

Sociodemographic differences, prevalence, and patterns of energy drink consumption among Jazan university students, Saudi Arabia

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ABSTRACT

Energy drinks are beverages containing a high amount of caffeine and other substances. Studies on the side effects of energy drink consumption among college students in Saudi Arabia are limited. In this cross-sectional study, we aimed to determine the consumption patterns and effects of energy drinks among college students. The study was conducted using a self-administered questionnaire about sociodemographic differences, prevalence, and patterns of energy drink consumption.

A total of 458 students responded, among whom 45.31% were energy drink users. The students reported reasons for using and not using energy drinks as well as the side effects. The pleasing taste of energy drinks was the most common cause for their consumption, whereas lack of curiosity and questionable health effects were the reasons for not using them. Increased heart rate and urination were the most common side effects of energy drink consumption. A significant proportion of students at Jazan University consume energy drinks, which is almost similar to that reported in previous studies.

Keywords: Epidemiology, Health policy, Marketing, International, Outcome research, Environmental health

Introduction

Energy drinks are a type of commercial cold beverages containing caffeinated stimulant materials [1, 2]. These stimulants temporarily increase the nervous system's functional activity and dopamine levels, leading to a feeling of pleasure [3, 4]. People usually consume energy drinks to provide energy,

alertness, and wakefulness [3, 5]. Energy drinks include various ingredients such as caffeine, sugar, B vitamins, taurine, guarana, ginseng, antioxidants, L-carnitine, glucuronolactone, and trace minerals [1]. Some of these ingredients may repeatedly stimulate the nervous system, leading to harmful health consequences [6]. Thus, many types of research have been conducted to examine the side effects of energy drink consumption on human health. Previous studies found that excessive energy drink consumption could lead to health effects among consumers including sleep patterns and cardiac and psychiatric dysfunction [7, 8].

Since the introduction of the first energy drink in Japan in 1960 by Taisho Pharmaceuticals, the energy drink market has increased tremendously over the last decades [9]. The market size of global energy drinks was valued at \$53.01 billion in 2018 and is expected to reach \$86.01 billion by 2026 [10, 11].

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Energy drinks are a fast-growing segment of the Saudi Arabian's soft drink market, particularly among adolescents and college students [12]. The growth of energy drink consumption is attributed to the aggressive marketing of their overestimated ability to provide enormous energy [13]. Several energy drink brands such as Bison®, Red Bull®, Boozy®, Code Red®, and Power Horse® are available in the Saudi market [14].

Previous studies carried out in Saudi Arabia targeting the 18–35 years old age group investigated the prevalence of energy drink consumption. Only a limited number of studies discussed the side effects of energy drink consumption among undergraduate students. The determinants and prevalence of energy drinks among college students are high, with regional and sex disparities. A study reported that the prevalence of energy drink consumption among college students was 57% in males and 26% in females in Dammam [15]. In Makkah, 70% and 30% of males and females, respectively, consumed energy drinks [16]. A survey conducted in Jeddah found that 71% of males and 36% of females used energy drinks [11]. In Madinah, almost 52% of young female students consumed energy drinks [17]. Moreover, nearly 38% of young male students in Al-Qassim University reported energy drink consumption [18].

Although the energy drink market, its advertising activities, and associated health risk concerns are rapidly increasing, relatively few published scientific studies have been conducted in Saudi Arabia. Thus, in this study, we aimed to assess the prevalence of energy drink consumption and their effects on the health status of college students to support other national and international reports. This study was conducted to help raise attention and awareness of energy drink consumption among young adults.

Materials and Methods

Study design, area, and population

Our study was conducted at Jazan University, Jazan, Saudi Arabia, with approximately 50,000 students and 24 colleges. Jazan University is the only university in the Jazan region. Jazan is located in the south-western area of Saudi Arabia, with almost 1.6 million residents [19]. The study design was an observational, cross-sectional, self-administered survey targeting Jazan University students who registered for the academic year 2018/2019.

Sampling procedures

A sample size of 458 students was calculated based on a confidence interval of 95%, error not exceeding 5%, nonresponse rate of 20%, and the following sample size formula:

$$n = \frac{Nz_{(\alpha)}^2 P(1 - P)}{(N - 1)d^2 + P(1 - P)z_{(\alpha)}^2} \quad (1)$$

A stratified sampling technique was used here. First, colleges were stratified into three different strata based on three broad fields of study: health field colleges, science colleges, and neither field colleges. Second, two colleges from each field stratum were randomly selected. Finally, Determining the number of students at each selected college chosen to the actual student size in each college was conducted using simple random sampling.

Data collection

Data was collected using an Arabic self-administered questionnaire. It was adapted from a previously published study [20]. It includes a total of 27 items, divided into three sections, to achieve the goals of the study. The first section involved information on demographics, socioeconomic factors, and other background characteristics. The second section involved information on daily habits that are of considerable significance such as smoking, physical activity, and sleeping patterns. The last section included questions on usage, side effects, and knowledge of energy drinks.

Statistical analysis

Fieldwork supervisors reviewed the submitted questionnaires daily for any errors or inconsistencies to ensure data quality. Stata/IC™ 13.1 (StataCorp LP, College Station, TX) was used for statistical testing. Data analysis involved inferential and descriptive statistics. Participants' socioeconomic and demographic data, daily habits, energy drink use, and side effects were presented by descriptive statistics.

Results and Discussion

This study included 448 undergraduate students, with a response rate of 97.17%. The prevalence of energy drink consumption was 45.31%. **Table 1** clearly shows the socioeconomic characteristics of the study participants and their energy drink consumption status. The majority of the students were female (51.12%), single (86.38%), living in rural areas (63.17%), belong to non-science colleges (55.13%), and were in their final academic year (44.64%). A significant difference in energy drink consumption according to smoking status and school type was observed (**Table 1**). Smokers (96.97%) were more likely to consume energy drinks than non-smokers (77.59%). Moreover, students in science colleges were more likely to consume energy drinks than those in non-science colleges and health-related colleges (89.43% versus 75.30% and 74.36, respectively).

Table 1. Sociodemographic Factors and Energy Drink Consumption among Students (n = 448)

Age \pm (mean SD)	21.75 \pm 1.82	21.81 \pm 1.85	21.55 \pm 1.68	P-value*
Characteristics	Total Sample	Energy Drink Users	Non-users	
	N (%)	N (%)	N (%)	
Sex				
Male	219 (48.88)	179 (81.74)	40 (18.26)	0.167
Female	229 (51.12)	175 (76.42)	54 (23.58)	
Marital Status				
Single	387 (86.38)	310 (80.10)	77 (19.90)	0.155
Married	61 (13.62)	44 (72.13)	17 (27.87)	
Place of Residence				
Urban	165 (36.83)	136 (82.42)	29 (17.58)	0.176
Rural	283 (63.17)	218 (77.03)	65 (22.97)	
College				
Health-related	78 (17.41)	58 (74.36)	20 (25.64)	0.004
Science	123 (27.46)	110 (89.43)	13 (10.57)	
Non-science	247 (55.13)	186 (75.30)	61 (24.70)	
Academic Year				
First	68 (15.18)	46 (67.65)	22 (32.35)	0.093
Second	75 (16.74)	62 (82.67)	13 (17.33)	
Third	105 (23.44)	85 (80.95)	20 (19.05)	
Fourth	200 (44.64)	161 (80.50)	39 (19.50)	
BMI				
Underweight	96 (21.43)	77 (80.21)	19 (19.79)	0.500
Normal	244 (54.46)	196 (80.33)	48 (19.67)	
Overweight or Obese	108 (24.11)	81 (75)	27 (25)	
Smoking Status				
Yes	33 (7.37)	32 (96.97)	1 (3.03)	0.009
No	415 (92.63)	322 (77.59)	93 (22.41)	
Regular Sleeping				
Yes	120 (26.79)	91 (75.83)	29 (24.17)	0.317
No	328 (73.21)	263 (80.18)	65 (19.82)	
Exercise Regularly				
Yes	351 (78.35)	277 (78.92)	74 (21.08)	0.921
No	97 (21.65)	77 (79.38)	20 (20.62)	

*Calculated using the Chi-square Test.

Students who never consumed energy drinks reported specific reasons for their nonconsumption (**Table 2**). The majority of them (53.19-61.70%) stated that these products are not healthy, and they do not have enough curiosity to try them. Half of the students claimed that they do not need them. Other reasons such as their high level of calories, the anonymity of their contents, and their relatively high price prevented some participants from using them.

Table 2. Reasons for not Consuming Energy Drinks among Non-users (n = 94)

They are not healthy.	58 (61.70)
I am not curious to try them.	50 (53.19)
I do not need more energy.	47 (50)

I do not have a specific reason.	46 (48.94)
They have high-calorie content.	44 (46.81)
I do not know their components.	35 (37.23)
They are pricey.	33 (35.11)

Table 3 shows the reasons why students consumed energy drinks. The most commonly reported reasons for energy drink consumption was to enjoy the taste (78.30%), followed by staying alert (32.55%). A part of the participants consumed energy drinks to mimic their friends (20.82%). Less than 20% of the students consumed energy drinks to improve study concentration, increase physical activity, get rid of depression, or relieve headaches and tension.

Table 3. Reasons for Consuming Energy Drinks among ever Users (n = 341)

I enjoy the taste.	267 (78.30)
To keep me awake	111 (32.55)
To mimic my friends	71 (20.82)
To improve study concentration	58 (17.01)
To boost physical activity	51 (14.96)
To combat depression	49 (14.37)
To relieve tension	40 (11.73)
To relieve headache	40 (11.73)

Most study participants (63.11%) reported specific symptoms during their energy drink consumption (**Table 4**). These symptoms include increased heart rate (36.89%), increased urination (26.22%), sleep deprivation (23.34%), increased weight (17.87%), headache (12.97%), and stress (9.8%).

Table 4. Symptoms Experienced after Consuming Energy Drinks among ever Users (n = 347)

Symptoms	Number of Students per Symptom (%)
Increased Heart Rate	128 (36.89)
No Symptoms Experienced	126 (36.31)
Increased Urine Frequency	91 (26.22)
Sleep Deprivation	81 (23.34)
Increased Weight	62 (17.87)
Headache	45 (12.97)
Stress	34 (9.80)

The overall prevalence of the current energy drink consumption among the participants was 45.31%, which is comparable to that reported in previous studies in Saudi Arabia (37.00-45.63%) [15, 18, 21]. Our results showed more consumption of energy drinks in male students than in female students (**Table 1**). Previous studies also reported similar findings [11, 15, 22]. From our point of view, males usually tend to get involved in more risks, physical activity, and careless behavior than did females [21]. Similar to a previous study, the frequency of energy drink consumption was higher in unmarried students, probably because they are younger and involved in a higher level of risk-taking [4, 21, 23]. As students proceed through their academic level, they experience a wide range of ongoing stressors related to academic demands, which encourage them to use stimulants like energy drinks [24]. This could explain the differences in energy drink consumption between early and late academic years. As expected, students in health-related colleges were fewer consumers of energy drinks, which was probably because health college students have a better knowledge of the side effects of the different substances than the students in non-health colleges [21]. A positive association was found between smoking drinks and consumption of energy. Previous studies showed that smokers need to ingest more stimulant compounds such as caffeine and taurine to experience a similar effect than non-smokers because smoking causes smokers to metabolize compounds such as caffeine faster [25].

One of the most important achievements of this study was the discussion of the reasons for not consuming energy drinks among non-users. To the best of our knowledge, this study is the first of its kind involving the Saudi population. Most students reported that perceived unhealthiness was the main reason for abstaining from energy drinks. A previous study showed that 47.80% of medical students did not use energy drinks for the same purpose [26]. Almost half of the study participants were not curious to try them or did not need the claimed energy from them. Similar to the study conducted by Aslam *et al.*, nearly half of our study participants (48.95%) did not have specific reasons for not using them. Two-thirds of the non-users claimed that they could afford the prices, but they do not want to buy them. Thus, advertising campaigns for energy drink companies did not succeed in a significant part of non-users due to lack of credibility or overrated advertising.

In contrast to other national studies, energy drink users reported that their main reason for using them was to enjoy the taste (78.30%). Other reasons such as being more active, staying awake for a longer time, and improving mental and physical activities were reported to trigger undergraduate students to consume energy drinks. Different studies conducted in Saudi Arabia reported various main reasons among users. A survey conducted in Makkah reported that most users consumed energy drinks because they think that these drinks keep them awake [16]. Another study conducted in Jeddah reported that the taste and flavor allured the majority of the users to consume energy drinks [11]. A study conducted in Ghana found that a high proportion of the respondents consumed energy drinks to renew lost energy after working out [27]. Studies conducted in the United States reported that the main reason for consumption was to make them more active [28, 29]. Justifications for energy drink use seem to vary based on other variables such as race, culture, and social norms.

Similar to a previous study conducted in Saudi Arabia, almost two-thirds of the study participants reported side effects while using energy drinks [15]. These adverse effects were all reversible and reflected enhanced neuronal activity. Increased heart rate was the most common symptom among users. Previous studies found that energy drinks can raise blood pressure and heart rate [15, 30, 31]. Moreover, almost a quarter of the participants said they suffered from increased urination during energy drink consumption, which is similar to that reported in a previous study conducted in the United States [32]. Other symptoms such as sleep deprivation and increased weight were reported to a less extent in this study. A study conducted in the United States found that the majority of the college students had poor sleep manners [33]. Two other studies conducted in Chile and Thailand found that energy drink use among college students had a positive correlation with poor sleep quality [34, 35]. Only 12.97% and 9.80% reported that they experienced headaches and stress, respectively. Previous studies reported that energy drink consumption plays a role in cardiometabolic diseases associated with obesity [36, 37]. A previous review also revealed that frequent intake of energy

drinks can increase the risk of overweight or obesity in adolescents and children [38].

The authors acknowledge the following limitations of this study. This study is prone to selection and recall biases because of its cross-sectional survey design. The included population may not be representative of the Jazan University students. Future analytical studies are warranted to investigate the causal relationship between energy drink consumption use and health effects.

Conclusion

In conclusion, energy drink consumption is relatively high among college students. A noteworthy proportion of college students at Jazan University use energy drinks. Participants who are female, single, smokers, non-science college students, living in rural areas or the final academic year at Jazan University often use energy drinks. The most frequent reason for their use is to enjoy the taste, whereas the most common reasons for not using energy drinks are lack of curiosity and questionable health effects. The participants associate a variety of adverse effects with energy drinks; the most common effects are increased heart rate and urination. This phenomenon of energy drink consumption is highly widespread among college students in Saudi Arabia. Our findings will raise questions among medical and health practitioners regarding their awareness of the side effects of these beverages. Thus, further studies are warranted to investigate the factors associated with energy drink consumption. Similar to the tobacco smoke industry, labeling and marketing of energy drinks are critical; specific evidence-based health warnings should be included. Health education programs should be established to increase awareness among the public population about health effects.

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