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EXPERIENCE AND HABIT OF CONSUMING CAFFEINE: A STUDY FROM COLLEGE OF MEDICINE, IMAM MOHAMMAD IBN SAUD ISLAMIC UNIVERSITY (IMSIU), RIYADH, KINGDOM OF SAUDI ARABIA

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ABSTRACT

The use of caffeine to stay awake and alert is a long-lasting habit. The main motivations of the caffeine consumption are concentration, combat drowsiness fatigue and physical performance improvement. This study aimed to assess the habit of caffeine consumption and their awareness of caffeine impact on their health at Imam Muhammad ibn Saud Islamic University, Riyadh, kingdom of Saudi Arabia by performing cross-sectional survey of 333 medical students. Most of the respondents were male (69.4%), in the age group of 21 to 23 and nearly half of them are in pre-clinical year. Majority of them (64%) consumed caffeine daily, while 24.5% consume caffeine weekly, and 11.5% <1/week. Enhancement of morning awakening (46.3%), mood enhancement (45.7%), increase alertness (45.3%), and concentration during study time (45%) were the most prominent reasons to consume caffeinated beverages among participants. Most participants agreed that caffeine can increase arousal (63.7%), cause lack of sleep (80.8%),

increase blood pressure (76.0%), and increase heart rate (90.4%). Our finding will enlighten in provision a strategy for educating students for consuming caffeine more acceptable in a planned way.

Keywords: Caffeine, medical students, adverse effects, academic performance

INTRODUCTION

Caffeine is believed to be the most commonly used psychoactive substance all over the world [1]. Although caffeine is present in many types of drinks and food, the majority of people drink coffee as a source of caffeine more than any other substance, whereas tea is the second most common source, [2, 3] despite the fact that caffeine improves physical and mental performance, health care providers have a huge concern toward its negative effect on health [4].

Pioneer in coffee study was done in Arabian Peninsula, physician Rhazes was the first to mention it in his manuscripts. Coffee plants was first cultivated in Yemen, whilst Turkey was the first country to roast the green coffee beans. So, its fact that "coffee" finds its origins in Arab, where it is called "Qahwah". Persian physician Avicenna was mentioned coffee as a medication in his book "The Canon of Medicine". Initially coffee was used as cosmetic to clean the skin, dry up the andgive a better odor to the body. After 17th century, the use of coffee became common in Europe [5].

Usually, caffeine is safe, but the benefits and health effects are dose dependent. It should not be consumed at high dose since consumption of caffeine beyond the upper limit is associated with an increased risk of adverse effects on an individual's health [5]. According to the Saudi ministry of health and Canadian ministry of health, daily caffeine consumption should not exceed 400 mg which equals to 4 cups of coffee [6, 7]. Although Coffee drinking has been associated with a lower risk of certain chronic diseases and overall mortality, it has been associated with a higher risk of fracture in females and some adverse effects in pregnancy. Moreover, women who are planning to get pregnant and lactating women are also at high risk, and their upper limit of daily caffeine intake is less than the general population [2, 8, 9]. Caffeine has a huge impact on the cardiovascular system especially in toxic dosage. A study revealed that drinking more than 3 cups per day can increase the risk of myocardial infarction in males significantly [10]. In addition, heavy caffeine consumption as much as ten cups

daily in patients who have had coronary artery disease is associated with an increased risk of cardiac arrest [11]. On the other hand, there is another study showed that protection against cardiovascular disease can be achieved by drinking beverages that contain caffeine regularly in elderly patients who do not suffer from hypertension [12].

Caffeine intake can affect the central nervous system dramatically since caffeine mimics certain receptors and influence the cholinergic neurons. Notably, it can enhance the cognitive function of the individual and it may also lower the development of neurodegenerative disorders such as dementia and Alzheimer's disease in the elderly if it is taken regularly in the middle age [3, 13-15].

Some students who are in high education levels use caffeine in order to be awake most of the day by lessening their sleeping hours to maintain the balance between their academic and social life. In addition, they have to consume more caffeine so that they keep themselves concentrated. Moreover, the more academic stress, the more sleep gets disturbed and this seen particularly in medical students since they spend more time in studying than other specialties. A study showed that poor sleep, including an increase

in midday sleep, is more prevalent among medical students [16].

Unfortunately, many medical students believe that consuming caffeine will boost their academic execution. Scientifically proven that there is no relation between caffeine consumption and academic performance [17]. Moreover, there are some studies concluded that students who shorten their sleeping hours have poor academic performance. In addition, A study found that caffeine intake among medical students is associated with late chronotype and obesity [18-20].

A study has been done on medical students in Jeddah found that palpitation was the most common side effect, whereas insomnia was the second most common [21]. Other side effects such as anxiety, irritability and tremors have been reported as well [22-24].

Keeping the aforesaid facts in view, the present study was aimed to assess medical student habit of caffeine consumption and their awareness of caffeine impact on their health at Imam Mohammad ibn Saud Islamic University, Riyadh, kingdom of Saudi Arabia.

METHODOLOGY

1. Ethics Statement

The study protocol was approved by the Ethics Committee, Institutional Review

Board (IRB) of College of Medicine, Imam Mohammad Ibn Saud Islamic University (IMSIU). All participants provided written informed consent prior to the experiment.

2 Study design and sample

A community based cross-sectional study was conducted to assess the daily amount of caffeine consumption among medical students in College of Medicine, Imam Mohammad Ibn Saud Islamic University, Riyadh. A cross-sectional study design using 26 questions self-administered questionnaire distributed to 400 medical students (200 male and 200 female) at IMSIU. To cover this study a systematized questionnaire was developed by following the previously published reports with needful modifications. The Study was implemented in two segments. During the first pre-test segment, twenty-eight survey questionnaires were randomly distributed among medical students to assess daily amount of caffeine consumption. The survey questionnaire was checked and revised to overcome all obstacles faced during this pilot study. The questionnaire was validated by experts to assess the content validity. Knowledge assessed using caffeine consumption questionnaire that contains questions which include "yes" or "no" questions. Attitude towards multiple suggested effects of

caffeine consumption assessed using 8 questions: increase arousal, cause lack of sleep, increase blood pressure, increase heart rate, cause anxiety if being consumed in high doses, and cause addiction if being consumed in high doses for long time. In the second segment, the self-administered typed survey questionnaire was distributed among 400 participating medical students (All years) at College of Medicine, IMSIU, Riyadh. Study was conducted for three months during the period of March to May. Inclusion criterion was full-time undergraduates of the college of medicine, and exclusion criteria were participants who have a history of major diseases, chronic health condition, and those who submitted questionnaires with incomplete answers.

3. Survey questionnaire structure and data collection

3.1. Demographic Variables

The trained study personnel participated in the survey questionnaire distribution and data collection. All participants provided complete questionnaire information, including gender (male/female), age (years), residence (campus/other places), and grades (GPA).

3.2. Physical, Sedentary Behavior, and Psychological impact

The pretested survey questionnaire was used to obtain the socio-demographic factors that related to the participants' knowledge about caffeine consumption, as well as to evaluate their approach of quit. The survey questionnaire included a series of yes/no statements and multiple response questions to evaluate the knowledge of students regarding caffeine consumption. Participants were asked regarding their caffeinated drinks consumption daily/weekly. Physical impact was assessed using the open-ended question: enhancement of morning awakening, mood enhancement, increase alertness, decrease fatigue and additionally, sedentary behavior information was acquired through the following question: concentration during study time, combat drowsiness and depression, used as relaxant etc.

4. Statistical analysis

The data collection was followed by tabulated in Microsoft Excel and data-extrapolation for the meaningful results. All the statistical analysis involved in this study was performed by using SPSS software program (SPSS Version 24, SPSS Inc., Chicago, IL). The data were expressed as frequencies, percentages, and means. Frequencies and percentages were used to present categorical variables. Chi squared test were used for comparison of the level of

experience and habit of caffeine consumption in medical students. Any test was declared significant at a p-value<0.05.

RESULT

Table 1 present the characteristics of the study participants. A total of 400 questionnaires were distributed among students at IMSIU, of them 333 (83.3%) responded with filled questionnaires. The total number of participants was 333 students, 69.4% were male, and 49.2% were between 21 to 23 years of age. Response included all academic levels; 15.6% of students were in preparatory year, 14.1% in first year, 14.1% in second year, 20.7% in third year, 18.9% in fourth year, and 16.5% in fifth year. Students' academic performance was mostly toward the higher end: more than two third (64.3%) had a GPA of 4.00 or more. Regarding caffeine consumption, only 11 (3.3%) students have never consumed caffeine, however about one fourth (24.8%) the consumers have tried to quit it.

Caffeine consumption habits among different study variables are illustrated in table 2. Around 64% of participants consume caffeinated beverages daily, 24.5% consume caffeine weekly, and 11.5% <1/week (p <0.001). This distribution does not differ significantly between gender groups (61%

and 65.3% daily, 25% and 24.3% weekly, and 14% and 10.4% <1/week for female and male respectively). Daily consumption was also the most frequent habit between different age groups. However, significant differences were found; less students who are ≤20 years old consumed caffeine daily in compare to their older colleagues, but they are the highest among weekly consumers (daily: 47.6% vs. 72.3% and 70.7%, weekly: 35.2% vs. 18.2% and 22.4%, p = 0.001).

Enhancement of morning awakening (46.3%), mood enhancement (45.7%), increase alertness (45.3%), and concentration during study time (45%) were the most prominent reasons to consume caffeinated beverages among participants. (Figure 1). Interestingly, we found that 41.9% students consumed coffee due to taste only.

Figure 2 shows participants attitude toward multiple suggested effects of caffeine. Most participants agreed that caffeine can increase arousal (63.7%), cause lack of sleep (80.8%), increase blood pressure (76.0%), increase heart rate (90.4%), cause anxiety if being consumed in high doses (67.0%), and cause addiction if being consumed in high doses for long time (73.3%). Around 44.7% disagreed and that caffeine can cause hallucination if used in high doses for long time, while 36.3% chose "Don't know".
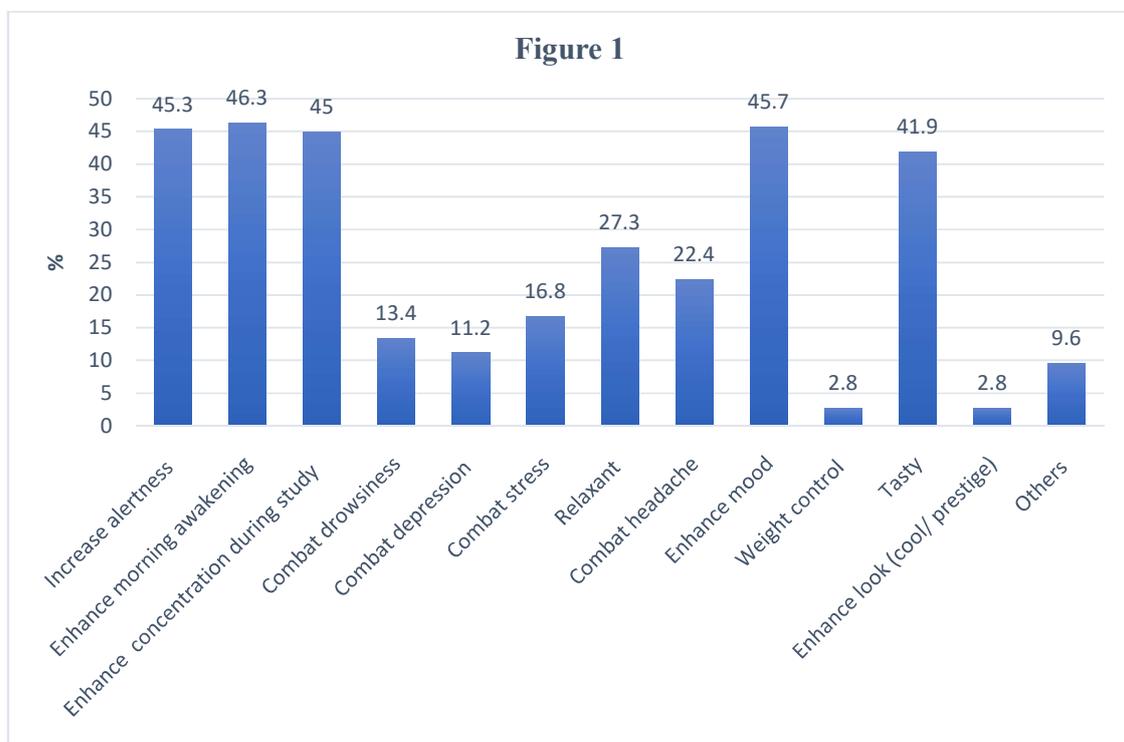
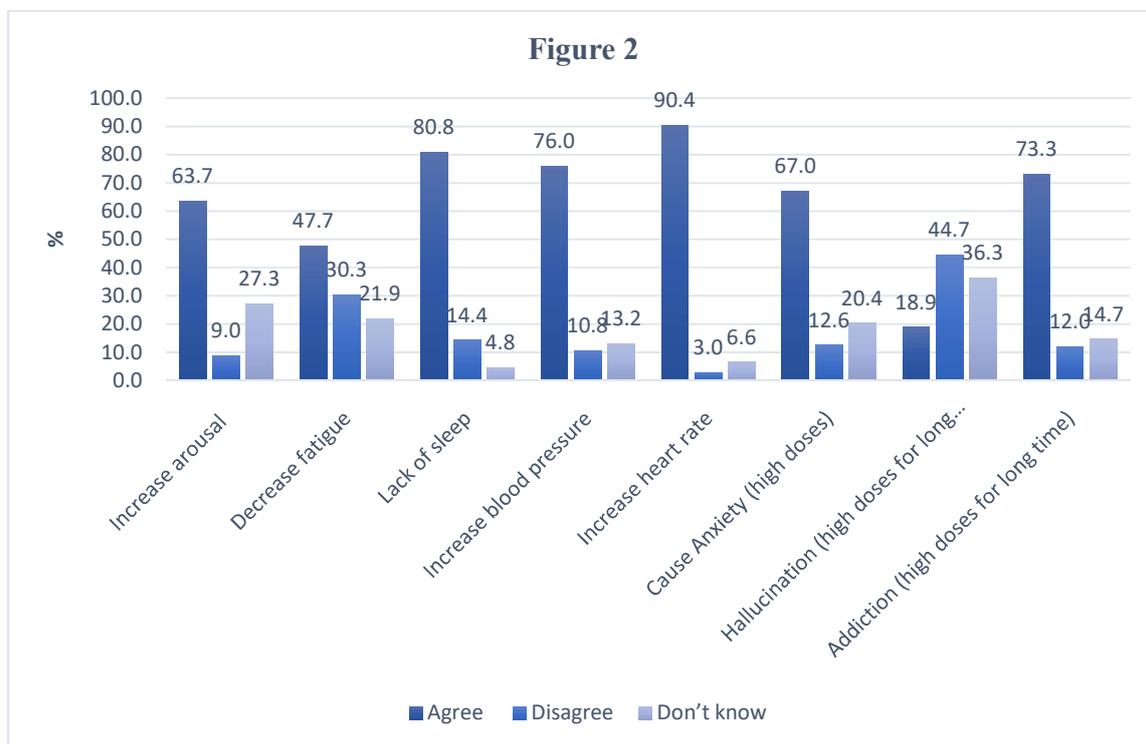Figure 1: Basis of caffeine consumption among participants

Figure 2: Participants attitude towards multiple suggested effects of caffeine consumption (n=333)

Table 1: Characteristics of the study participants

Characteristic		F	%
Gender(n=333)			
	Female	102	30.6
	Male	231	69.4
Age(n=333)			
	≤20	106	31.8
	21 to 23	164	49.2
	≥24	63	18.9
Grade(n=333)			
	Preparatory	52	15.6
	First	47	14.1
	Second	47	14.1
	Third	69	20.7
	Fourth	63	18.9
	Fifth	55	16.5
GPA(n=333)			
	<4.00	119	35.7
	≥4.00	214	64.3
Have you ever consumed caffeine(n=333)			
	Yes	322	96.7
	No	11	3.3
Have you ever tried to quit caffeine (N=322)			
	Yes	80	24.8
	No	242	75.2

GPA: students grade point average

Table 2: Caffeine consumption habits among the different study variables

Variables		Daily n (%)	Weekly n (%)	<1/week n (%)	P-value
Total		206 (64)	79 (24.5)	37 (11.5)	<0.001
Gender (n=322)					
	Female	61 (61.0)	25 (25.0)	14 (14.0)	0.604
	Male	145 (65.3)	54 (24.3)	23 (10.4)	
Age (n=322)					
	≤20	50 (47.6)	37 (35.2)	18 (17.1)	0.001*
	21 to 23	115 (72.3)	29 (18.2)	15 (9.4)	
	≥24	41 (70.7)	13 (22.4)	4 (6.9)	
Grade (n=322)					
	Preparatory	20 (39.2)	20 (39.2)	11 (21.6)	<0.001*
	First	26 (56.5)	16 (34.8)	4 (8.7)	
	Second	30 (63.8)	8 (17.0)	9 (19.1)	
	Third	56 (83.6)	9 (13.4)	2 (3.0)	
	Fourth	42 (68.9)	12 (19.7)	7 (11.5)	
	Fifth	32 (64.0)	14 (28.0)	4 (8.0)	
GPA (n=322)					
	<4.00	69 (61.1)	32 (28.3)	12 (10.6)	0.506
	≥4.00	137 (65.6)	47 (22.5)	25 (12.0)	
Have you ever tried to quit caffeine (N=322)					
	Yes	151 (62.4)	63 (26.0)	28 (11.6)	0.528
	No	55 (68.8)	16 (20.0)	9 (11.3)	

GPA: students grade point average
considered statistically significant

DISCUSSION

Coffee is the most popular beverage after water and is consumed worldwide in daily with a impressive amounts of approximately 1.6 billion cups. Caffeine increased alertness, improved memory, and enhanced mood. Even though, caffeine can have harmful physical consequences. Caffeine improves performance by reducing reaction times and improving attentional performance, if it is taken in a defined dose [25, 26]. Improvements are seen across psychomotor and vigilance tasks, particularly when responses are sustained over time. The use of caffeine to stay awake and alert is a long-standing habit. A study showed that caffeine is associated with modulation of mood, most notably increasing alertness and reducing fatigue [27]. Even improve Cognitive performance and mood enhancement could be improve with low doses of caffeine (12.5 to 100 mg) [28].

Notwithstanding, over the past decade caffeine consumption has grown in popularity, especially among university students. Keeping this in view, the present study was focused for the assessing the medical student habit of caffeine consumption and their awareness of caffeine impact on their health at Imam Muhammad ibn Saud Islamic University, Riyadh, Saudi Arabia. Among 333 students (College of Medicine, IMSIU) participated. The study showed that consumption of daily caffeine is increasing as the student going from preparatory to the next years till reach the

maximum (83.6%) at third year, then the percentage is decreasing in the clinical years (4th and 5th years), while the proportion of consuming caffeine weekly is higher in the preparatory and first year. A study conducted in South Africa showed no statistically significant differences among the grades of medical school [29]. Although it was not statistically significant, but the present study showed that the consumption of caffeine is higher in the high GPA students (64.3%). While in those with GPA less than 4 is (35.7%). This can be explained by that the more academic stress, the more sleep disturbances so they drink more caffeinated beverages in order to be awake most of the day to balance the social life and academic performance [16]. Regarding the age, the participants those between 21-23 years old represent the highest percentage of daily caffeine consumers.

The survey findings also indicated that male tend to consume more coffee (69.4%) as compared to female (30.4%). Some study showed that coffee and energy drink consumption was more prevalent in males. Male university students in Israel showed the prevalence of coffee consumption specifically was higher among males (90.7%) than females (78%) [30]. Another study conducted in Saudi Arabia, concluded that

male ((72.1%)) tend to consume energy drinks twice as much as female (64.4%) [31]. The present study also showed that there were around two third of participants consume caffeinated beverages daily, only (3.3%) have never consumed caffeinated beverages. A study conducted at king Saud University, Riyadh (KSU) showed a high percentage of students those consume caffeine (97.5%), and 22.7% of them considered as high intake, however, the non-consumers were only (2.5%) which is comparable to the present study [32]. Another study conducted at three medical colleges in Jeddah concluded that about (20.3%) of all their students drink energy beverages daily and (4.6%) drink more than once [21]. Similar to the above finding in South Africa, the percentage of consuming caffeine for academic purpose more than seven times per week is around (36.5%) [29]. In a survey conducted in America showed that (17.6%) drink five to ten caffeinated beverages daily [33].

Regarding the reasons of caffeine consumption, in KSU, the study showed most common reasons were to feel more alert (56%), followed by to keep morning awakening (46.4%) and then because of the taste (44.5%), only (3.3%) for weight control [33]. On the other hand, as caffeine is

considered a psychoactive substance [1], some studies concluded that the less sleep the students get, the poorer academic performance [18]. In the present study, the participants stated that they consume caffeine for enhancement of morning awakening, followed by mood enhancement, increase alertness, and concentration during study time. The least reasons were to control body weight (2.8%) and same percentage to enhance look (prestige). About the weight control, a study conducted in China concluded that the caffeine may lead to late chronotype and higher BMI in medical students [16]. However, small percentage (2.8%) in the present study believed that consumption of coffee helps in weight control.

A study for the reason of consuming of caffeinated drink, 57.5% of them consumed caffeinated energy drink beverages to enjoy free times with friends, while (56.4%) drink them to feel more powerful for studying, and almost half of consumers of energy drinks for morning awakening in Jeddah [21]. However, (72.4%) prefer caffeinated drink because of the taste in South Africa [29].

Regarding the effects of caffeine, the caffeine should not be consumed at high doses, since it can cause many adverse effects, such as: increased heart rate, gastroesophageal reflux

disease, gastric ulcerations [5, 34]. On the other hand, heavy doses of caffeinated beverages especially coffee is not related to risk of cardiovascular diseases [35]. moreover, there is a study concluded that, the caffeine may protect against cardiovascular disease and this can be achieved by drinking beverages that contain caffeine regularly in elderly patients who do not suffer from hypertension [12]. Also, caffeine can enhance the cognitive function of the person, and it may decrease the risk of the neurodegenerative disorders such as dementia and Alzheimer's disease in the elderly if it is consumed regularly in the middle age [3, 13, 15].

About (73.3%) of participants in this study believe that the long use of caffeine can cause addiction. However, less than half of them agreed with that the caffeine does not cause hallucination. In KSU (69.2%) believe that the caffeine can cause arousal, which can be supported by the result of the present study (63.7%) [33]. About the heart rate, (59.7%) of participant in South Africa, and (77.6%) in KSU know that the caffeine can increase heart rate, however, the percentage was significantly higher in the present study (90.4%) [29, 33]. The curriculums of medical schools may explain why their students are aware about the side effects of caffeine.

Recommendations: Based upon the findings of this study, the following has been recommended

- Further research is necessitated to knowledge of medical students regarding the role of caffeinated drink in academic performance, may be caffeinated drinks were to boost energy, to stay awake, to improve mood, to increase concentration,

- One major answer about enhance morning awakens which was not in details in our questionnaire, hence we recommend more research on its occurrence. Especially after stressful long night awake during exam period.

- University curriculum must play a major role in educating the students about caffeine consumption and must include in the survey.

- Researchers should continue to investigate the long-term caffeine consumption effects.

- Also, more research is needed to investigate the caffeine consumption along with cigarette or other edible stuffs, and also include monitoring some physiological sign.

CONCLUSION

In conclusion, this cross-sectional survey-based study provides valuable evidence and suggests that by improving the knowledge of consuming of caffeinated drink among the medical college students. Our study revealed that significant proportion of students at College of Medicine, IMSIU uses caffeine, a large percent of students consumes caffeine daily for the commonest reasons including enhancement of morning awakening, mood enhancement, increase alertness, and concentration during study time. Our finding will enlighten in planning a strategy for educating students for consuming caffeine more acceptable in a planned way. Also, some guidelines and awareness programs implement on caffeine intake could help in minimizing consumption of these drinks.

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