



Impact of energy drink consumption on pattern and quality of sleep among students in Libyan International Medical University

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Abstract: Consumption of energy drinks was significantly associated with sleep problems, which are progressively used regardless of negative health effects particularly among adolescents and young adults. The goal of this study is to examine the relationship between energy drinks and sleep patterns in college students by more than one parameter. The target number of students was taken to be 1,000 participants and the study reached 434 participants were invited via self-administered questionnaire at Libyan International Medical University students during 2020 and 2021 in all levels which consisted of 20 questions and the main measurements are dependency, negative effect of energy drink and effect of energy drink on sleep. The results showed that the consumption prevalence rate of energy drinks amongst participants is 59.4%. The majority of participants enrolled in this study were male (52.5%) and 47.5% were female students. In conclusion: energy drink consumption is a risk factor for poor sleep quality among Libyan International Medical University students. Awareness must be increased about energy drinks consumption to confirm the relation to sleep quality and general health.

Introduction

The first energy drinks (EDs) appeared in Europe and Asia and then in the USA. Consumption of EDs has consequently been increased in the world. For instance, the universal consumption of these types of drinks increased by 17.0% in 2006 compared to the previous year [1, 2]. Sleep is one of the factors associated with a person's health and according to the American Psychological Association, the recommended amount of sleep for an adult is 7-8 hours per day [3]. EDs differ from sports drinks, most of them contain similar ingredients including water, sugar, caffeine, non-nutritive stimulants (guarana, ginseng, yerba mate, taurine, l-carnitine, d-glucunolactone and inositol) and certain vitamins and minerals (B vitamins) [4, 5]. Producers of EDs claim that these beverages contain natural ingredients that expand fatigue and improve mental alertness, in contrast with sports or isotonic drinks which are intended to help athletes rehydrate after exercise. However, there are implicit claims that EDs promote a more active and healthier lifestyle [6].



Nowadays, ED consumption is increasingly used despite growing evidence of their negative health effects particularly among adolescents and young adults [3, 7]. When people drink three or more ED during a day has more chance to report sleeping less than four hours a night and are more likely to report sleep disruption related to stress and illness on average than individuals taking two drinks or less during a day [8]. Hershner and Chervin establish that poor sleep quality can be caused by sleep disorders, use of technology before sleeping, consumption of alcohol, EDs and use of stimulants [9]. This can adversely affect student's academics, as irregular sleep patterns have been shown to have a negative impact on learning and memory. Moreover, the consumption of EDs increases sleep latency and the effects of EDs can persist for up to eight hours which can lead to sleeplessness [9]. Long-term consumption of EDs has risks and negative health effects that include reduced sleep duration and sleep quality which are manifested by increased wake time after sleep onset and decreased proportion of deep sleep [10]. So, there is a need for suitable public health prevention and intervention for ED consumers who can make informed choices when indulging in these behaviors [11].

There is a high risk for several problems when young children and adolescents take high ED consumption as high stress, low school performance and suicide attempts [12]. Even though EDs are targeted at young adult consumers who are into sports and other activities. EDs is one of the most common substances used by athletes due to their role in increasing the ergogenic effect [13]. EDs also contain moderate concentrations of carbohydrates and a lack of electrolytes, they are also habitually consumed before exercise [14]. Indeed, carbohydrate sources in EDs, glucose and sucrose, in the beverages supply the substrates needed for physiological energy. Adolescents who consume EDs are likely to smoke, use alcohol and illicit drugs [15, 16]. About half of U.S. young adults and one-third of minor teens are consuming caffeinated EDs [17]. In the UK, sales of EDs have raised from 235 to 600 million which the leading brands' shares are Red Bull (25.0%), Own Label (12.0%) and Monster (10.0%) [18, 19]. Several studies have been carried out on the consumption of EDs among university students. ED consumption among university students in the USA estimated over 50.0% consumed over one ED per month with 67.0% citing inadequate sleep [20]. Also, consumption of EDs is quite common among university students in Turkey and most of them were not aware of the effects or ingredients of EDs [21].

Nevertheless, ED consumption is a common drinking behavior among university students in an urban setting in Lebanon, particularly in males [22]. Although, there is not much-published data on ED consumption among university students in Africa. Thus, one study evaluated the consumption of EDs among students in Ghana but it considered only those who were athletes. Further, the study did not explore the effects of EDs on sleep quality [23]. In Ethiopia, the consumption of EDs was associated with poor sleep quality. As much as 50.0% of the students had poor sleep quality. However, the poor sleep quality as factors such as cigarette smoking and use were cited and not exclusively due to EDs consumption [24]. In Saudi colleges and universities, consumption of EDs have been used at higher rate, specifically during examinations or presentations that have been marketed aggressively over the last two decades [25]. Studies have established that poor sleep quality caused by psychosocial stressors, according to inadequate sleep leads to judgment impairment, agitation, irritability and even increased mortality and significantly prolongs QTc interval and is associated with a rise in blood pressure [12, 26, 27]. Most of the drivers had poor knowledge of the potential health problems linked with the consumption of EDs [28]. Thus, the study aimed to analyze the outcome of ED consumption on sleep patterns and quality among university students at Libyan International Medical University in Benghazi.

Materials and methods

This is a descriptive cross-sectional study and was carried out at Libyan International Medical University (LIMU) in Benghazi, Libya by undergraduate self-reported students. Data were collected to help analyzers of survey measures. The target period was for three months from December 2020 to February 2021. The public

announcement was made online for all the students and the target number was 1 000 participants. The response rate of the study reached 434 participants (43.4%). The sample of convince is made non-randomly. Data were collected via self-administered questionnaire which consisted of 20 questions included, 15 questions are multiple choices (MCQs) and the rest were open-written questions. Selected questions included gender, academic year, smoking state, sport level, chronic disease, level and kind of ED use, reason for use of ED, knowledge about EDs, quality of sleep, quality of health, dependency and negative effect of ED. Open written questions included age, a drug used to help in sleep, the effect of ED on sleep and content of EDs. This research project is being conducted by informed consent. Participants were free to refuse or withdraw from the study. Participation in this research study is voluntary and there is no harm physically and/or psychological. Confidentially was confirmed that no information about the participants was exposed to anyone who was not part of the research team. This observational study was approved by the research ethics committee of Libyan International Medical University (4-G-00001 Certificate Reference Number: PHR-2022-00002 issued by LIMU). Statistical analysis: data were presented as frequency and percentage as descriptive statistics by using SPSS software version (21).

Results

General demographic information of the study population: The majority of the participant were between 20 and 23 years old, while a minority of participants were between 28 and 40 years old because the average of students in LIMU at young age. The study showed that the number of males was 228 while a number of females was 206, **Table 1**.

Table 1: General demographic information of the Libyan Participants

Characteristics of participants		Frequency	Percentage
Age frequency	16-19	194	44.7%
	20-23	212	48.8%
	24-27	022	05.1%
	28-40	006	01.4%
Gender	Male	228	52.5%
	Female	206	47.5%
Faculty categories	AMS	056	12.9%
	IT	059	13.6%
	Pharmacy	119	27.4%
	Business Administration	036	08.3%
	Dentistry	064	14.7%
	Medicine	100	23.0%
Year of study	First year	172	39.6%
	Second year	068	15.7%
	Third year	102	23.5%
	Fourth year	059	13.6%
	Fifth year	020	04.6%
Smoking state	Internship year	013	03.0%
	Non-smoker	364	83.9%
	Smoker	046	10.6%
Sport level	Former smoker	024	05.5%
	Occasionally	319	73.5%
	Non	044	10.1%
Chronic disease	Every day	071	16.4%
	Heart disease	003	00.7%
	Diabetes T1	002	00.5%
	Diabetes T2	002	00.5%
	Hypertension	006	01.4%
Take medications help to sleep	Other disease	036	08.3%
	Don't have	385	88.7%
Take medications help to sleep	Yes	022	05.1%
	No	412	94.9%

In **Table 1**, most of the students who responded to the survey were from the Faculty of Pharmacy (27.4%) while the minor is from business administration (08.3%). The distribution of participants according to the years of the study showed that most of the participants were from first year (39.6%) while the rest (just three) of the participants were from the internship year. The greater number of participants are non-smokers (83.9%) while the smaller number of participants are former smokers (05.5%). According to the sport level of students, the majority of the participants occasionally did sport (73.5%) while a minority of the participants did not do sport (10.1%). The higher of participants did not have any chronic disease (88.7%) while the lower of participants (two of them) had diabetes type (one and two). Most of the participants did not take any medications help to them sleep (94.9%) while the rest of the participants took medications help to them sleep (05.1%).

Table 2: Assessment evaluation of Libyan University students for energy drinks

Assessment	Frequency	Percentage
Are you consumed energy drinks	Yes	258 59.4%
	No	176 40.6%
How much ED are consumed	Daily	096 22.1%
	Monthly	093 21.4%
	At examination period	107 24.7%
	Stay awake	137 31.6%
Why you take energy drinks	Improve performance	135 31.1%
	Improve memory	036 08.3%
	Mood improvement	041 09.4%
	Increase focus	085 19.6%
Can you quit energy drinks	Yes	385 88.7%
	No	049 11.3%
Are you aware of the harms of ED	Yes	332 76.5%
	No	102 23.5%
		190 43.7%
Which type of ED are you consuming	Boom Boom	
	Monster	007 01.6%
	Red Bull	141 32.6%
	More than one type	096 22.1%
Do you think that consuming energy drinks causes difficulty sleeping	Probably	169 38.9%
	Yes	174 40.1%
	No	091 21.0%

Assessment evaluation of energy drinks parameters: The majority of the participants consume ED (59.4%), while the rest of the participants are not (40.6%) **Table 2**. Most of the participants take ED during the examination period (24.7%) while some participants approximately consume ED monthly and daily (21.4%). Furthermore, most of the participants took EDs to stay awake (31.6%) while smaller of participants consume ED to improve their memory (08.3%). In addition, the majority of participants can quit EDs (88.7%). The higher of participants are aware of harms of EDs (76.5%). The majority of participants consume Boom Boom (23.3%) while the rest of them consume Monster (01.6%).

Discussion

In this study, the main purpose of this study was to determine the outcome ED consumption and its effects on sleep quality among undergraduate students at University Faculties. The prevalence rate of ED consumption was medium (59.4%) compared to consistent with the findings in similar study at Copperbelt University School of Medicine in Zambia [15] where the incidence of EDs was a slightly above 27.0%. This may be because most students in Libyan university think that the consumption of EDs improves the performance and stay awake. A total number of participant students reached are 434. When compare the prevalence age of consumption in Libyan university students results that the majority of participants were between 20 and 23 years-old. These because the average of students at a young age. Number of male and female participants is approximately similar; the percentage of males is 52.5% while females is 47.5%. This due to Libyan university male and female students have the capability to share in the studies. Faculty of Pharmacy students most responded to the survey and the distribution of participants according to the years of the study showed that most of the participants were from the first year [29]. This because the Faculty of Pharmacy students and first-year students had more excited and desired for sharing in this study. The majority of participants are occasionally did sport may be because EDs enhance performance during exercise which is according to similar study demonstrated that pre-exercise ingestion of an ED did improve the endurance performance on 12 professional cyclists from both genders. The higher of participants did not have any chronic disease while the lower of participants (two) had diabetes type (one and two). This is may be due to Libyan University students not heavily consuming ED. In comparing with similar studies showed that some individuals are genetically susceptible to the effects of EDs, resulting in arrhythmias or it may be the actual acute ingestion of EDs putting the patient at risk of arrhythmias [30] and her strongest risk factor about kidney disease was her daily consumption of large amounts of EDs [31]. Most of the participants did not take any medications help to them sleep (94.9%). This is may be because the majority of students take ED during the examination period to stay awake and improve their performance, thus, they did not need medications to help them sleep.

In this study, when asked about consume of EDs, a lot of participants consume ED (59.4%). When asked about the extent of their consumption of energy drinks most of the participants took ED during the examination period (24.7%). This may be to make them more active mentally and physically and stay awake during examination period. Furthermore, participants were asked about the reason of taken EDs, a greater of participants consume ED to stay awake (31.6%). Hence, when asked the participants if can quit ED, the majority of them say can quit EDs (88.7%). While participants asked about awareness of harms of EDs the greater of them were aware of the harmful effects (76.5%). This indicates that the majority of students have sufficient awareness and knowledge of the dangers side effects of EDs consuming. When asked participants about which type of ED is consumed, most of them consume Boom Boom (23.3%) while the rest of them take Monister (01.6%). This is possible because the Boom Boom is the most popular in the University students. In comparing with the previous study carried out at Peruvian college students [29], which report that the majority of the participants have a poor sleep quality (55.0%) while the present findings showed a poor sleep quality among Libyan University students. Thus, 40.0% had difficulty sleeping and 40.0% had difficulty sleeping associated with ED consumption. However, this study did not assess other factors that can affect sleep quality and patterns such as alcohol intake, smoking and stimulant use.

Conclusion: consumption rate of EDs among Libyan University students is high. Poor sleep quality is high and associated with ED consumption. High consumption of EDs to stay awake and improve memory is concluded. Poor sleep quality reported factors with high consumption of EDs and have shown positive and negative behavioral, cognitive and health effects depending on amount intake. The effects can be avoided by education programs and the promotion of the daily intake of EDs among the college students.



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Data availability statement: The raw data that support the findings of this article are available from the corresponding author upon reasonable request.

Author contributions: SFE, MAA & NHA collected data and contributed in analysis of data with drafting of the manuscript. MA, NES & AE contributed to the conception, compilation of data and drafting the manuscript. AE performed the analysis and interpretation of data. All authors approved the final version of the manuscript and agreed to be accountable for its contents.

Conflict of interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Ethical issues: Including plagiarism, informed consent, data fabrication or falsification and double publication or submission were completely observed by the authors.

Author declarations: The authors confirm that all relevant ethical guidelines have been followed and any necessary IRB and/or ethics committee approvals have been obtained.

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