Caffeine consumption among university students in Jordan: a cross-sectional study using a self-administered online questionnaire

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Abstract

Caffeine is a naturally occurring stimulant from the methylxanthine family, and its consumption has notably increased among Arab youth. Despite this trend, empirical studies addressing caffeine consumption patterns among university students in Jordan remain limited. Therefore, this study aims to assess caffeine consumption patterns among Jordanian university students to evaluate their daily caffeine intake in relation to the safe intake level recommended by the European Food Safety Authority. A cross-sectional study was conducted, using a questionnaire structured via Google Forms, and distributed randomly through social media platforms. A total of 400 participants were recruited and completed the questionnaire between March and May 2025. The results showed that the students consumed products containing caffeine. Caffeine consumption was more prevalent among females (70.1%) than among males (29.9%). Coffee was the primary contributor to caffeine intake for both males and females. Participants reported consuming caffeine mainly to enhance academic performance (50.7%), for its unique flavor (50.1%), and to overcome drowsiness (46%). Overall, 46.8% of the participants reported daily caffeine consumption exceeding the safe level of caffeine (400 mg/day). These findings indicate that a considerable percentage of university students consume caffeine at high levels, highlighting the need for awareness and educational initiatives to warn students about the potential health consequences of excessive caffeine consumption.

Keywords: caffeinated drinks, caffeine, consumption, Jordan, students.

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استهلاك الكافيين بين طلبة الجامعات في الأردن: دراسة مقطعية باستخدام استبيان إلكتروني ذاتي التعبئة

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ملخص

الكافيين هو منبّه طبيعي ينتمي إلى عائلة الميثيل زانثين، وقد لوحظ تزايد استهلاكه بين الشباب العرب. وعلى الرغم من هذا التوجه، لاتزال الدراسات الشاملة حول استهلاك الكافيين بين طلبة الجامعات في الأردن محدودة. لذلك، يهدف هذا البحث إلى تقييم أنماط استهلاك الكافيين لدى طلبة الجامعات الأردنيين وتقييم استهلاكهم اليومي منه مقارنة بالمستوى الآمن الذي توصي به الهيئة الأوروبية لسلامة الغذاء. أُجريت دراسة مقطعية باستخدام نموذج عبر نماذج جوجل، ووزع الاستبيان عشوائيًا عبر وسائل التواصل الاجتماعي. بلغ عدد المشاركين في الدراسة 400 مشاركًا خلال الفترة من مارس إلى مايو 2025. أظهرت النتائج أن معظم الطلبة يستهلكون منتجات تحتوي على الكافيين، وكان استهلاك الكافيين أعلى بين الإناث (70.1%) مقارنة بالذكور (29.9%). وتبيّن أن القهوة هي المصدر الرئيسي لاستهلاك الكافيين لدى الجنسين. وأفاد 50.7% من المشاركين بأنهم يستهلكون الكافيين بغرض تحسين الأداء الدراسي، بينما 50.1% منهم يستهلكونه لنكهته المميزة، و46% يستهلكونه للتغلب على النعاس. كما أظهرت النتائج أن 46.8% من المشاركين يستهلكون كميات من الكافيين تتجاوز المستوى الآمن الموصى به (400 ملغ/اليوم). وخُلصت النتائج إلى أن بعض الطلبة يستهلكون مستويات مرتفعة من الكافيين، مما يستدعي تنفيذ مبادرات توعوية لتثقيفهم حول الآثار الصحية المحتملة للاستهلاك المفرط للكافيين.

الكلمات المفتاحية: المشروبات المحتوية على الكافيين، الكافيين، الاستهلاك، الأردن، الطلاب.

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Introduction:

Caffeine is the most frequently consumed psychoactive substance worldwide and one of the most important compounds in terms of research and studies within food supply (Temple et al., 2017). It is a natural stimulant and an alkaloid belonging to the methylxanthine class of compounds (Wolde, 2014). Caffeine is classified as an alkaloid since it is a secondary plant metabolite generated from purine nucleotides and contains a heterocyclic nitrogen atom (Depaula & Farah, 2019). It occurs naturally in coffee beans, cocoa beans, kola nuts, and tea leaves, as well as other foods and beverages. Major dietary sources of caffeine include coffee, tea, energy drinks, yerba mate, and caffeinated soda such as cola (Reyes & Cornelis, 2018). It is also found in many commercial powders, capsules, and therapeutic medications (Depaula & Farah, 2019).

According to reports, the global coffee consumption in 2020-2021 reached approximately 166.63 million bags weighing 60 kilograms (Ridder, 2021) . In Jordan, coffee imports were valued at 78 million Jordanian dinars during the first half of 2023, totalling approximately 18 tons from various countries (Department of Statistics, Jordan, 2023). The widespread popularity of coffee can be attributed to its distinctive flavor profile and stimulant effects, as well as its considerable role within the cultural traditions of many societies (Rodak et al., 2021).

Caffeine is primarily consumed to alleviate fatigue and drowsiness, yet it has many additional therapeutic applications (Holstege & Holstege, 2014). It has recently attracted scientific interest as a bioactive chemical with good health benefits, where it may exert a protective effect against oxidative stress associated with Alzheimer's disease (Kolahdouzan & Hamadeh, 2017). Furthermore, it may lower the risk of chronic illnesses including type 2 diabetes (Kolb et al., 2021), liver disease (Li et al., 2024), and specific types of cancer (Safe et al., 2023).

Studies unravel a range of reasons for caffeine consumption. College students have reported using caffeinated products to enhance mood and cognitive performance, or to maintain alertness (Choi, 2020). Moreover, several investigations have proved that caffeine intake among college students is commonly motivated by the desire to boost alertness, overcome fatigue, manage stress, and improve overall cognitive function (AlSharif et al., 2018; Bucher et al., 2019; Mahoney et al., 2019).

Health authorities state that healthy adults are not generally at risk for caffeine's adverse effects (European Food Safety, 2017; Food & Drug, 1980).

However, there is an ongoing concern that caffeine consumption is increasing among children, adolescents, and pregnant or lactating women. This increase in caffeine consumption potentially leads to negative health outcomes (Verster & Koenig, 2018) due to the increase in consuming food products containing caffeine and the changing consumption habits related to traditional caffeine sources (Temple et al., 2017).

The European Food Safety Authority (EFSA) has recently set maximum acceptable levels of caffeine consumption among different age groups. It was found that daily caffeine consumption up to 400 mg for adults and 3 mg/kg for children and adolescents do not pose a safety risk. Whereas for pregnant women, the recommended maximum daily intake is limited to 200 mg (European Food Safety, 2015).

However, the increasing consumption of caffeine may lead to the so-called "caffeine intoxication," which refers to a syndrome noted by a set of adverse reactions, for example, nervousness, insomnia, irritability, muscle twitching, restlessness, headache, increased urination, irregular and increased pulse, arrhythmia, increased respiratory rate, and gastrointestinal disturbances (such as vomiting, nausea, and diarrhea) (Holstege & Holstege, 2014; Temple et al., 2017). Therefore, this study aims to assess caffeine consumption among Jordanian university students to evaluate their daily caffeine intake compared to the safe level recommended by the European Food Safety Authority (EFSA).

Methodology:

1. Study Design, Settings, and Participants:

A cross-sectional survey was conducted to estimate caffeine intake among Jordanian university students to evaluate their daily caffeine consumption compared to the recommended safety level. It was conducted between March and May 2025. The survey was developed using Google Forms and was distributed through various social media platforms to reach a broad student population. The questionnaire was distributed to several Jordanian universities to achieve a diverse and balanced sample. Efforts were made to encourage participation across genders and academic disciplines. The main inclusion criterion was that participants be residents of Jordan, be 18 years of age or older, and be enrolled at a Jordanian university at the time of data collection. Prior to initiating the online questionnaire, enrolled participants were provided with an information form stating the objectives of the study and asserting the voluntary nature of participation. All the study participants

gave their consent to use the information they submitted for research purposes.

2. Sample Size:

According to previous studies and the Raosoft Sample Size Calculator, the required sample size was determined using a 95% confidence interval, a 5% margin of error, and the total population size of Jordanian university students. According to data reported by the Ministry of Higher Education and Scientific Research and the Department of Statistics Jordan, the total population of university students in Jordan in 2023 was 399,923. Taking all these parameters into consideration, the minimum required sample size was 384 participants, which was considered statistically representative for the objectives of the current study.

3. Ethical Consideration:

Ethical approval for this study was obtained from the Institutional Review Board at Al-Balqa' Applied University (145/12/2024/2025). Furthermore, the administrations of the universities participating in the survey were notified of the data collection procedures prior to the commencement of the study.

4. Study Questionnaire Validity:

The questionnaire was adapted from Hamdan (2025) and Kharaba et al. (2022). It had been pre-validated and employed to collect comparable data in Jordan, with some modifications. The questionnaire, originally created in English, was translated into Arabic by language specialists to accommodate the participants' native language. Then, the Arabic version of the questionnaire was reviewed by academic experts in food processing and nutrition to ensure clarity and accuracy.

5. Study Tool:

A self-administrated questionnaire was developed in Arabic using Google Forms. It contained 30 multiple-choice items, in addition to two items about weight and height. The questionnaire comprised 30 items organized into three main sections, each containing several questions. The first section covered socio-demographic data, the second addressed medical history and lifestyle, and the third focused on patterns of caffeine consumption.

6. Statistical analysis:

Data analysis was conducted using version 25 of the Statistical Package for the Social Sciences (SPSS). Descriptive statistics were employed to summarize the characteristics of the study sample, with frequencies and percentages for categorical variables. Chi-square tests were used to examine

associations between gender (male vs. female) and socio-demographic characteristics, lifestyle factors, and patterns of caffeine consumption. In addition, caffeine consumption levels, classified as safe versus unsafe, were compared across all study variables using Chi-square tests. Statistical significance was established as a p-value of <0.05.

Results:

1. Socio-demographic Characteristics:

A total of 400 participants were recruited; however, 39 participants reported no caffeine consumption and were therefore excluded from further analyses related to caffeine intake. The socio-demographic characteristics of the participants are summarized in Table (1). The sample consisted of 68.8% females and 31.3 % males. Most of the female and male participants fell within the 20-23-year age group (71 %). Approximately 49.5% of the participants reported living in urban areas, while 50.5% reported living in rural areas. Nearly 34.3% reported that they were in their third year of university study. Most participants lived with their families (97%), were single (93.8%), were not employed (77.5%), were enrolled in non-medical academic programs (89%), and attended public universities (88.7%). Chi-square analysis examining the distribution of socio-demographic variables according to levels of caffeine consumption showed no statistically significant association between age and caffeine consumption ($p = 0.070$). However, participants aged $\geq$28 years manifested a higher proportion of high caffeine intake (66.7%), suggesting a possible trend toward increased caffeine consumption with advancing age, though this association did not reach statistical significance (Table 4).

Table 1. Socio-demographic characteristics of university students (n=400).

Variable		N (%)
Age	17-19 years 20-23 years 24-27 years ≥28years	57(14.2%) 284(71%) 45(11.3%) 14(3.5%)
Sex	Male Female	125(31.3%) 275(68.8%)
Place of residency	City Village	198(49.5%) 202 (50.5%)
Living status	With Family Alone	388(97%) 12(3%)
Material status	Single Married Other	375(93.8%) 21(5.3%) 4(1%)
Working	Yes No	90(22.5%) 310(77.5%)
University	Public Private	355(88.7%) 42(11.3%)
College	Medical Non-medical	44(11%) 356(89%)
Year of study	First Second Third Fourth Fifth Sixth	75(18.8%) 74(18.5%) 137(34.3%) 77(19.3%) 27(6.8%) 10(2.5%)

2. Medical History and Lifestyle Characteristics

Table 2 presents the medical history and lifestyle characteristics of the study population, including only participants who reported caffeine consumption. The majority of participants reported that they did not have any chronic diseases (94.5%), were not taking regular medication (87.5%), and were not following any specific dietary regiments (87.5%). Regarding physical activity, 26% of the participants reported low levels of activity, 67% reported moderate levels, and 6.9% reported high levels of physical activity. More than half of the participants (54.8%) reported experiencing insomnia, while 52.4% indicated suffering from sleep disorders. About (33.8%) of the participants were smokers; among these, 48.0% reported smoking electronic cigarettes, 42% smoked conventional cigarettes, and 10% smoked both types. The Chi-square analysis demonstrated statistically significant associations

between the consumption of caffeinated beverages and smoking status, physical activity level, insomnia, and sleep disorders across male and female participants ($p < 0.05$).

Table 2. Medical history and lifestyle characteristics of participants, and association between gender and medical history, and lifestyle characteristics (Chi-Square Test).

	N (%)			
Medical History	Total	Male (n=108)	Female (n=253)	p-value
Chronic disease Yes No	 20(5.5%) 341(94.5%)	 5(4.6%) 103(95.4%)	 15(5.9%) 23894.1%)	0.621
Medication Yes No	 45(12.5%) 316(87.5%)	 11(10.2%) 97(89.8%)	 34(13.4%) 219(86.6%)	0.32
Following a diet Yes No	 65(18%) 316(87.5%)	 27(25%) 81(75%)	 38(15%) 215(85%)	0.024*
Lifestyle habits				
Smoking Yes No	 122(33.8%) 239(66.2%)	 69(63.9%) 39(36.1%)	 53(20.9%) 200(79.1%)	<0.001*
Type of smoking Cigarette E-cigarette Both	 55 (42%) 63 (48%) 14(10%)	 50(46.3%) 13(12%) 11(10.2%)	 5(2%) 50(19.8%) 3(1.2%)	<0.001*
Physical activity Low/sedentary Moderate High	 94(26%) 242(67%) 25(6.9%)	 21(19.4%) 71(65.7%) 16(14.8%)	 73(28.9%) 171(67.6%) 9(3.6%)	<0.001*
Do you suffer from insomnia? Yes No	 163(45.2%) 198(54.8%)	 38(35.2%) 70(64.8%)	 125(49.4%) 128(50.6%)	0.013*
Sleep disorder Yes No	 189(52.4%) 172(47.6%)	 46(42.6%) 62(57.4%)	 143(56.5%) 110(43.5%	0.015*

Significant at *: $p < 0.05$ using Pearson Chi-square test or Fisher test

3. Pattern of Caffeine Consumption:

Table 3 shows the patterns of caffeine consumption among university students. Approximately 67.3% of the respondents reported preferring to consume caffeinated beverages in the morning. A total of 39.3% of the participants reported consuming caffeinated drinks two to three times per day, 38% once daily, 12.7% one to three times per week, 7.5% four to five times per day, and 2.5% four to six times per week. More than half of the

participants (64%) revealed a preference for consuming caffeinated drinks after meals. Nearly over half of the participants (57.6%) reported that post-meal caffeine consumption was a habit, while 32.1% believed that it helped prevent acid reflux and upset stomach. The most common caffeine source among the participants was coffee (76.5%), followed by tea (28%) and chocolate (23.3%). Approximately 66.5% of the participants reported increased caffeine intake during examination periods.

More than half of the respondents (51.8%) were aware that certain painkillers include caffeine and believed that consuming coffee with Panadol would not alleviate their headache/pain compared with taking Panadol alone (59%). The main reasons for consuming caffeinated beverages were 'for studying' (50.7%), and 'for the taste' (50.1%), as shown in Figure 1.

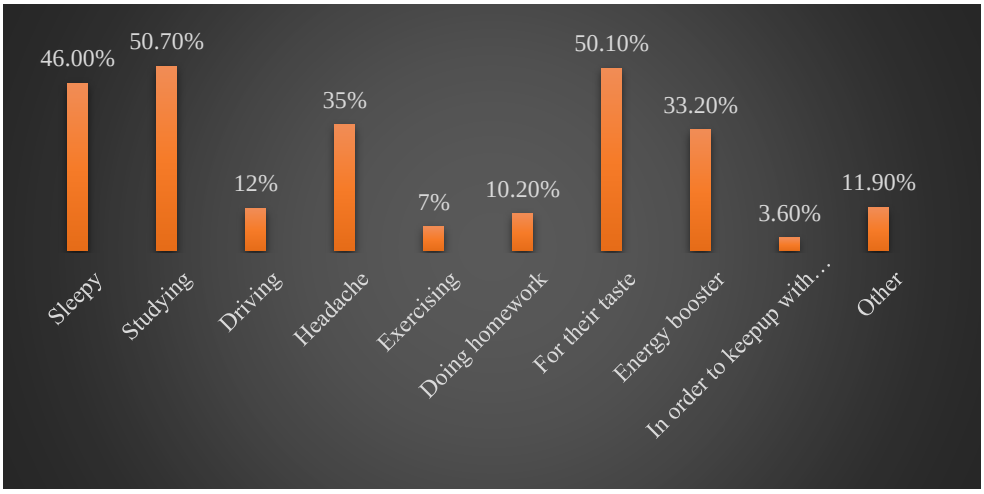

Figure 1. Reasons for caffeine consumption.

A significant difference was found between preferences, sources, and related knowledge between male and female participants. As for caffeine consumption, although the absolute number of females consuming energy drinks was higher (n = 44) compared to males (n = 28), the proportion of male consumers was higher (25.9% vs. 17.4%). This difference approached statistical significance (p = 0.06), suggesting a potential trend for greater energy drink consumption among males (Table 3).

The cross-tabulation analysis indicated that 26.0% of the participants with high caffeine consumption reported consuming energy drinks, whereas 74.0% did not. These findings suggest that, although energy drinks contribute to overall caffeine intake, the majority of the individuals with high caffeine consumption obtain caffeine from other sources. The association between energy drink consumption and high caffeine intake was statistically significant (χ^2 (1) = 7.383, p = 0.007). The corresponding Phi coefficient (0.143) indicated a small to moderate effect size (Table 5).

Table 3. Comparison of caffeine consumption patterns, preferences, sources, and related knowledge between male and female participants. (N=361).

Caffeine consumption pattern	N (%)	Male (N=108)	Female (n=253)	p-value
How frequently do you drink caffeinated beverages? Once daily Two to three times a day Four to five times a day One to three times weekly Four to six times weekly	 137(38%) 142(39.3%) 27(7.5%) 46(12.7%) 9(2.5%)	 41(38%) 41(38%) 11(10.2%) 13(12%) 2(1.9%)	 96(37.9%) 101(39.9%) 16(6.3%) 33(13%) 7(2.8%)	0.75
During the day, when do you usually consume caffeine? * At morning At afternoon At evening	 243(67.3%) 183(50.7%) 183(53.5%)	 73(67.6%) 47(43.5%) 54(50%)	 170(67.2%) 136(53.8%) 139(54.9%)	 0.94 0.075 0.389
When is the best time for you to consume caffeine? Before eating While eating After eating	 118(32.7%) 11(3%) 232(64%)	 38(35.2%) 5(4.6%) 65(60.2%)	 80(31.6%) 6(2.4%) 167(46.3%)	 0.37
Why do you choose to have a caffeine drink after eating? To aid digestion Habit To prevent upset stomach and acid reflux	 116(32.1%) 208(57.6%) 37(10.2%)	 46 (42.6%) 54(50%) 8(7.4%)	 70(27.7%) 154(60.9%) 29(11.5%)	 0.018**
Sources of caffeine* Coffee Tea Caffeinated soft drink Energy drinks Chocolate	 276(76.5%) 101(28% 57(15.8%) 72(19.9%) 84(23.3%)	 84(77.8%) 28(25.9%) 22(20.4%) 28(25.9%) 10(9.3%)	 192(75.9%) 73(28.9%) 35(13.8%) 44(17.4%) 74(29.2%)	 0.69 0.57 0.119 0.06** <0.001**
Do you consume caffeine “more than usual” during studying for exam? Yes No	 240(66.5%) 121(33.5%)	 75(69.4%) 33(30.6)	 165(65.2%) 88(34.8%)	 0.43
Are you aware that some medications used to treat pain include caffeine? Yes No	 174(48.2%) 184(51.8%)	 40(37%) 68(63%)	 134(53%) 119(47%)	 0.006**
Does drinking a cup of coffee with Panadol alleviate	148(41%)	35(32.4%)	113(44.7%)	0.03**

headache/pain better than taking Panadol alone? Yes No	213(59%)	73(67.6%)	140(55.3%)	

* Allowed respondents to select more than one answer

**Statistically significant at $p < 0.05$ using Chi-square or fisher test, % Percentages are based on the number of males and females who answered each question.

Table 4. Distribution of sociodemographic variables according to the level of caffeine consumption.

Variable	Consumption of Caffeine		p-value
	Safe level (n=192)	Unsafe level (n= 169)	
	N (%)	N (%)	
Age 17-19 years 20-23 years 24-27 years ≥28years	34(66.7%) 130(50.6%) 24(58.5%) 4(33.3%)	17(33.3%) 127(49.4%) 17(41.5%) 8(66,7%)	0.07
Sex Male Female	56(51.9%) 136(53.8%)	52(48.1%) 117(46.2%)	0.74
Place of residency City Village	97(53%) 95(53.4%)	86(47%) 83(46.6%)	0.94
Living status With Family Alone	186(53.1%) 5(50%)	164(46.9%) 5(50%)	0.84
Working Yes No	36(46.2%) 156(55.1%)	42(53.8%) 127(44.9%)	0.160
University Public Private	175(54.9%) 17(40.5%)	144(45.1%) 25(59.5%)	0.079

Table 5. Relationship between caffeine consumption level and knowledge, preferences, and behaviours related to caffeine use (N = 361).

	Caffeine consumption		p-value
	Safe level	Unsafe level	
Caffeine consumption time			
Before eating	64(33.3%)	54(32%)	
While eating	9(4.7%)	2(1.2%)	0.126
After eating	119(62%)	113(66.9%)	
Caffeine consumption time, during day*			
Morning	118(61.5%)	44(74%)	0.011*
Afternoon	74(38.5%)	109(64.5%)	<0.001*
Evening	90(46.9%)	103(60.9%)	0.007*
Why do you prefer having your caffeine drink after meals?			
To aid digestion	65(33.9%)	51(30.2%)	
Habit	103(53.6%)	105(62.1%)	0.171
To prevent upset stomach and acid reflux	24(12.5%)	13(7.7%)	
Sources of caffeine			
Coffee	133(69.3%)	143(84.6%)	0.001*
Tea	53(27.6%)	48(28.4%)	0.86
Caffeinated soft drink	28(49.1%)	29(17.2%)	0.503
Energy drinks	28(14.6%)	44(26%)	0.007*
Chocolate	43(22.4%)	41(24.3%)	0.67
Are you aware that some medications used to treat pain include caffeine?			
Yes	86(44.8%)	88(52.1%)	0.167
No	106(55.2%)	81(47.9%)	
Do you consume caffeine “more than usual” during studying for exam?			
Yes	103(53.6%)	137(81.1%)	<0.001*
No	89(46.4%)	32(18.9%)	

*Statistically significant at $p < 0.05$ using Chi-square or fisher test

Discussion:

Caffeine is among the most widely consumed stimulants worldwide, affecting mood and the central nervous system (Hawamdeh et al., 2024). According to AlSharif et al. (2018), roughly 80% of the global population consumes caffeine. This percentage is particularly high among university students, reaching up to 92% (Mahoney et al., 2019; Maqsood et al., 2020). Despite the high levels of coffee and caffeine consumption among young people, only a few studies carried out in Jordan have examined caffeine intake prevalence among different universities. Therefore, this current study aimed to assess caffeine consumption among Jordanian university students and to evaluate their daily caffeine intake in relation to the recommended safe intake level. The findings revealed that a high percentage of the participants were using caffeine. Females exhibited higher caffeine consumption rates than males (70.1%). This can be attributed to the fact that, according to the Department of Statistics (2024), the number of female students in Jordanian universities exceeds that of male students. These results are in line with those of related research conducted in Middle Eastern and global university settings, indicating that caffeine consumption among students is a common behavioral trend. Similar results were found in a study conducted by El-Nimr et al. (2019) and Kharaba et al. (2022) . According to Stachyshyn et al. (2021), women metabolize caffeine faster than men, enabling them to tolerate comparatively higher caffeine doses without suffering from more severe or prolonged adverse effects (Stachyshyn et al., 2021).

The current results showed that the most consumed caffeine sources were coffee followed by tea. This pattern is consistent with findings reported in several previous studies (Alfaifi et al., 2022; Jahrami et al., 2020; Kharaba et al., 2022; Mahoney et al., 2019). These findings may reflect the social perception of coffee as the most distinctive drink in the Arab region, which has led to its increased consumption among university students (Kharaba et al., 2022). In contrast, the association between energy drink consumption and exceeding the recommended safe level of caffeine consumption was found to be statistically significant. This result is consistent with previous research conducted in Jordan that investigated energy drink consumption among university students and reported high consumption rates (Qasem et al., 2024; Thiab et al., 2023).

According to the present findings, the majority of students preferred to consume caffeine after meals for various reasons. This pattern aligns with the

results of a previous study conducted in Palestine that examined caffeine intake among university students (Hamdan et al., 2025). In addition, the current study identified a statistically significant association between caffeine consumption and levels of physical activity, with moderately active students exhibiting higher caffeine consumption. This may be due to increased exposure to the stimulating effect of caffeine, which may enhance their alertness and physical performance, encouraging them to engage in physical activity and exercise (Akik et al., 2024).

In the current study, over 50% of the students experienced disruptions in their sleep patterns, which is consistent with several studies conducted in Saudi Arabia (AlSharif et al., 2018), Lebanon (Khalil & Antoun, 2020), and Syria (Bitar, 2025). These studies reported that, following caffeine consumption, students experience sleep disturbances and reduced sleep duration. This finding may be explained by linking sleep disorders to disruptions in the circadian rhythm. Adenosine is a "physiological sleep enhancer" that helps regulate sleep; however, caffeine blocks adenosine receptors and thereby alters the circadian rhythm, leading to poorer sleep quality (Eduviere et al., 2021).

A significant difference in caffeine consumption between smokers and non-smokers was observed in this study. Caffeine consumption was higher among male smokers than non-smokers. These findings are consistent with earlier studies demonstrating that smokers consumed more caffeine (Akova et al., 2023; Farhoud et al., 2024). This may be because smokers need to consume higher amounts of caffeine than non-smokers to achieve the same effects, as smoking accelerates metabolism of caffeine by activating the cytochrome P450 1A2 (CYP1A2) enzyme (Hamdan et al., 2025). Both caffeine and smoking negatively affect cardiovascular function—caffeine increases blood pressure, while smoking raises both blood pressure and heart rate. Their frequent co-occurrence suggests a combined harmful effect on cardiovascular health (Abu-Taha et al., 2019).

Many participants reported that they consume more caffeinated drinks during exam periods. Our results were similar to those of a study conducted to assess the consumption habits of caffeinated beverages among medical students, particularly during examination periods (Saadeh, 2019). Higher caffeine consumption during exam periods could be attributed to the fact that many students use caffeine-containing products as a coping strategy to deal with stress, as they believe it may increase alertness; however, caffeine intake may reduce students' nightly sleep by two or more hours, which in turn negatively hinders student performance (Hawamdeh et al., 2024).

The study identified the most commonly reported reasons for caffeine consumption as overcoming sleepiness, studying, and enjoying the taste. However, when examining the relationship between caffeine consumption and gender using a Chi-square test, significant associations ($P<0.05$) were found for driving, taste, and exercise. These findings indicate that, while some reasons are common across the board, gender plays a role in influencing specific motivations for caffeine consumption.

In accordance with the EFSA, the maximum recommended daily caffeine consumption is 400 mg. Although 46.8% of the study sample consumed over 400 mg of caffeine per day compared with the recommended intake, the prevalence of overconsumption was higher among males (48.1%) than females (46.2%); nevertheless, this difference did not reach statistical significance ($P = 0.74$) (Table 4). A similar finding was reported in a cross-sectional study conducted in United Arab Emirates (Rola M et al., 2017). Another study conducted in Palestine to estimate caffeine intake among university students, evaluate their daily caffeine intake, and identify the causes of unsafe consumption showed that the majority of respondents did not exceed the safe limit (Hamdan et al., 2025). The only variable significantly associated with caffeine consumption was increased intake during the examination period ($p < 0.001$), indicating that students are more likely to exceed the recommended daily caffeine threshold during examinations.

Strengths and Limitations of the study:

The current study has several strengths and limitations. Notably, this is the first study to specifically examine caffeine intake among university students in Jordan. Although a previous study by Alqawasmi et al. (2024) investigated caffeine consumption among medical students in Jordan, the present study expands this line of research to include a broader college student population. In addition, caffeine consumption was assessed by considering a wide range of potential sources. Furthermore, the sampling and recruiting strategy enabled the inclusion of students from a variety of academic specializations and years of study.

This study has a number of limitations. First, it was difficult to obtain precise information regarding beverage types, quantities, and timing of consumption. Second, reliance on self-reported data introduces the possibility of recall bias, which may result in inaccurate reporting, including the overestimation or underestimation of caffeine intake. Such inaccuracies may affect the strength and precision of the associations observed between

caffeine consumption and the variables under investigation. Despite these limitations, the use of a validated questionnaire likely helped to mitigate the impact of these potential biases.

Conclusion:

This study concluded that a significant proportion of university students consumed caffeine in amounts that approached or exceeded the recommended daily allowance. Consumption rates were higher among females than males. Additionally, coffee, caffeinated- soft drinks, and energy drinks were identified as the primary sources of caffeine among the study sample. The majority of consumers of caffeine-containing products reported using them to overcome difficulties related to studying and sleep, as well as for the distinctive tastes of caffeinated beverages. The findings of this study highlight the importance of raising awareness about the potential negative effects of caffeine toxicity among students who exceed the recommended caffeine safe intake level.

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