

# Energy drinks

## Pattern of consumption and associated factors among students in a Bangladeshi University. A cross-sectional study

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### Abstract

**Purpose** – This research aimed to study patterns of energy drinks (ED) consumption among university students and to identify the determinants for their preferences.

**Design/methodology/approach** – This cross-sectional study was conducted among 400 students from various departments of Jashore University of Science and Technology, Bangladesh, by convenience sampling. A self-administered, structured questionnaire was used to collect data.

**Findings** – About 52.3 per cent of the students were between 21 and 23 years of age, and half of them were male. More than half (53 per cent) of the students had consumed ED at least once in their lifetime. Only 22.1 per cent of these consumers had any knowledge of the ingredients in ED, and 4.3 per cent did not know the possible negative impacts. Bivariate analysis was performed to identify the variables significantly associated with ED consumption among students. The risks of ED consumption were found to be: male gender (Odds Ratio (OR) = 4.04; 95 per cent Confidence Interval (CI) = 2.36–6.92), father educated up to SSC (OR = 18.47; 95 per cent CI = 2.30–148.90) or college and above (OR = 17.01; 95 per cent CI = 2.31–135.60), smoker (OR = 3.87; 95 per cent CI = 1.61–9.35) and doing irregular physical activity (OR = 2.43; 95 per cent CI = 1.23–4.78).

**Originality/value** – ED consumption among university students is high, but their perception regarding the ingredients and potential health hazards is opaque. Therefore, it is imperative that at both community and individual levels, interventions should focus on educating and empowering individuals to make firm and positive decisions concerning their dietary habits and health.

**Keywords** Energy drink, University students, Bangladesh

**Paper type** Research paper

### Introduction

Beverages marketed as “energy drinks” are nonalcoholic fluids that contain stimulants, mainly caffeine, and generally claim to provide an extra burst of energy to perform well through the day [1]. Nowadays, there has been an increase in the consumption of energy drinks (ED), and consuming these beverages has become a common practice, especially among younger adults [2]. Although ED contains a large dose of caffeine, some other stimulants such as taurine, glucuronolactone, B group vitamins, inositol, niacin and panthenol can be present according to brand and type [3, 4]. Caffeine content may range from a modest 50 mg to an alarming 505 mg in an ED can or bottle [4, 5].



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Highly caffeinated ED has become a common attraction among youngsters, particularly because of its advertised ability to enhance energy and stamina, reduce fatigue and accelerate general performance, that is, mental and physical performance [3, 6, 7]. Young adults tend to consume ED while playing, studying, partying and driving to stimulate energy levels and wakefulness or sometimes, to showcase their modern and active lifestyle [8]. A number of studies have reported that 30–50 per cent of adolescents and young adults in developed and developing countries are consuming ED [8, 9]. A positive association between ED consumption and improved psychomotor and mental performance has been shown [8, 10]. However, the human body does not require caffeine for proper body functioning, and caffeine, even in small doses, may stimulate cognitive performance and mood.

There are some safety concerns relating to ED consumption and the claims of physiological and behavioral benefits [11]. High levels of caffeine in ED have been shown to adversely affect the cardiovascular system [12]. An increase in blood pressure and sleep problems have also been reported as a result of high caffeine consumption. Likewise, during pregnancy, it is suspected to raise the risk of late miscarriages, stillbirths and size for gestational age infants. Consequently, it is advised to be cautious with the consumption of high levels of caffeine in any form, particularly among health-sensitive individuals [13, 14].

Although ED is mainly targeted at young adult consumers, there has been little research regarding ED consumption among university students in Bangladesh. Hence, the present study was undertaken to investigate the prevalence of consumption of ED among university students and assess the determinants for preferring such drinks. This study also provided an insight into the student's level of knowledge about the ingredients of ED and their potential health hazards.

## Methods

This cross-sectional study was carried out among both male and female students of Jashore University of Science and Technology, Bangladesh, from August to December 2018. A convenience sampling technique was used to select 400 students from various departments of the university. A self-administered, structured questionnaire, developed on the basis of literature reviews, was used to collect the required research information. Pretesting of the initial questionnaire was done among 20 students of the university who were randomly selected and not included in the final data collection process. Necessary corrections and modifications were done on the basis of the field-testing responses.

This validated questionnaire contained three sections:

- (1) Section 1: Sociodemographics such as participant's age, gender, residence, parents' educational level, monthly expenditure, anthropometry.
- (2) Section 2: Personal health and habit-related questions such as cigarette smoking, alcoholic consumption, physical activity, sleeping and breakfast-taking habits.
- (3) Section 3: Information regarding ED and its consumption, which included questions on frequency and reasons for ED consumption, reasons for nonconsumption, when and where first started and with whom and the experience of any adverse effect or not.

The Ethical Review Board, Jashore University of Science and Technology, provided the appropriate ethical approval to conduct the study (NFT – 2018/20130). The study aims and objectives were properly stated in front of the students to facilitate their active participation and cooperation, and written consent was taken. Some postgraduate (M.Sc.) students of the department were trained to assist in the study related to questionnaire administration. The students who willingly agreed to participate in the survey were requested to mark the correct choice from the provided list of answers and, upon completion, were required to return the

questionnaire. The received questionnaire was thoroughly checked for completeness and any errors found were rectified and corrected accordingly.

Descriptive statistics were employed to ascertain the general characteristics of the participants, their ED consumption habits and the effects of ED consumption expressed as numbers and percentages. Participants were regarded as ED consumers if their responses stated that they regularly or occasionally consumed ED, whereas individuals identified as nonconsumers when they reported consuming ED only once in their life, or tried for a while but later stopped or if they had never consumed ED. A bivariate logistic regression analysis was completed to reveal the factors that affected the student's consumption of ED. Statistically significant variables from the bivariate logistic analysis were added into a multivariate model to identify the independent predictors of a student's intention to consume ED. All analyses were completed on the Statistical Package for the Social Sciences (SPSS) version 25.0 for Windows (SPSS Inc., Chicago, IL, USA) and statistical significance was set at  $p < 0.05$  for all tests.

## Results

### *Participant characteristics*

Table I represents the sociodemographic characteristics of the students. The study enrolled 400 students, aged from 18 to 26 years, with a mean age of  $22.2 \pm 1.9$  years. The majority of students (52.3 per cent) were between 21 and 23 years of age. About 50 per cent of the students were male, of which 73.2 per cent were ED consumers. Among the participants, 69.2 per cent lived in a hall of residence. In the case of the parents' education, 61.2 per cent of fathers had some college or university experience while 55.0 per cent of mothers were educated up to SSC. About 80 per cent of participants had a monthly average expenditure of  $\leq 5,000$  takas. Most students (80.3 per cent) were physically average in their weight with BMI levels of 18.5–24.9  $\text{kg/m}^2$ . About 8.8 per cent of students suffered from chronic diseases and about 9 per cent used medicine regularly.

The distribution of some personal habits of the study participants is shown in Table II. According to the students, 10.5 per cent were cigarette smokers while none reported consuming alcohol. Only 16.0 per cent of students reported participating in regular physical activity. A regular sleeping habit was reported by 59.3 per cent of students and 95.2 per cent of students slept more than six hours a day. About 71.0 per cent reported that they studied during both day and nighttime and 77.4 per cent were in the habit of eating breakfast.

### *Energy drink consumption*

According to the students' self-reporting, 46.7 per cent ( $n = 187$ ) of study participants had never consumed ED, 5.0 per cent ( $n = 20$ ) had tried once only and 11.0 per cent ( $n = 44$ ) consumed ED for a while but later stopped. While the level of students reporting that they used them occasionally was 37.3 per cent ( $n = 149$ ), none stated that they consumed ED regularly.

Figure 1 illustrates the most common reasons for consuming ED among participants while the most common reasons for not consuming ED among the nonconsumers are presented in Figure 2.

Most students began ED consumption during their high school years and the most common venue for their first experience of trying ED included the street, tea/coffee shops and home. Most students first started consuming ED in the company of a friend. The most common reasons for first consuming an ED among those who had tried ED at least once were curiosity about its taste (48.4 per cent) ( $n = 103$ ), recommendation from friends (19.7 per cent) ( $n = 42$ ), media advertisements (11.7 per cent) ( $n = 25$ ), easy availability (8.9 per cent) ( $n = 19$ ), family influence (5.6 per cent) ( $n = 12$ ) and appeal of the drink (5.6 per cent) ( $n = 12$ ).

Variables	Frequency (n)
<i>Age (years)</i>	
≤20	94
21–23	209
>23	97
<i>Gender</i>	
Female	200
Male	200
<i>Residence</i>	
Hall	227
With family	10
With friends/mess	111
With relatives	2
<i>Father's education</i>	
Illiterate	20
Up to SSC	135
Some college and above	245
<i>Mother's education</i>	
Illiterate	24
Up to SSC	220
Some college and above	156
<i>Monthly expenditure (average taka)</i>	
≤5,000	320
>5,000	80
<i>BMI (kg/m<sup>2</sup>)</i>	
<18.5	46
18.5–24.9	321
25.0–29.9	28
≥30.0	5
<i>Presence of chronic disease</i>	
No	365
Yes	35
<i>Use of any medicine regularly</i>	
No	364
Yes	36

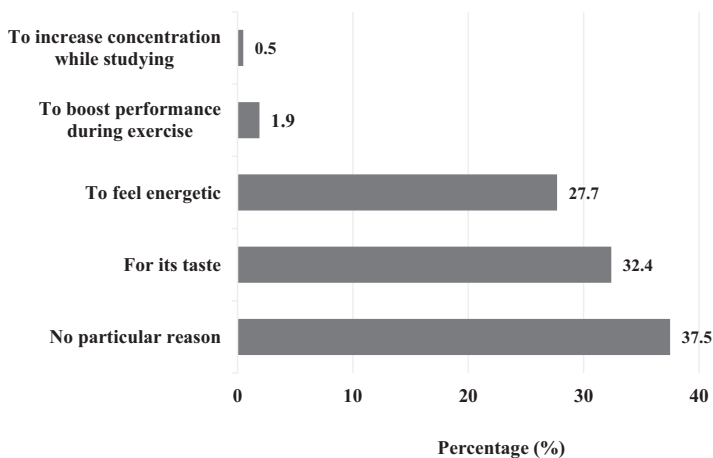
**Notes:** BMI = Body mass index, SSC = Secondary school certificate

**Table I.**  
Sociodemographic characteristics of university students (n = 400)

Among those had who consumed ED, 59.2 per cent (n = 126) noticed no effect, 27.2 per cent (n = 58) reported that they did feel more energetic, 10.3 per cent (n = 22) felt happier, 1.4 per cent (n = 3) reported increased concentration during study, 0.9 per cent (n = 2) felt less sleepy and 0.9 per cent (n = 2) observed an increase in muscle strength. Of the students who had tried ED at least once, 20.2 per cent (n = 43) used ED with meals, while 59.6 per cent (n = 127) consumed ED alone, with the most commonly reported time for consumption being between the hours of 15:00 and 18:59. 75 per cent of respondents (n = 159) reported no special occasion for drinking energy consumption, while 10.8 per cent (n = 23) stated that they mostly consumed ED during sports or recreational activities, 8.9 per cent (n = 19) at parties and 5.2 per cent (n = 11) while studying or before an examination.

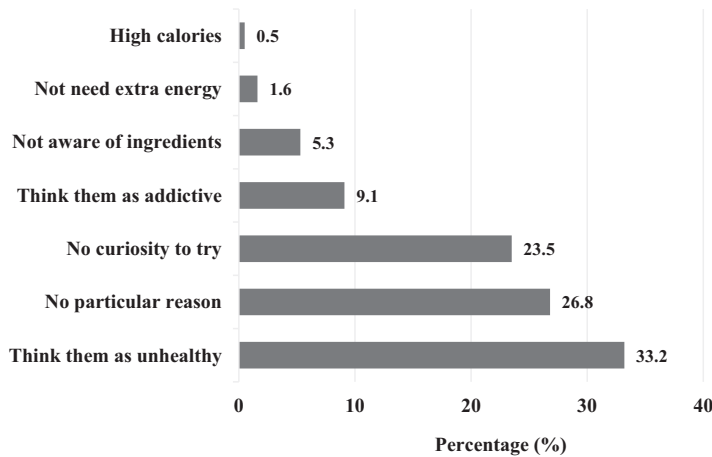
About 22.1 per cent (n = 47) of the students who had consumed ED at least once stated that they knew the components of ED, 53.5 per cent (n = 114) partially knew, while 24.4 per

Variables	Frequency (n)	Energy drinks consumption pattern among students	
<i>Smoking habits</i>			
No	358	<b>225</b>	
Yes	42		
<i>Alcohol consumption</i>			
No	400		
Yes	0		
<i>Physical activity</i>			
Regular	64		
Irregular	205		
Never	131		
<i>Sleeping habit</i>			
Regular	237		
Irregular	163		
<i>Daily sleeping hour (average)</i>			
<6	19		
≥6	381		
<i>Study time</i>			
Day	11		
Night	105		
Both day and night	284		
<i>Breakfast-taking habit</i>			
Regular	310	<b>Table II.</b> Some personal habits of university students (n = 400)	
Irregular	89		
Never	1		



**Figure 1.**  
The most common reasons for consuming energy drinks (n = 213)

cent (n = 52) did not know the ingredients at all. Among the participants reporting to know the ingredients of ED, 4.3 per cent (n = 2) said that they did not know about the potential health hazards regarding the consumption of ED. More than half (59.7 per cent) of the students still consuming ED (n = 89) did not read the warnings on the cans. The most commonly encountered negative effects among regular users of ED were anxiety (7.4 per



**Figure 2.** Common reasons for not using energy drinks among participants who had never consumed energy drinks ( $n = 187$ )

cent), thirst (6.0 per cent), restlessness (5.4 per cent), insomnia/sleeplessness (3.4 per cent), irritability (2.7 per cent), headache (2.0 per cent) and vertigo/dizziness (0.7 per cent).

*Factors affecting energy drink consumption*

Bivariate logistic regression analyses revealed a significant relation between ED consumption and participant’s gender, father’s level of education, monthly average expenditure, smoking, sleeping habits and involvement in physical activity (Table III).

Table IV shows the multivariate logistic regression model for students consuming energy drinks. According to the model, male students consumed ED 4.04 (2.36–6.92) times higher than female students. Participants whose fathers were educated up to SSC level tended to consume ED 18.47 (2.30–148.90) times higher while participants whose fathers had some college and above educational experience consumed ED 17.01 (2.13–135.60) times higher than those whose fathers were illiterate. Students who had a cigarette smoking habit were 3.87 (1.61–9.35) more prone to consume ED than individuals who did not smoke cigarettes. Compared to the students engaged in regular physical activity, those who were not physically active or rarely so were 1.52 times more likely to consume ED.

**Discussion**

The rapid increase of production and marketing has made ED easily available and accessible at local shops as well as at university campuses [2]. Nowadays, ED consumption among adolescents and young adults has become a common practice. Hence, the present study was undertaken to assess the consumption pattern of ED and its’ associated factors among students in a public university of Bangladesh.

The proportion of students reporting consumption of ED in the present study was 53 per cent. It is slightly higher than that in a study conducted in Bangladesh where 47 per cent of the university students were ED consumers [15]. It also corroborates the findings of other studies carried out in Norway, where 52.3 per cent of adolescents [16], and in Turkey, where 52.5 per cent of university students consumed ED [17]. However, this proportion is much higher than in some other studies. In Turkey, for instance, 22.5 per cent of university students [3], in Canada, 15.6 per cent of youth and young adults [18], in Saudi Arabia, 19.5 per cent of university students [14] and in Zambia, 27.4 per cent of university students [19] were ED

Variables	OR (95% CI)	p-value
<i>Age (years)</i>	–	0.154
≤20	1	–
21–23	1.11 (0.67–1.86)	–
≥23	1.69 (0.94–3.03)	–
<i>Gender</i>	–	<0.001*
Female	1	–
Male	4.80 (3.07–7.47)	–
<i>Residence</i>	–	–
External	1	0.404
With family	1.71 (0.49–6.00)	–
<i>Father's education</i>	–	0.033*
Illiterate	1	–
Up to SSC	13.86 (1.81–106.74)	–
College and above	11.22 (1.48–85.27)	–
<i>Mother's education</i>	–	0.128
Illiterate	1	–
Up to SSC	2.12 (0.81–5.54)	–
College and above	1.50 (0.56–4.00)	–
<i>Monthly expenditure (average taka)</i>	–	0.002*
≤5,000	1	–
>5,000	2.20 (1.34–3.62)	–
<i>BMI (kg/m<sup>2</sup>)</i>	–	0.075
<18.5	1	–
18.5–24.9	1.69 (0.84–3.39)	–
≥25.0	3.01 (1.17–7.78)	–
<i>Smoking habits</i>	–	<0.001*
No	1	–
Yes	8.98 (4.03–20.02)	–
<i>Physical activity</i>	–	0.029*
Irregular/never	1	–
Regular	0.51 (0.28–0.93)	–
<i>Sleeping habit</i>	–	0.001*
Regular	1	–
Irregular	2.35 (1.55–3.56)	–
<i>Daily average sleeping hour</i>	–	0.064
<6	1	–
≥6	0.41 (0.16–1.05)	–
<i>Study time</i>	–	0.758
Day	1	–
Night	0.91 (0.25–3.32)	–
Both day and night	1.09 (0.31–3.81)	–

**Notes:** BMI = Body mass index, CI = Confidence interval, OR = Odds ratio, SSC = Secondary school certificate; \*Bivariate logistic regression test and p-value of <0.05 considered statistical significance

**Table III.**  
Bivariate logistic regression analysis of factors affecting the consumption of energy drinks among university students (n = 400)

consumers. The highest intake was in Poland where a study found that 67 per cent of adolescents were reported to consume ED [20].

Most participants stated that they started to consume ED during their high school years. This is similar to some studies conducted among different university students in Bangladesh,

**Table IV.**  
Multivariate logistic regression analysis of factors associated with the consumption of energy drinks among university students (*n* = 400)

Variables	OR (95% CI)	<i>p</i> -value
<i>Gender</i>		
Female	1	–
Male	4.04 (2.36–6.92)	<0.001*
<i>Father's education</i>		
Illiterate	1	–
Up to SSC	18.47 (2.30–148.90)	0.006*
Some college and above	17.01 (2.13–135.60)	0.007*
<i>Monthly expenditure (average taka)</i>		
≤5,000	1	–
>5,000	0.94 (0.51–1.73)	0.850
<i>Smoking habits</i>		
No	1	–
Yes	3.87 (1.61–9.35)	0.003*
<i>Physical activity</i>		
Regular	1	0.010*
Irregular/never	2.43 (1.23–4.78)	–
<i>Sleeping habit</i>		
Regular	1	–
Irregular	1.52 (0.94–2.46)	0.089

**Notes:** CI = Confidence interval, OR = Odds ratio, SSC = Secondary school certificate; \*Multivariate logistic regression test and *p* value of <0.05 considered statistical significance.

Turkey and Korea [3, 4, 15, 21]. The present findings reveal the importance of the formulation of age-specific formal and informal health education on ED.

The most common side effects reported by ED users in our study were anxiety, thirst, restlessness, insomnia/sleeplessness, irritability, headache and vertigo/dizziness. Similar side effects were observed among ED consumers in the study conducted in America, Turkey, Pakistan and other countries [3, 8, 15, 17, 19, 22, 23].

University students are generally believed to be knowledgeable regarding the content and side effects of ED compared to the general population. But this study found that only one-fifth of consumers had knowledge of the ingredients of ED and among them, only 4.3 per cent knew its potential health hazards. The finding is higher compared to a study in Korea, where 10.4 per cent of nursing students were acquainted with the ingredients in ED [21], and lower than a study in Bangladesh, where 31.4 per cent of university students knew about ED components [15] and in Turkey, where more than half of the university students had a knowledge of the ingredients in ED [4].

The common reasons for consuming ED reported by the participants were its taste, feeling more energetic, to boost performance during exercise and to increase concentration while studying. Other similar studies recorded similar reasons [3, 4, 8, 15, 17, 19, 22, 24, 25].

In our study, a significantly higher proportion of male students were found to consume ED than their female counterparts. A number of studies reported similar findings [3, 4, 8, 14, 15, 20, 26, 27]. This might be because male students are involved in more physical activity, are more susceptible to peer pressure, are more careless in their behavior and leave examination preparation to the last minute.

The present study shows that students whose fathers were literate consumed ED more than those whose fathers were illiterate. In our opinion, literate fathers are more involved in productive activities and they get little time to take care of their children. Also, their income is



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higher, and they can provide enough financial support to the family enabling the children to buy what they liked.

It is reported that ED consumption was associated with smoking among participants. Some previous studies support the statement [6, 28, 29]. This may be due to the fact that students prefer ED when they smoke when together with their peers at shops or parties, or they use ED while smoking to look smart or to present a modern lifestyle.

The participants who rarely or never engaged in physical activities were found to consume more ED than the students that did exercise regularly. Our result contradicts the findings of other studies [3, 20]. The observed difference may be because respondents from other studies were all from the physical education department and engaged in athletics, who perceived energy drinks to be an easy source of energy and a performance enhancer.

Students who had consumed ED at least once stated that they first tried it mostly while they were accompanied by friends. Also, such drinks are often reported to be consumed in social gatherings. Hence, young adults should be encouraged to follow healthier nutritional habits and lifestyles over unhealthy socializing habits such as cigarette smoking or ED consumption.

Most students who had consumed ED mentioned that they began ED consumption during their high school years and a significant number first tried them at home in the presence of a family member. Thus, it is suggested that awareness and motivation among family members are crucial to enable young family members to choose wisely between beverages. Also, health-related lessons about healthy nutrition (including drinks and supplements) should be included in the school curricula, and such educational activities should be provided during the primary school years. Moreover, easy availability and accessibility of such drinks at home and the school environment should be restricted.

The idea of the present study is not novel, and a number of studies have already been conducted on this topic. Yet, in Bangladesh, there is a scarcity of concrete evidence about the consumption of EDs and the associated health problems. The strength of the present study lies in the fact that it provides a hint about the magnitude of the problem of ED consumption and the factors that provoke consumption of such drinks, particularly among university students. It also provides some recommendations or guidelines about how to reduce the risk relating to this issue, which might be of use in policy regulations and in future research. The present study has some limitations. Firstly, it included students from a public university through convenience sampling. Therefore, the study findings cannot be generalized among university students in Bangladesh. Secondly, being a university in rural Bangladesh, the study population was fairly homogeneous in nature and the information was gathered through self-reporting. If the data were collected from a variety of universities of Bangladesh, the findings would be more effective and provide a more realistic scenario about ED consumption and its determinants among university students.

## Conclusions

The present study revealed that the proportion of students consuming ED is high, and their lack of knowledge regarding the ingredients and the potential health hazards of such drinks is a matter of concern. In order to reduce both the frequency and quantity of consumption of these unhealthy drinks, a global and comprehensive strategy is essential. Both community- and individual-level interventions should be centered on empowering individuals to make firm and positive decisions concerning their dietary habits and health. Thus, it is imperative to formulate effective nutrition-focused education programs detailing the hazards of ED consumption by increasing knowledge about its nutrient composition and the harmful effects

on health both in the short and in the long term. In addition, behavioral change interventions should explain the addiction process and work on how to enjoy life without the necessity for ED. Lastly, university authorities, as well as public health officials, also need to improve their regulatory roles to ascertain the availability and accessibility of healthy foods only in the universities and various institutions.

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