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Research Article

Caffeine Consumption among Zayed University Students in Dubai, United Arab Emirates: A Cross-Sectional Study

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Abstract

Background: Over the past decade, the global caffeine consumption rate has increased dramatically. Coffee and tea are among the common sources, but energy drinks are becoming an important contributor to total caffeine consumption. Recommendations for daily caffeine intake is not being followed due to the perceived benefits of caffeine which include mood improvement, concentration, social factors, and energy boosting. This study was important to add to the limited data about caffeine consumption in the Gulf region and mainly in the UAE.

Objectives: The objectives were to determine the prevalence of caffeinated beverage consumption among university students and perceived benefits in addition to the estimation of daily caffeine consumption (mg/day).

Design: Data was collected through a self-reported questionnaire from a total of 175 participants (129 females and 46 males) who were conveniently selected from different settings at Zayed University - Dubai. Usual Caffeine intake was calculated from all caffeine containing beverages.

Results: Eighty-six percent of the 175 participants, both males and females, at Zayed University-Dubai consumed caffeinated beverages with an average intake of 249.7 ± 235.9 mg. The intake among the 150 caffeine consumers varied from 4.2 mg/day to 932.2 mg/day. Average intake of caffeine was not significantly different between genders ($P = 0.125$). Thirty-five percent of the population consumed more than 400 mg/day of caffeine, with no statistical difference between males and females ($P = 0.202$). Coffee was the most commonly consumed drink among both genders, followed by tea. Most perceived benefits of caffeine consumption were not significantly different except for the relationship between caffeine and improved exercise performance ($P = 0.018$) and caffeine in relation to weight loss ($P = 0.001$) among males.

Conclusion: The prevalence of caffeine consumption at Zayed University was high among both males and females. Further research is necessary to estimate the total caffeine intake from all dietary sources, mainly the cultural foods and beverages, and to determine the relationship between accessibility to caffeine containing beverages and caffeine consumption among University student.

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1. Introduction

Caffeine of the methyl xanthine –class is a central nervous stimulant and the world's most popular psychoactive drug [3]. The scientific name of caffeine is 1, 3, 7-trimethylxanthine ($C_8H_{10}N_4O_2$), consisting of specific A1 and A2 receptor subtypes on its adenosine component. Respectively, one receptor is responsible of providing the body with protective features allowing tissues to maintain stability, whereas the other subtype shows the major effect in developing the effects seen after caffeine consumption [15]. Caffeine is readily available in coffee, tea, fizzy drinks, energy drinks, chocolate, and cola nuts [22]. Caffeinated beverages have the highest contribution to the total caffeine intake per day amongst all sources of caffeine [7, 22].

Generally, caffeine is safe, but the benefits and health effects are dose related. Health Canada [8] indicated that up to 400 mg/day is an acceptable daily consumption of caffeine with no health risk factors. Several meta-analyses supported this conclusion [4, 13]. On the other hand, woman who are planning to become pregnant, pregnant, or lactating females, should limit their intake to 300 mg/day due to the adverse effect of high caffeine on the fetal health (Victor et al., 2015).

While individuals respond differently to stimulants, research has found that caffeine has both positive and negative effects on the body, such as anxiety, insomnia, tachycardia, irritability, Broncho-pulmonary dysplasia and muscle tremors [5, 8, 16, 18, 20].

Commonly reported reasons behind caffeinated drinks were to boost energy, to stay awake, to improve mood, to increase concentration, and to socialize [16, 19, 21]. However, many people ingest these drinks disregarding the recommendations due to various reasons including lack of knowledge and awareness regarding energy drinks ingredients [21]. This results in the side effects of caffeine outweighing the benefits that consumers seek [20]. While it is indeed true that caffeine boosts moods, alertness and long-term memory, it is advisable to consume recommended proportions of caffeine [20]. The consumption of more than 5 cups daily increase the likelihood of cardiovascular complications, especially stroke or coronary artery disease [5]. In addition, caffeine has several renal and genitourinary complications, increased urine flow rate, sodium and calcium excretion, creatinine clearance, and urinary incontinence are the most common [8]. In fact, many individuals reported that they have experienced some of the adverse effects of caffeine. [1, 10]. In a recent study, more than 31.6% of caffeine consumers reported that they experienced some of the adverse side effects of caffeine; heart rate was the most common and "jolt and crash episodes" was the least common [10]. Another study showed that caffeine is more effective in showing its effects on males than females [1].

Caffeine has some benefits when consumed in moderate amounts, but the question is, are people following recommendations? In 2014, more than fifteen million of sixty-gram coffee bag was consumed by individuals globally. Compared to data obtained in 2011, the global coffee consumption showed an average annual growth rate of 2.5% increase in coffee intake [11]. Multiple studies have shown high rates of caffeine consumption across different countries including the United States, Israel, and India [14, 17, 21, 23].

On the other hand, regional studies showed the same trend in the consumption of caffeinated drinks, mainly energy drinks, among university students in the Gulf and Middle East [2, 19]. In the UAE, the limited studies that were done in this concern showed the high tendency of university students towards the consumption of caffeinated drinks, mainly energy drinks [12]. Gender was a determinant for caffeine consumption in many studies, where males tended to consume more caffeinated drinks than females [2, 10, 19, 24].

Given the lack of studies in this area in the UAE, and due to the global increase in caffeine overconsumption prevalence, more research is required in this area. Results will be beneficial for future planning of awareness programs and will be considered as a baseline for future research. Early control over caffeine consumption may be a key in reducing the prevalence of caffeine overconsumption, if the results showed any.

So the objectives of this study were to determine the prevalence of caffeinated beverage consumption among university students and perceived benefits in addition to the estimation of daily caffeine consumption (mg/day).

2. Methodology

This is a cross-sectional study where convenience sampling technique was used to select the study population. A total of 175 participants (46 males and 129 females) were recruited from Zayed University – Dubai campus.

The study conformed to the ethical standards of the university and ethical approval was obtained from the Research Ethics Committee at Zayed University. Consent was taken from all the participants prior to their participation.

The research focused on studying gender difference in caffeine consumption among students who met the inclusion criteria (caffeine consuming students who were currently enrolled Zayed and were 17 years or older). Exclusion criteria included: those who participated in the pilot study, students below 17 years, pregnant students, students who did not completely fill in the self-reported questionnaire, and students were not currently enrolled at the university.

A self-administered food frequency questionnaire that included all caffeine containing beverages in the market was used to determine the frequency of caffeine consumption and to estimate the average daily consumption. Demographic data such as gender, age, and marital status, participant's lifestyle including eating habits, physical activity, sleeping patterns, smoking, reasons for caffeine consumption and perceived benefits and health effects of caffeine consumption was also collected.

Data was analyzed descriptively and inferentially using SPSS 15.11.2 software. Independent samples T test and Chi-square tests were used to assess significant differences at a P-value of less than 0.05. Descriptive and frequency analysis to determine the general characteristics of all 175 participants was done, and then descriptive, comparison analysis and conclusions were conducted on the sub-sample of caffeine consumers (n = 150).

3. Results

The study sample consisted of 129 female students (73.7%) and 46 male students (26.3%), a total of 175 participants. The mean age of the students was 20.7 ± 2.9 years. The majority of participants were females (73.7%) while males represented around one fourth of the study sample (26.3%). This is due to the unbalanced number of enrolled students from both genders where there is a significantly larger female population than male population at the university. Zayed University is a governmental university, therefore, the vast majority of students are Emirati. Thus, 95.4% of the study sample were Emirati and 4.6% were other Arab nationals mainly from Saudi Arabia, Kuwait, Afghanistan, Bahrain, and Yemen. Most of the participants were not married (86.9%) and non-smokers (83.4%). They were distributed over the different university colleges; mainly University College (26.3%), College of Sustainability Sciences and Humanities (20.6%), Technological Innovation (18.3%) and College of Business (10.3%), and about 52% of the participants were in their 3rd or 4th year of studies. The majority (72.6%) reported not taking any nutrition related course during their course of study. From the 175 participants, 85.7% (n = 150) reported to consume caffeinated beverages.

The focus sample of analysis for this study was the caffeine consumer subgroup (n = 150). From the 150 caffeine consumers, 26% were males (n = 39) and 74% (n = 111) were females. Table 1 describes the general characteristics of this group.

On average, caffeine consumption was reported to be 249.7 ± 235.9 mg/day. The range of the amount of caffeine consumed in the study sample varied from a minimum of 4.2 mg/day to 932.2 mg/day. Males, separately, had an average consumption of

Character		Frequency (N) ¹	Percent (%)
Gender	Male	39	26
	Female	111	74
Nationality	Emirati	142	94.7
	Non Emirati	8	5.3
Marital status	Single	130	86.7
	Engaged, married or divorced	20	13.3
Year of study	English levels	22	14.7
	First year	33	22
	Second year	19	12.7
	Third year	38	25.3
	Fourth year	38	25.3
College	Academic Bridge Program	22	14.7
	University College	40	26.7
	College of Art and Creative Enterprises	3	2
	College of Business Sciences	16	10.7
	Communication and Media Sciences	9	6
	College of Education	5	3.3
	College of Sustainability Sciences and Humanities	30	20
Nutrition related courses	Yes	41	27.3
	No	109	72.7
Smoker	Yes	24	16
	No	126	84
Caffeine consumption	Yes	150	85.7
	No	25	14.3

TABLE 1: Caffeine consumer sample characteristics (n = 150).

300.1 ± 244 mg/day which was not significantly different ($P = 0.125$) than the female average consumption of 232.2 ± 231.0 mg/day.

Compared to referenced recommended intake, 23.3% of the study population consumed more than 400 mg caffeine/day with higher overconsumption prevalence in males (30.8%) compared to females (20.7%), but this difference did not show statistical significance ($P = 0.202$).

Contributing factors to caffeine consumption varied among the study population. Reported reasons for caffeine consumption are presented in **Table 2**. A large percent of male (51.3%) and female (47.7%) students, claimed that they consume caffeinated beverage because it acts as a source of energy for them and boosts their energy.

Analysis showed that a significantly greater percent of male students consumed caffeinated drinks and beverages to enhance performance during exercise compared to females ($P = 0.018$). Moreover, a significantly greater percentage of males consumed caffeine to help them in dieting and weight loss ($P = 0.001$). Other reasons for caffeine consumption are shown in table 2.

Coffee was the main source of caffeine from liquid based drinks among both males and females. Tea, soft drinks, and then Energy drinks contributed to total caffeine intake as per order. In general, males consumed more coffee, soft drinks and energy drinks, while females tended to consume more tea and cocoa based drinks.

Average intake of caffeine from coffee among males and females was 232.1 mg/day and 172.8 mg/day, respectively, however, this difference was not statistically significant ($P=0.587$). A significantly higher amount of decaffeinated espresso was consumed by males than females ($P = 0.001$). Espresso, Double Espresso, Instant, and Americano are types of coffee that are significantly consumed in larger amounts by males in the study ($P < 0.001$). Notably, Intake of caffeine from green tea was significantly higher in females than males ($P = 0.004$). The total caffeine intake from energy drinks did not achieve any statistical difference between genders ($P = 0.063$). **Figure 1** presents a summary of the average intake of caffeine form different caffeinated beverages by males and females.

4. Discussion

Over the past decade, caffeine consumption has grown in popularity, especially among adolescents and adults who attend school or university. This study provides an insight on the general behavior of Zayed University-Dubai students towards caffeine intake and the consumption of caffeinated drinks. Similar to the findings of many studies [12, 21, 23, 24], (Al-Islam and Faris 2014), the overall, caffeine consumption was highly prevalent among Zayed University students. This can be attributed to the general trend

Reason	Males (n = 39)		Females (n = 111)		P (gender)
	No.	%	No.	%	
It is cheap	2	5.1	6	5.4	0.983
It give me energy	20	51.2	53	47.7	0.739
My friends consume it	2	5.1	6	5.4	0.938
It increases my concentration while working on a project or studying for an exam	14	35.8	46	41.4	0.517
It enhances my performance during exercise	7	17.9	6	5.4	0.018
It wakes me up in the morning	14	35.8	42	37.8	0.8
It helps me stay awake	17	43.5	35	31.5	0.185
It relieves my stress	8	20.5	17	15.3	0.468
It relieves headache	12	30.7	23	20.7	0.212
I am curious about its taste and effect	3	7.6	13	11.7	0.475
It helps me with dieting and weight loss	5	10.9	1	0.8	0.001

TABLE 2: Reported reasons for caffeine consumption among males and females*. *This question was a multiple answer question, therefore; the given percentage reflects the percentage of the total responses on this question and not on the total study sample.

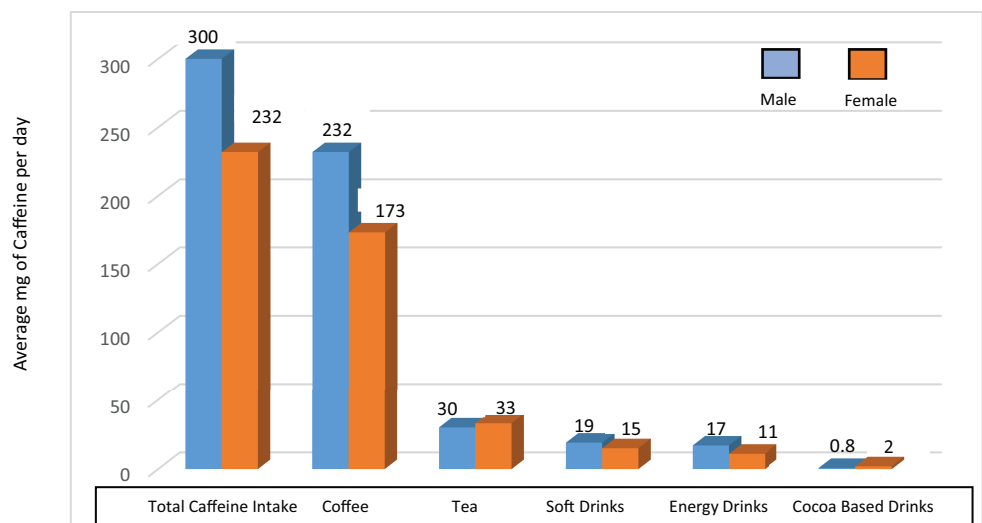


Figure 1: Daily average caffeine intake (mg) from caffeinated beverages (n = 150).

of high coffee consumption by the UAE citizens due to the culture and tradition of the country.

This study was the first study amongst the Arab region that determined the average intake of caffeine in mg by university students. Despite the difference between mean caffeine intake between male and females, yet this did not show any statistical difference ($P = 0.125$). On average, males consumed 300.1 ± 244 mg/day while females consumed 232.2 ± 231.0 mg/day. The big difference in standard deviation of the means can be explained by the huge variances between the consumption of caffeine among the study sample which ranged from 12.7 mg/day to 840.7 mg/day among females and ranged from 4.2 mg/day to 932 mg/day among males. Compared to safe average recommendations of 400 mg/day, the overall amount of caffeine consumed by Zayed University-Dubai students was not alarming. However, 23.3% of participants consumed 400 mg of caffeine or more per day.

Coffee was the main contributor to the total caffeine intake in this study population, followed by tea. The average amount of caffeine taken from coffee including instant coffee, espresso, latte, cappuccino, and decaffeinated coffee was 188 mg/day which was higher than the average reported in India (15 mg) [23]. As for tea, our study population consumed on average 32 mg/day of caffeine, while tea contributed to 6 mg/day in Suhasini and Sethu [23] study.

In regards to gender difference in caffeine intake, selective and limited studies were found in the literature yet none of them had the same focus as this study. Although there was no statistical difference between males and females in regards to caffeine consumption, yet, in alignment with other studies [2, 19], males tend to have higher caffeine consumption than females. In addition, coffee and energy drink consumption was more prevalent in males. Two different studies conducted in Israel and KSA supported this finding. Male university students in Israel scored higher prevalence in coffee consumption than female medical students [24]. Similarly, in this study, the prevalence of coffee consumption specifically was higher among males (90.7%) than females (78%). Another study conducted in Dammam City, Saudi Arabia, concluded that male adolescents tend to consume energy drinks twice as much as female adolescents do [19]. This concurred with the findings from this study population which showed that energy drink consumption was more prevalent in males (72.1%) than females (64.4%) but this difference was not significant.

Reasons for caffeine consumption that were pointed out in this study were coherent with other similar studies. The findings indicated that the main reason for caffeine consumption among Zayed University students is for energy boosting. Similarly, a large percent of adolescents and young adults in Jeddah [19] and the United States [21] consumed caffeinated beverages for the same reason. A minority of participants (5.4%) in this study indicated that they consume caffeinated drinks due to social influencers, such as friends.

5. Conclusion

Despite the fact that some students at Zayed University - Dubai are not caffeine consumers, a large percent of students consume caffeine at least once a month for reasons including boosting energy, improving concentration, staying awake, relieving headache, tasting, and dieting. The amount of caffeine consumed by students from beverages varied, with the majority consuming moderate amounts. This study focused on caffeine intake from beverages only. For this reason, we cannot say that Zayed University - Dubai students consume caffeine in moderate amounts as other dietary sources have influence on the total intake as well. Despite the fact that the average daily intake was within the recommended levels, yet several cases of caffeine overconsumption were reported. Further research is necessary to estimate the total caffeine intake from all dietary sources and to determine the relationship between caffeine consumption and accessibility to caffeine at the University. More on-campus awareness programs on caffeine adverse effects are necessary to control the high prevalence of caffeine consumption. Awareness on reading labels and the determination of caffeine content of beverages should also be raised as it may contribute to reducing the caffeine consumption to within acceptable levels.

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