




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

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### HOW TO CITE THIS

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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 on college students by more than one parameter. 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 are male (52.5%) and 47.5% were female students. In conclusion: energy drinks consumption is a risk factor of poor sleep quality between Libyan International Medical University students. An 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 type of drinks increased by 17% 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 sport 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 healthy lifestyle [6].

Nowadays, EDs consumption are increasingly used despite growing evidence of their negative health effects particularly among adolescents and young adults [3, 7]. When people drinking three or more ED during a day has more chance to report sleeping less than four hours a night and more likely to report sleep disruption related to stress and illness on average than individual 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 negative impact on learning and memory. Moreover, consumption of EDs increases sleep latency and the effects of EDs can persist for up to eight hours that can lead to sleepless [9]. Long-term consumption of EDs are had risks negative health affect that include reduced sleep duration and sleep quality which manifested by increased wake time after sleep onset and decreased the proportion of deep sleep [10]. Accordingly, there is a need for suitable public health prevention and intervention for ED consumers which can make informed choices when indulging in these health behaviors [11].

There is a high risk for several problems when young child and adolescents take high ED consumption as high stress, low school performance and suicide attempts [12]. Even though EDs are targeted to young adult consumers who are into sports and other activities. EDs is one of the most common substances used by athletes due to its role in increasing ergogenic effect [13]. EDs also contain moderate concentration of carbohydrates and 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 UK, sales of EDs have raised from 235 to 600 million which the leading brands' shares 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 USA estimate 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 no 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 that use were cited and not exclusively due to EDs consumption [24]. In Saudi college and university, consumption of EDs has been used at higher rate, specifically during examinations or presentations that has marketed aggressively from 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 prolong QTc interval and associated with rise of 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 was aimed to analyze the outcome of EDs consumption on sleep pattern and quality among university students in 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. 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 was open written questions. Selected questions included gender, academic year, smoking state, sport level, chronic disease, level and kind of ED use, reason for use ED, knowledge about EDs, quality of sleep, quality of health, dependency and negative effect of ED. Open written questions included age, drug used to help in sleep, effect of ED on sleep and content of EDs. This research project being conducted by informed consent. Participants were free to refuse or withdraw from the study. The participation in this research study is voluntary and there is no harm physically and/or psychological. Confidently was confirm 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 a descriptive statistics by using SPSS software version (21).

## Results

*General demographic information of the study population:* The majority of participant were between 20 and 23 years old, while minority of participant are between 28 and 40 years old because the average of students in LIMU at young aged. The study showed that number of male 228 while number of female are 206, **Table 1**.

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

**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%

<b>Year of study</b>	First year	172	<b>39.6%</b>
	Second year	068	<b>15.7%</b>
	Third year	102	<b>23.5%</b>
	Fourth year	059	<b>13.6%</b>
	Fifth year	020	<b>04.6%</b>
<b>Smoking state</b>	Internship year	013	<b>03.0%</b>
	Non-smoker	364	<b>83.9%</b>
	Smoker	046	<b>10.6%</b>
<b>Sport level</b>	Former smoker	024	<b>05.5%</b>
	Occasionally	319	<b>73.5%</b>
	Non	044	<b>10.1%</b>
<b>Chronic disease</b>	Every day	071	<b>16.4%</b>
	Heart disease	003	<b>00.7%</b>
	Diabetes T1	002	<b>00.5%</b>
	Diabetes T2	002	<b>00.5%</b>
	Hypertension	006	<b>01.4%</b>
	Other disease	036	<b>08.3%</b>
<b>Take medications help to sleep</b>	Don't have	385	<b>88.7%</b>
	Yes	022	<b>05.1%</b>
	No	412	<b>94.9%</b>

**Table 2:** Assessment evaluation of Libyan university students for energy drinks

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

*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**. The extent of consumption of EDS most of participants take ED at examination period (24.7%) while a little of participants approximately consume ED monthly and daily (21.4%). Furthermore, most of the participants taken 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 are 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 EDs consumption and their 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 in 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 to improve the performance and stay awake. A total number of participant students reached are 434.

According to **Table 1**, when compare the prevalence age of consumption in Libyan university students result that the majority of participants were between 20 and 23 years-old. These because the average of students at young aged. Number of male and female participants are approximately similar, the percentage of males is 52.5% while female is 47.5%. This due to Libyan university male and female students have both capability to share in the studies. Faculty of Pharmacy students most responded to survey and the distribution of participant according to the years of study showed that most of participants from 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 the performance during exercise which is according to similar study demonstrated that pre-exercise ingestion of an ED did improve endurance performance on 12 professional cyclists from both genders. The higher of participants did not had 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 consume 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 participants did not take any medications help to sleep (94.9%). This is may be because the majority of students take ED at examination period to stay awake and improve their performance, therefore, they did not need medications to help them sleep.

According to **Table 2**, when asked about consume of EDs, a lot of participants consume ED (59.4%). And when asked about the extent of their consumption of energy drinks most of participants take ED at 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, the 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 harms effects (76.5%). This indicates that the majority students have sufficient awareness and knowledge of the dangers side effect energy drinks consuming. When asked participants about which type of ED are consumed, most of them consume Boom Boom (23.3%) while the rest of them take Monster (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 of sleeping and 40.0% had difficulty of 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 stimulants use.

*Conclusion:* consumption rate of EDs among Libyan University students is high. Poor sleep quality among 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 program and 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 and NHA have collected data and contributed in analysis of data with drafting the manuscript. MA, NES and AE have contributed to the conception, compilation of data and drafting the manuscript. AE has performed the analysis and interpretation of data. All authors have 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 have completely been observed by 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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