



# ENERGY DRINK CONSUMPTION AMONG PHYSICALLY ACTIVE PERSONS IN LEBANON: A MULTICENTER CROSS-SECTIONAL STUDY

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<sup>A</sup> Study Design; <sup>B</sup> Data Collection; <sup>C</sup> Statistical Analysis; <sup>D</sup> Manuscript Preparation

**Abstract Introduction:** Energy drinks (EDs) are caffeinated drinks marketed as energy and performance boosters and commonly used by athletes worldwide. They are widely used among youth and university students, with limited research about their

consumption among physically active persons. **Objectives:** This study aims to assess ED consumption among physically active persons in Lebanon, the association between ED use and the participants' general characteristics, and to explore the predictors of ED use among them. **Methods:** An observational cross-sectional study was conducted over three months, targeting 384 physically active persons from 8 gyms across Lebanon. **Results:** The prevalence of ED consumption was 49.2%, namely to boost energy (68.2%) and stimulate awakens (19.3%). Around 20% used EDs during workouts, and 15.8% used them before it. Females had 59% lower odds of ED consumption than males (OR 0.41, 95% CI 0.19–0.89), while older participants had 4.74 times higher odds of ED use (OR 4.74, 95% CI 1.16–19.3). Waterpipe smokers and alcohol consumption had 3.68 and 2.28 times higher odds of ED use than non-users. Among other sports, those doing weightlifting had significantly higher odds of ED consumption than others (OR 2.61, 95% CI 1.30–5.25). **Conclusion:** The predictors of ED consumption should be considered for better-informed decisions and effective awareness campaigns.

**Key words:** energy drinks, consumption, physically active persons, physical activity, predictors

## Introduction

Caffeinated drinks are the most consumed and socially accepted stimulants, with approximately 90 percent of all adults worldwide consuming coffee and tea regularly (Knapik et al., 2022). Among others, energy drinks (EDs) are caffeinated drinks marketed as an energy and performance boosters and commonly used by athletes worldwide. They are soft drinks with a high sugar content, caffeine, and other stimulants such as taurine, l-carnitine, and herbal extracts (Peacock et al., 2013). EDs were initially marketed in Europe and Asia in the 1960s but remained unpopular until "Red Bull" was merchandized in Austria in 1987 and was afterward advertised worldwide (Grósz & Szatmári, 2008). EDs differ from sports drinks because the latter drinks do not contain caffeine or any other stimulant and are not intended to have any stimulant or energizing effect (Pound et al., 2017).

In contrast to the claimed advantageous effects of EDs, consuming these drinks may usually be associated with several unintended side effects, which according to the World Health Organization, are attributed to high caffeine levels (Siddique, 2014). Among others, insomnia, nervousness, headache, tachycardia, and seizures are the most reported side effects (Alamzeb Jadoon et al., 2022; Yusupova & Firdavs, 2022). An experimental study recently published reported a significant increase in hepatic and renal biochemical parameters following 3 months of consumption of EDs in rats (Mukhiddinovna, 2022). Noticeable changes were also observed among humans in the levels of low-density lipoproteins (LDL), triacylglycerols (TAG), and triiodothyronine (T3) up to 21 days after ED consumption (Akramovna, 2022). Furthermore, research found a possible contribution of ED consumption to the development of cardiovascular disorders, and changes in the gastrointestinal tract, leading to significant metabolic effects (Yusupova & Firdavs, 2022). Some consumers combine EDs with alcohol, sometimes leading to death (Nurmurodovna, 2022). A recent study showed a higher willingness to drive after consumption of such a combination than drinking alcohol solely, putting consumers and other people at a high risk of accidents (Pérez-Mañá et al., 2022).

EDs were reported to be used by teenagers to mask other tastes such as alcohol, counteract the behavioral effects of alcohol and provide more energy for prolonged activity during exams and stressful periods (Graczyk et al., 2022). Among athletes, they are primarily used to improve focus, alertness, and performance (Tambalis, 2022). In 2012 and to manage ED use and its corresponding outcomes, the Lebanese ministries of Economy and Health issued a policy targeting energy drinks' importers and producers to lower the caffeine level from 65 to 35 grams (*mTV Lebanon*, 2013). Nevertheless, no further steps were taken, with a lack of law application since, for example,

a Red Bull still contains 80 mg of caffeine. Moreover, advertising campaigns promoting ED use are allowed without highlighting the possible adverse events of such consumption. In Lebanon, ED consumption is common, mainly among youth and university students (63.6%) (Itany et al., 2014), with no study assessing their use among physically active persons. Moreover, the pandemic has significantly impacted sports practices and events worldwide. While the specific guidelines and regulations can vary depending on the country and region, in Lebanon, restrictions on group sizes, social distancing measures, and hygiene practices were imposed (Hatem & Goossens, 2022), in addition to regular cleaning and disinfection of equipment and facilities and any commonly used areas such as locker rooms or restrooms (Piotrowski & Piotrowska, 2021). This study aims to assess (i) ED consumption among physically active persons in Lebanon, (ii) the association between ED use and the general characteristics of the participants, and (iii) to explore the predictors of ED use among them.

## Methods

### Study design

An observational cross-sectional study was carried out over three months (August–October 2022), targeting physically active persons from 8 gyms in Lebanon.

### Study sample and sample size

Participants were recruited with no selection criteria based on sex, nationality, age, or ethnicity. Two gyms were located in Beirut, three in Mount Lebanon, and one in South, North, and Bekaa, respectively. Participants who refused to answer the survey and those practicing sports for less than three months were excluded. The sample size was determined using the Epi Info 7 software. The calculation assumed that the probability of consumption of EDs was 45% based on findings from a recent study published in Lebanon (Ghozayel et al., 2020). Considering a 95% confidence interval and a 5% acceptable margin of error, 381 participants were required. GPower 3.1. was used to perform a power analysis since 384 participants were included and a power of 87.5% was achieved.

### Data collection

Three pharmacy students approached the participants during weekdays from 10 am to 4 pm and explained the study objectives orally. They invited them to participate by filling out a survey on a tablet. The first page of the survey mentioned above included a written version of the objectives with an estimated 12 minutes to answer.

### Study tool

A questionnaire was developed and used for data collection. It was available in Arabic (the official language in Lebanon). The survey was initially piloted on 20 participants, and questions that needed more clarity were adjusted or deleted. The first part included questions about the general characteristics of the participants including sex, age (<18, 18–30, and >30), the level of education (elementary school, high school, and university or more), the governorate of residence, and the household arrangement (with family or alone). This part also collected the lifestyle habits and sport practices of the sample such as smoking (cigarettes and waterpipe), alcohol consumption, type of sports (running, weightlifting, swimming, biking, and football). The frequency of practicing sports was also

reported in addition to the place of workout (gym, outdoors, and home) and if they had a workout partner. The second part of the survey comprised questions related to ED consumption. Participants were asked if they agree to 15 statements related to EDs including their use and the intended reasons, place and context of consumption, and the different side effects of ED use. They reported the frequency of ED consumption, if they encountered any side effects, whether or not they mix EDs with alcohol, and their perceived satisfaction and dependence on EDs.

### Statistical analysis

Statistical analyses were performed using Statistical Package for Social Sciences (SPSS Inc, Chicago, Illinois) Version 28. Categorical variables are presented through frequencies and percentages. These variables included the general characteristics of the participants, their lifestyle habits, sport practices and questions related to ED consumption. In contrast, continuous variables such as the age, BMI, and sport frequency per week are presented in means and standard deviations. Considering the values of skewness (0.017) and kurtosis (0.271), data are normally distributed and converged toward their expected values (Hatem et al., 2022). Bivariate analyses were performed to test the association between ED use among physically active persons, and their general characteristics. Chi-square/Fisher exact tests were used to compare percentages between the associated categorical variables. The unpaired student t-test/ Mann-Whitney test was used for the comparison of data between two different groups. A multivariate analysis using a logistic regression model was performed to assess the predictors of ED consumption. These analyses produced Odd Ratios with a 95% Confidence Interval (CI). Independent variables were only selected if they had p-values <0.20 in bivariate analyses. A p-value <0.05 was considered statistically significant.

### Ethical considerations

The study protocol, survey, and consent form were reviewed and approved by the institutional review board of the faculty of pharmacy of the Lebanese University. Data were completely anonymous and non-identifiable. Written informed consent was obtained from each participant by asking them to sign before filling out the survey. They were acknowledged that they could withdraw their participation at any point during the interview and that findings would only be used for research purposes.

## Results

### *General characteristics of the participants*

Overall, 437 potential participants were approached, and 384 agreed to participate in the study (87.9%). The general characteristics of the sample are presented in Table 1. The sample included more males (N = 291, 75.8%) than females (N = 93, 24.2%). The mean age was 26.2 (1.6), with the majority (69.3%) between 18 and 30 years. Most students (93.3%) were less than 30 years of age and had a university degree or more (74.0%). As regards the governorate of residence, participants were distributed in five governorates, with Mount Lebanon (48.2%), North (20.8%), and Beirut (16.7%) accounting for the highest proportions. Three-thirds lived with their family. Around 48% of the participants were cigarette smokers, 29.9% were waterpipe smokers, and 48.2% were passive smokers. Weightlifting (68.8%), running (46.4%), and swimming (29.0%) were the most common type of sports, while muscle gain (62.2%) and weight loss (37.0%) were the main reasons for practicing sports. More than half of the sample (56.8%) exercised for more than 4 days, 75.3% regularly went to the gym, and 51% had a workout partner.

**Table 1.** Distribution of the general characteristics of physically active persons in the study sample

		Total (N = 384)
		Frequency (%)
<b>Sex</b>	Male	291 (75.8%)
	Female	93 (24.2%)
<b>Age (years)</b>	<b>Mean ±SD</b>	26.2 ±1.6
	<18	52 (13.5%)
	18–30	266 (69.3%)
	>30	66 (17.2%)
<b>BMI</b>	<b>Mean ±SD</b>	24.6 ±3.1
<b>Level of education</b>	Elementary	23 (6.0%)
	school	
	High school	77 (20.1%)
	University or more	284 (74.0%)
<b>Governorate of residence</b>	Beirut	64 (16.7%)
	Mount Lebanon	185 (48.2%)
	North	80 (20.8%)
	South	36 (9.4%)
	Bekaa	19 (4.9%)
<b>Household arrangement</b>	With family	290 (75.5%)
	Alone	94 (24.5%)
<b>Cigarette smoking (N = 254)</b>	Smoker	121 (47.6%)
	Non-smoker	133 (52.4%)
<b>Waterpipe smoking (N = 254)</b>	Smoker	76 (29.9%)
	Non-smoker	178 (70.1%)
<b>Passive smoking</b>	Yes	185 (48.2%)
	No	199 (51.8%)
<b>Alcohol consumption</b>	Yes	84 (21.9%)
	No	300 (78.1%)
<b>Type of sports practiced</b>	Running	178 (46.4%)
	Weightlifting	264 (68.8%)
	Swimming	111 (29.0%)
	Biking	60 (15.7%)
	Football/	46 (12.0%)
	Basketball	
<b>Reasons for practicing sports</b>	Muscle gain	239 (62.2%)
	Weight loss	142 (37.0%)
	Hobby	99 (25.8%)
	Health reasons	49 (12.8%)
<b>Sports frequency per week</b>	<b>Mean ±SD</b>	4.4 ±1.6
	≤2 days	40 (10.4%)
	3–4 days	126 (32.8%)
	>4 days	218 (56.8%)
<b>Workout location</b>	Gym	289 (75.3%)
	Outdoors	143 (37.2%)
	Home	34 (8.9%)
<b>Workout partner</b>	Yes	196 (51.0%)
	No	188 (49.0%)

Results are given in terms of frequency (percentage) or Mean ± Standard Deviation.

**Energy drinks consumption among physically active persons**

Table 2 presents the prevalence, characteristics, and perceptions of ED use among physically active persons. The prevalence of ED consumption in the sample was 49.2%. The reasons for using them were mainly to boost energy (68.2%) and stimulate awakeness (19.3%). Around 20% used EDs during workouts, and 15.8% used them before it. Family (19.7%) and friends (21.7%) gatherings were the main occasions for using EDs, with higher consumption in public places (48.4%) than at home (26.3%). Only 9% declared that they feared being addicted to EDs, and 30.9% said that they used safer alternatives for energy stimulation. Almost 20% of the participants used

EDs daily, and 17.4% used them weekly. More than half of physically active persons (56.3%) encountered side effects from EDs, with tachycardia (41.3%), headaches (18.5%), and agitation (18.0%) as the most common ones. Seventy percent of the participants reported never mixing EDs with alcohol, and only 12.3% always did it. Only 13.1% of them said they depended on EDs, and 47.5% felt satisfied after consuming them.

**Table 2.** Energy drink consumption among physically active persons in Lebanon

		Total (N = 384)
<b>Do you agree with the following?</b>		<b>Frequency (%)</b>
I regularly use energy drinks		189 (49.2%)
I use energy drinks to stimulate awakesness		74 (19.3%)
I use energy drinks to boost my energy		262 (68.2%)
I use energy drinks to boost my mental activity		15 (3.9%)
I use energy drinks when doing sports (N = 244)		49 (20.1%)
I use energy drinks before workouts (N = 244)		38 (15.8%)
I use energy drinks during exams/stressful periods (N = 242)		22 (9.1%)
I use energy drinks to be awake at night (N = 244)		90 (36.9%)
I only use energy drinks during family gatherings (N = 244)		48 (19.7%)
I only use energy drinks with friends (N = 244)		53 (21.7%)
I only use energy drinks at home (N = 244)		64 (26.3%)
I only use energy drinks in public places (N = 244)		118 (48.4%)
I fear being addicted to energy drinks		23 (9.0%)
I use safer alternatives for energy stimulation		79 (30.9%)
Energy drinks have side effects		230 (59.9%)
Yes		39 (10.2%)
No		115 (29.9%)
I don't know		115 (29.9%)
<b>Frequency of energy drinks consumption (N = 190)</b>		
Daily		39 (20.5%)
Weekly		33 (17.4%)
Monthly		11 (5.8%)
Occasionally		107 (56.3%)
<b>Side effects from energy drinks (N=244)</b>		
Yes		129 (52.9%)
No		115 (47.1%)
<b>Please cite them</b>		
Tachycardia		85 (41.3%)
Headache		38 (18.5%)
Agitation		37 (18.0%)
Frequent		28 (13.7%)
urination		
Nausea		24 (11.7%)
Gastrointes-		12 (5.9%)
tinal		
<b>Mixing energy drinks with alcohol (N = 243)</b>		
Never		170 (70.0%)
Rarely		32 (13.2%)
Usually		11 (4.5%)
Always		30 (12.3%)
<b>Energy drinks can (N = 244)</b>		
Stimulate		74 (30.3%)
awakesness		
Boost energy		107 (43.9%)
Improve		13 (5.3%)
confidence		
Improve		26 (10.7%)
mental state		
<b>Satisfaction with energy drinks (N = 244)</b>		
Yes		116 (47.5%)
No		128 (52.5%)
<b>Energy drinks dependence (N = 245)</b>		
Yes		32 (13.1%)
No		213 (86.9%)

Results are given in terms of frequency (percentage)

**Association between energy drink consumption and the general characteristics of the participants**

Table 3 shows the association between ED use and the participants' general characteristics. Males reported significantly higher ED use than females (55% and 31.2%, respectively,  $p < 0.001$ ). Although no differences were noted when taking age as a covariate, it was noted that physically active persons younger than 18 years used fewer EDs than their older peers (34.6%,  $p = 0.074$ ). Smoking, in general, was associated with ED consumption where compared to non-smokers, cigarette (62.8% vs. 49.6%,  $p = 0.035$ ), waterpipe (73.7% vs. 48.3%,  $p < 0.001$ ) and passive (62.7% vs. 36.7%,  $p < 0.001$ ) smoking was associated with the consumption of EDs. Furthermore, 69% of alcohol drinkers used EDs compared to 43.7% of non-drinkers ( $p < 0.001$ ). Regarding the association with the type of sports practice, those doing weightlifting had significantly higher ED consumption than those who did not (53.8% vs. 39.2%,  $p = 0.008$ ). Moreover, 56.6% of physically active persons having a workout partner used EDs compared to 41.5% of those practicing alone ( $p = 0.003$ ).

**Table 3.** Association between energy drink consumption and the general characteristics of the participants

Energy drinks consumption among athletes		Yes (N = 185)	No (N = 195)	
		Frequency (%)	Frequency (%)	p-value
<b>Sex</b>	Male	160 (55.0%)	131 (45.0%)	<b>&lt;0.001</b>
	Female	29 (31.2%)	64 (68.8%)	
<b>Age (years)</b>	<18	18 (34.6%)	34 (65.4%)	0.074
	18–30	136 (51.1%)	130 (48.9%)	
	>30	35 (53.0%)	31 (47.0%)	
<b>Level of education</b>	Elementary school	12 (52.2%)	11 (47.8%)	0.212
	High school	31 (40.3%)	46 (59.7%)	
	University or more	146 (51.4%)	138 (48.6%)	
<b>Governorate of residence</b>	Beirut	30 (46.9%)	34 (53.1%)	0.432
	Mount Lebanon	86 (46.5%)	99 (53.5%)	
	North	41 (51.2%)	39 (48.8%)	
	South	19 (52.8%)	17 (47.2%)	
	Bekaa	13 (68.4%)	6 (31.6%)	
<b>Household arrangement</b>	With family	149 (51.4%)	141 (48.6%)	0.137
	Alone	40 (42.6%)	54 (57.4%)	
<b>Cigarette smoking (N = 254)</b>	Smoker	76 (62.8%)	45 (37.2%)	<b>0.035</b>
	Non-smoker	66 (49.6%)	67 (50.4%)	
<b>Waterpipe smoking (N = 254)</b>	Smoker	56 (73.7%)	20 (26.3%)	<b>&lt;0.001</b>
	Non-smoker	86 (48.3%)	56 (73.7%)	
<b>Passive smoking</b>	Yes	116 (62.7%)	69 (37.3%)	<b>&lt;0.001</b>
	No	73 (36.7%)	126 (63.3%)	
<b>Alcohol consumption</b>	Yes	58 (69.0%)	26 (31.0%)	<b>&lt;0.001</b>
	No	131 (43.7%)	169 (56.3%)	
<b>Weightlifting</b>	Yes	142 (53.8%)	122 (46.2%)	<b>0.008</b>
	No	47 (39.2%)	73 (60.8%)	
<b>Biking</b>	Yes	23 (38.3%)	37 (61.7%)	0.063
	No	166 (51.4%)	157 (48.6%)	
<b>Sports frequency per week</b>	≤2 days	20 (50.0%)	20 (50.0%)	0.137
	3–4 days	53 (42.1%)	73 (57.9%)	
	>4 days	116 (53.2%)	102 (46.8%)	
<b>Workout partner</b>	Yes	111 (56.6%)	85 (43.4%)	<b>0.003</b>
	No	78 (41.5%)	110 (58.5%)	

Results are given in terms of frequency (percentage). P-values <0.05 are considered statistically significant.

**Predictors of energy drink consumption among physically active persons**

The predictors of ED use among physically active persons are presented in Table 4. After adjusting for covariates, females had 59% lower odds of ED consumption than males (OR 0.41, 95% CI 0.19–0.89). The odds of ED use were 4.74 times higher among those older than 30 years compared to physically active persons younger than 18 (OR 4.74, 95% CI 1.16–19.3). Waterpipe smokers had 3.68 times higher odds of ED use than non-smokers (OR 3.68, 95% CI 1.85–7.33). Moreover, passive smokers had 2.84-fold higher odds of ED consumption than other participants (OR 2.84, 95% CI 1.57–5.15). Alcohol consumers had 2.28 times higher odds of ED use than non-consumers (OR 2.28, 95% CI 1.14–4.58). Among others, those doing weightlifting had significantly higher odds of ED consumption than others (OR 2.61, 95% CI 1.30–5.25).

**Table 4.** Predictors of energy drink consumption among physically active persons

	Crude model OR [95% CI]	Adjusted model OR [95% CI]	p-value
Female sex (male as reference)	0.37 [0.23–0.61]	0.41 [0.19–0.89]	<b>0.024</b>
Age (<18 as a reference)			
18–30	1.98 [1.06–3.67]	3.06 [0.91–10.3]	0.072
>30	2.13 [1.01–4.51]	4.74 [1.16–19.3]	<b>0.030</b>
Living alone (With family as a reference)	0.70 [0.44–1.12]	0.54 [0.26–1.14]	0.106
Cigarette smoking (No as a reference)	1.71 [1.04–2.83]	0.67 [0.33–1.33]	0.248
Waterpipe smoking (No as a reference)	2.99 [1.66–5.40]	3.68 [1.85–7.33]	<b>&lt;0.001</b>
Passive smoking (No as a reference)	2.90 [1.92–4.39]	2.84 [1.57–5.15]	<b>&lt;0.001</b>
Alcohol consumption (No as a reference)	2.88 [1.72–4.82]	2.28 [1.14–4.58]	<b>0.020</b>
Weightlifting (No as a reference)	1.81 [1.17–2.81]	2.61 [1.30–5.25]	<b>0.007</b>
Biking (No as a reference)	0.59 [0.33–1.03]		
Sports frequency (≤2 days as a reference)			
3–4 days	0.73 [0.36–1.48]		
>4 days	1.14 [0.58–2.23]		
Workout partner (No as a reference)	1.84 [1.23–2.76]	1.58 [0.88–2.82]	0.122

Question: Do you consume energy drinks? The baseline answer is "No". OR: Odds ratio; CI: Confidence Interval  
Omnibus test ( $p < 0.001$ ), Nagelkerke  $r$  square (0.287), Hosmer & Lemeshow ( $p = 0.016$ )

**Discussion**

The present study aimed to assess ED consumption among physically active persons and the predictors of ED use. A high prevalence of ED consumption was reported among participants, namely for energy boosting and stimulating awakens. More than half of physically active persons encountered side effects from ED consumption, particularly tachycardia and headaches. Around 30% of participants reported mixing EDs with alcohol, and 13.1% reported dependency.

Around half of the participants reported using EDs. A recent study showed a correlation between ED use and the perception of athletic identification and sports participation (Pfender et al., 2023). Moreover, a systematic review published in 2022 found that ED consumption increased the probability of risky behaviors, anxiety, depression, and impulsivity in addition to a progressive increase in consumption within 5 years (Silva-Maldonado et al., 2022). Previous research conducted among young athletes in the United States showed a higher prevalence (80.1%) than in this study (Hoyte et al., 2013). Since most participants in this study were adults, this might be due to the



lower consumption of EDs among this group compared to younger ages (32% vs. 68%) (Erdmann et al., 2021). In Lebanon, studies reported a slightly lower prevalence of ED use (45%) among university students (Ghozayel et al., 2020), but much higher among adolescents and youth (Itany et al., 2014). Many physically active persons in this study used EDs to enhance their physical performance, making them prone to side effects such as insomnia, heart palpitation, hypertension, and anxiety (Dwaidy et al., 2018). Tachycardia was the most reported side effect in this study, which was also reported among young adults using EDs (Costa et al., 2023) and among athletes (Guerra et al., 2023). The study sample was predominantly men. Research showed gender differences in exercise habits and motives, where men tended to exercise more for fitness and shape toning while women focused on weight loss and health quality (Craft et al., 2014). As regards ED use, men reported a significantly higher consumption than women, in agreement with previous reports (Fagaras et al., 2023; Llorent-Bedmar et al., 2023).

Most participants used EDs to boost their energy, with 36% using them before or during the workout. This misuse can lead to substantial health outcomes, such as pre-workout-induced ischemia (Guerra et al., 2023), and an increase in blood sugar levels (Ragsdale et al., 2010). Smoking (cigarettes, waterpipe, or passive) was associated with higher ED consumption. This finding was also reported in previous studies (Larson et al., 2014; Pavlovic et al., 2023), where physically active persons and smokers had significantly increased use of EDs compared to others. Tobacco consumption in ED advertising (Bleakley et al., 2022), could explain this finding and call for better supervision, due to the harmful effect of substance abuse since cigarettes are cheap in Lebanon. Participants practicing weightlifting reported greater use of EDs. Weightlifting training was reported to be ameliorated with the consumption of caffeinated drinks (Menezes et al., 2022). They are mainly used to boost energy and hydration and were found to improve both aerobic and anaerobic exercise performance (Tambalis, 2022) but should be considered with caution. Working out with a partner significantly increased ED consumption, possibly related to using them as socialization tools and the self-perception of better engagement in sports (Attila & Çakir, 2011). Among the reported predictors, alcohol consumption was found to significantly induce ED use among the participants. This finding was also shown in previous research, where a high proportion of ED users tended to mix them with alcohol (Attila & Çakir, 2011; Llorent-Bedmar et al., 2023; Pavlovic et al., 2023).

This study has limitations. Selection bias may have been induced since the data collectors conveniently selected the participants in the gyms. Recall bias can affect the findings since a self-reported survey was used for data collection. However, pharmacists were uniformly trained and used the same data collection form, and a different researcher performed data coding and analysis. Despite the multi-center aspect of the study, participants were only recruited from selected gyms; therefore, results cannot be extrapolated to other physically active persons or to those practicing outside these settings. Nonetheless, the present study is among the few studies tackling the consumption of ED among physically active persons and the predictors of this consumption. Findings can allow better-informed decisions and tailored campaigns targeting this specific group.

## Conclusion

A high prevalence of energy drink consumption was found among physically active persons in Lebanon. Despite the reported side effects, EDs were commonly used as energy boosters and awakens. After adjusting for covariates, ED use was significantly higher among females, waterpipe and passive smokers, alcohol drinkers, and those practicing weightlifting. For better informed-decision and effective awareness campaigns, these predictors should be considered.

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