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Risky behavior and depression are linked to energy drink and tobacco use among Palestinian refugee children in a conflict setting

A cross-sectional study

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Abstract

Palestinian refugee children are prone to using energy drinks (EDs) and smoking tobacco because of their stressful lives. Limited research has focused specifically on Palestinian adolescents in the context of depression and substance use. This study aims to examine the effects of ED intake and tobacco smoking on the mental health of refugee children on the West Bank. A cross-sectional study was conducted in 2022 among 362 Palestinian refugee schoolchildren (aged 12–15) in 5 camps on the northern West Bank. Data on ED and tobacco use were collected through structured interviews. Depression was assessed via the Birleson Depression Self-Rating Scale for Children, psychosomatic symptoms were self-reported for the most recent 1-month period, and waist circumference was measured. χ^2 tests, Fisher exact test, and logistic regression analyses were performed to examine associations between substance use, depression, and obesity. Among the 329 participants, 53.8% reported using ED, 22.8% smoked waterpipe (WP), and 11.6% smoked cigarettes. Depression was noted in 28.9% of children. Logistic regression revealed that depression was more prevalent among girls (OR = 2.7, 95% confidence interval (CI):1.57–4.98, *P*-value < .001) and was associated with cigarette smoking (OR = 2.6, 95% CI: 1.15–5.98, *P*-value = .022) and ED intake (OR = 1.808, 95% CI: 1.04–3.17, *P*-value = .038). No associations between WP use and electronic cigarette use were detected. The study revealed that depression and risky behaviors were highly prevalent among Palestinian refugee children. ED and tobacco use were strongly associated with depressive symptoms and psychosomatic complaints. These findings highlight the urgent need for early detection, culturally tailored school-based interventions, and mental health support programs for refugee adolescents. Future research should explore longitudinal effects and preventive strategies to reduce substance use and improve child mental health in conflict settings.

Abbreviations: 95% CI = 95% confidence interval, DSRS = Birleson depression self-rating scale for children, e-cigarette = electronic cigarette, ED = energy drink, OR = odds ratio, *P*-value = probability value, WC = waist circumference, WP = waterpipe.

Keywords: cognitive enhancers and psychostimulants, depression in children, energy drinks, Palestinian refugee adolescents, tobacco smoking, UNRWA

1. Introduction

Depression is a widespread disorder that significantly limits psychological and social functioning and negatively affects overall quality of life.[1] In 2008, the World Health Organization considered major depression the third most common cause of disease burden globally, and it is expected to be the leading cause of depression by 2030.[2] Furthermore, depression is associated with the development of cardiovascular disease, and people with depression have a higher mortality rate than does the general population.[3] Therefore, the early detection of depression is essential, as depression can lead to suicidal ideation, suicide attempts, and even death.[4]

Depression is a common problem in adolescence, and the prevention of depression in adolescents should be a public health priority.[5,6] It can lead to severe consequences,

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including academic difficulties, poor relationships with parents and peers, and other illegal acts, most importantly, substance abuse.[7] It was reported that adolescents with depressive symptoms have a greater risk of smoking cigarettes than do those without depressive symptoms.[8] The exact relationship between waterpipe (WP) smoking and depression is uncertain; one theory is that WP smoking is associated with increased central obesity, which is known to be a major factor in depression.[9]

A significantly positive association between depression and caffeine consumption was also established. Teenagers' energy drinks (EDs) consumption is associated with experiencing physical fights and accidents or injuries, in addition to illicit drug consumption and harmful behaviors. Frequent ED consumers reported stress, depressive mood, suicidal ideation, insomnia, and other psychological adverse events than moderate and infrequent ED consumers did, particularly in the pediatric population.[10] Moreover, excessive consumption of ED is associated with depression and suicidal ideation.[11]

Adolescents living in conflict and displacement settings are disproportionately affected by mental health disorders.[12] Refugee youth are frequently exposed to various forms of violence, including conflict-related and intracommunal violence, poverty, and social instability, all of which increase their vulnerability to depression and risky behaviors.[12–14] Moreover, individuals (particularly adolescents) may take these risky behaviors as a coping mechanism to manage emotional distress, including symptoms of depression and anxiety.[15,16]

In the West Bank, 36.6% of refugee adolescents reported using ED, which is consistent with the global 30-day prevalence of ED consumption among adolescents aged 10 to 18 (33.5%).[17,18] The caffeine content of the ED available locally ranged from 7.5 to 32.0 mg per 100 mL, which may contribute substantially to daily intake.[19] Current recommendations suggest that adolescents aged 12 to 18 years should not exceed 100 mg of caffeine per day, whereas caffeine consumption is not considered safe for children under 12 years of age age.[16] Moreover, 8.6% of refugee adolescents reported cigarette smoking and 11.9% reported WP smoking, both of which are lower than the global adolescent tobacco use prevalence of 19.3%.[18,20] Depressive symptoms were also identified in 36.3% of adolescent refugees, which is slightly higher than the worldwide estimate of 34.0% among adolescents.[21,22] Moreover, Palestinian refugee children were found to have a greater prevalence of cigarette smoking, WP smoking, and ED consumption than nonrefugee children did.[11] Limited research has focused specifically on Palestinian adolescents in the context of depression and substance use.[11]

Therefore, this study aimed to examine the association between ED intake and tobacco smoking on 2 primary mental health outcomes: depression and psychosomatic symptoms among refugee children living in West Bank camps. The results of this study could help improve smoking cessation programs and healthy lifestyle programs among refugees. Additionally, this study's results can track global committees' and organizations' attention to develop culturally tailored interventions addressing depression and substance use among Palestinian refugee children living in West Bank camps.

2. Method

2.1. Study design and population

In 2022, refugee adolescent students were recruited for a cross-sectional study from 5 refugee camps in the northern West Bank, specifically in the Nablus, Tulkarm, and Jenin governorates. These camps mainly host Palestinian refugee families who were internally displaced in 1948 due to the Palestinian–Israeli conflict. The camps include school-aged children and broadly represent the Palestinian refugee population in the northern West Bank. The target population is school children (7th–9th grade).

3. Sample size and sampling technique

In the 5 refugee camps located in Tulkarm, Jenin, and Nablus, there are a total of 14 schools for children aged 12 to 15, which include both boys' and girls' schools. Each school serves approximately 100 to 300 children in that age group, resulting in an estimated total of around 2000 children across the selected camps. To determine the minimum required sample size for our study, we assumed a prevalence rate of 37% for the outcome of interest, a 95% confidence level, and a 5% margin of error. Using standard sample size calculations for a finite population of 2000 children, we determined that a minimum of 304 participants was necessary. We employed a clustered multistage sampling technique. In the first stage, 6 schools, 3 for boys and 3 for girls, from the northern refugee camps of the West Bank were randomly selected. In the second stage, all students in the 7th to 9th grades, aged 12 to 15 years, in the chosen schools were invited to participate in the study.

Students who signed informed consent forms and agreed to participate were interviewed. Those who showed any reluctance to participate were excluded. The following exclusion criteria were applied: cognitive impairment (difficulty understanding questions), auditory or verbal dysfunction (difficulty communicating), and prior participation in a pilot study by any of the children.

4. Data collection tools

We anticipated that many children might have difficulty with reading and writing based on findings from a pilot study and our previous research conducted in these refugee camps; therefore, data were collected through face-to-face interviews [Supplementary File 1, Supplemental Digital Content, https://links.lww.com/MD/Q960]. The structured questionnaire comprised 5 sections: Section 1: Sociodemographic information; Section 2: Depressive symptoms; Section 3: Psychosomatic symptoms; Section 4: The practices and patterns of tobacco and caffeine products; and Section 5: Motivation for substance and ED consumption. A pilot study was conducted to assess the clarity, understanding, and suitability of the questionnaire items, as well as to enhance the validity and precision of the results. Each interview lasted approximately 20 to 30 minutes and was conducted privately and anonymously. The pilot included a convenience sample of 50 children aged 12 to 15 years from the same refugee camps targeted in the main study. Participants were selected to reflect the age, gender, and school distribution of the study population, ensuring that the questionnaire was comprehensible and appropriate for the larger sample.

5. The practices and patterns of tobacco and caffeine products

The structured interview questionnaire used to assess the practices and patterns of tobacco and caffeine products was validated in previous work.[11] In this study, a "current user" status applies to schoolchildren who have used the product in the last 30 days. The caffeine content of the ED cans sold in the West Bank ranged from 7.5 to 32.0 mg per 100 mL, and the sugar content ranged from 10.0 to 11.8 grams per 100 mL.[5] Other caffeine sources used were black tea, coffee, and its derivatives, and chocolate. Tobacco smoking includes traditional (cigarettes) and nontraditional tobacco (WP and electronic cigarettes (e-cigarettes), which are the most commonly used forms in Palestine.[23–25] ED was assessed by how often the child drank at least one can of the ED at the time of assessment (every day, several cans per week). Smoking was assessed by how often the

student smoked at the time of assessment (every day, several times per week). Risk behaviors were categorized as follows to describe the prevalence and other analyses: current ED users (yes/no) and current smokers (yes/no).

6. Depressive symptoms and psychosomatic symptoms

The Birleson Depression Self-Rating Scale (DSRS) was used to assess symptoms of depression in children.[26] The DSRS is a self-rating scale used to evaluate depressive symptoms in children and adolescents. It consists of 18 items related to depression in children and adolescents. The scale is a way of understanding how children feel about things. Refugee children were asked to rate their condition during the most recent 1-week period on a 3-point scale. The scores for the scale are 2 for most of the time, 1 for sometimes, or 0 for never. The researchers explained to children that there is no right or wrong answer and that it is important to say how they have felt. The social workers read the statements neutrally, indicating no preference for what the children wish to hear. The item scores were summed to obtain the total score. The DSRS cutoff score of 15 points was used to determine the percentage of refugee adolescents with clinically significant depression.[12]

For psychosomatic symptoms, refugee adolescents were asked to rate their condition during the most recent 1-month period. The frequency of symptoms is rated on a 3-point scale: never, sometimes during the week, and daily. The child was asked if he/she had insomnia, if he/she felt nervous and engaged in physical fighting, felt with headache or dizziness, felt with tachycardia, felt with tremors or shivering of limbs, felt with numbness, felt with shortness of breath, felt that his/her skin and hair were dry, felt that his/her skin was pale, felt that he/she had pain in his/her tongue or swelling, felt hungry, and experienced discomfort in the abdomen. The answers were treated as categorical, with 3 levels: Never, Several times per week, and daily.

7. Motivation for substance

Participants who reported current use of any substance, including cigarettes, WP, e-cigarettes, ED, coffee, black tea, or chocolate, were asked about their motivations for use. A structured list of possible reasons was presented, and participants were asked to select all that applied. The options included seeking fun, curiosity, socializing with friends, staying awake or alert, relieving boredom, relaxation, coping with problems or anger, studying, beliefs about weight control, and the influence of the political situation.

8. Central obesity

Waist circumference (WC) is a measure of central obesity.[27] It was measured midway between the inferior margin of the thoracic cage and the superior border of the iliac crest during minimal inspiration. European data for WC were utilized following International Diabetes Federation criteria, as specific ethnicity cutoff points are unavailable for Palestinians.

9. Ethical approval and consent to participate

The study was approved by the Institutional Review Board (IRB) at An-Najah National University (ANNU), IRB archive number November 16, 2019. Written informed consent was obtained from parents or legal guardians, and assent was obtained from each child prior to participation. Participation was voluntary, and children could withdraw at any time. All data were kept confidential using coded numbers, and privacy was strictly maintained during the interviews.

10. Data analysis

Statistical analyses were performed using IBM SPSS Statistics for Mac, version 27. Data normality was assessed using the Shapiro–Wilk test. Descriptive statistics included medians, interquartile ranges (25th–75th percentiles), and frequency distributions. Associations between categorical variables were examined using Pearson χ^2 test or Fisher exact test as appropriate. Adjusted multiple logistic regression analyses were conducted to identify independent predictors for the outcomes of interest, with results presented as odds ratios (ORs) and 95% confidence intervals (CIs). Model 1: Dependent variable is current ED consumption (Yes/No); independent variables include age, gender, employment status, and use of other products (cigarettes, WP, coffee, black tea, chocolate). Model 2: Dependent variable is the presence of depression (DSRS score ≥ 15); independent variables include age, gender, working hours, WC, and substance use. The interaction between WP smoking and WC was tested. Model 3: Dependent variable is engagement in physical fighting (never, several times/week, daily); independent variables include grade, gender, work status, substance use, depression status, and insomnia. Variables were included in multivariate models if they showed bivariate associations ($P < .20$) or were considered theoretically relevant. Statistical significance was defined as $P < .05$.

11. Results

11.1. Participant selection

Among the 447 recruited schoolchildren, 362 agreed to participate in the study, 352 were interviewed, 10 withdrew during the interview, and 23 questionnaires were discarded because of incomplete information. The final number of included participants is 329.

12. General characteristics of the study population and depression results

Among the participants (N = 329), 50.5% were boys, with a mean age of 13.4 ± 1.1 years, and 49.5% were girls, with a mean age of 13.3 ± .91 years. Central obesity was more common among boys (18.1%) than among girls (16.8%). The total

Table 1

General characteristics and depression prevalence among Palestinian refugee adolescents, West Bank, Palestine (2022).

Total	329 (100)
Gender n (%)	
Males	166 (50.5)
Females	163 (49.5)
Working n (%)	
Yes	32 (9.7)
Working h/wk n (%)	
2–20	10 (43.8)
21–60	22 (56.7)
Central obesity n (%)	
Males	30 (18.1)
Females	27 (16.8)
Depression n (%)	
Males	39 (23.5)
Females	56 (34.5)
Mean *DSRS score ± SD	
Total	11.9 ± 4.9
Males	11.5 ± 4.7
Females	12.4 ± 5.1

Central obesity: Defined as a waist circumference above the European cutoff points for adolescents, based on International Diabetes Federation (IDF) criteria. Depression: Defined as a *DSRS (Birleson Depression Self-Rating Scale) score ≥ 15, indicating clinically significant depressive symptoms. SD: Standard deviation.

percentage of working students was 9.7% (14.5% of boys and 4.9% of girls). The prevalence of depression was 28.9%, which was significantly greater among girls (34.5%) than among boys (23.5%) (*P*-value = .03). The mean DSRS score for all participants was 11.9 ± 4.9. The mean score was 11.5 for boys and 12.4 for girls (Table 1).

13. Practice, pattern, and initiation age of tobacco and caffeine products

The prevalence of ED consumption was 56.2%, which was significantly greater among boys (68.7%) than among girls (43.6%) (*P*-value < .001). About one-sixth (14%) of participants had ever smoked cigarettes, with a significantly higher proportion among boys when compared to girls (23.5% vs 4.3%, *P* < .001). The median age at initiation of consumption of cigarettes was 10 (9–11) and 10.5 (9–1.3) years in boys and girls, respectively. Among all participants, 39.5%, 21.1% and 21.1% of boys and 0%, 16.7% and 16.7% of girls stated that they smoked daily, several times weekly, or were ex-smokers, respectively (Table 2).

14. Motivation for ED consumption and tobacco smoking

Among ED consumers, fun was the most common motivator in both genders (boys 95.6%, girls 64.7%), followed by curiosity (60.2% vs 63.2%) and peer influence (48.7% vs 39.7%), both significantly higher in boys. Coffee use was also mainly driven by fun and curiosity, with girls having higher percentages (85.4% and 59%, respectively). Curiosity was also the leading motivator for cigarette (51.4% vs 57.1%) and WP smoking (61.4% vs 70.8%), followed by fun and peer influence (48.6% vs 28.6%) and (28.6% vs 14.3%), respectively (Table 3).

15. Psychosomatic symptoms

The majority of the participants (52.7%) had insomnia either daily (9.4%) or several times per week (43.3%). The majority of participants (63.6%) felt nervous and were engaged in physical fighting either daily (21.7%) or several times per week (41.9%). The majority of the participants (54%) had headaches either daily (13.3%) or several times per week (41%) (Table 4).

16. Adjusted logistic regression models

16.1. Factors predictive of ED consumption

Participants who consumed ED were more likely to be boys than girls (OR 2.11, 95% CI: 1.29–3.46, *P* = .003). Likewise, participants who consumed ED were more likely to smoke cigarettes (OR = 4.84, 95% CI: 1.54–15.22, *P*-value = .007), smoke WP (OR = 2.75, 95% CI: 1.38–5.45, *P*-value = .004), and consume coffee (OR = 2.21, 95% CI: 1.15–4.25, *P*-value = .02) (Table 5).

16.2. Factors predictive of depression

Participants that were depressed were more likely to be girls (OR = 3.23, 95% CI: 0.1.79–5.88, *P*-value < .001), with a higher WC (OR = 1.03, 95% CI: 1.00–1.05, *P*-value = .027), who smoked cigarette (OR = 2.99, 95% CI: 1.33–6.71, *P*-value = .008), and consumed ED (OR = 1.92, 95% CI: 1.07–3.44, *P*-value = .029) (Table 6).

Table 2

Tobacco and caffeine product practices, initiation ages, and patterns of use.

A: The practice of tobacco and caffeine products				
	Total n (%)	**Boys n (%)**	**Girls n (%)**	***P*-value**
Cigarettes	46 (14.0)	39 (23.5)	7 (4.3)	<.001*
Waterpipe	80 (24.6)	56 (33.7)	24 (15.1)	<.001*
Electronic cigarettes	14 (4.3)	9 (5.4)	5 (3.1)	.29
Energy drinks	185 (56.2)	114 (68.7)	71 (43.6)	<.001*
Coffee	265 (80.8)	139 (83.7)	126 (77.8)	.21
Black tea	301 (92.3)	159 (95.8)	142 (88.8)	.021*
Chocolate	315 (96.6)	158 (95.8)	157 (97.5)	.54
B: Initiation age of use median (25%–75%)				
Cigarette	10 (9–11)	10 (9–11)	10.5 (9–1.3)	.99
Waterpipe	11 (10–12)	11 (10–12)	12 (11–13)	.07
Electronic cigarettes	12 (12–12.3)	12 (12–13)	12 (11–12)	.87
Energy drinks	11 (9–12)	11 (8.5–12)	11 (10–13)	.17
Coffee	10 (8–12)	10 (7–11)	10 (10–12)	.07
C: Pattern of use				

	Boys			**Girls**		
	Daily	**Several times/weekly**	**Ex-user**	**Daily**	**Several times/weekly**	**Ex-user**
Cigarettes	15 (39.5)	8 (21.1)	8 (21.1)	0 (0.0)	1 (16.7)	1 (16.7)
Waterpipe	11 (20.8)	20 (37.7)	1 (1.9)	3 (12.5)	4 (16.7)	5 (20.8)
Electronic cigarettes	0 (0.0)	1 (11.1)	2 (22.2)	2 (40.0)	6 (66.7)	1 (20.0)
Energy drinks	30 (26.3)	59 (51.8)	3 (2.6)	16 (22.5)	29 (40.8)	5 (7.0)
Coffee	49 (39.2)	52 (41.6)	0 (0.0)	25 (22.3)	55 (49.1)	0 (0.0)
Black tea	95 (57.2)	51 (34.2)	0 (0.0)	71 (58.2)	36 (29.5)	0 (0.0)
Chocolate	86 (59.7)	46 (31.9)	0 (0.0)	70 (51.1)	47 (34.3)	6 (4.4)

Information on age at initiation for black tea and chocolate was not collected due to recall bias, as these items are commonly consumed from very early childhood, and precise recall is unreliable in this population.

*Significant value < .05.

Table 3

Motivation for energy drink consumption and tobacco smoking.

Motivation	Boys n (%)	Girls n (%)	Total n (%)	Boys n (%)	Girls n (%)	Total n (%)
		Energy drinks			Coffee	
Fun	108 (95.6)	44 (64.7)	147 (81.2)	123 (82.0)	123 (85.4)	246 (83.7)
Curiosity	68 (60.2)	43 (63.2)	111 (61.3)	61 (40.7)	85 (59.0)	146 (49.7)
Get along with friends	55 (48.7)	27 (39.7)	82 (45.3)	48 (32.0)	65 (45.1)	113 (38.4)
Wakefulness	38 (33.6)	16 (23.5)	54 (29.8)	46 (30.7)	42 (29.2)	88 (29.9)
Boredom	35 (31.0)	17 (25.0)	52 (28.7)	31 (20.7)	45 (31.3)	76 (25.9)
Relax	30 (26.6)	17 (25.0)	47 (26.0)	55 (36.7)	50 (34.7)	105 (35.7)
Escape from problems	25 (22.1)	15 (22.1)	40 (22.1)	19 (12.7)	30 (20.8)	49 (16.7)
Anger	25 (22.1)	16 (23.5)	41 (22.7)	13 (8.7)	25 (17.4)	38 (12.9)
Studying	19 (16.8)	8 (11.8)	27 (14.9)	31 (20.7)	48 (33.3)	79 (26.9)
Believe it reduces weight	14 (12.4)	9 (13.2)	23 (12.7)	17 (11.3)	29 (20.1)	46 (15.7)
Political situation	13 (11.5)	7 (10.3)	20 (11.1)	18 (12.0)	20 (13.9)	38 (12.9)
		Cigarettes			Waterpipe	
Curiosity	18 (51.4)	4 (57.1)	22 (52.4)	27 (61.4)	17 (70.8)	44 (64.7)
Fun	17 (48.6)	2 (28.6)	19 (45.24)	23 (52.3)	14 (58.3)	37 (54.4)
Get along with friends	10 (28.6)	1 (14.3)	11 (26.19)	14 (31.8)	5 (20.8)	19 (27.9)
Escape from problems	7 (20.0)	1 (14.3)	8 (19.05)	1 (2.3)	2 (8.3)	3 (4.4)
Anger	7 (20.0)	2 (28.6)	9 (21.43)	3 (6.8)	3 (12.5)	6 (8.8)
Addiction	7 (20.0)	0 (0.0)	7 (16.67)	1 (2.3)	3 (12.5)	4 (5.9)
Wakefulness	6 (17.1)	0 (0.0)	6 (14.29)	4 (9.1)	4 (16.7)	8 (11.8)
Boredom	5 (14.3)	0 (0.0)	5 (11.90)	9 (20.5)	5 (20.8)	14 (20.6)
Relax	2 (5.7)	1 (14.3)	3 (7.14)	2 (4.6)	3 (12.5)	5 (7.6)
Studying	2 (5.7)	0 (0.0)	2 (4.76)	0 (0.0)	0 (0.0)	0 (0.0)
Political situation	1 (2.9)	0 (0.0)	1 (2.38)	0 (0.0)	1 (4.7)	1 (1.5)
Believe it reduces weight	1 (2.9)	1 (14.3)	2 (4.76)	0 (0.0)	3 (12.5)	3 (4.4)

Information on the motivation for using black tea and chocolate was not collected due to recall bias, as these items are commonly consumed from very early childhood, making precise recall unreliable in this population.

Table 4

Psychosomatic symptoms among participants.

During the last 1-mo period	Daily n (%)	Several times/wk n (%)	Never n (%)
I have felt nervous and engaged in physical fighting	70 (21.7)	135 (41.9)	117 (36.3)
I have felt hungry	60 (18.6)	116 (36.0)	146 (45.3)
I have felt a headache or dizziness	42 (13.3)	129 (41.0)	144 (45.7)
I have insomnia	30 (9.4)	138 (43.3)	151 (47.3)
I have felt discomfort in my abdomen	26 (8.1)	116 (36.0)	180 (55.9)
I have felt numbness	21 (6.7)	95 (30.2)	199 (63.2)
I have felt tremors or shivering in my limbs	21 (6.7)	73 (23.2)	220 (70.1)
I have felt shortness of breath	21 (6.5)	83 (25.8)	218 (67.7)
I have felt with tachycardia	16 (5.0)	93 (29.2)	209 (65.7)
I have felt that my skin and hair are dry	15 (4.7)	47 (14.7)	257 (80.6)
I have felt that my skin is pale	14 (4.4)	37 (11.7)	266 (83.9)
I have felt that I have pain in my tongue, or it is swelling	9 (2.8)	38 (11.9)	273 (85.3)

16.3. Factors predictive of engaging in physical fights stratified by frequency of engagement in physical fights

Participants that engage in physical fights daily were more likely to be of a higher grade (OR = 1.57, 95% CI: 1.08–2.28, *P*-value = .019), who were depressed (OR = 4.13, 95% CI: 1.81–9.41, *P*-value = .001), smoked WP (OR = 3.14, 95% CI: 1.18–8.36, *P*-value = .022), consumed ED (OR = 2.53, 95% CI: 1.14–5.65, *P*-value = .023), and reported daily or frequent insomnia (OR = 24.05, 95% CI: 3.95–46.57, *P*-value = .001) (OR = 2.98, 95% CI: 1.40–6.32, *P*-value = .005), respectively (Table 7).

17. Discussion

This study aimed to investigate the association between ED intake and tobacco smoking on 2 major mental health outcomes: depression and psychosomatic symptoms among refugee children living in West Bank camps. Our study revealed that depressive symptoms were highly prevalent, especially among females. ED consumption was common and associated with cigarette and WP smoking. Depression was independently associated with female sex, higher WC, cigarette smoking, and ED consumption, and psychosomatic complaints, sleep disturbances, and engagement in physical fights were frequent and associated with both ED and tobacco use.

Depression is one of the top ten causes of disability and death worldwide, with individuals often experiencing its effects for extended periods.[5] The current study revealed several important findings. The overall rate of depression among refugee children was high, especially among females. This rate exceeds that reported in the general population of the West Bank.[28] In this study, the prevalence of depression among refugee adolescents was 28.9%, compared with 36.3% among adolescent refugees aged 13 to 16 years in the West Bank.[22] The higher rate among refugees may reflect cumulative exposure

to displacement-related stress, economic hardship, and limited access to mental-health services. Current United Nations Relief and Works Agency initiatives, in collaboration with World Health Organization and United Nations Children's Fund, have begun implementing school-based psychosocial and counseling programs aimed at supporting refugee youth.[29,30] These

Table 5

Adjusted binary logistic regression of the associations between energy drink consumption and other products.

Energy drink consumption Yes*	Variable	Reference	Odds ratio	95% confidence interval (CI)	*P*-value
Age			0.91	0.71–1.15	.41
Gender	Boys	Girls	2.11	1.29–3.46	.003*
Work	Yes	No	0.83	0.34–2.0	.67
Cigarette smoking	Yes	No	4.84	1.54–15.22	.007*
Waterpipe smoking	Yes	No	2.75	1.38–5.45	.004*
Coffee consumption	Yes	No	2.21	1.15–4.25	.02*
Black tea consumption	Yes	No	1.25	0.50–3.15	.63
Chocolate consumption	Yes	No	1.75	0.44–7.03	.43

*The reference category for Energy drink consumption is No.

Table 6

Adjusted binary logistic regression for the association between depression and energy drink consumption.

Depression (yes)†	Variable	Reference category	Odds ratio	95% confidence interval (CI)	*P*-value
Age			1.05	0.81–1.36	.708
Waist circumferences			1.03	1.00–1.05	.027*
Working hours			1.00	0.99–1.04	.306
Gender	Girls	Boys	3.23	1.79–5.88	<.001*
Cigarette smoking	Yes	No	2.99	1.33–6.71	.008*
Waterpipe smoking	Yes	No	0.95	0.48–1.87	.878
Energy drink consumption	Yes	No	1.92	1.07–3.44	.029*
Coffee consumption	Yes	No	1.10	0.58–2.21	.791
Chocolate	Yes	No	1.07	0.26–4.49	.922
Black tea	Yes	No	0.94	0.36–2.47	.896

†Reference category is depression.

*Significant value < .05.

Table 7

Adjusted multiple logistic regression for the association between physical fighting and energy drink consumption.

Nervousness, along with engagement in physical fights	Variable	Reference category	Odds ratio	95% confidence interval (CI)	*P*-value
Daily					
Grade			1.57	1.08–2.28	.019*
Gender	Boys	Girls	0.51	0.23–1.13	.10
Depression	Yes	No	4.13	1.81–9.41	.001*
Cigarette smoking	Yes	No	1.15	0.32–4.22	.83
Waterpipe smoking	Yes	No	3.14	1.18–8.36	.022*
Electronic cigarettes	Yes	No	0.45	0.07–3.01	.41
Energy drink consumption	Yes	No	2.53	1.14–5.65	.023*
Coffee consumption	Yes	No	0.79	0.31–1.98	.61
Chocolate	Yes	No	9.44	0.82–109.41	.70
Black tea	Yes	No	1.21	0.33–4.53	.78
Work	Yes	No	1.49	0.37–6.05	.58
Insomnia	Daily	Never	24.05	3.95–46.57	.001*
	Several times/weeks		2.98	1.40–6.32	.005*
Several times/wk					
Grade			1.15	0.86–1.53	0.35
Gender	Boys	Girls	0.45	0.25–0.84	0.011*
Depression	Yes	No	2.08	1.00–4.31	.049*
Cigarette smoking	Yes	No	1.87	0.60–5.86	.28
Waterpipe smoking	Yes	No	2.16	0.93–5.02	.08
Electronic cigarettes	Yes	No	0.65	0.13–3.35	.61
Energy drink consumption	Yes	No	1.07	0.58–1.98	.83
Coffee consumption	Yes	No	1.62	0.76–3.43	.21
Chocolate	Yes	No	2.11	0.47–9.53	.33
Black tea	Yes	No	1.32	0.45–3.86	.61
Work	Yes	No	3.45	1.13–10.53	.030*
Insomnia	Daily	Never	9..21	1.66–51.05	.011*
	Several times/weeks		2.61	1.46-4.67	.001*

Physical fighting, the dependent variable was treated as categorical, with 3 levels: Never, Several times per week, and Daily. A reference category is physical fighting never, with a significant value of < .05.

*Significant value < .05.

results are consistent with a previous study showing a significant prevalence of depression in the West Bank population.[31] Additionally, the increased vulnerability of females to depression is a well-known global trend, particularly after the onset of adolescence. However, the reasons for this variation remain unclear and are still debated.[32] Participant characteristics, including the higher proportion of females and generally low socioeconomic conditions in refugee camps, may have contributed to the elevated depression and risk-behavior prevalence observed. The gender differences observed emphasize the need to implement targeted mental health initiatives, including early detection and screening of depression symptoms in adolescents in refugee communities.

Hawash et al emphasized in their study of adolescents in Palestine, Jordan, and Turkey that substances such as caffeine and tobacco are linked to depression and psychosomatic symptoms.[33] The use of these harmful substances during adolescence may lead to lasting adverse effects, increasing the risk of developing substance use disorders and addiction later in life. Moreover, psychoactive substances can negatively affect brain development, hinder academic performance, increase the likelihood of engaging in risky behaviors, and lead to adverse health outcomes.[11,31,34–36] Sherman et al noted that adolescents who are exposed to these risk factors are at a greater risk of developing substance use disorders later in life.[37]

Additionally, Grant and Dawson suggested that they may experience poor academic performance and increased vulnerability to risky behaviors, sexually transmitted diseases, and criminal activities.[38] Odgers et al further supported these findings.[37] The study findings also highlight the increasing prevalence of nontraditional tobacco products, such as WPs and e-cigarettes, among refugee adolescents.[11,19,39] In agreement with other studies on adolescents, ED consumption increased the risk of cigarette smoking, WP smoking, and coffee consumption.[40] Moreover, the motives for ED and tobacco product consumption, including curiosity, social influence, and the desire for pleasure, further emphasize the need for targeted interventions to address these behaviors and their associated risks.

ED and tobacco use prevalence among refugee adolescents in this study exceeded rates reported in other regional adolescent populations. A considerable portion of participants reported frequent or daily ED use. Targeted interventions, such as peer-education campaigns, regulation of ED marketing to minors, and integration of substance-use prevention within school health curricula, are needed to counteract curiosity, social influence, and pleasure-seeking motives.

Consistent with previous research, a significant number of risky behaviors, such as ED consumption and tobacco smoking, are linked to depression among Palestinian refugee adolescents.[14] This connection, which has been consistently observed in multiple studies, underscores the potential impact on public health.[40] ED containing caffeine has raised public health concerns because of its association with caffeine toxicity and substance abuse.[41] In line with other studies, teenagers who consumed ED reported experiencing specific side effects, including restlessness, nervousness, dizziness, difficulty concentrating, problems with focus, digestive discomfort, and insomnia.[42] ED use was positively associated with tobacco and coffee consumption, consistent with evidence suggesting that stimulant-seeking tendencies and peer modeling contribute to multiple substance-use behaviors among adolescents.[7]

The relationship between depression and smoking is multifactorial, but the main factor is the genetic factor of depression. These factors increase the incidence of smoking initiation, maintenance, and dependence.[43] In addition, depressed people tend to smoke due to the antidepressant effect of nicotine, which increases the levels of central nervous system catecholamines (dopamine, serotonin, and noradrenaline).[44] The high smoking prevalence of refugees can be attributed to their lack of social support and lower perceived family, which makes them vulnerable to depression and subsequently to WP smoking.[45] Addressing adolescent depression in refugee settings requires community-based resilience programs and early psychosocial interventions. Although specific genetic polymorphisms may increase vulnerability, chronic stress and insecurity likely play a more dominant role in this population.[46] The exact relationship between WP smoking and depression is uncertain; one theory is that WP smoking is associated with increased central obesity, which is known to be a major factor in depression. In this study, depression was associated with increased WC. This finding is consistent with another study of adolescents.[47] However, no effect of the interaction between increased WC and WP smoking on depression was detected. A prospective study suggested that shorter night sleep duration and greater emotional eating are the mechanisms underlying the increase in weight circumference and obesity associated with depression.[48]

Owing to the harsh environment in which they are forced to live, refugee children can be characterized by aggressiveness, unstable emotional behavior, a lack of concentration, constant rebellion against authority, mistrust of others, and sometimes abusive behavior toward other children. Several psychosomatic symptoms in this study, including insomnia, headaches, and nervousness, along with engagement in physical fights, were highly prevalent among Palestinian refugee children. Most studies agree that these symptoms are common among refugees.[49] The notable prevalence of insomnia, headaches, nervousness, and engagement in fights among refugee adolescents may result from chronic exposure to conflict, displacement stress, and overcrowded living environments. Strengthening psychosocial support, trauma-informed counseling, and structured recreational programs within camps could mitigate these psychosomatic manifestations.

18. Strengths and limitations

This study focused on a vulnerable and underrepresented population, highlighting the importance of public health issues and the urgent need for interventions to address depression and its associated risk factors among Palestinian refugee children. The study used face-to-face interviews with validated instruments (Birleson DSRS) to enhance response accuracy, included objective anthropometric measures (WC) and detailed substance-use patterns, and applied multivariable models to adjust for potential confounders.

However, the study has some limitations, including the reliance on self-reported data, which may be subject to recall and social desirability biases, leading to over- or underestimation of certain behaviors. Additionally, the cross-sectional design of the study limits the ability to establish causality between ED intake, tobacco smoking, and depression among Palestinian refugee children. To minimize these effects, validated instruments and anonymous data collection were employed. Future studies are recommended to strengthen causal understanding. The study was conducted within the context of Palestinian refugee camps, which may have unique social and cultural factors that could impact the generalizability of the findings to other refugee populations or nonrefugee communities. The final analysis included only children who were present at school and completed the questionnaire, which may limit the data's representativeness because absentees were not captured.

Furthermore, the study did not explore potential confounding variables that could influence the relationships among ED intake, tobacco smoking, and depression, including socioeconomic status and exposure to trauma. It is important to consider these factors when interpreting the associations between substance use and mental health outcomes in this population. These limitations suggest the need for further longitudinal and more comprehensive studies to understand better the association between substance use and mental health among refugee children.

19. Conclusions

This study highlights the association between depression, ED, and tobacco use, psychosomatic symptoms, and aggression among Palestinian refugee adolescents. These findings highlight the urgent need for comprehensive mental-health and behavioral interventions tailored to the realities of refugee life. Additionally, this link suggests the potential for long-term consequences and public health impacts.

20. Recommendations

The study's insights highlight the urgent need for comprehensive support systems and mental health services tailored to the unique challenges faced by refugee adolescents, including addressing psychosomatic symptoms and behavioral issues. Further research and proactive interventions are essential to mitigate the adverse effects of depression and risky behaviors among Palestinian refugee adolescents. Interventions recommended to curb excessive consumption include community-based awareness campaigns, restrictions on the sale and advertising of ED to minors, and the incorporation of nutrition and substance-use education into school programs.

Author contributions

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