%)	6(10.90%)		
	Poor Concentration	41(15.12%)	31(16.66%)	8(14.54%)		
	Depressed Mood	62(22.87%)	42(22.58%)	8(14.54%)		
	Tremor	5(1.84%)	3(1.61%)	1(1.81%)		
	None of these	69(25.46%)	46(24.73%)	18(32.72%)		
	No side effects	71(26.19%)	50(26.88%)	16(29.09%)		
4. Which side effects did you have while taking caffeine?	Headache	60(22.14%)	28(15.05%)	12(21.81%)	23.794	>0.05
	Tremor	10(3.69%)	0	3(5.45%)		
	Nervousness and restlessness	24(8.85%)	7(3.76%)	3(5.45%)		
	Insomnia	33(12.17%)	14(7.52%)	4(7.27%)		
	Palpitation	9(3.32%)	3(1.61%)	2(3.63%)		
	Anxiety	23(8.48%)	7(3.76%)	4(7.27%)		
	Hallucination	8(2.95%)	4(2.15%)	1(1.81%)		
	None of these	91(33.57%)	70(37.63%)	20(36.36%)		
	No side effect	112(41.32%)	90(48.38%)	25(45.45%)		

Table 4 shows that 40.49% can prefer to drink caffeine in the early morning but most of them 60.14% preferred to drink their caffeine in the evening. 81.8% of students accepted that they

couldn't go for 2-3 days without consuming caffeine and caffeinated beverages. 36.53% were experiencing headaches when they suddenly stopped caffeine consumption and few of them said that they were experiencing side effects while taking caffeine.

DISCUSSION:

In this young population consuming caffeine and caffeinated beverages for their stimulating effect is very popular among students. Most studies have demonstrated that excessive consumption of caffeine may cause a health risk. This study subjects 52.92% of students in the age group of 18-21 years, 36.32% of students in the age group of 22-24, and 10.74% of students above 24 years. A similar study reported that 60.9% were aged between 17-20, 30.1% were aged between 21-24 and 9% were aged above 24 by Marie Tannous et.al.[15] The current study shows that the students were consuming caffeine. A similar study reported that 18.7% did not consume caffeine and the rest of them are consuming caffeine 81.3% by Nor Alya AtikahRamli et.al.[16] They usually drink caffeinated drinks for making them feel better. A similar study was done by Narender Suhag, in which the majority of the participants were reported as in-takers of caffeinated drinks.[17] Only a few of them were not sure of the caffeine content in the beverages they consume. The majority of them said that caffeine consumption increased over the years due to their stress, work tension, tiredness, alertness, addiction, and mood swing. Another research was conducted by Vijayalakshmi S. Bhojaraja et al, in which 60% of the students believe that due to school and study activities; the consumption of caffeine-containing beverages has increased over the years.[18] In our study, most of the students' caffeine consumption has increased over the years, especially during their exam period due to stress, work tension, and alertness. A similar study was conducted by Rami Saadeh, in which 78% of students reported that caffeine consumption increased during the examination period.[19] Furthermore, the study shows that they have side effects when they suddenly stop consuming caffeine like headache, fatigue, low energy, irritability, anxiety, poor concentration, depressed mood, and tremor and only a few of them feel any side effects. The study was conducted by R. Gayatri Devi et al, in which side effects of headaches, fatigue, and drowsiness may be experienced when caffeine intake is stopped suddenly; however, the symptoms are generally mild and temporary.[20]

CONCLUSION:

Now a day, caffeine intake is increasing among students especially the young age group in our study. They have more knowledge about caffeine and caffeinated beverages but not the

safest amount. Caffeine has both beneficial effects and side effects. Due to stress, work tension, tiredness, and addiction some students believe that their caffeine consumption is increased over the years, and during exam time. So they need more attention or to reduce the amount of caffeine daily intake. So, the students need an awareness program to develop proper knowledge and also beneficial to prevent future health-related problems.

ACKNOWLEDGMENT:

We would like to thank participants for those who voluntarily participated in our study by providing consent and information about the study which is confidential to us.

REFERENCES:

1. Górnicka M, Pierzynowska J, Kaniewska E, Kossakowska K, et.al. School pupils and university students surveyed for drinking beverages containing caffeine. Rocz Panstw Zakl Hig. 2014; 65(2):113-7.
2. Barone JJ, Roberts HR. 1996. Caffeine consumption. Food Chem Toxicol 34:119–29. DOI: 10.1016/0278-6915(95)00093-3
3. McCusker RR, Goldberger BA, Cone EJ. 2003. The caffeine content of specialty coffees. J Anal Toxicol 27:520–2. DOI:10.1093/jat/27.7.520
4. Malinauskas BM, Aeby VG, Overton RF, et.al. A survey of energy drinks consumption patterns among college students. Nutrition Journal. 2007; 6:35. DOI:10.1186/1475-2891-6-35.
5. Adam M Gonzalez, Allyson L. Walsh, Nicholas A. Ratamess, et.al, Effect of pre-workout energy supplement on acute multi-joint resistance exercise, Journal of sports science and medicine. 2011 Jun; 10 (2): 261–266.
6. Tom M. McLellan, John A. Caldwell, Harris R. Lieberman, A review of Caffeine's Effects on Cognitive, Physical and Occupational Performance, Neuroscience & Biobehavioral Reviews. 2016 Dec; 71: 294-312. https://doi.org/10.1016/j.neubiorev.2016.09.001
7. Roberta Danese. Caffeine, https://flipper.diff.org/app/items/info/5925. 07/11/2013
8. Escott-Stump S. 2008. Nutrition and Diagnosis-Related Care. 6th ed. Philadelphia, Pa: Lippincott Williams & Wilkins.
9. Yousif Al-Turki, Basel Alenazy, Abdulrhman Algadheeb, Mazi Alanazi, et al. Caffeine Habits among Medical Students in King Saud University. International Journal of Science and Research. 2016; 5(2).
10. Smith, A., 2002, Effects of caffeine on human behavior, Food and Chemical Toxicology, 40, 1243-1255. DOI:10.1016/S0278-6915(02)00096-0
11. Bjorksten, O., Sutherland, S., Miller, C., and Stewart, T., 1983, Identification of medical student problems and comparisons with those of other students, J Med Educ, 58, 759-767.
12. Lazarus, R.S., 1993, Coping theory and research: Past, present, and future, Psychosom Med, 55, 234-247. DOI: 10.1097/00006842-199305000-00002
13. Alissa Rumsey, MS, RD., Food, and Nutrition: What Caffeine Does to Your Body https://alissarumsey.com/nutrition/health-benefits-caffeine/ Mar 20, 2017.
14. Wierzejska R. Caffeine – common ingredients in a diet and its influence on human health. Rocz Panstw Zakl Hig. 2012;63(2):141-7.
15. Marie Tannous, Yara Al Kalash: Prevalence of Caffeinated-beverage Consumption by University Students in North Lebanon Public Health Research 2014, 4(5): 173-178 DOI: 10.5923/j.phr.20140405.04
16. Nor Alya AtikahRamli, Venkata Pavan Kumar Sriperumbuduru, Hasanain Faisal Ghazi, Nava Jyothi Dalayi. A Study of Caffeine Consumption Patterns and Dependence among Management and Science University Students. Indian Journal of Forensic Medicine & Toxicology, January-March 2019, Vol. 13, No. 1 DOI:10.5958/0973-9130.2019.00021.5

17. Narender Suhag. Caffeine awareness among college going students: An insight from Pilot study,2(4); 2017; 486-491.
18. Vijayalakshmi S. Bhojaraja, Harshitha Janardhan, Najila Abdul Hameed, et.al.Knowledge, attitude and practices towards consumption of caffeine-containing drinks among the student population of Ras al-Khaimah medical and health sciences university, UAE. Int J Res Med Sci. 2016 Aug;4(8):3537-3541 www.msjonline.org DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20162326
19. Rami Saadeh. Caffeinated – Beverages Consumption Habits and Use among Medical Students in North Jordan. J Med J 2019; Vol. 53 (1):1-6 https://www.researchgate.net/publication/333204165
20. V. P. R. B. Ranjith Raj, R. Gayatri Devi, A. Jothi Priya. Awareness on the effects of caffeine among students - A survey. Vol 10.Special Issue 1 .2018. jprsolutions.info. ISSN:0975-7619