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Awareness of health risks associated with energy drink consumption among students in Abha City, Saudi Arabia

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ABSTRACT

Introduction

Consumption of beverages, especially ones containing caffeine and other stimulants, called 'energy drinks', has been recognized as a growing public health problem worldwide. As energy drinks are popular among students, this study aimed to explore students' awareness of the potential health risks associated with such drinks.

Methods

A cross-sectional study was conducted, with a sample size of 602. This included 300 male and 302 female students, of whom half attended intermediate and half attended high school. Data was gathered from high school and intermediate school students of Abha City, Saudi Arabia. Students completed a self-administered questionnaire that asked questions on their knowledge of energy drink ingredients, awareness of potential health impacts, reasons for consuming such drinks, preferred brands and sources of information about drinks.

Results

Most respondents (81%) were aware of the high sugar contents of energy drinks. Nearly half were well-informed about the caffeine content while there was less awareness of carbon dioxide (34%), citric acid (26%) and ethyl alcohol (18%). The respondents who consume energy drinks mostly knew that energy drinks can have harmful effects on health, but only 16% realised that most such drinks do not have any beneficial effects on health. Few respondents linked energy drinks to obesity (11%), diabetes (6%), stomach ulcers (4%), depression (4%) or feelings of lethargy (6%).

Conclusion

A significant proportion of the students in Abha City reported consuming energy drinks even though they were also aware of the ingredients of such drinks and their potentially harmful effects. Topics covering energy drinks should be part of the high school and intermediate curriculum. Health education, health promotion strategies and campaigns may help to reduce consumption of energy drinks.

Keywords: Energy Drinks, Students, Awareness, Ingredients, Consumption

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INTRODUCTION

Consumption of beverages, especially ones containing caffeine and other stimulants, often called 'energy drinks' (ED) has been recognized as a growing public health problem worldwide.[1,2] Meanwhile, it has become a multi-billion dollar market over the years, and is considered one of the fastest growing economies in the beverage market.[3,4] There are various brands producing drinks available in many flavours and can sizes.[5] Such drinks are marketed as energy boosters and stimulants.[6] Some are also marketed as providing improvement in mental or physical performance[1,7].

The prevalence of energy drinks use varies according to age group and geographic region. Regionally, EDs are widely consumed in the Middle East. According to one study, 55% male and 26% female students at Dammam University in Saudi Arabia consume EDs[8] and Saudi Arabia is ranked among the top 10 countries for ED consumption globally.[9] In 2013, the Central Information Organization, Bahrain reported that the use of EDs in Bahrain was 174 per 1,000 people.[10]

In the USA, about 1 in 9 young people (11.1%) have received advice from health professionals to reduce their consumption of EDs.[11] The prevalence of ED consumption in Europe has been recorded as 68% of the population, varying from 48% in Greece to 82% in the Czech Republic, and is particularly high in the 15-18 age group (73%).[12]

Energy drinks are marketed and promoted to athletes and college students in particular.[13] Many people consume energy drinks without knowing their ingredients and the adverse health effects that have been linked to these.[14]

Energy drinks, including brand names such as Red Bull, Amp, Monster, Rock Star, Rip It, Full Throttle and Cocaine, are manufactured to give the consumer a 'jolt' of energy provided by the combination of stimulants and 'energy boosters'. Ingredients of energy drinks include caffeine, herbal extracts such as guarana, ginseng and ginkgo biloba, B vitamins, amino acids such as taurine, and sugar derivatives.[15]

It has been proven that the long-term exposure of the body to an excess of simple sugars is associated with the development of obesity and insulin resistance. Pancreatic beta cells increase insulin secretion in response to high plasma glucose, a consequence of consumption of many energy drinks. In some individuals, over a period of time, the beta cells become unable to secrete sufficient insulin levels to maintain the normal blood glucose level, eventually leading to the development of diabetes.[16]

Many other ingredients, such as caffeine which is an adenosine receptor antagonist, stimulate the central and peripheral nervous system, affecting neuronal activities.[17]

Taurine, a sulfur-containing amino acid, is present as a normal constituent of the human diet.[18] It helps the body to perform physiological functions such as bile acid conjugation, central nervous system modulation, retinal development, endocrinal and metabolic functions, antioxidant and anti-inflammatory functions.[19] However, the amount of taurine found in popular EDs is far below that needed to provide therapeutic benefits, though it is also too low to have a detrimental effect.[20] Further, the combination of caffeine and taurine has no effect on short-term memory,[21] though low doses of caffeine (12.5 to 50 mg) can improve cognitive performance and mood.[22]

Many studies have found an association between energy drinks and adverse effects including ADHD, diabetes, depression, insomnia, stomach ulcers and obesity. The high sugar content in energy drinks may hamper the physical activity of an individual, consequently increasing the risk of obesity and metabolic syndromes[23] beyond the direct risk of diabetes. Acute caffeine intake reduces insulin sensitivity,[24] which could be the cause of the rise in blood glucose levels after energy drink consumption that has been documented in some studies.[25] For example, Beaudoin et al[26] stated that caffeine intake reduces insulin sensitivity in a dose-dependent manner, with a 5.8% increase in insulin for each mg/kg increase in caffeine.

Recent investigations identify the use of energy drinks as a common and potentially dangerous behaviour among college students.[27-30] Problematically high consumption levels are not only limited to college students[31] but the targeted marketing of energy drinks to young people may contribute to high levels of use among students. Association between the consumption of energy drinks and hazardous health behaviour among college students has been noted.[32]

METHODS AND MATERIALS

A descriptive cross-sectional study was conducted in Abha City, Saudi Arabia, after receiving ethical approval. Self-administered questionnaires were distributed among students who were studying in intermediate and high school. The total sample size included 602 students (300 males and 302 females): 50% students were from intermediate school and 50% students were from high school. Two schools were randomly selected from the Abha region and the students of intermediate and high school grades were informed about the purpose of the study and were enrolled for the study after giving their consent; those who did not consent were excluded. Prior to the start of data collection, the study tool was tested through a pilot study on 20 students.

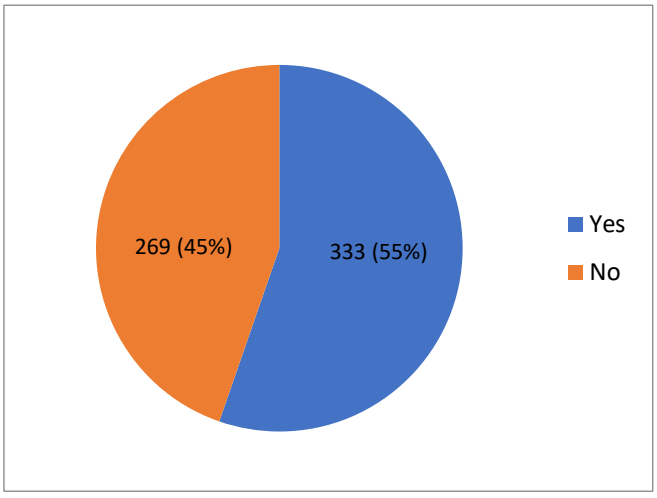

Fig 1: Proportion of respondents who reported that they consume energy drinks

Descriptive statistics were used to analyze baseline participant characteristics. The questionnaire included personal characteristics and demography, knowledge about the contents of energy drinks, source of information, types of energy drinks, harmful effects of energy drinks and reasons for consumption of energy drinks.

Simple random sampling was applied to collect data. A researcher visited the two study schools, for boys and girls, and all students were invited to participate in the study. Written consent was taken from participants. Statistical Package for Social Sciences (SPSS v23.0) was used for data entry and analysis.

RESULTS

The data gathered from the participants were analyzed and interpreted under the following headings: personal characteristics; demography; knowledge about the harmful effects of the energy drink; reason for consuming the energy drink; and source of information about energy drinks. Socio-demographic characteristics of respondents are presented as frequency and percentage (Table 1).

Just over half of the respondents (333; 55%) had consumed energy drinks at least once, shown in Fig 1.

Table 1 shows that nearly equal number of male (300) and female (302) respondents out of 602 participated in the study; the majority (79%) of them were living in nuclear families and the rest in extended families (21%). The majority of the respondents (81%) were aware of the high sugar content of energy drinks and nearly half knew they contained caffeine but fewer displayed knowledge of the carbon dioxide (34%), citric acid (26%) and ethyl alcohol (18%) contents of the energy drinks; 38.5% of respondents were aware that energy drinks contain stimulants such as nicotine and taurine.

Most (89%) of participants had consumed Red Code brand energy drinks and two third (66%) had consumed Red Bull brand. Results showed that students were also fond of other brands such as Bison, (51%), Power House (17%) and Buigzy (19%).

Table 1 Personal characteristics and demography of respondents (n=602)

Characteristics	Frequencies	Percentage
Sex		
Male	300	50%
Female	302	50%
Nature of family		
Nuclear	476	79%
Extended	126	21%
Nature of sleep		
Irregular	280	47%
Smoking		
Smoker	54	9%
Other problematic behaviour and practices reported by respondents		
I don't use seat belts	272	45%
High speed car driving	87	14.5%
I carry weapons	47	8%
Violence with others	26	4%
Consumption of energy drink		
Yes	333	55%
No	269	45%
Knowledge about the contents of drink (Yes)		
Sugar	506	81%
Caffeine	304	50.5%
Salt and Minerals	95	16%
Carbon dioxide	202	34%
Citric acid	159	26%
Nicotine	43	7%

Ethyl alcohol	109	18%
Taurine	39	6.5%
Stimulant compound	233	38.5%
Type of energy drink (yes)		
Red Bull	202	66%
Power House	52	17%
Bison	154	51%
Buigzy	57	19%
Code Red	207	89%

Table 2 reveals that out of the 333 respondents who do consume energy drinks, the majority are aware of the potential health risks and 16% of these participants know that such drinks do not have any beneficial effects on health, 11% believe that energy drinks can be addictive and 8% think they can cause obesity. A smaller number knew that the drinks can cause depression (4%), diabetes (6%), stomach ulcers (4%) and feelings of lethargy (6%) but continued to drink them nonetheless. More than 90% did not realise the drinks can cause diabetes.

The study results (Table 3) show that the majority of the students (81%) consumed energy drinks because they liked the taste, and around one third of the students (34.5%) felt powerful and energetic after consuming an energy drink. It was also observed that some students (29%) use energy drinks to stay awake for a longer time. Others reported feeling that the drinks improve sports performance (23%), enhance sexual desire (23%), and improve their ability to study (28%); 38% of students linked to mix energy drinks with other drinks (38%).

Table 2 Awareness of harmful effects of energy drinks on health by individuals (n=333)

Variables	Frequencies			
	Yes	Percentage	No	Percentage
It does not have beneficial effect on health	53	16%	280	84%
Cause addiction	35	11%	298	89%
Cause obesity	26	8%	307	92%
Cause depression	13	4%	320	96%
Cause diabetes	20	6%	313	94%
Cause stomach ulcer	14	4%	319	96%
Feeling of lethargy	19	6%	314	94%

Table 3 Reasons for drinking EDs and source of information about EDs given by respondents

Reasons for drinking	Frequencies			
Characteristics	(Yes)	Percentage	(no)	Percentage
Increases my desire/my sex ability	77	23%	256	77%
Imitation of other celebrities or friends	18	5%	315	94%
Improve my ability to study	31	9%	302	91%
Because I like its taste	269	81%	64	19%
To feel powerful and energetic	115	34.5%	218	65.5%
To improve my sports and scientific performance	77	23%	256	77%
Mixed with other drinks	127	38%	206	62%
To stay awake for longer hours	95	29%	238	71%

Table 4 Source of information about energy drinks

Characteristics	Frequencies (Yes)	Percentage	Frequency (No)	Percentage
Book, magazines, scientific websites	104	17%	496	83%
Public website	84	14%	516	86%
Newspaper	65	11%	535	89%
Co-workers and classmates	150	25%	449	75%
Friends	258	43%	341	57%
Social networking (facebook, twitter)	242	40%	357	60%
Visual press	146	24%	454	76%

Regarding the source of information (Table 4), 43% of students received information about energy drinks from their colleagues/friends, 40% respondents received it through social networking such as facebook and twitter, etc. Other sources of information included public websites (14%), books/magazines (17%), newspapers (11%). Visual press was a source of information for 24%.

DISCUSSION

It is evident that students across the world consume (and also choose not to consumer) energy drinks for many reasons, including believing such drinks can affect their behaviour and academic performance. This study aimed to explore awareness of energy drinks contents and their potential effects amongst high and intermediate school students in Abah City,

Saudi Arabia, including their knowledge of the potential harmful effects of such drinks. Information on the brands and sources of information on them was gathered and reasons for energy drink consumption was interrogated throughout this study.

Results of the present study indicate that female and male college students are using energy drinks in a similar fashion and suggest and overall prevalence of consumption of 55% for energy drinks among the students enrolled in this study. The literature search revealed that the prevalence of energy drink consumption shows regional variations in Saudi Arabia: another study found 51% prevalence of energy drinks consumption,[33] supporting the findings of our study, though Klue et al[34] reported slightly higher prevalence than ours.

We found that energy drink consumption is a popular practice among college students, particularly when the students have had insufficient sleep and if they needed more energy in general, such as while studying for exams. The American College Health Association has reported that 71% of college students report having insufficient sleep.[35] The primary content of the energy drink being sugar was known to most of the students and overall, knowledge about the ingredients of energy drinks was found to be fairly good. This did not deter them from using such drinks.

There are many brands available in the market but in the present study; Red Bull and Code Red were the most preferred brands of energy drinks chosen by the school students we surveyed. The reason for their choice of brands is not fully explored, though our findings show that a lot of respondents consume energy drinks due to liking the taste.

In the present study, several reasons were explored for ED consumption and respondents mentioned taste, a belief that consumption would lead to an improvement in studies, result in an increase in sexual desire, make them feel more energetic and help them to stay awake for a longer time. All these factors might be have an impact on their academic performance: other studies have shown that consuming energy drinks can have a significant detrimental impact on students' academic achievement – the opposite of what they believe to be the impact.[36]

In this study, the main source of information about EDs was friends and social networking, however other sources such as newspapers, books and classmates were also identified. Different sources play a very important role in affecting the consumption of EDs among students. Students were aware of the potential consequences of consuming energy drinks that could impact their health and academic performance and yet consume them anyway; this suggests further study is needed.

CONCLUSION

A significant proportion of the students in Abha City reported consuming energy drinks. Students were aware of the potentially harmful effects of ED ingredients. Students were found to receive information about energy drinks through social networking and other sources, suggesting that there are also opportunities to disseminate reliable information using mass media to highlight the potential adverse effects of EDs related to health.

Topics on energy drinks should be part of the high school and intermediate curriculum. Health organizations should raise the awareness about harmful effects of energy drinks in the community and highlight that they in fact diminish rather than improve academic performance. Health education and health promotion strategies and campaigns may help to reduce the burden of this public health problem. Health institutions of public and private sectors should conduct more workshops, training and conferences on energy drinks topics.

As many students consume energy drinks despite being aware of the harm they can cause,we suggest that energy drinks should not be allowed within the school campus, so that students don't have access to them. Parents should be educated about the harms associated with the consumption of energy drinks, to prevent the development of the potential negative consequences.

REFERENCES

1. Subaiea GM, et al. Energy drinks and population health: consumption pattern and adverse effects among Saudi population. BMC Public Health. 2019;19:1539.
2. Shah SA, Szeto AH et al. Impact of high-volume energy drink consumption on electrocardiographic and blood pressure parameters: a randomized trial. J Am Heart Assoc. 2019; 8:e011318.
3. Facts P. Energy drinks and shots. Rockville: US market trends; 2013.
4. Reissig CJ, et al. Caffeinated energy drinks-a growing problem. Drug Alcohol Depend. 2009;99(1–3):1–10.
5. Nowak D, Jasionowski A. Analysis of the consumption of caffeinated energy drinks among polish adolescents. Int J Environ Res Public Health. 2015;12(7): 7910–21.
6. Ehlers A, et al. Risk assessment of energy drinks with focus on cardiovascular parameters and energy drink consumption in Europe. Food Chem Toxicol. 2019;130:109–21.
7. Breda JJ, et al. Energy drink consumption in Europe: a review of the risks, adverse health effects and policy options to respond. Front Public Health. 2014;2:134.
8. Alsunni AA BA. Energy drinks consumption pattern, perceived benefits and associated adverse effects amongst students of University of Dammam, Saudi Arabi. J Ayub Med Coll Abbottabad 2011;23:3-9.
9. Chan M. Return to Alma-Ata. Lancet. 2008;372(9642):865-6
10. Devi S. Reforming health care in Kazakhstan. Lancet. 2014;383(9936):2197-2198.
11. Kumar GS et al. Association between reported screening and counseling about energy drinks and energy drink intake among U.S. young people. Pt Educ Couns. 2014;94:250-254.
12. Knowledge @ Warton. Family physicians make a comeback in India. 2013; http://knowledge.wharton.upenn.edu/india/article.cfm?articleid=4719. Accessed August 7, 2014.
13. Michael JG, Jorge RM-M, José RG, Carlos M, Ricart yD-P. Energy drinks and health: a brief review of their effects and consequences. Ciencias Conducta. 2012;27(1):23–34.
14. Seifert SM, et al. Health effects of energy drinks on children, adolescents & young adults. Pediatrics. 2011; 127(3):511–28.
15. Boyle M, Castillo VD: Monster on the loose. Fortune. 2006, 154: 116-122.
16. Peake JM et al. The influence of antioxidant supplementation on markers of inflammation and the relationship to oxidative stress after exercise. J Nutr Biochem. 2007;18(6):357-371
17. Jones G. Caffeine and other sympathomimetic stimulants: modes of action and effects on sports performance. Essays Biochem. 2008;44(1):109-123
18. Robertson D, et al. Tolerance to the humoral and hemodynamic effects of caffeine in man. J Clin Invest. 1981;67(4):1111-1117
19. Lourenço R, Camilo ME. Taurine: a conditionally essential amino acid in humans? An overview in health and disease. Nutr Hosp. 2002;17(6):262-270
20. Clauson KA, et al Safety issues associated with commercially available energy drinks. J Am Pharm Assoc. (2003) 2008;48(3)
21. Bichler A, Swenson A, Harris MA: A combination of caffeine and taurine has not effect on short term memory but induces changes in heart rate and mean arterial blood pressure. Amino Acids. 2006, 31: 471-476. 10.1007/s00726-005-0302-x.
22. Smit HJ, Rogers PJ: Effects of low doses of caffeine on cognitive performance, mood and thirst in low and higher caffeine consumers. Psychopharmacology. 2000, 152: 167-173. 10.1007/s002130000506
23. Greenblum S, et al. Metagenomic systems biology of the human gut microbiome reveals topological shifts associated with obesity and inflammatory bowel disease. Proceedings of the National Academy of Sciences. 2012;109(2):594–599.
24. Lee S, Hudson R, Kilpatrick K, Graham TE, Ross R. Caffeine ingestion is associated with reductions in glucose uptake independent of obesity and type 2 diabetes before and after exercise training. Diabetes Care. 2005 Mar;28(3):566–572.
25. Ragsdale FR, et al. Effect of Red Bull energy drink on cardiovascular and renal function. Amino Acids. 2010; 38(4):1193–1200.
26. Beaudoin M-S, Allen B, Mazzetti G, Sullivan PJ, Graham TE. Caffeine ingestion impairs insulin sensitivity in a dose-dependent manner in both men and women. Applied Physiology, Nutrition, and Metabolism. 2012;38(2):140–147.
27. Brache K, Stockwell T. Drinking patterns and risk behaviors associated with combined alcohol and energy drink consumption in college drinkers. Addict Behaviour 2011; 36:1133_40.
28. Marczinksi CA. Alcohol mixed with energy drinks: consumption patterns and motivations for use in U.S. college students. Int J Environ Res Public Health. 2011;8:3232_45.
29. Miller KE. Energy drinks, race, and problem behaviors among college students. J Adolesc Health. 2008;43:490_7.
30. Oteri A, Salvo F, Caputi AP, Calapai G. Intake of energy drinks in association with alcoholic beverages in a cohort of students of the school of medicine of the University of Messina. Alcohol Clin Exp Res. 2007;31:1677_80.
31. Berger LK, et al. Sociodemographic correlates of energy drink consumption with and without alcohol: results of a community survey. Addict Behav. 2011;36:516_9.
32. Reissig CJ, et al. Caffeinated energy drinks*a growing problem. Drug Alcohol Depend. 2009;99:1_10.
33. Malinauskas, B.M., Aeby, V.G., Overton, R.F. et al. A survey of energy drink consumption patterns among college students. Nutr J 6, 35 (2007).
34. Klu MW, et al Quantitative estimation of the caffeine content in some energy drinks on the Ghanaian market. Int J Nutr Metab. 2018;10(3):16–22.
35. American College Health Association National College Health Assessment Spring 2006 Reference Group Data Report (abridged). Journal of American College Health. 2007, 55: 195-206. 10.3200/JACH.55.4.195-206.
36. Champlin SE, et al Is the Consumption of Energy Drinks Associated with Academic Achievement Among College Students? J Prim Prev. 2016 Aug;37(4):345-59.