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Energy drink consumption among young Palestinians and associated risk factors: Call for action

BASMA DAMIRI¹, OMAR YAISH², EIAD JANINI², HISHAM SANDOUKA²

¹Drugs and Toxicology Division, Faculty of Medicine and Health Sciences
An-Najah National University,

²Department of Medicine
An-Najah National University,

For correspondence:

Dr. Basma Damiri
An-Najah National University
Nablus, 00970
Palestinian Territories
Email: bdamiri@najah.edu

Abstract

Objectives: This study was conducted to determine energy drink (ED) consumption and the associated risk factors among Palestinian university students, particularly concerning gender differences. **Methods:** A cross-sectional study was conducted in 2017 across five public universities in the West Bank, Palestine. A self-administrated questionnaire was distributed between 2100 students to achieve the above objectives. **Results:** The response rate was high (84.9%), with 1782 students (44.8% males, 55.2% females) completing the questionnaire. The findings indicated that the prevalence of ED intake was high for both lifetime users (66.4%; 83.5% males, 52.3% females) and current users (43.5%; 62.5% males, 31.4% females). Around 82.4% of users had consumed EDs regularly on a daily or weekly basis. Regular consumption of ED was associated with risky behavior, including self-reporting violent behavior, smoking tobacco, alcohol intake, and illicit drug use. Different factors influenced the consumption of ED, including family and social peer pressure, parents' education levels and relationships, and students' relationships with their fathers. Consumption was more prevalent among males, working students, and refugees. Common reasons for consuming ED were to increase energy levels, cope with anger, combat sleepiness, and for its taste. **Conclusion:** The results in this study highlight an alarming situation concerning EDs intake among young Palestinians. They provide insight into the consumption patterns of EDs among university students and shed light on their potential adverse effects. This data can be reviewed when considering regulations over ED and similar products.

Keywords: energy drink, smoking, Palestinians, caffeine intoxication, risk factors

إستهلاك مشروبات الطاقة لدى الطلبة الجامعيين الفلسطينيين وعوامل الخطورة المرتبطة

ملخص

الهدف: هدفت الدراسة الحالية إلى تحديد درجة إستهلاك مشروبات الطاقة لدى الطلبة الجامعيين، والفروق بين الجنسين في درجة الإستخدام، وعوامل الخطورة المرتبطة باستخدام تلك المشروبات لدى الطلبة الجامعيين الفلسطينيين.

الأدوات: أجريت الدراسة الحالية خلال العام 2017 في خمس جامعات فلسطينية، ولتحقيق أغراض الدراسة، تم توزيع إستبيان على عينة من الطلبة بلغ عدد أفرادها 2100 طالبة وطالبة.

النتائج: أظهرت النتائج أن معدل إستجابة الطلبة على أداة الدراسة قد بلغ (84.9 %)، فقد إستجاب 1782 من الطلبة (44.8% ذكور ، 52.3% إناث)، وقد أشارت نتائج الدراسة ان استخدام مشروبات الطاقة كان مرتفعاً (66.4 %) لدى الطلبة الجامعيين الذي يستخدمون المشروبات بصورة مستمرة، فقد بلغت النسبة 83.5% لدى الذكور، و 52.3% لدى الإناث، وان حوالي 82.4% من المشاركين يستخدمون تلك المشروبات بشكل منتظم، يومي أو إسبوعي، وان الاستخدام المنتظم لمشروبات الطاقة قد ارتبط بالعديد من السلوكيات الخطرة، بما في ذلك العنف، والتدخين، وتناول الكحول، وتعاطي المخدرات، وقد اثرت مجموعة من العوامل على تعاطي مشروبات الطاقة منها: الضغط الأسري، وتأثير الزملاء، والعلاقات الأسرية، ومستوى تعليم الوالدين، وقد أظهرت النتائج ان استهلاك مشروبات الطاقة كان أكثر ارتفاعاً لدى الطلبة الذكور العاملين، وطلبة المخيمات الفلسطينية، كما أشارت النتائج إلى أن اهم الأسباب التي تدفع الطلبة الجامعيين لاستهلاك مشروبات الطاقة هي: التعامل مع الضغوط ، والحصول على الطاقة، والتغلب على النعاس.

الخلاصة: تقدم نتائج الدراسة الحالية مزيداً من الإستبصار فيما يتعلق باستخدام مشروبات الطاقة من قبل الطلبة الجامعيين، كما تسلط النتائج الضوء على القلق المرتبط بتناول الطلبة الجامعيين لمشروبات الطاقة، نظراً لاتباط تناول تلك المشروبات بالعديد من المشكلات والسلوكيات السلبية، وعليه فان نتائج الدراسة الحالية تعتبر مهمة لجميع العاملين والمهتمين بالتعامل مع هذه المشكلة.

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Background

Energy drinks (ED) are beverages that contain high levels of caffeine, ranging from 50 mg to 500 mg or more per can (Malinauskas, Aeby, Overton, Carpenter-Aeby, & Barber-Heidal, 2007). The growing market for EDs has raised concerns surrounding excessive caffeine intake and potential adverse effects, particularly among young people (Arria et al., 2011; Higgins, Tuttle, & Higgins, 2010; Reid et al., 2017; Verster et al., 2018). They have become nearly ubiquitous on university campuses and recreational hot spots (Miller, 2008). Reasons for the consumption of EDs vary across populations, including improving cognitive performance, increasing attention span, reducing fatigue, and enhancing endurance (Higgins et al., 2010; Lieberman, 2001; Spriet, 2014; Van Batenburg-Eddes, Lee, Weeda, Krabbendam, & Huizinga, 2014). It is known that ED have no therapeutic benefit, and many ingredients are understudied and unregulated (Dierker et al., 2006). Therefore, it is recommended to avoid consuming EDs because of their potential for excess risk (Bhui, Warfa, Edonya, McKenzie, & Bhugra, 2007; Kerrigan & Lindsey, 2005; Seifert, Schaechter, Hershorin, & Lipshultz, 2011). Negative effects of ED consumption include anxiety and tension, increased nervousness, and insomnia. Frequent use has been associated with depression and self-harming behavior (Azagba, Langille, & Asbridge, 2014; Berigan, 2005; Chelben et al., 2008; Evren & Evren, 2015; Menkes, 2011; Salinero et al., 2014; Wesnes, Barrett, & Udani, 2013).

It has been proposed that ED use is one of many activities associated with larger patterns of impulsive or risky behavior (Meredith, Sweeney, Johnson, Johnson, & Griffiths, 2016). EDs have emerged as a public health concern due to their association with caffeine toxicity and alcohol use (Dart et al., 2015; Davison, Shoben, Pasch, & Klein, 2016). When examining the co-occurrence of substance use by drug abusers, it has been concluded that dependence on caffeine, nicotine, and alcohol are all governed by the same factors (Kozlowski et al., 1993; Reissig, Strain, & Griffiths, 2009). Different studies have examined the positive association between smoking and caffeine consumption, as well as the potential health risks of combining nicotine and caffeine (Davison et al., 2016; Kroon, 2007; Swanson, Lee, & Hopp, 1994; Treur et al., 2016; Wolk, Ganetsky, & Babu, 2012). Previous research has also established associations between ED use and alcohol-related problems among college students and adolescents (Arria et al., 2011; Dierker et al., 2006; Kendler, Schmitt, Aggen, & Prescott, 2008; Kristjansson et al., 2018; Miyake & Marmorstein, 2015; Polak et al., 2016; Velazquez, Poulos, Latimer, & Pasch, 2012). However, the nature of the relationship between ED use and high risk behavior remains unclear, and could vary

depending on the person's race and ethnicity (Meredith et al., 2016; Utter, Denny, Teevale, & Sheridan, 2018). The socio-cultural background may also influence ED consumption (Frayon et al., 2019). The effects of the ingredients found in ED (excluding caffeine) on physical and cognitive performance remain controversial and require more investigation (Bigard, 2010).

Psychoactive substance use is a growing problem in the West Bank, Palestine, and particularly among adolescents and young adults (Damiri, Salahat, & Aghbar, 2018; Damiri, Sayeh, Odeh, & Musmar, 2018; Shaheen et al., 2016). Their consumption is common among 10th grade Palestinian school students, and most consumers have combined EDs with other psychoactive substances (Damiri, Salahat, et al., 2018). The increasing prevalence of psychoactive substance use among the general population and its link to high risk behaviors and adverse health outcomes on Palestinians has gained great attention in the West Bank in the last decade (Damiri, Salahat, et al., 2018; Shaheen et al., 2016). Consuming caffeinated EDs among students is of particular interest, and has recently attained prominence in the young adult market in the West Bank. University students experience unique challenges, making them more prone to use psychoactive substances, and particularly caffeinated EDs. While the use of ED is a growing problem among Palestinians, most of the current information available about their use largely comes from the media. Few empirical studies have examined the demographics behind ED consumption (Sabbah, NaimQamhia, Mustafa, & Younis, 2015). This research was conducted to address this gap in the literature. Research into patterns of consumption could help governments take more effective action and reduce adoption rates for ED use among young adults in the future. This research is part of ongoing research that aims to explore the patterns and side effects of EDs on physical and cognitive performances, and risk factors associated with ED use among Palestinians in different age groups. The aim of this study was to examine the prevalence of ED use and associated risk factors among university students in the West Bank, Palestine.

Methods

Study design and setting

A cross-sectional study was conducted in 2017 among university students across five main public universities scattered across the West Bank – two in the north, two in the middle, and one in the south of the West Bank.

Population, sample size, and sampling technique

A stratified proportional sampling technique was used to select subjects from each university. In order to

minimize bias, every third student was invited according to his/her academic year and gender. Students (2100 in total) who freely accepted to participate in the study, and had not taken any legally prescribed narcotic drug, were recruited. Students were recruited through universities, community advertising, and across social media.

Data collection tool

A self-administered questionnaire, used in the European school survey project on alcohol and other drugs was modified (EMCDDA, 2011), translated into Arabic and back into English, and then interpreted. The questionnaire was divided into four sections. The first section identified the socio-demographic background and self-reported incidents of violence of the participants. The second section assessed the consumption patterns of ED, tobacco, alcohol, and illicit drugs in the past 30 days among participants and their close contacts. In this study, those who consumed at least one ED in the past 30 days was defined as a current ED user, and was asked to complete the third section of the questionnaire concerning patterns and motivations behind ED use. The fourth section was to assess the attitudes toward consuming EDs. The EDs in this study included imported as well as locally manufactured products available for purchase in the West Bank at the time of the study. The ED products included in this study were listed in the questionnaire to help participants understand the scope of the survey and answer questions.

Operational definitions

The locality was collapsed into three categories: city, village, and refugee camp. A current user for any psychoactive substance in this study is defined as anyone who had used psychoactive substances at least once within the past 30 days leading up to completing the questionnaire. A lifetime user is any user who has used a substance at least once during their lifetime. Parental education refers to the educational level of the parents, which is categorized as having either a low level of education (high school or less) or a high level of education (undergraduate or more). Ten problem-behavior outcomes were measured: smoking (tobacco), drinking (alcohol), using illicit or prescription drugs without a prescription, and seven other types of high risk behaviors (physical fighting, carrying a sharp knife, hurting someone, running away from home for more than 24 hours, entering other houses forcibly, and having trouble with police). A participant was categorized as having a "history of violence" when the participant admitted at least one problem behavior in the last 12 months. While a "no history of violence" label was used for those participants who had never had any of the problem behaviors addressed in this study.

Ethics

The study was carried out following ethical standards according to Declaration of Helsinki and approval was obtained from the Institutional Review Board (IRB) at An-Najah National University (ANU) in Palestine prior to research conduction. Ethical safeguards were employed: Informed consent was signed prior to study conduction, self-reported anonymous questionnaires were used, participation was voluntary, and participants' privacy was ensured. The names of the universities were not included in the results, as requested by the IRB committee, to avoid stigmatization issues.

Data analysis

Statistical Package of Social Sciences (SPSS) (version 22, IBM Corporation) was used for data entry and analysis. Continuous variables were expressed as the means \pm Standard deviations, and categorical variables were expressed numerically and as percentages. Differences in the means between groups were assessed using the independent samples t-test and analysis of variance (ANOVA) test, whereas the Pearson's chi-square test or Fisher's exact test was used for categorical variables. Descriptive statistics were computed to assess personal characteristics of the participants. Univariate analysis was conducted using a chi-square test with an odds ratio (OR) calculated for risk factors. Binary logistic regression was performed for variables found to be significant in univariate analysis. A P-value of <0.05 was used to indicate the statistical significance, and a confidence interval was set at 95%.

Results

Socio-demographic characteristics

Out of 2100 invited students, 1782 had responded, with a response rate of 84.9%. Out of the 1782 students, 799 (44.8%) were males, 983 (55.2%) were females, 39.7% were from cities, 53.9% were from villages, 6.3% were from refugee camps, and 43.7% were employed (Table 1).

Table 1

Socio-Demographic Characteristics of Participants

	Male n (%)	Female n (%)	Total n (%)
City	291(41.2)	416(58.8)	709(39.7)
Village	446(46.4)	516(53.6)	962(53.9)
Camp	62(54.9)	51(45.1)	113(6.3)
Work	591 (74.1)	185(18.9)	776(43.7)

Differences in the prevalence and pattern of energy drink use based on gender

Around 45.3% of the students were current ED consumers (62.5% of males and 31.4% of females), and

66.4% were lifetime users (83.7% of males and 52.3% of females) (P value 0.000) (Table 2). Around 36.9% of ED users had consumed them several times per week, while 19.4% (25.4% of male users and 11.5% of female users) drank them on a daily basis. In addition, 33.6% (45.8% of males and 23.6% of females) had the intention to consume EDs in the future. For co-morbidity recording between ED consumption and other psychoactive substance use, it was found that 64.4% of current ED users were also cigarette smokers, 9.3% were alcohol drinkers, 3.8% were alcohol drinkers and cigarette smokers, and 2.3% were users of all substances. The mean initiation age for ED consumption was 15.1 years, which is significantly younger than the mean initiation age of cigarette smoking (15.9 years), water pipe smoking (16.5 years), alcohol consumption (17.8 years), and illicit drug use (17.0 years) (P value <0.001). Most cigarette smokers (86.6%), alcohol users (96.2%), and illicit drug users (94%) were also ED consumers (P value <0.001). The most common motivations reported for consuming EDs was to increase energy (65.7%), cope with anger (38.7%), and combat sleepiness (27.4%). Only 35.5% of the students had prior knowledge of the harmful effects of ED consumption (Table 2).

Mean initiation age of water pipe smoking ±SEM	15.7±0.13	17.5±0.13	16.5±0.1	<0.001
Mean initiation age of alcohol use ±SEM	17.9±0.98	17.4±0.52	17.8±0.80	0.79
Mean initiation age of illicit drug use ±SEM	17.1±0.33	15.0±0.55	17.0±0.313	0.08
Motivations and attitudes				
I use ED to enhance energy	425 (63.5)	352(68.5)	777(65.7)	0.075
I use ED for its taste	214(26.9)	192(19.8)	406(23.0)	<0.001
I use ED to combat sleepiness	251(31.5)	233(24.0)	484(27.4)	<0.001
I use ED to cope with anger	337(42.3)	347(34.7)	684 (38.7)	0.005
I use ED for curiosity	185(23.3)	260(26.7)	445(25.2)	<0.001
I take care of my health	619(78.9)	891(91.4)	1510(85.8)	<0.001
I have been informed that ED are harmful	295(37.0)	333(34.3)	628(35.5)	0.000

Note. ED: Energy Drink, SEM: Standard Error of Mean

Table 2

Prevalence, Pattern, Initiation Age, and Motivations of ED among Students

Pattern of use	Male	Female	Total	P value
	n (%)	n (%)	n (%)	
Current users	499 (62.5)	309 (31.4)	808 (45.3)	<0.001
Lifetime users	669(83.7)	514(52.3)	1183 (66.4)	<0.001
Daily use	170 (25.4)	59 (11.5)	229 (19.4)	0.007
Several times/week	245 (36.3)	191 (37.2)	436 (36.9)	0.039
Several times/month	161 (24.1)	105 (20.4)	266 (22.5)	<0.001
Several times/year	93 (13.9)	159 (30.9)	252 (21.3)	<0.001
Do not drink it at all	130 (16.3)	468 (47.6)	598 (33.6)	0.009
Has the intention to drink it	362 (45.8)	230 (23.6)	592 (33.6)	0.009
Risk behaviors				
Cigarette smoking	563(70.5)	306(31.1)	869(48.8)	<0.001
Alcohol use	131(16.4)	22 (2.2)	153(8.6)	<0.001
Illicit drug use	74(9.3)	4(0.4)	78(4.4)	<0.001
Mean initiation age of ED use ±SEM	14.7±0.11	15.7±0.13	15.1±0.09	<0.001
Mean initiation age of cigarettes smoking ±SEM	15.3±0.14	17.4±0.18	15.9±0.12	<0.001

Univariate analysis of factors related to energy drink use

The univariate analysis revealed that ED consumption was more prevalent among males (OR=3.63), workers (OR=2.25), tobacco smokers (OR=7.499), alcohol users (OR=5.436), illicit drug users (OR=8.937), and participants that had the intention to consume EDs in the future (OR=39.661), compared to non-user students. They were more likely to have parents with high levels of education and negative parent-to-parent relationships (OR=1.862). The relationship between ED consumers and their fathers was more likely to be negative compared to non-user students (OR=1.486). Moreover, user students were more likely to have close contacts who consume EDs (P-value <0.05) and were offered EDs by close contacts, parents, siblings, relatives, neighbors, and friends, compared to those who were not users (P-value <0.01) (Table 3).

Table 3

Univariate Analysis for Factors Associated with Energy Drink Intake among Students

		Using ED		Odds ratio	95% Confidence interval	P value
		Yes	No			
Gender	Male	499(62.5)	300(37.5)	3.628	2.981-4.416	<0.001
	Female	309(31.4)	674(68.8)			
Work	Yes	439(56.6)	337(43.4)	2.254	1.861-2.730	<0.001
	No	367(36.6)	635(63.4)			

Intend to drink ED in future	Yes	542(91.6)	50(8.4)	39.66	28.758-54.697	<0.001
	No	252(21.5)	922(78.5)			
Risk behaviors						
Smoking tobacco	Yes	520(73.3)	189(26.7)	7.499	6.052-9.292	<0.001
	No	288(26.8)	789(73.2)			
Alcohol use	Yes	75(80.6)	18(19.4)	5.436	3.22-9.174	<0.001
	No	732(43.6)	955(56.6)			
Illicit drugs use	Yes	49(87.5)	7(12.5)	8.937	4.025-19.842	<0.001
	No	759(43.9)	969(56.1)			
Father educational level	Low	134(37.3)	225(62.7)	0.658	0.519-0.835	0.001
	High	672(47.5)	743(52.5)			
Mother educational level	Low	183(39.7)	278(60.3)	0.739	0.595-0.917	0.006
	High	615(47.1)	690(52.9)			
Relationships with close contacts						
Father	Bad	105(54.4)	88(45.6)	1.486	1.100-2.008	0.01
	Good	676(44.5)	842(55.5)			
Mother	Bad	40(51.9)	37(48.1)	1.327	0.840-2.097	0.223
	Good	746(44.9)	916(55.1)			
Brothers	Bad	63(53.8)	54(46.2)	1.454	0.998-2.118	0.050
	Good	727(44.5)	906(55.5)			
Relatives	Bad	243(47.7)	266(52.3)	1.137	0.925-1.398	0.222
	Good	559(44.5)	696(72.3)			
Friends	Bad	60(48.8)	63(51.2)	1.079	0.803-1.672	0.431
	Good	739(45.1)	899(54.9)			
Neighbors	Bad	332(46.6)	381(53.4)	1.454	0.891-1.306	0.438
	Good	467(44.7)	578(55.3)			
Parents relationship	Bad	46(59.7)	31(40.3)	1.862	1.169-2.967	0.008
	Good	729(44.3)	915(55.7)			
Close contacts use ED						
Father	Yes	65(54.2)	55(45.8)	1.462	1.008-2.12	0.044
	No	743(44.7)	919(55.3)			
Mother	Yes	42(57.2)	31(42.5)	1.666	1.037-2.676	0.033
	No	31(42.5)	942(55.2)			
Brothers	Yes	168(53.3)	147(46.7)	1.477	1.157-1.885	0.002
	No	640(43.6)	827(56.4)			
Sisters	Yes	54(56.3)	42(43.8)	1.589	1.050-2.406	0.027
	No	754(44.7)	932(55.3)			
Friends	Yes	301(62.7)	179(37.3)	2.367	2.125-3.27	<0.001
	No	507(38.9)	795(61.1)			
Relatives	Yes	213(53.7)	184(46.3)	1.537	1.228-1.92	<0.001
	No	595(43.0)	790(57.0)			
Close contacts offer ED						
Father	Yes	45(81.8)	10(18.2)	5.715	2.862-11.415	<0.001
	No	759(44.1)	964(55.9)			
Mother	Yes	23(76.5)	7(23.3)	4.064	1.735-9.521	<0.001
	No	781(44.7)	966(55.3)			
Brothers	Yes	100(56.2)	78(43.8)	1.632	1.194-2.229	0.002
	No	704(44.0)	896(56.0)			
Relatives	Yes	147(63.4)	85(36.6)	2.34	1.759-3.113	<0.001
	No	85(36.6)	889(57.5)			
Friends	Yes	420(60.6)	273(39.4)	2.808	2.307-3.419	<0.001
	No	384(35.4)	701(64.0)			
Neighbors	Yes	82(72.6)	31(27.4)	3.455	2.260-5.282	<0.001
	No	722(43.4)	943(56.6)			

Note. ED: Energy Drink

Multivariate logistic regression analysis

The binary logistic regression model included all variables found to be significant in the univariate analysis: gender, work, intention to use EDs in the future, co-occurrence with other psychoactive substances, parental level of education, relationship with their father, close contacts offering EDs, close contacts consuming EDs, and locality. Controlling for all of the above-mentioned variables, the Logistic-Regression Model identified only gender (P-value 0.000, OR=2.557), the intention to use EDs in the future (P-value 0.000, OR=43.347), smoking tobacco (P-value <0.001, OR=3.14), having friends consume EDs (P-value 0.043, OR=1.505), and having relatives offer EDs to them (P-value 0.024, OR=1.711) to be significantly associated with the consumption of EDs (Table 4). Refugees were more likely to consume EDs than urban students (P-value 0.012, OR=2.288). Reported low levels of education from the participant's mother educational levels was significantly associated with an increased likelihood of consuming EDs (P-value <0.001, OR=1.906) (Table 4).

Table 4

Logistic Regression Model of Factors Associated with Energy Drink Intake

Energy users*		Odd ratio	95% Confidence interval	P value
Gender	Male	2.557	1.784-3.663	<0.001
	Female	Reference group		
Work	Yes	0.939	0.664-1329	0.722
	No	Reference group		
Address	City	0.437	0.229-0.833	0.012
	Village	0.547		
	Camps	Reference group		
Intend to drink ED in future	Yes	43.347	28.957-64.888	<0.001
	No	Reference group		
Risk behaviors				
Smoking tobacco	Yes	3.140	2.25-3.4377	<0.001
	No	Reference group		
Alcohol use	Yes	1.4754	0.621-3.501	0.378
	No	Reference group		
Illicit drugs use	Yes	1.666	0.467-5.940	0.432
	No	Reference group		
Father educational level	Low	0.557	0.373-0.833	0.004
	High	Reference group		
Mother educational level	Low	1.906	1.339-2.172	<0.001
	High	Reference group		
Relationships with close contacts				
Father	Bad	0.829	0.466-1.473	0.522
	Good	Reference group		
Mother	Bad	1.368	0.641-2.919	0.418
	Good	Reference group		

Parents relationship		Bad	1.665	0.467-5940	0.432
		Good	Reference group		
Close contacts use ED					
Father	Yes		1.587	0.797-3.161	0.189
	No		Reference group		
Mother	Yes		1.088	0.453-2.615	0.850
	No		Reference group		
Brothers	Yes		0.756	0.486-1.178	0.216
	No		Reference group		
Sisters	Yes		0.968	0.459-2.040	0.931
	No		Reference group		
Friends	Yes		1.505	1.012-2.236	0.043
	No		Reference group		
Relatives	Yes		1.015	0.680-1.518	0.940
	No		Reference group		
Close contacts offer ED					
Father	Yes		2.793	0.923-8.453	0.069
	No		Reference group		
Mother	Yes		1.336	0.378-6.249	0.549
	No		Reference group		
Brothers	Yes		1.607	0.9871-2.614	0.056
	No		Reference group		
Relatives	Yes		1.711	1.072-2.730	0.024
	No		Reference group		
Friends	Yes		0.967	0.696-1.345	0.844
	No		Reference group		
Neighbors	Yes		1.011	0.709-1.442	0.951
	No		Reference group		

*Reference groups are non-ED users. *Note.* ED: Energy Drink

Energy drink consumption and self-reported violent behaviors

When examining self-reported violent behaviors, only 39% of ED consumers did not show any self-reported violent behavior, compared to 60.6% of non-users (OR=2.4, 95% CI (2.0-2.9), P value <0.001). Compared to non-users, 70.5% of male users (OR=1.6, 95% CI (1.2-2.2, P value 0.002) and 47.5% of female users (OR=1.9, 95% CI (1.4-2.5), P value <0.001) had manifested one or more violent behaviors. The multivariate logistic regression model including self-reported violent behaviors revealed that ED consumers were more likely to enter other houses forcibly (P-value <0.001, OR=1.701), encountered trouble with the police (P-value 0.016, OR=1.543), and carried sharp knives (P-value 0.001, OR=1.793). Other self-reported behaviors, including running away from home for more than 24 hours, physical fighting, hurting someone, and stealing did not show any association with ED consumption (P value \geq 0.05) (Table 5).

Table 5

Logistic Regression Model of Self-Reported Violent Behaviors Associated with Energy Drink Intake

Energy drink users*		Odd ratio	95% Confidence interval	P value
Run away from home for \geq24hours	Yes	1.345	0.924-1.959	0.122
	No	Reference group		
Physical fighting	Yes	1.261	0.993-1.602	0.057
	No	Reference group		
Hurt someone	Yes	1.348	0.978-1.858	0.068
	No	Reference group		
Steal	Yes	1.104	0.798-1.526	0.551
	No	Reference group		
Enter other houses forcibly	Yes	1.701	1.281-2.260	<0.001
	No	Reference group		
Trouble with police	Yes	1.543	1.083-2.260	0.016
	No	Reference group		
Carry sharp knife	Yes	1.793	1.260-2.552	0.001
	No	Reference group		

*Reference groups are non-energy drink users

Discussion

The findings of this study indicate that EDs are popular among Palestinian university students; nearly half were current users, and two-thirds of them had reported consuming EDs at least once in their life. These results are higher than what was found in other culturally-similar regions like the Gulf Cooperation Council States, Europe, the United States (USA), and Turkey (Alhyas, El Kashef, & AlGhaferi, 2015; Attila & Cakir, 2011; Bhui et al., 2007; Bulut, Beyhun, Topbaş, & Çan, 2014; Larsen, Friis, Lyng, & Lasgaard, 2014; Malinauskas et al., 2007; Jacob, 2013; Seifert et al., 2011; Zucconi et al., 2013).

Males were more likely to report ED consumption, and at an earlier age. This trend was also found in other studies (Alhyas et al., 2015; Musaiger & Zagzoog, 2013). They also had the intention to consume EDs more than females. However, these findings conflict with results from college students in the USA, where females were recorded as the predominant consumers (Bhui et al., 2007; Malinauskas et al., 2007). This could be due to the restrictions that eastern culture imposes on females' usage of different psychoactive substances in comparison to males (Tucktuck et al., 2017; WHO, 2007). These results indicate that ED consumption is a habit among university students in general, and specifically among males, which is a potential health risk.

The gateway theory states that the use of less deleterious drugs, such as tobacco, alcohol, or cannabis, can lead to future use of more dangerous drugs via a sequence of stages or crime (Kirisci et al., 2013; Kirisci, Tarter, Ridenour, Reynolds, & Vanyukov, 2013;

Vanyukov et al., 2012). Different studies have discussed that the consumption of ED is a gateway activity, as their consumption has been conceptualized as a predictor of other behaviors (Miller, 2008). A positive association between ED and symptoms of mental health problems and risky behaviors have been established (Arria et al., 2011; Dierker et al., 2006; Kendler et al., 2008; Kristjansson et al., 2018; Miller, 2008; Miyake & Marmorstein, 2015; Polak et al., 2016; Reid et al., 2017; Velazquez et al., 2012). Emerging evidence has linked ED consumption with a number of negative health consequences, including the intoxication of caffeine when combined with nicotine (Davison et al., 2016; Kroon, 2007; Swanson et al., 1994; Treur et al., 2016; Verster et al., 2018; Wolk et al., 2012). The observed association between ED consumption and other psychoactive substance use among Palestinian students is of particular concern. When examining the co-occurrence of substance use among ED users, they were at a higher risk to be cigarette smokers, which raises concerns about the possible adverse effects, including related high risk behaviors. Moreover, the initiation age of ED consumption was earlier than cigarette smoking, alcohol use, and illicit drug use. The idea that caffeine serves as a gateway to other forms of drug dependence remains controversial and needs more investigation (Collins, Graham, Rousculp, & Hansen, 1997). It is important to note that 99% of students in this study were Muslims, and Islam is considered to have strong proscriptive norms against alcohol and illicit drug use (Blankinship, 2018). Therefore, results surrounding alcohol and illicit drug use could be underestimated. Further studies on negative health consequences, particularly among participants with cardiovascular disease, is required (Petit, Levy, Lejoyeux, Reynaud, & Karila, 2012).

The observed associations between regular consumption of EDs, even in moderate amounts, may have a negative impact on daily life, including anxiety, restlessness, irritability, difficulty concentrating, depression, and self-harm (Azagba et al., 2014; Berigan, 2005; Chelben et al., 2008; Evren & Evren, 2015; Menkes, 2011; Meredith et al., 2016; Salinero et al., 2014; Van Batenburg-Eddes et al., 2014; Wesnes et al., 2013). Different studies have observed an association between ED consumption and depression, self-harm, and suicidal thoughts (Evren & Evren, 2015; Yudko & McNiece, 2014). Similar to other studies, respondents who reported a history of ED consumption were more likely to manifest violent behavior towards others (Miller, 2008; Reid & Gentius, 2018). Most of the male users and roughly half of female users had manifested one or more violent behaviors. The ED consumers were more likely to carry sharp knives, enter houses forcibly, and have trouble with police than non-users. These results indicate that frequent consumption of ED consumption may serve as a useful

screening indicator for identifying at-risk students. The most common reasons reported for consuming EDs were to increase energy, cope with anger, combat sleepiness, and for its taste. These reasons agree with findings from other studies, except for coping with anger (Reid et al., 2017; Zucconi et al., 2013). Moreover, the West Bank is a conflict zone, and stress is known to be associated with psychoactive substance use, which cannot be ignored (Damiri, 2019). The results of this study were consistent with other studies (Basma Damiri, 2019) in which refugee students were more likely to consume EDs than urban and rural students. It is known that internationally displaced persons, refugees, ex-combatants, women, and youth in post-conflict situations are especially more likely to consume psychoactive drugs compared to individuals in a stable society (Bhui et al., 2007). Refugees suffer from common daily life stressors (Habib, Seyfert, & Hojeij, 2012). ED consumption and its association with stress among Palestinian refugees needs further investigation.

Only around one-third of participants were aware of the harms of EDs. When examining factors that had influenced the consumption of EDs among Palestinian university students, the results of this study were consistent with other international studies (Bulut et al., 2014; Miller, 2008; J. L. Reid, Hammond, McCrory, Dubin, & Leatherdale, 2015) and local studies (Basma Damiri, Salahat, et al., 2018; Basma Damiri, Sayeh, et al., 2018). Work, social and peer interactions (Jorge et al., 2018; Neiderhiser, Marceau, & Reiss, 2013), family relations, and ED consumption by close contacts (Ghosh, 2016; Neiderhiser et al., 2013; Whitesell, Bachand, Peel, & Brown, 2013) were among the most prevalent factors that contributed to the increase of ED consumption, indicating that ED consumption is a health problem among Palestinians in general and among young adults specifically.

Parental monitoring and education may influence ED consumption (Miyake & Marmorstein, 2015; Visram, Cheetham, Riby, Crossley, & Lake, 2016). The results showed a social gradient in the degree of ED consumption-intake was higher in students whose fathers had low levels of education. Negative parental relationship and child-father relationship were associated with ED consumption. These findings underscore the role family plays in enhancing psychoactive substance-related behaviors in youth. Overall, the findings of this study showed that ED intake can be considered a new epidemic among Palestinians in general and, more specifically, in university students. The results of this study suggest a number of recommendations that will further enhance safe ED consumption among university students. Student awareness of caffeine intoxication, withdrawal, and dependence should be increased. Health care professionals should take more action in preventing ED consumption

among young adults, and need to develop effective prevention and cessation strategies. The Palestinian National Authority needs to make more efforts in passing ED and smoking legislation; regulating the age of access and consumption for youths and adults. Moreover, since a person's socioeconomic status and life stressors are also strongly associated with ED consumption, policies addressing youth's wellbeing and mental health may be important in addition to policies that regulate ED consumption.

Limitations

Although this is the first study that was conducted to investigate the prevalence and risk factors associated with ED consumption in the West Bank and on a large population in the West Bank, the results of this study should be interpreted within the context of several limitations. First, the data was collected through self-reporting methods, so the consumption may have been over or under reported. Sexual risk-taking behavior was not measured due to cultural restrictions. While this is a representative sample of university students in the West Bank, we were not able to conduct the study in the Gaza Strip. The West Bank and Gaza Strip are conflict zones, and stress due to political conflict is known to be associated with increased psychoactive substances use. It is recommended to conduct future studies in the Gaza Strip to collect this data. We did not investigate the association between stress and ED consumption.

Conclusion

This study indicates an alarming situation concerning ED intake among Palestinian university students. The majority of university students report ED consumption, with many using EDs daily. ED consumption was more prevalent among males and was associated with the use of other psychoactive substances. The initiation age of ED consumption was younger than the initiation age of smoking, drinking alcohol, and using drugs. Different factors influenced the consumption of

EDs among university students, including family use, social-peer pressure, parents' education, and child-parent relationships. Many factors highlighted the potential dangers of consuming EDs by Palestinian university students, including the initiation age of consumption, frequency of use, and co-morbidities with other psychoactive substances. Given the observed association between the consumption of EDs and negative health behaviors, these results are important to increase awareness in dealing with this problem. Policies, strategies, and action plans for controlling this substance should be developed, taking into account social issues. Strict ED and tobacco control legislation that limit the distribution of EDs and cigarettes to minors are important strategies that could decrease the potential of youth experimenting with these substances (Botello-Harbaum et al., 2009). Early intervention is vital in the effort to deter young students from engaging in risk-taking behavior.

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Declaration of interest statement

Author BD, Author OY, Author EH, and Author HS declare that they have no conflict of interest.

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Availability of data and materials

Most data generated or analyzed during this study are included in this manuscript. Other data that support the findings of this study and /or analyzed during the current study are available from the corresponding author upon reasonable request.

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