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Clinical research article

Effect of caffeine consumption on the academic performance among students of University of Kalamoon (UOK)

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SUMMARY

Introduction: Caffeine is the most commonly used psychoactive substance throughout the world. It is found in coffee, tea, and chocolate, as it is produced naturally in the beans and leaves of the plants used to manufacture these products. Caffeine is often used for its benefits, which include increased vigilance. It does have side-effects, however, such as palpitations and withdrawal symptoms that include headache. **Objective:** This study aimed to determine the frequency of caffeine consumption and its effect on academic performance among students of the University of Kalamoon (UOK). **Methodology:** The study was conducted 550 undergraduate students from first to final year. **Results:** About 51.6% were females, 84.2% of the students scored less than 3 Grade Point Average (GPA). Majority of the students (98.9%) consume caffeine in any form such as an international Coffee's trademark (72.9%), tea and coffee. About 64.4% of the students consume caffeine at morning. About 51.3% of the students reported sleeplessness as a side effect and 32.9% of them reported headache as a withdrawal symptom. High proportions of the students were found to be consuming caffeine due to the misconception that caffeine (75.5%) increase their academic performance. **Conclusions:** This study found no significant association between academic performance and caffeine consumption.

Keywords: Academic performance; caffeine; grade point average (GPA); University of Kalamoon (UOK).

RESUMEN

Efecto del consumo de cafeína en el rendimiento académico de los estudiantes de la Universidad de Kalamoon (UDK)

Introducción: La cafeína es la sustancia psicoactiva más consumida en todo el mundo. Se encuentra en el café, el té y el chocolate, ya que se produce de forma natural en los granos y hojas de las plantas utilizadas para elaborar estos productos. La cafeína se utiliza a menudo por sus beneficios, que incluyen una mayor lucidez mental. Sin embargo, presenta efectos secundarios, como palpitaciones y síntomas de abstinencia, como dolor de cabeza. **Objetivo:** Este estudio tuvo como objetivo determinar la frecuencia del consumo de cafeína y su efecto en el rendimiento académico de los estudiantes de la Universidad de Kalamoon (UOK). **Metodología:** El estudio se realizó con 550 estudiantes de pregrado, desde el primero hasta el último año. **Resultados:** El 51,6 % eran mujeres y el 84,2 % de los estudiantes obtuvo un

promedio de calificaciones (GPA) inferior a 3. La mayoría de los estudiantes (98,9 %) consume cafeína en alguna forma, como alguna marca comercial internacional de café (72,9 %), té y café. Aproximadamente el 64,4 % de los estudiantes consumen cafeína por la mañana. El 51,3 % reportó insomnio como efecto secundario y el 32,9 % dolor de cabeza como síntoma de abstinencia. Se observó que un alto porcentaje de estudiantes consumía cafeína debido a la idea errónea de que esta aumenta su rendimiento académico (75,5 %). **Conclusiones:** Este estudio no encontró una asociación significativa entre el rendimiento académico y el consumo de cafeína.

Palabras clave: Rendimiento académico; cafeína; promedio de calificaciones (GPA); Universidad de Kalamoon (UDK).

RESUMO

Efeito do consumo de cafeína no desempenho acadêmico entre alunos da Universidade de Kalamoon (UDK)

Introdução: A cafeína é a substância psicoativa mais comumente usada em todo o mundo. É encontrada no café, chá e chocolate, pois é produzida naturalmente nos grãos e folhas das plantas usadas para fabricar esses produtos. A cafeína é frequentemente usada por seus benefícios, que incluem maior vigilância. No entanto, ela tem efeitos colaterais, como palpitações e sintomas de abstinência, que incluem dor de cabeça. **Objetivo:** Este estudo teve como objetivo determinar a frequência do consumo de cafeína e seu efeito no desempenho acadêmico entre alunos da Universidade de Kalamoon (UOK). **Metodologia:** O estudo foi conduzido com 550 alunos de graduação do primeiro ao último ano. **Resultados:** Cerca de 51,6% eram mulheres, 84,2% dos alunos pontuaram menos de 3 na média de notas (GPA). A maioria dos alunos (98,9%) consome cafeína em qualquer forma, como alguma marca comercial internacional de café (72,9%), chá e café. Cerca de 64,4% dos alunos consomem cafeína pela manhã. Cerca de 51,3% dos alunos relataram insônia como efeito colateral e 32,9% deles relataram dor de cabeça como sintoma de abstinência. Altas proporções de alunos consumiam cafeína devido ao equívoco de que a cafeína (75,5%) aumentava seu desempenho acadêmico. **Conclusões:** Este estudo não encontrou associação significativa entre desempenho acadêmico e consumo de cafeína.

Palavras-chave: Desempenho acadêmico; cafeína; média de notas (GPA); Universidade de Kalamoon (UDK).

1. INTRODUCTION

Caffeine (1,3,7-trimethylxanthine) is a psychostimulant purine-like alkaloid, which is found naturally in coffee, tea, cacao beans (source for chocolate and cocoa) guarana, mate, and kola nuts, though it has been identified in more than 60 plant species [1, 2]. Nowadays, caffeine is the most widely consumed psychostimulant in the world. It is estimated that caffeine is being consumed by more than 80% [1, 3]. The caffeine quantity reported was (± 137 mg/cup of caffeinated coffee and ± 2 mg/cup of decaffeinated coffee; the volume of one cup is approximately 240 ml), tea (± 47 mg/cup), caffeinated soft drinks (± 46 mg/340 ml can or bottle of cola beverage), energy drinks (up to 80 mg/can) and caffeinated chocolates, non-beverage foodstuff, medications (± 7 mg/200 g) [4, 5].

The reason behind caffeine consumption reported was increased self-reported alertness, improved performance, vigilance in performing tasks, concentration, improved long-term memory and faster locomotors speed [6, 7].

While caffeine is generally thought to be safe in moderate amounts (i.e., ≤ 400 mg per day) in healthy adults [8], it is clearly not an innocuous compound and can cause significant toxicity

and even lethality (i.e., most commonly via myocardial infarction or arrhythmias) if sufficient quantities are consumed [8, 9].

With regard to the effects of dosage, caffeine doses from 12.5 mg to 20 times this amount affect performance in terms of vigilance and related tasks to a similar extent, indicating a very flat dose–response relationship. Thus, increasing the dosage does not necessarily strengthen the positive effects of caffeine [10]. Low to moderate doses of caffeine (20–200 mg) reportedly produce increased well-being, happiness, energy, alertness, and sociability, whereas higher doses are more likely to produce anxiety, irritability and gastric discomfort [11].

Excessive ingestion (1000–1500 mg per day) leads to a state of intoxication known as caffeinism, which is characterized by restlessness, agitation, excitement, incoherent and excited thoughts and speech, and insomnia. Caffeinism is often overlooked by doctors during psychiatric assessments as these symptoms are similar to many psychiatric disorders [12]. Although the modest acute effects may occur following initial use, tolerance to these effects appears to develop in the context of habitual use of the substance, with the occurrence of withdrawal symptoms after periods of abstinence [5].

Typically, the onset of withdrawal symptoms occurs 12 to 24 hours after abstinence, with peak intensity at 20 to 51 hours. Withdrawal symptoms, including headaches, fatigue, decreased energy/physical activity, decreased alertness, drowsiness, decreased contentedness, depressed mood, difficulty in concentrating, irritability and clouded mentality, have been reported, and may last for two to nine days [11, 12].

The aim of the study was to determine (i) the use of caffeine for academic and other purposes, (ii) which caffeinated products were mostly used, (iii) the frequency of caffeine use for academic purposes, and (iv) knowledge of its benefits, side-effects and withdrawal symptoms among students of University of Kalamoon (UOK). Knowledge of common facts and misconceptions regarding the effects of caffeine in the target population were also investigated.

1.1. The specific contribution of the research:

Since caffeine consumption is very widespread especially among university students; and it causes toxicity if it is consumed in large quantities, and due to the misconception that caffeine increases academic performance, in addition to the fact that the global studies on this subject are limited and due to the lack of a prior study in Syria on this matter, therefore the aim of this research is to find out if there is a significant association between caffeine consumption academic performance or not by performing a cross-sectional study on 550 students of UOK population and analyzing data by using SPSS program. This study found no significant association between academic performance and caffeine consumption.

2. METHODOLOGY

A cross-sectional study was carried out on 550 students of UOK population that included all first to final year students. After an introductory presentation informing students about the rationale and implementation of the study, data were collected by means of a questionnaire available in Arabic. Participants were given the opportunity to ask questions on matters unclear to them. In addition to demographic details, information regarding different types of caffeinated products and frequency of consumption, the questionnaire included multiple-choice questions on the benefits, side-effects and withdrawal symptoms of caffeine. All participants received a consent form and information document with the questionnaire. Participation was voluntary. The signed consent forms and questionnaires were handed in separately.

Academic performance was assessed through latest GPA (Grade Point Average) of the study participants. GPA less than 3.0 was considered as below average academic performance and GPA more than 3.0 was labelled as above average academic performance. The data were entered and analyzed by using SPSS program. Frequency and percentages were calculated and multivariate analysis was performed for determining the association of caffeine consumption and academic performance.

3. RESULTS

About 51.6% of the students were females and 48.4% were males. About 15.8% of the students scored less than 3 GPA and 84.2% scored more than 3 GPA. Majority (98.1%) of the students consumed caffeine in any form and only 1.1% of the students did not consume caffeine in any form (Table 1).

Table 1. Socio-demographic characteristics of the study participants N=550.

Characteristics	Percentage (%)
Gender	
Male	48.4
Female	51.6
GPA	
0-1	2-4
1-2	14
2-3	67.8
3-4	15.8
Consume caffeine in any form	
Yes	98.9
No	1.1

About 72.9% of the students consumed caffeine in form of international Coffee's trademark, 59.9% tea, 57.9% coffee, 42.5% cola and 22.6% in energy drinks form (Table 2).

Table 2. Frequency distribution of consumption of caffeine containing items by the study participants.

Caffeine containing items	Percentage (%)
Consume international Coffee's trademark	
Yes	72.9
No	27.1
Consume coffee	
Yes	57.9
No	42.1
Consume tea	
Yes	59.9
No	40.1
Consume cola	
Yes	42.5
No	57.5
Consume energy drinks	
Yes	22.6
No	77.4

About 64.4% of students consume caffeine at morning, 42.9% at the time of studying, 31.2% at evening and 27.3% at middle of the day (Table 3).

Table 3. Frequency distribution of caffeine consumption time by the study participants.

Time	Percentage (%)
Morning	
Yes	64.4
No	35.6
Middle of the day	
Yes	27.3
No	72.7
Evening	
Yes	31.2
No	68.8
Time of the studying	
Yes	42.9
No	57.1

Regarding perception about caffeine consumption 75.5% reported that it increases academic performance, 48.2% reported that caffeine containing drinks have a favorite flavor, 46% reported that it increases alertness, 42.7% reported that in improves group work activity, 19.5% reported that it increases study hours, 12.4% reported that it reduces headache and 11.7% reported that it reduces fatigue (Table 4).

Table 4. Distribution of variables regarding perceptions of students about caffeine consumption.

Variables	Percentage (%)
Caffeine consumption increases academic performance	
Yes	75.5
No	24.5
Caffeine consumption increases alertness	
Yes	46
No	54
Caffeine consumption increases study hours	
Yes	19.5
No	80.5
Caffeine consumption reduces fatigue	
Yes	11.7
No	88.3
Caffeine consumption reduces headache	
Yes	12.4
No	87.6
Caffeine consumption improves group work activity	
Yes	42.7
No	57.3
Caffeine containing beverages have a favorite flavor	
Yes	48.2
No	51.8

Regarding side effects resulted from increasing consumption of caffeine 51.3% reported that it causes sleeplessness, 26.5% reported that it causes tremors, 24.5% reported that it causes tachyarrhythmias, 21.1% reported that it induces peptic ulcers, 8.5% reported that it causes dizziness and 5.6% reported that it causes convulsions (Table 5).

Table 5. Frequency distribution of side effects of caffeine consumption by the study participants.

Side effect	Percentage (%)
Sleeplessness	
Yes	51.3
No	48.7
Tachyarrhythmias	
Yes	24.5
No	75.5
Tremors	
Yes	26.5
No	73.5
Dizziness	
Yes	8.5
No	91.5
Convulsions	
Yes	5.6
No	49.4
Peptic Ulcer	
Yes	21.1
No	78.9

Regarding withdrawal symptoms caused after periods of caffeine consumption abstinence 32.9% reported that it causes headache, 27.8% reported that it causes difficulty in concentrating, 21.6% reported that it decreases alertness, 19.5% reported that it causes anxiety and 14.9% reported that it causes fatigue (Table 6).

Table 6. Frequency distribution of withdrawal symptoms of caffeine consumption abstinence by the study participants.

Withdrawal symptom	Percentage (%)
Headache	
Yes	32.9
No	67.1
Decreased alertness	
Yes	21.6
No	78.6
Increased anxiety	
Yes	19.5
No	80.5
Difficulty in concentrating	
Yes	27.8
No	72.2
Fatigue	
Yes	14.9
No	85.1

The data were analyzed by using SPSS program. According to Spearman's rho test caffeine consumption did not show any significant association with academic performance (GPA) (Table 7).

Table 7. Characteristics of socio-demographics, caffeine containing substances consumption and Grade Point Average (GPA).

Correlations			
	GPA		
Spearman's rho	**Number of Coffee's trademark cups consumed per day**	Correlation Coefficient (r)	-0.050
		Sig. (2-tailed) (P-value)	0.240
		N	550
	Number of coffee cups consumed per day	Correlation Coefficient (r)	0.011
		Sig. (2-tailed) (P-value)	0.803
		N	549
	Number of tea cups consumed per day	Correlation Coefficient (r)	0.023
		Sig. (2-tailed) (P-value)	0.585
		N	550
	Number of cola boxes consumed per day	Correlation Coefficient (r)	-0.105*
		Sig. (2-tailed) (P-value)	0.013
		N	550
	Number of energy drinks boxes consumed per day	Correlation Coefficient (r)	-0.135**
		Sig. (2-tailed) (P-value)	0.002
		N	549
	GPA	Correlation Coefficient (r)	1.000
		Sig. (2-tailed) (P-value)	
		N	550
**Correlation is significant at the 0.01 level (2-tailed)			
* Correlation is significant at the 0.05 level (2-tailed)			

4. DISCUSSION

Caffeine is the most widely consumed psychoactive substance worldwide. Coffee, tea, Coffee's trademark and some soft drinks are popular nutritional sources of caffeine. This study was carried out on 550 students of UOK population that included all first to final year students.

This study majority reported that the majority of the participants consume caffeine in different forms (coffee, Coffee's trademark, tea, cola and energy drinks) especially in morning. The most popular caffeinated beverage among students was Coffee's trademark followed by tea and coffee respectively. And the major side-effect of consuming caffeine was sleeplessness.

This study demonstrates that majority of the participating students self-perceive that caffeinated beverages improve the academic performance.

There found no significant relation between the number of Coffee's trademark cups consumed per day and the cumulative GPA of the students with (r=-0.050, N=550, P-value of 0.240) where P-value is > 0.05. There found no significant relation between the number of coffee cups consumed per day and the cumulative GPA of the students with (r=0.011, N=549, P-value of 0.803) where P-value is > 0.05. There found no significant relation between the number of tea cups consumed per day and the cumulative GPA of the students with (r=0.023, N=550, P-value of 0.585) where P-value is > 0.05. Although P-value is <0.05, there found no significant relation between the number of cola boxes consumed per day and the cumulative GPA of the students with (r=-0.105, N=550, P-value of 0.013) because correlation coefficient is negative. Although P-value is <0.05, there found no significant relation between the number of energy drinks boxes consumed per day and the cumulative GPA of the students with (r=-0.135, N=549, P-value of

0.002) because correlation coefficient is negative. However, no association was found between caffeine consumption and academic performance.

5. CONCLUSIONS

This study concluded that high proportions of the students were consuming caffeine due to the misconception that caffeine increases academic performance. This study found no significant association between academic performance and caffeine consumption. It is recommended that students should adopt healthy life style and use caffeine in moderation. The false perception that caffeine improves academic performance should be corrected by frequent health awareness sessions and seminars. Most of the participants were consuming caffeine without having sufficient knowledge of its benefits, side-effects and withdrawal symptoms. It is recommended that awareness programs on the side-effects and symptoms of caffeine withdrawal should be carried out.

The possible side effects that the study population might exposed to:

Sleeplessness was the main side effect that appeared on about the half of the study population, while the frequency of occurrence of tachyarrhythmias, tremors and peptic ulcer were less, whereas convulsions and dizziness were the lowest.

CONFLICTS OF INTEREST

Author has no conflict of interest.

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