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امسح الكود لزيارة موقع المجلة

Energy Drink Consumption and Its Impact on Nutritional and Health Status among Female Students At Al-Razi University, Sana'a, Yemen

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Abstract:

Energy drink consumption has risen globally, particularly among adolescents and young adults, with potential adverse effects on cardiovascular, neurological, and gastrointestinal health. This cross-sectional study investigated the prevalence, patterns, and health impacts of energy drink use among 348 female students at Al-Razi University, Sana'a, Yemen. Data on socio-demographics, dietary habits, consumption patterns, and reported symptoms were collected using structured questionnaires and anthropometric measurements. Results showed that 36.8% of students consumed energy drinks, with Lift Up and Code Red being the most popular. Consumption was significantly associated with academic year, smoking, qat chewing, and moderate dietary patterns, but not with BMI, age, marital status, or residence. Common symptoms among consumers included increased heart rate, tremors, frequent urination, and insomnia. Most participants had healthy BMI and good dietary habits. These findings align with international studies highlighting cardiovascular and neurological effects of energy drinks and underscore the need for targeted health education and interventions to promote safer consumption and healthier lifestyles among female university students.

Keywords:

Energy drinks, female university students, cardiovascular effects, dietary habits, Yemen

الكلمات المفتاحية
مشروبات الطاقة، طالبات الجامعة، التأثيرات القلبية، العادات الغذائية، اليمن

1. Introduction

Over the past two decades, energy drink consumption has risen dramatically worldwide, particularly among adolescents and young adults, including university student (Kaur et al., 2022; Aonso-Diego et al., 2023)These beverages are marketed as products that enhance energy, improve physical performance, and boost cognitive functioning, yet scientific evidence supporting such benefits remains limited (Orrù et al., 2018; Corbo et al., 2014), At the same time, numerous studies report potential adverse effects, including cardiovascular disturbances, insomnia, gastrointestinal discomfort, dehydration, and caffeine dependence (De Sanctis et al., 2017). University students, especially females, represent a vulnerable population due to academic pressures, lifestyle changes, and social influences, often consuming energy drinks to stay awake, improve concentration, relieve fatigue, or engage in social activities, with consumption patterns differing from those of male students (Park, 2026; Seo & Kim, 2018). Moreover, energy drink use has been linked to poor dietary habits, lower nutrition knowledge, and higher body mass index (Larson et al., 2015; Hardy et al., 2017), while even medical students, despite awareness of potential risks, demonstrate similar consumption rates, highlighting a disconnect between knowledge and behavior (Hardy et al., 2017; Mularczyk-Tomczewska et al., 2025). In Yemen, research on energy drink consumption among female university students is limited (Goaill et al., 2023), making it essential to understand prevalence, motivations, and the nutritional and health impacts of these beverages at Al-Razi University. The growing popularity of energy drinks raises concerns about their effects on cardiovascular, gastrointestinal, and metabolic health, as well as potential influences on dietary patterns that could lead to nutrient deficiencies or imbalanced nutrition (Higgins et al., 2018; Costantino et al., 2023). Investigating these behaviors among female students is particularly important, as their nutritional status affects academic performance, overall well-being, and long-term health. This study addresses a critical knowledge gap by providing evidence to guide targeted health education, inform policy, and support interventions that promote safer consumption and improved nutritional awareness in this vulnerable population.

ترجمة الى العربية

استهلاك مشروبات الطاقة وتأثيره على الحالة الغذائية والصحية لدى الطالبات في جامعة الرازي، صنعاء، اليمن

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2025

الملخص

ازداد استهلاك مشروبات الطاقة على مستوى العالم، لا سيما بين المراهقين والشباب، لما لها من آثار سلبية محتملة على صحة القلب والأوعية الدموية، والجهاز العصبي، والجهاز الهضمي. هدفت هذه الدراسة المقطعية إلى دراسة معدل الانتشار، وأنماط الاستهلاك، والتأثيرات الصحية لمشروبات الطاقة بين 348 طالبة في جامعة الرازي بصنعاء، اليمن. تم جمع البيانات المتعلقة بالخصائص الاجتماعية والديموغرافية، وقياسات الجسمانية، والعادات الغذائية، وأنماط استهلاك مشروبات الطاقة، والأعراض الصحية المبلغ عنها، باستخدام استبيانات مُنظمة. أظهرت النتائج أن 36.8% من الطالبات يستهلكن مشروبات الطاقة، وكانت أكثر الأنواع شيوعًا Lift Up وCode Red وارتبط استهلاك مشروبات الطاقة ارتباطًا ذا دلالة إحصائية بالسنة الدراسية، والتدخين، وتعاطي القات، واتباع نمط غذائي متوسط، في حين لم يُسجَّل ارتباط معنوي مع مؤشر كتلة الجسم، أو العمر، أو الحالة الاجتماعية، أو مكان الإقامة. وشملت الأعراض الشائعة بين المستهلكات زيادة معدل ضربات القلب، والرعشة، وكثرة التبول، والأرق. كما أظهرت النتائج أن معظم المشاركات يتمتعن بمؤشر كتلة جسم صحي وعادات غذائية جيدة. تتوافق هذه النتائج مع دراسات دولية سابقة تُبرز التأثيرات القلبية والعصبية لمشروبات الطاقة، وتؤكد الحاجة إلى برامج توعوية وتدخلات صحية موجهة لتعزيز الاستهلاك الآمن وأنماط الحياة الصحية بين طالبات الجامعات.

2. Research methodology

2.1. Study design

This study employed a cross-sectional descriptive design to investigate energy drink consumption and its impact on the nutritional and health status of female students at Al-Razi University, Sana'a, Yemen. The cross-sectional approach allowed data collection at a single point in time, providing a snapshot of consumption patterns, associated health symptoms, and dietary habits among participants.

2.2. Study Setting

The study was conducted at Al-Razi University, Sana'a, targeting female undergraduate students across all faculties and academic years. Data collection took place in university classrooms and designated areas for anthropometric measurements. Printed questionnaires were distributed to reach students comprehensively. The university setting provided convenient access to participants and a controlled environment to ensure accurate data collection.

2.3. Study Population and Sample

The study population consisted of female undergraduate students enrolled at Al-Razi University, including students from all academic years (1st to 5th) and faculties to ensure a representative sample. The sample size (Convenience sampling), determined using standard formulas for cross-sectional studies, included approximately 348 participants. Participation was voluntary, and informed consent was obtained from all students prior to data collection.

2.4. Inclusion and Exclusion Criteria

Inclusion criteria comprised female students currently enrolled at Al-Razi University who agreed to participate and provide informed consent. Exclusion criteria included students with chronic medical conditions affecting diet or cardiovascular health (e.g., diabetes or heart disease), as well as pregnant or lactating students.

2.5. Data Collection Tools

Data were collected using a structured questionnaire adapted from Ryu et al. (Ryu, 2016) with minor modifications. The questionnaire was reviewed and validated by experts in the fields of nutrition and food science. It consisted of five sections. The first section collected socio-demographic information, including age, marital status, place of residence, exercise habits, academic year, grades, smoking status, and qat chewing. The second section assessed participants' nutritional status by measuring height, weight, and calculating body mass index (BMI). The third and fourth sections focused on energy drink consumption, examining patterns, reasons for use, consumption locations, social influences, and associated health effects. The fifth section evaluated Dietary patterns were assessed using a validated food frequency questionnaire (FFQ), which captured participants' weekly intake of various food groups in accordance with food pyramid guidelines. Based on their responses, overall diet quality was categorized as poor, moderate, or good, enabling analysis of the relationship between nutrition and energy drink consumption (Saghir et al., 2023).

2.6. Data Collection Methods

Printed questionnaires were distributed to female students to ensure wide coverage. Anthropometric measurements were conducted in designated university facilities using standardized equipment by trained personnel. Participants received instructions on accurately reporting their energy drink consumption and dietary habits. Data collection was conducted over a defined period.

2.7. Data Analysis

Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize socio-demographic characteristics, consumption patterns, health symptoms, and dietary habits. Associations between categorical variables (e.g., energy drink consumption and BMI, health symptoms, dietary habits) were analyzed using Chi-square tests, while continuous variables (e.g., BMI) were compared across groups using t-tests or ANOVA (Hanafi et al., 2024). Statistical significance was set at $p < 0.05$. Data were analyzed using SPSS version 26.

2.8. Ethical Considerations

Ethical approval was obtained from the Ethics Committee of Al-Razi University. Informed consent was obtained from all participants before completing the questionnaire. Participant privacy and confidentiality were maintained, and data were used exclusively for research purposes. Participants had the right to withdraw from the study at any time without penalty.

3. Results and Discussion

3.1. The distribution of Demographics factors among selected sample

The present study investigated energy drink consumption and its impact on the nutritional and health status of female students at Al-Razi University, Sana'a, Yemen. The majority of

participants were aged 20–24 years (73%), single (85.6%), and urban residents (97.4%), which reflects the common demographic profile of university students in Yemen (Table 1). Most students had healthy BMI (59.5%) and good dietary patterns (58.9%), with a smaller proportion underweight (28.7%) or overweight/obese (11.7%). Exercise participation was limited, with over half (52%) not practicing regular physical activity, indicating a sedentary lifestyle that may exacerbate the health risks associated with energy drink consumption. Academic performance was generally high, with nearly 90% of students reporting very good or excellent grades. Smoking (12.6%) and khat chewing (13.5%) were relatively low but notable, as these behaviors may interact with energy drink consumption to affect health outcomes.

When compared to previous studies, these findings align with global trends of high energy drink use among young adults. Alsunni (Alsunni, 2015) reported increasing energy drink consumption among adolescents and young adults due to marketing claims of enhanced physical and cognitive performance, yet highlighted potential adverse health effects. Similarly, Spierer et al. (Spierer et al., 2013) found that university students frequently consumed energy drinks and engaged in high-risk behaviors, particularly in urban settings. Our results indicate that female students at Al-Razi University consume energy drinks at moderate levels, consistent with findings by Park (Park, 2026), who reported complex perceptions and concerns about caffeine dependence among female students.

Table 1 : Socio-Demographic and nutritional factors distribution (n=348)

Variable	Categories	Frequency	Percentage
Age	Under 20	64	18.4
	20–24	254	73.0
	25–29	26	7.5
	30 or above	4	1.1
Marital Status	Single	298	85.6
	Married	41	11.8
	Divorced	7	2.0
	Widowed	2	0.6
Residence Area	Urban	339	97.4
	Rural	9	2.6
Weekly Exercise Frequency	Do not practice	181	52.0
	1–2 times	133	38.2
	3–5 times	28	8.0
	More than 5 times	6	1.7
Academic Year	1st year	62	17.8
	2nd year	53	15.2
	3rd year	92	26.4
	4th year	124	35.6
	5th year	17	4.9
University Grade Average	Fair	4	1.1
	Good	29	8.3
	Very Good	171	49.1
	Excellent	144	41.4
Smoking Habit	Yes	44	12.6

Variable	Categories	Frequency	Percentage
	No	304	87.4
Chewing Khat	Yes	47	13.5
	No	301	86.5

Regarding nutritional status, our study found most female students had healthy BMI and good dietary patterns, similar to Alshukri et al. (Elramli et al., 2025) in Libya, where energy drink consumption was high among students but did not significantly affect BMI. Likewise, Mularczyk-Tomczewska et al. (Mularczyk-Tomczewska et al., 2025) noted that even medical students with higher nutrition knowledge consumed energy drinks at similar rates to non-medical students, indicating that awareness alone may not deter consumption. Conversely, Hardy et al. (Hardy et al., 2017) observed that energy drink users often had lower nutrition knowledge, which may affect dietary habits.

Exercise and lifestyle factors also influenced consumption. Seo & Kim (Seo & Kim, 2018) reported that stress, smoking, and higher academic year levels were associated with increased energy drink intake among college students. This is partly reflected in our sample, where a substantial portion of students were in the 3rd and 4th academic years and reported low physical activity, suggesting that academic stress and lifestyle choices may contribute to consumption behaviors.

3.2. BMI and dietary pattern

The analysis of BMI and dietary patterns among the 348 female students revealed that most participants had a healthy BMI (59.5%), with smaller proportions underweight (28.7%), overweight (10.6%), and obese (1.1%) (Table 2). This indicates that while the majority maintain a normal body weight, a notable proportion of students are underweight, highlighting potential nutritional deficiencies or imbalanced dietary habits. Regarding dietary patterns, most students reported good dietary habits (58.9%), with 37.6% classified as moderate and 3.4% as poor.

Table 2: BMI Classification Dietary Pattern distribution (n=348)

Variable	Categories	Frequency	Percentage
BMI Classification	Underweight	100	28.7
	Healthy	207	59.5
	Overweight	37	10.6
	Obesity	4	1.1
Dietary Pattern	Poor	12	3.4
	Moderate	131	37.6
	Good	205	58.9

These findings are comparable to Alshukri et al. (Elramli et al., 2025) and Mularczyk-Tomczewska et al. (Mularczyk-Tomczewska et al., 2025), where the majority of students exhibited adequate nutrition despite frequent energy drink consumption, suggesting that while energy drink intake is common, it does not necessarily correspond to poor dietary quality. However, the presence of underweight students and moderate dietary patterns emphasizes the importance of targeted nutrition education to support healthy eating behaviors and prevent potential health risks associated with energy drink use.

3.3. Type of Energy Drink Consumption

The study revealed that 36.8% of female students at Al-Razi University reported consuming energy drinks, while the majority (63.2%) did not. Among consumers, the most popular brand was Lift Up, used by 57.8% of participants, followed by Code Red (24.2%), Red Bull (8.6%), Shark (6.3%), Rita (5.5%), and Carabao (3.9%), with Levin Up not being consumed at all (Table 3). Additionally, 18.8% of energy drink users reported consuming multiple types of these beverages. These findings are consistent with international studies reporting increasing energy drink consumption among young

adults and university students, particularly females, for purposes such as boosting energy, enhancing concentration, or social engagement (Park, 2026; Alsunni, 2015). Although the prevalence in this study (36.8%) is lower than reported in some other regions—such as 54.1% among female college students in South Korea (Seo & Kim, 2018) or 60% in Benghazi University, Libya (Elramli et al., 2025)it still highlights a substantial proportion of students exposed to the potential health and nutritional risks associated with energy drink consumption.

Table 3: Type of Energy drink consumption

Variable	Categories	Frequency	Percentage
Consume Energy Drinks	Yes	128	36.8
	No	220	63.2
Lift Up- Energy Drink	Yes	74	57.81
	No	54	42.19
Code Red- Energy Drink	Yes	31	24.22
	No	96	75
Red Bull - Energy Drink	Yes	11	8.59
	No	117	91.41
Carabao- Energy Drink	Yes	5	3.91
	No	123	96.09
Rita- Energy Drink	Yes	7	5.47
	No	121	94.53
Shark- Energy Drink	Yes	8	6.25
	No	120	93.75
Levin Up- Energy Drink	Yes	0	0
	No	128	100
Different Type- Energy Drink	Yes	24	18.75
	No	104	81.25

3.4. Participants' Reported Disease Symptoms

The findings of this study indicate that 36.8% of female students at Al-Razi University reported consuming energy drinks, with Lift Up being the most popular brand (57.8%), followed by Code Red (24.2%) and Red Bull (8.6%) (Table 4). A smaller proportion consumed multiple types of energy drinks (18.8%). Regarding nutritional status, the majority of participants had a healthy BMI (59.5%), while 28.7% were underweight, 10.6% overweight, and 1.1% obese. Most students reported a good dietary pattern (58.9%), although 37.6% had moderate habits and 3.4% had poor dietary patterns. Concerning health outcomes, participants frequently reported adverse effects related to energy drink consumption, with the most common symptoms being upset stomach (60.9%), headaches (59.5%), and insomnia (46.3%). Other notable symptoms included general discomfort (48.6%), dehydration (38.8%), and increased heart rate (34.2%), while less common effects included tremors (28.4%), frequent urination (33%), itching (15.2%), vomiting (13.2%), and skin redness (11.8%). Overall, more than half of the participants experienced at least one adverse symptom.

Table 4: Participants' Reported Disease Symptoms

Variable	Categories	Frequency	Percentage
Symptom-Increased Heart Rate	Yes	119	34.2
	No	229	65.8
Symptom-Headaches	Yes	207	59.5
	No	141	40.5
Symptom-Upset Stomach	Yes	212	60.9
	No	136	39.1
Symptom-Vomiting	Yes	46	13.2
	No	302	86.8
Symptom-Tremors	Yes	99	28.4
	No	249	71.6
Symptom-Discomfort	Yes	169	48.6
	No	179	51.4
Symptom-Erythema (Skin Redness)	Yes	41	11.8
	No	307	88.2
Symptom-Itching	Yes	53	15.2
	No	295	84.8
Symptom-Feeling Hot	Yes	94	27.0
	No	254	73.0
Symptom-Dehydration	Yes	135	38.8
	No	213	61.2
Symptom-Insomnia	Yes	161	46.3
	No	187	53.7
Symptom-Frequent Urination	Yes	115	33.0
	No	233	67.0

These findings align with previous studies highlighting the potential negative health effects of energy drinks, including gastrointestinal disturbances, cardiovascular effects, sleep disruption, and general discomfort (Alsunni, 2015; Spierer et al., 2013; Almshhad et al., 2024). The results also indicate that even among students with relatively healthy BMI and good dietary patterns, energy drink consumption is associated with multiple adverse symptoms, emphasizing the need for targeted health education and awareness programs to mitigate potential risks in this population.

3.5. The relationship between Energy drink consumption and different factors

The present study assessed the relationship between energy drink consumption and various demographic, lifestyle, and nutritional factors among female students at Al-Razi University (Table 5). Our findings revealed that age, marital status, and residence area were not significantly associated with energy drink use, suggesting that these socio-demographic characteristics may not strongly influence consumption in this population.

This aligns with observations in Alshukri et al. (Elramli et al., 2025) and Hardy et al. (Hardy et al., 2017), where BMI, age, and general demographics showed limited or non-significant associations with energy drink intake. In contrast, academic year was significantly associated with energy drink consumption, with first-year students consuming

more than their senior peers (p = 0.019). This is partially consistent with Ryu (Ryu, 2016), who reported that academic workload and adaptation to school life influenced consumption patterns among high school and university students, though in some studies, higher academic years were linked to greater intake (Seo & Kim, 2018). This discrepancy may reflect contextual differences in academic stress and cultural factors influencing female students in Yemen.

Behavioral factors demonstrated stronger associations with energy drink use. Both smoking and qat chewing were significantly related to consumption (p < 0.001) for both), indicating a clustering of risky lifestyle behaviors. Similar associations have been documented in Spierer et al. (Spierer et al., 2013) and Seo & Kim (Seo & Kim, 2018), where energy drink consumption co-occurred with other high-risk behaviors such as alcohol use, smoking, and unhealthy lifestyle choices. These findings suggest that interventions targeting energy drink reduction may benefit from addressing broader lifestyle habits.

BMI classification was not significantly associated with energy drink consumption (p = 0.460), which is in agreement with Alshukri et al. (Elramli et al., 2025) and Hardy et al. (Hardy et al., 2017), where no clear link between BMI and energy drink intake was observed. This indicates that energy drink use may be more behaviorally motivated (e.g., for alertness or social purposes) rather than directly linked to body weight.

Dietary pattern, however, showed a significant relationship, with students consuming energy drinks more likely to have moderate dietary patterns and less likely to have good dietary habits (p = 0.034). This observation mirrors findings in (Hardy et al., 2017) , where energy drink consumers tended to have lower nutrition knowledge and poorer dietary practices. This underscores the potential for energy drinks to be part of an overall pattern of suboptimal dietary behavior, particularly among students who may rely on stimulants instead of balanced nutrition.

Table 5: The relationship between Energy drink consumption and different factors (n=348)

Variable	Energy drink consumption		p-value
	Yes (n, %)	No (n, %)	
Age			
Under 20	27 (21.1%)	37 (16.8%)	0.690
20–24	89 (69.5%)	165 (75.0%)	
25–29	10 (7.8%)	16 (7.3%)	
30 or above	2 (1.6%)	2 (0.9%)	
Marital Status			
Single	108 (84.4%)	190 (86.4%)	0.186
Married	15 (11.7%)	26 (11.8%)	
Divorced	5 (3.9%)	2 (0.9%)	
Widowed	0 (0%)	2 (0.9%)	
Residence Area			
Urban	124 (96.9%)	215 (97.7%)	0.629
Rural	4 (3.1%)	5 (2.3%)	
Weekly Exercise Frequency			
Do not practice	69 (53.9%)	112 (50.9%)	0.566
1–2 times	50 (39.1%)	83 (37.7%)	
3–5 times	8 (6.3%)	20 (9.1%)	
More than 5 times	1 (0.8%)	5 (2.3%)	
Academic Year			
1st year	34 (26.6%)	28 (12.7%)	0.019

Variable	Energy drink consumption		p-value
	Yes (n, %)	No (n, %)	
2nd year	18 (14.1%)	35 (15.9%)	
3rd year	28 (21.9%)	64 (29.1%)	
4th year	44 (34.4%)	80 (36.4%)	
5th year	4 (3.1%)	13 (5.9%)	
University Grade Average			
Fair	2 (1.6%)	2 (0.9%)	0.433
Good	7 (5.5%)	22 (10.0%)	
Very Good	67 (52.3%)	104 (47.3%)	
Excellent	52 (40.6%)	92 (41.8%)	
Smoking Habit			
Yes	30 (23.4%)	14 (6.4%)	0.000
No	98 (76.6%)	206 (93.6%)	
Chewing Khat			
Yes	31 (24.2%)	16 (7.3%)	0.000
No	97 (75.8%)	204 (92.7%)	
BMI Classification			
Underweight	36 (28.1%)	64 (29.1%)	0.460
Healthy	75 (58.6%)	132 (60.0%)	
Overweight	14 (10.9%)	23 (10.5%)	
Obesity	3 (2.3%)	1 (0.5%)	
Dietary Pattern			
Poor	6 (4.7%)	6 (2.7%)	0.034
Moderate	58 (45.3%)	73 (33.2%)	
Good	64 (50.0%)	141 (64.1%)	

3.6. The relationship between Energy drink consumption and symptoms (n=348)

The findings from Table 6 highlight that energy drink consumption among female students was significantly associated with several physiological symptoms, including increased heart rate (44.5% vs. 28.2%, p = 0.002), tremors (35.9% vs. 24.1%, p = 0.018), and frequent urination (41.4% vs. 28.2%, p = 0.011), with insomnia showing borderline significance (53.1% vs. 42.3%, p = 0.050).

Table 6: The relationship between Energy drink consumption and symptoms (n=348)

Variable	Energy drink consumption		p-value
	Yes (n, %)	No (n, %)	
Increased Heart Rate			
Yes	57 (44.5%)	62 (28.2%)	0.002
No	71 (55.5%)	158 (71.8%)	

Variable	Energy drink consumption		p-value
	Yes (n, %)	No (n, %)	
Symptom-Headaches			
Yes	77 (60.2%)	130 (59.1%)	0.845
No	51 (39.8%)	90 (40.9%)	
Symptom- Upset Stomach			
Yes	84 (65.6%)	128 (58.2%)	0.170
No	44 (34.4%)	92 (41.8%)	
Symptom-Vomiting			
Yes	22 (17.2%)	24 (10.9%)	0.095
No	106 (82.8%)	196 (89.1%)	
Symptom-Tremors			
Yes	46 (35.9%)	53 (24.1%)	0.018
No	82 (64.1%)	167 (75.9%)	
Symptom-Discomfort			
Yes	57 (44.5%)	112 (50.9%)	0.251
No	71 (55.5%)	108 (49.1%)	
Symptom-Erythema			
Yes	14 (10.9%)	27 (12.3%)	0.709
No	114 (89.1%)	193 (87.7%)	
Symptom-Itching			
Yes	18 (14.1%)	35 (15.9%)	0.644
No	110 (85.9%)	185 (84.1%)	
Symptom-Feeling Hot			
Yes	34 (26.6%)	60 (27.3%)	0.886
No	94 (73.4%)	160 (72.7%)	
Symptom-Dehydration			
Yes	48 (37.5%)	87 (39.5%)	0.706
No	80 (62.5%)	133 (60.5%)	
Symptom-Insomnia			
Yes	68 (53.1%)	93 (42.3%)	0.050
No	60 (46.9%)	127 (57.7%)	
Symptom-Frequent Urination			
Yes	53 (41.4%)	62 (28.2%)	0.011
No	75 (58.6%)	158 (71.8%)	

Other symptoms, such as headaches, upset stomach, vomiting, discomfort, skin redness, itching, feeling hot, and dehydration, were not significantly different between consumers and non-consumers.

These results are consistent with previous studies reporting adverse cardiovascular and neurological effects of energy drink consumption. Alsunni (Alsunni, 2015) emphasized that energy

drinks may cause palpitations, insomnia, and nervous system disturbances due to high caffeine and stimulant content, despite claims of enhanced performance. Similarly, (Ryu, 2016) found that high school students consuming energy drinks experienced palpitations (59.3%) and insomnia (35.6%), supporting the observation that stimulatory effects on the cardiovascular system and sleep patterns are among the most common adverse outcomes. Almshhad and Hammoud (Almshhad et al., 2024) also reported that students were aware of the effects of energy drinks on pulse and blood pressure, with a proportion experiencing these physiological symptoms, highlighting the link between consumption and cardiovascular response.

The association of tremors and frequent urination in the present study aligns with Spierer et al. (Spierer et al., 2013) and Park (Park, 2026), who described that stimulant-related adverse effects, such as nervousness, tremors, and increased urination, are frequently reported, especially among female students who consume energy drinks. Mularczyk-Tomczewska et al. (Mularczyk-Tomczewska et al., 2025) further support these findings by indicating that students, despite knowledge of adverse effects, continue consumption due to energy and concentration motives, which may exacerbate such physiological symptoms.

Interestingly, some symptoms such as headaches and gastrointestinal discomfort were not significantly associated with consumption in this study. This contrasts with Alsunni (Alsunni, 2015) and Alshukri et al. (Elramli et al., 2025), who reported gastrointestinal upset as common among consumers. This discrepancy may be due to differences in study populations, gender distribution, consumption frequency, and local dietary habits.

4. Conclusion

Energy drink consumption is common among female students at Al-Razi University, with over one-third reporting regular use. Consumption is significantly associated with behavioral factors such as smoking, qat chewing, and moderate dietary patterns, as well as academic year, but not with BMI or other demographic variables. Common adverse effects include increased heart rate, tremors, frequent urination, and insomnia, highlighting potential cardiovascular and neurological risks. Despite generally healthy BMI and dietary habits, energy drink use poses health concerns and may reflect broader lifestyle behaviors. These findings emphasize the need for targeted health education programs, awareness campaigns, and interventions to promote safe consumption practices, improve dietary habits, and reduce the risk of adverse health outcomes in this population.

5. Limitations

This study has several limitations. First, its cross-sectional design captures a single point in time, preventing causal conclusions between energy drink consumption and health outcomes. Second, data relied on self-reported questionnaires, which may introduce recall bias or underreporting of consumption and symptoms. Third, the study focused only on female students at Al-Razi University, limiting the generalizability of findings to males or students in other universities or regions of Yemen. Additionally, consumption frequency, quantity, and long-term effects of energy drinks were not deeply explored. Finally, lifestyle factors such as stress levels, sleep patterns, and co-consumption of other stimulants were not comprehensively assessed, which may influence observed associations.

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