

The relationship between daily caffeine consumption and withdrawal symptoms: a questionnaire-based study

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Aim: To estimate daily caffeine intake among a group of university students at the Kocaeli Vocational School of Health Services in Turkey, and to determine the relationship between daily caffeine consumption and withdrawal symptoms.

Materials and methods: This survey study was conducted using a questionnaire that was administered to 156 university students (129 females, 27 males) at the Kocaeli Vocational School of Health Services in Kocaeli, Turkey. The quantity of caffeine-containing products consumed was recorded on a daily basis, depending on the dietary habits of the consumer. The t test for differences between 2 proportions (using the normal approximation) was used for comparison of the frequency of complaints that began within 12-24 h of the cessation of caffeine consumption in relation to the quantities of daily caffeine consumption at $P < 0.05$.

Results: Daily caffeine intake was estimated to range from 0 to 500 mg day⁻¹. A significant increase in headache, fatigue, irritability, and sleepiness/drowsiness ($P < 0.05$) was reported by student's whose daily caffeine consumption was > 200 mg than by those whose daily caffeine consumption was < 200 mg.

Conclusion: The data obtained show that Turkish university students consume similar amounts of caffeine as American, Canadian, Swedish, and British university students. The survey results show that there was a relationship between daily caffeine consumption and withdrawal symptoms (headache, fatigue, irritability, and sleepiness/drowsiness).

Key words: Caffeine, daily consumption, withdrawal symptoms, university student, questionnaire

Günlük kafein tüketimi ile yoksunluk belirtileri arasındaki ilişki: anket çalışması

Amaç: Bu çalışmanın amacı, Türkiye'de Kocaeli Sağlık Hizmetleri Meslek Yüksekokulu'ndaki üniversite öğrencileri arasında günlük kafein alımını hesaplamak ve günlük kafein tüketimi ile yoksunluk belirtileri arasındaki ilişkiyi bulmaktır.

Yöntem ve gereç: Bu çalışma, Kocaeli, Türkiye'de Kocaeli Sağlık Hizmetleri Meslek Yüksekokulu'ndaki 156 üniversite öğrencisine (129 kadın, 27 erkek) bir anket kullanılarak düzenlendi. Kafein içeren ürünlerin tüketim miktarı, tüketicinin beslenme alışkanlıklarına bağlı bir günlük kaydedildi. Günlük kafein tüketim miktarları ile kafein tüketiminin kesilmesinden sonra 12 ile 24 saat içinde başlayan ilgili şikâyet sıklıklarının mukayesesi için, iki örnek grubundan elde edilen yüzdelerin karşılaştırılmasında istatistiksel analiz yöntemi (normal yaklaşımlı) kullanılmıştır.

Bulgular: Günlük alınan kafein 0 mg gün⁻¹ ile 500 mg gün⁻¹ aralığında değerlendirildi. Baş ağrısı, yorgunluk, sinirlilik, uykusuzluk/uykulu olma belirtileri, günlük kafein tüketimi 200 mg' dan fazla olanlar ile karşılaştırıldığında, günlük kafein tüketimi 200 mg' dan az olanlara göre belirgin bir artış görüldü ($P < 0,05$).

Sonuç: Elde edilen veriler Türk üniversite öğrencilerinin Amerikalılar, Kanadalılar, İsviçre ve İngilizlerle karşılaştırıldığında yaklaşık aynı miktarlarda kafein tükettiğini göstermektedir. Anket çalışmasının bir sonucu olarak, günlük kafein tüketimi ile kafein tüketiminin kesilmesine bağlı yoksunluk belirtileri (özellikle baş ağrısı, yorgunluk, sinirlilik, uykusuzluk/uykulu olma belirtileri için) arasında bir ilişki vardır.

Anahtar sözcükler: Kafein, günlük tüketim, yoksunluk belirtileri, üniversite öğrencisi, anket

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Introduction

Caffeine, or 1,3,7-trimethylxanthine, is a natural alkaloid. Caffeine is found in common beverages (coffee, tea, and soft drinks), products containing cocoa or chocolate, and medications, including headache or pain remedies and over-the-counter stimulants (1). Standard values for caffeine content in these foods and beverages have been established (2).

Caffeine is the most widely consumed psychoactive substance in the world (1). It has been shown that moderate caffeine consumers can experience symptoms of withdrawal when daily consumption of caffeine is terminated (3). Common caffeine withdrawal symptoms include headache, drowsiness, increased work difficulty, decreased feelings of well-being/contentment, decreased sociability/friendliness/talkativeness, flu-like symptoms, and blurred vision (4,5). Some studies have demonstrated that caffeine, especially from coffee, tea, and soft drinks, disrupts sleep (6).

A survey on the potential intake of caffeine was carried out in Brazil in 1993. The average and median potential daily intake of caffeine in the studied population were, respectively, 2.74 and 1.85 mg kg⁻¹ (7).

In another survey concerning caffeine levels in retail beverages in Portugal, daily caffeine intake was estimated to range from 4.7 to 200 mg day⁻¹ (8).

The present survey study included 156 university students living in a Turkish city. The aim of the study was to estimate the quantity of daily caffeine consumption (Turkish coffee, tea, soft drinks, chocolate products, and instant coffee), and to determine the relationship between daily caffeine consumption and withdrawal symptoms.

Materials and methods

Questionnaire

A questionnaire was distributed to 156 university students at the Kocaeli Vocational School of Health Services. The questionnaire was designed specifically for this study and was composed of 2 sections. The first section collected data on gender, age, occupation, and specific habits related to the consumption of

Turkish coffee, tea, soft drinks, chocolate products, and instant coffee. The second section collected data about the possible effects of caffeine use on the health of the participants. The survey also collected data on the following symptoms: headache, fatigue, irritability, sleepiness/drowsiness, lack of concentration, work difficulty, anxiety, depression, flu-like symptoms, and psychomotor impairment.

Collection of consumption data

The quantity of caffeine-containing products consumed was recorded on a daily basis, depending on the dietary habits of the consumer. Additional information was collected regarding the type of coffee (Turkish or instant), chocolate (black, white, and wafer coated in milk chocolate), and soft drinks (cola, diet, and iced tea) consumed. The quantity consumed was recorded in units of volume or mass (mL or g), or in terms of household measures. When the quantity consumed was reported using household measures, conversion factors were applied, for example, a Turkish coffee cup (80 mL), a tea glass (100 mL), or a glass (250 mL).

Study population

The study group was 83% female and 17% male. In all, 66% of the students were 15-20 years old, 19% were 21-25 years old, and 15 were 26-30 years old. In all, 59% of the study group worked in the health services field (nurse, midwife, laboratory technician) (Table 1).

Data analysis

The t test for differences between 2 proportions (using the normal approximation) was used for comparison of the frequency of complaints that began 12-24 h after cessation of caffeine consumption in relation to quantities of daily caffeine consumption at $P < 0.05$.

Results

The quantity of daily caffeine consumption was estimated according to Table 2 and was divided into 5 sub-groups: 0-100 mg, 100-200 mg, 200-300 mg, 300-400 mg, and > 400 mg. Table 3 shows these intervals and that 29% of daily caffeine consumption was 200-300 mg.

Table 1. Distribution of occupations.

Occupation	%
Nurse	27
Midwife	8
Laboratory technician	17
Health service	7
Student	41

Table 2. Caffeine content of selected dietary sources.

Product	Volume or weight	Caffeine content (mg)
Tea	100 mL	31
Iced tea	330 mL	20
Turkish Coffee	80 mL	58
Instant Coffee	200 mL	88
Coca-Cola	330 mL	46
Diet Coca-Cola	330 mL	46
Classic Chocolate	50 g	3-63
Dark Chocolate	41 g	31
Wafer coated in milk chocolate	38 g	5

A significant increase in headache, fatigue, irritability, and sleepiness/drowsiness ($P < 0.05$) was reported by those whose daily caffeine consumption was > 200 mg, as compared to those whose daily caffeine consumption was < 200 mg (Table 4). For other withdrawal symptoms experienced by caffeine consumers, no significant differences were observed between daily caffeine consumption > 200 mg and < 200 mg.

Discussion

In the present study daily caffeine intake was estimated to range from 0 to 500 mg day⁻¹. In all, 76% of the participants consumed caffeine from caffeine-containing products at levels ranging from 100 to 500 mg day⁻¹. The data obtained show that university students at the Kocaeli Vocational School of Health

Table 3. Daily caffeine consumption intervals.

Caffeine quantity (mg)	%
0-100	24
100-200	27
200-300	29
300-400	6
>400	14

Table 4. Influence of daily caffeine consumption on the frequency of complaints.

Symptoms	<200 mg (79)	>200 mg (77)
Headache	8.8	20.7*
Fatigue	5.1	27.2*
Irritability	5.1	18.1*
Sleepiness/drowsiness	13.9	32.4*
Lack of concentration	11.3	14.2
Work difficulty	7.5	12.9
Anxiety	11.3	16.8
Depression	1.3	2.6
Flu-like symptoms	1.3	2.6
Psychomotor impairment	3.8	7.8
No symptoms	64.5*	28.5

* $P < 0.05$.

Services consumed similar amounts of caffeine as American, Canadian, Swedish, and British university students (9). In Turkey, as in Britain, the main dietary source of caffeine is tea. Furthermore, the data obtained show that the university students consumed caffeine for its stimulant effect.

The study found no evidence that the consumption of caffeine caused lack of concentration, work difficulty, anxiety, depression, flu-like symptoms, or psychomotor impairment. These results contradict those reported by Silverman (10) and Nawrot (5). Based on the data obtained in the present study, the consumption of caffeine may cause headache, fatigue, irritability, and sleepiness/drowsiness. These results support those reported by Silverman (10) and Strain (11), concerning headache and fatigue, and Nawrot (5), concerning sleepiness/drowsiness.

References

1. Kendler KS, Prescott CA. Caffeine intake, tolerance and withdrawal in women: A population-based twin study. *American Journal of Psychiatry* 1999; 156: 223-228.
2. Barone JJ, Roberts HR. Caffeine consumption. *Food Chemistry and Toxicology* 1996; 34: 119-129.
3. Schuh KJ, Griffiths RR. Caffeine reinforcement: the role of withdrawal. *Psychopharmacology* 1997; 130: 320-326.
4. Richardson NJ, Rogers PJ, Elliman NA, O'Dell RJ. Mood and performance effects of caffeine in relation to acute and chronic caffeine deprivation. *Pharmacol Biochem Behav* 1995; 52: 313-320.
5. Nawrot P, Jordan S, Eastwood J, Rotstein J, Hugenholtz A and Feeley M. Effects of caffeine on human body. *Food Additives and Contaminants* 2003; 20: 1-30.
6. Malinauskas BM, Aeby VG, Overton RF, Carpenter-Aeby T, Barber-Heidal K. A survey of energy drink consumption patterns among college students. *Nutrition Journal* 2007; 6: 35: 1-6.
7. Camargo MCR, Toledo MCF, Farah HG. Caffeine daily intake from dietary sources in Brazil. *Food Additives and Contaminants* 1999; 16: 79-87.
8. Pena A, Lino C, Silveira MIN. Survey of caffeine levels in retail beverages in Portugal. *Food Additives and Contaminants* 2005; 22: 91-96.
9. James JE. *Caffeine and Health*, San Diego: Academic Press Limited, 1991; 432.
10. Silverman K, Mumford GK, Griffiths RR. Enhancing caffeine reinforcement by behavioral requirements following drug ingestion. *Psychopharmacology* 1994; 114: 424-432.
11. Strain EC, Mumford GK, Silverman K, Griffiths RR. Caffeine dependence syndrome. *JAMA*. 1994; 272: 1043-1048.