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# Use of Energy Drinks Among College Students in Saudi Arabia

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**Abstract:** Energy drinks are popular among college students in Saudi Arabia (S.A) who consume these drinks for a variety of reasons. For example, college students believe that energy drinks can improve attention and/or reaction times during extended periods of cognitive demand. However, some of the ingredients in energy drinks, particularly sucrose and caffeine, can cause negative health effects such as an increase in heart rate and blood pressure and possible dehydration. In addition, these drinks can interfere with and disrupt normal sleep patterns. The majority of college students in Saudi Arabia are generally unaware of the potential health hazards of energy drinks. Therefore, the objective of this study was to access the usage patterns of energy drinks among college Students in Saudi Arabia. For this study, healthy college student volunteers from three universities in Riyadh, S.A. (King Saud University, Princess Nora Bint Abdul Rahman University and Imam Muhammad Ibn Saud Islamic University) were recruited. Data were collected via a self-administered, standard pretested questionnaire consisting of 14 questions relating to students' socio-demographic characteristics, personal habits, total fluid intake, energy drink-related knowledge, and habits. Of the 472 students surveyed, 338 regularly consume energy drinks. The mean age and standard deviation were  $20.22 \pm 1.71$ . An exploratory analysis was performed to model significant predictors of energy drink consumption. A backward elimination logistic regression modeling technique was used to reach the most parsimonious yet statistically significant model. Although there was a high prevalence of energy drink usage among students involved in this study, a majority of these students do not have accurate information about the products' ingredients or potentially detrimental health effects. Our study showed that there is a need for more stringent labeling of energy drinks so that the consumer would know the exact quantity of each ingredient. Future studies are also needed to determine whether formal educational training could impact on understanding as well as intake of energy drinks and harmful side effects of such drinks among college students. Thus, there is an urgent need to provide college students with education and access to unbiased scientific information in order for the students to make informed and healthy choices.

**Keywords:** Energy Drinks, College Student, Intake, Survey

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## 1. Introduction

Each year, new energy drinks become available in Saudi Arabia. These energy drinks are popular among college students [1]. However, the Saudi Council of Ministers has decided to ban the advertisement of energy drinks due to a recent and significant rise in sudden cardiac deaths among young, healthy individuals. This ban also applies to the distribution of free energy drinks to consumers of all age groups and prohibits the sale of energy drinks in restaurants and canteens in government facilities, education and health

facilities, halls of government and private sports clubs. A committed council resolution of factory owners and importers of energy drinks has warned of the harmful effects of energy drinks [2, 19].

As the global market for energy drinks approaches nearly \$15 trillion, the general consumption of energy drinks has increased accordingly, particularly among college students. The consumption rates in this demographic are increasing primarily because of the concentration enhancement and fatigue-relieving effects of energy drinks [3], yet there is relatively little information regarding the safety and quality of these products. In addition, much of the available

information about energy drinks can be vague and misleading to consumers. In the quest to be the best, academically successful, or strongest and fastest in the case of student-athletes, many students consume unproven, potentially harmful, or even banned energy drinks. Popular energy drinks such as Red Bull, Power Horse, Bison, Bugzy, Code Red, Boom Boom, Shark, Double Horse, Blu Day, Black, and AMP were used in this study [4]. Students use different energy drinks for a variety of reasons [5]. However, many did not know where to obtain reliable information and were also unaware of the fact that energy drinks can have adverse effects.

Caffeine is no longer banned by the World Anti-Doping Agency. Nevertheless, one should only use caffeine under the advice of a sports medicine professional or sports dietitian, and individual responses to caffeine should be considered. Red Bull energy drink is a popular carbonated and caffeinated taurine drink with label wording that claims to vitalize the body and mind. Red Bull is designed especially for moments of increased physical and mental stress and improves endurance, alertness, concentration, and reaction speed. The effectiveness of Red Bull energy drink is supported by significant scientific research and endorsed by recognized sports professionals [6].

Caffeine is also contained in coffee, tea, chocolate, and many other food sources like cola and is used by many students as a stimulant [7, 8]. Even though the physiological mechanisms of caffeine are not well understood, caffeine beneficially affects performance by reducing the perception of fatigue, enhancing central drive, and/or improving exercise capability [9]. The ergogenic effect of caffeine in endurance exercise performance has been well established. Doherty and Smith [10] explained its extensive use by students by stating that one energy drink equaled about 4-6 cups of coffee. Caffeine intake with doses of between 5 and 13 mg/kg body mass causes an improvement in endurance exercise capacity [4]. For a college athlete, caffeine is rapidly absorbed in the human body, and performance effects can be maintained throughout an entire match. However, intake of caffeine in the form of coffee yields smaller effects than intake of a similar dose of pure caffeine, plus there can be gastrointestinal distress associated with drinking strong coffee. For college athletes, consuming even small doses of caffeine (1 – 2 mg/kg body mass) can influence reaction time, alertness, and visual information processing, which are crucial during exercise, practice, and competition. However, overdosing can negatively affect reaction time and alertness [11]. Therefore, the objective of this study was to access the usage patterns of energy drinks among college Students in Saudi Arabia.

## 2. Materials and Methods

The Institutional Review Board (IRB) of King Saud University approved this study and questionnaire. The survey method was discussed with the participants who consisted of both male and female college students from Riyadh, Saudi

Arabia. Questionnaires were designed to gauge the students' use of and perceptions about energy drinks. Two sets of questionnaires were developed for this survey, and the results were compared and analyzed to determine the extent and level of usage of energy drinks by the study participants. A consent form was presented at the top of the survey for the sports and health department policy regarding the use of human subjects along with a description of the research and the nature of the survey.

### 2.1. Sampling Method

Four hundred seventy-two (472) college students were recruited as subjects from three major universities in Riyadh. All subjects were randomly chosen between the ages of 18 and 23 and were either Saudis or foreign nationals. Of the total, 248 students were male and, 224 were female. Each gender team was assigned a coordinator who had the role of organizing recruitment efforts. The recruitment process included advertisement of the study via word of mouth, email, posters, and announcements at weekly training meetings. The date and location of the survey meeting was communicated in the recruitment information.

### 2.2. Translation of the Questionnaire

The questionnaire was written in English. However, most of the participants in this study did not have the ability to read the English version. Therefore, an Arabic version of the questionnaire was developed. The Translation Center at King Saud University reviewed and approved the Arabic version of the questionnaire.

### 2.3. Survey Questionnaire

A questionnaire was developed to collect data per the study objective. The questionnaire consisted of 14 questions divided into different categories including use of energy drinks, reason for consumption, personal beliefs, and behavior. Overall, the survey questions pertained to the frequency of energy drink purchases as well as factors that might be considered by college students when purchasing these energy drinks. Both sets of questionnaires (male and female) were exactly the same.

### 2.4. Data Collection (Survey Administration)

The survey administration and data collection took place during the months of April and May 2015. The time and location for each survey were arranged and announced at least one week in advance. Survey distribution and instructions took approximately 10–15 minutes, whereas about 40–45 minutes were needed for participants to complete the survey questionnaires.

### 2.5. Statistical Analysis

The Statistical Analysis System (SAS, Inc., Cary, NC, USA) was used to evaluate the data for this study. Dependent variable attitudes were measured by administering a

questionnaire that consisted of 14 questions divided into four different categories including the use of energy drinks, reason for consumption, personal beliefs, and behavior. The independent variables were the college students' responses. Results were analyzed using chi-square tests with a significance level of 0.05.

### 3. Results

This study focused on the use and attitudes of Saudi college students toward energy drinks. Table 1 shows the number of college students from each university who participated in the survey. Study subjects consisted of male and female college students with ages ranging from 18 to 23 years of age. The number of college students from King Saud University (male and female) was 51.1% ( $n = 241$ ) followed by Princess Nora Bint Abdul Rahman University (female only) with 28.8% ( $n = 136$ ) followed and Imam Muhammad Ibn Saud Islamic University (male only) with 20.1% ( $n = 95$ ).

Table 2 shows the number of college students by gender that participated in the survey. Of the total of 472 participants in the survey, 52.5% ( $n = 248$ ) were male and 47.5% ( $n = 224$ ) were female.

**Table 1.** Participation of the universities in the survey.

University Name	Participants	
	%	<i>n</i>
1. King Saud University (Male & Female)	51.1	241
2. Princess Nora Bint Abdul Rahman University (Only Female)	28.8	136
3. Imam Muhammad Ibn Saud Islamic University (Only Male)	20.1	95
Total	100.0	472

**Table 2.** Number of college students by gender that participated in the survey.

College Name	Participants	
	%	<i>n</i>
1. Male College Students	52.5	248
2. Female College Students	47.5	224
Total	100.0	472

Table 3 shows survey questions related to the reason each student used energy drinks. In the first question, we asked if the students took energy drinks. Of the 472 students surveyed, 338 college students were currently taking energy drinks (mean age and standard deviation were  $20.22 \pm 1.71$ ). Thus, we decided to focus only on those 338 (71.6%) students who actually consumed energy drinks.

In the second question, relating to the number of cans of energy drinks consumed per week, the results showed that a high percentage of college students (71.6%;  $n = 338$ ) use different brand energy drinks. A majority of students (39.3%;  $n = 133$ ) consumed only one can of energy drink, and 92 students (27.2%) consumed two cans per week. Fewer than 15% of students reported consuming five or more cans ( $n = 47$ ; 13.9%), 4 cans ( $n = 36$ ; 10.7%), and three cans ( $n = 30$ ; 8.9%) per week.

**Table 3.** Usage of energy drinks among college students ( $n = 472$ ).

Response	%	<i>n</i>
1. Do you currently take an energy drink?		
No	28.4	134
Yes	71.6	338
2. How many cans of energy drinks do you drink per week?		
More than 5 cans	13.9	47
4 cans	10.7	36
3 cans	8.9	30
2 cans	27.2	92
One can	39.3	133
3. What is the main reason of using energy drinks?		
Studying for exams or finishing a project	28.4	96
Enhance academic performance	23.4	79
Help recover from an injury or illness	13.6	46
Get energy (speed, strength, power)	26.0	88
Other	8.6	29
4. From whom do you get information about energy drinks?		
Coach or Physician	0.3	1
Nutritionist or dietician	0.0	0
Family or friends	54.7	185
Online	9.2	31
Retail Store	16.9	57
Other	18.9	64

*Note.* These results showed the response does differ significantly ( $p < 0.0001$ ) from the hypothesized value (0.05) indicating reasons for taking energy drinks differ from each individual.

In the question relating to the main reason for using energy drinks, results showed that students use energy drinks for different reasons (71.6%;  $n = 338$ ). For example, 28.4% ( $n = 96$ ) believed that studying for exams or finishing a project was a reason for using energy drinks. Eighty-eight students (26%) reported using energy drinks for gaining energy (speed, strength, power), whereas 23.4% ( $n = 79$ ) indicated that enhancing academic performance was their primary reason for using energy drinks. Most students ( $n = 185$ ; 54.7%) reported a family member or friend as being their main source of information on energy drinks, followed by retail stores ( $n = 64$ ; 18.9%), and other ( $n = 57$ ; 16.9%). Fewer than 10% of college students reported their sources of information as being online, coach or physician, and nutritionist or dietician resources.

Table 4 shows questions regarding the perception of energy drinks and their usage among college students in Riyadh, Saudi Arabia. Questions 5 to 12 in the study dealt with the students' perceptions regarding the use of energy drinks. A majority of college students (54.4%;  $n = 184$ ) felt that energy drinks were a healthy choice, and 64.5% ( $n = 218$ ) believed that energy drinks improved endurance.

Regarding the safety of energy drinks, most students surveyed ( $n = 163$ ; 48.2%) somewhat agreed that the energy drinks they used were safe, and 41.1% ( $n = 139$ ) believed that energy drinks are a safe product in general. Two hundred twenty-two college students (66.7%) agreed that energy drinks were a good source of energy, 185 (54.7%) felt that the drinks supported longer training sessions, and, 43.2% ( $n = 146$ ) reported that energy drinks helped to increase strength. High percentage of students ( $n = 131$ ; 38.8%) indicated that energy drinks were taken as a pain reliever

during training sessions, and 142 students (42.0%) used energy drinks to enhance concentration during athletic competition.

**Table 4.** Perception of energy drinks and usages among college students (n = 338).

Response	%	n
<b>5. Energy drinks make me healthier.</b>		
Agree	54.4	184
Somewhat agree	25.1	85
Neither agree nor disagree	18.3	62
Somewhat disagree	1.2	4
Do not know	0.9	3
<b>6. Energy drinks improve my endurance.</b>		
Agree	64.5	218
Somewhat agree	18.6	63
Neither agree nor disagree	15.4	52
Somewhat disagree	1.5	5
<b>7. Energy drinks are safe to use</b>		
Agree	48.2	163
Somewhat agree	41.1	139
Neither agree nor disagree	4.1	14
Somewhat disagree	3.6	12
Do not know	3.0	10
<b>8. Energy drinks provide me with more energy</b>		
Agree	66.7	222
Somewhat agree	30.5	103
Neither agree nor disagree	3.3	11
Somewhat disagree	0.6	2
<b>9. Energy drinks increase the amount of training I can undergo</b>		
Agree	54.7	185
Somewhat agree	37.6	127
Neither agree nor disagree	6.8	23
Somewhat disagree	0.6	2
Disagree	0.3	1
<b>10. Energy drinks increase my strength.</b>		
Agree	43.2	146
Somewhat agree	24.9	84
Neither agree nor disagree	15.4	52
Somewhat disagree	11.2	38
Disagree	5.3	18
<b>11. Energy drinks increase my ability to cope with pain.</b>		
Agree	38.8	131
Somewhat agree	37.6	127
Neither agree nor disagree	10.4	35
Somewhat disagree	9.5	32
Disagree	3.8	13

**Table 4.** (Cont.).

Response	%	n
<b>12. Energy drinks improve my concentration.</b>		
Agree	42.0	142
Somewhat agree	26.9	91
Neither agree nor disagree	25.1	85
Somewhat disagree	4.1	14
Disagree	1.8	6

Note. These results showed the response does differ significantly ( $p < 0.0001$ ) from the hypothesized value (0.05) indicating reasons of taking energy drinks differ for each individual.

In our study, we were also interested in knowing more about the types of energy drinks that were being consumed by these college students. Table 5 shows the list of energy drinks that college students reported using, and this list included more than 11 different products. Our results

showed that Red Bull ( $n = 107$ ; 31.7%) and Code Red ( $n = 87$ ; 25.7%) were the most popular energy drinks used among the students, followed by Bison ( $n = 62$ ; 18.3%), Bugzy ( $n = 24$ ; 7.1%), Power Horse ( $n = 18$ ; 5.3%), and Double Horse ( $n = 17$ ; 5.1%). Meanwhile, those brands ranking among the least used included Blu Day ( $n = 6$ ; 1.8%), Black ( $n = 6$ ; 1.8%), Boom Boom ( $n = 4$ ; 1.2%), Shark ( $n = 3$ ; 0.9%), and other ( $n = 4$ ; 1.2%).

**Table 5.** Type of energy drink and frequency of use among college students (n = 338).

Category of Energy Drink	%	n
<b>13. Which of these energy drinks have you used most frequently?</b>		
Red Bull	31.7	107
Code Red	25.7	87
Bison	18.3	62
Bugzy	7.1	24
Power Horse	5.3	18
Double Horse	5.1	17
Blu Day	1.8	6
Black	1.8	6
Boom Boom	1.2	4
Shark	0.9	3
AMP	0	0
Other	1.2	4

Note. Since the  $p$  value is 0.0001, we can conclude that there is statistically significant difference between the frequencies of use of energy drinks among college students.

### 4. Discussion

In this study, we conducted a survey about the consumption of energy drinks among college students ( $n = 472$ ) at three Saudi Arabian universities. Based on our results, college students generally seemed to have a lack of overall knowledge about energy drink ingredients or potential negative consequences of consuming these popular beverages.

Because college students are typically under a lot of pressure to perform well academically as well as athletically, some are always in need of energy drinks to enhance their academic and/or athletic performance. Since doping is illegal, these students need legal nutritional guidelines. There is inadequate information regarding the consumption of energy drinks in Saudi Arabia; thus, there is an obvious need to improve knowledge of energy drink use among consumers. Each year, new energy drinks appear on the market, and intake of energy drinks among college students is also increasing [1]. One recent study has shown a positive correlation between college students' level of sophistication regarding nutrition knowledge and the quality of their energy drink intake [12]. This finding is similar to that of similar studies regarding energy drink consumption patterns of college students in the U.S., college students in Manila, and college students at Bryant University, U.S. [13, 14, 15].

Of the 472 college students surveyed, we found that 71.6% ( $n = 338$ ) currently consume energy drinks. Survey results also showed that a majority of college students use different

energy drinks throughout the year either to enhance academic and/or athletic performance or simply to improve their health. In earlier studies [12], it was noted that the use of energy drinks among college students was primarily to enhance performance. Similarly, in a study involving Saudi students, 73% of the students reported using energy drinks to enhance performance objectives [11].

In our study, the results showed that a high percentage of college students (71.6%;  $n = 338$ ) use different energy drinks per week. A majority of students (39.3%;  $n = 133$ ) consumed only one can of energy drink, and 92 students (27.2%) consumed two cans of energy drinks, which is similar to the study conducted by Trunzo et al. [14]. Mean energy drink usage among college students was two to five days per week. Similarly, results showed that 40% of students drink energy drinks at least once a week yet sometimes increase frequency of consumption to twice a week (34%). On the other hand, professionals reported drinking energy drinks at least once a week (36%) with a tendency to increase intake to more than three times a week [12]. In another study, it was shown that 18.8% of college students consumed energy drinks at least weekly [15]. In another study, the average amount of energy drink consumption among nursing students when studying for their most recent midterm exam was  $1.63 \pm 2.64$  cans per week, and the number of cans of energy drink consumed during that time spanned 1–30 per week [16].

Regarding the primary reason for using energy drinks, our results showed that a high percentage of students 71.6% ( $n = 338$ ) used energy drinks for a variety of reasons. For example, 28.4% ( $n = 96$ ) believed that studying for exams or finishing a project was a reason for using energy drinks, 88 college students (26%) reported using energy drinks for gaining energy (speed, strength, power), whereas 23.4% ( $n = 79$ ) reported enhanced academic performance as their reason for using energy drinks. In another recent study, energy drinks were most commonly used to increase energy (50%), combat sleepiness (45%) enhance academic performance (40%), and enhance performance during sports (23%) [17]. In an additional study, it was found that the main reason for energy drink consumption among college students was to support studying for exams or completing a project (31.4%) [18]. These results correlate with our study, which showed that the majority of college students consumed energy drinks because the drinks were perceived to be safe (48.2%;  $n = 163$ ) and the students wanted to: improve health (54.4%;  $n = 184$ ), improve endurance (64.5%;  $n = 218$ ), gain more energy (66, 7%;  $n = 222$ ), increase training (54.7%;  $n = 185$ ), increase strength (43.2%;  $n = 146$ ), and improve concentration (42.0%;  $n = 142$ ). In a previous study, the reason for using energy drinks was to gain energy in general (32.8%), whereas other reasons given included: lack of sleep (12.8%), just to be like friends (11.4%), or driving (8.5%) [18]. In another study, it was found that the main reason for energy drink consumption among college students was to provide energy while work overtime to finish a course project or working overtime at the office [12]. Moreover, a recent study showed that, taste-driven consumers (31%) endorsed

pleasurable taste, energy-seeking consumers (24%) endorsed function and taste motives, and hedonistic consumers (33%) endorsed pleasure and sensation-seeking motives [19]. Additional reasons for energy drink consumption were for enhanced fatigue recovery (79.9%) concentration enhancement (29.3%) and curiosity (22.0%) [3].

A study by Emond et al. [20] showed that consumers got most of their information about energy drinks from store nutritionists, fellow college students and friends, and manufacturers that primarily advertise on television. These results were similar to our study, where a majority of college students ( $n = 185$ ; 54.7%) reported a family member or friends as being their main source of energy drink information, followed by information gleaned from retail stores ( $n = 64$ ; 18.9%), and other ( $n = 57$ ; 16.9%). However, fewer than 10% of college students reported their sources of information as originating online. This result was especially surprising given the propensity of college students nowadays to rely on technology as their primary source for so many types of information.

In the present study, 338 students used more than 11 different products. Our results showed that Red Bull ( $n = 107$ ; 31.7%) and Code Red ( $n = 87$ ; 25.7%) were the most popular energy drinks, followed by Bison ( $n = 62$ ; 18.3%), Bugzy ( $n = 24$ ; 7.1%), Power Horse ( $n = 18$ ; 5.3%), and Double Horse ( $n = 17$ ; 5.1%). Similarly, among brands of energy drinks most commonly consumed, Cobra, Red Bull, and Monster Energy were the most popular products used by students [12]. Among the popular brands of energy drinks, Cobra was significantly more popular among professionals (58%), while Red Bull and Monster Energy were significantly more popular among students at 29% and 7%, respectively [12].

This investigation into the factors that affect energy drink consumption behaviors is significant because it highlights the regulations concerning the marketing of energy drinks and the importance of students having accurate knowledge of possible side effects related to the ingestion of these beverages. As a result, the sale and use of energy drinks in universities, schools, and even café shops in Saudi Arabia have been restricted [2, 21].

## 5. Conclusion

Many college students use energy drinks as a part of daily habits. Energy drinks commonly used include Red Bull, Power Horse, Bison, Bugzy, Code Red, Boom Boom, Shark, AMP, Double Horse, Blu Day, Black, among others. These energy drinks are often used without a full understanding or evaluation of the potential benefits and risks associated with their use and without consultation with sports nutrition professional. Our study presents major classes and benefits of energy drinks as related to college students' performance. More research and increased public awareness is needed to bring about a greater understanding of their effects. There is a need for more stringent labeling of energy drinks so that the consumer knows the exact quantity of each ingredient. Future

studies are needed and recommended to determine whether longer educational training could impact on understanding as well as intake of energy drinks and dangerous side effects among college students.

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