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# Prevalence and association between eating disorders, depression, and obesity among Palestinian adolescent refugees

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## Abstract

**Background** Refugee children often experience high levels of stress and poor quality of life, which can increase their vulnerability to depression, substance use, and obesity. Previous research has highlighted a significant prevalence of obesity among Palestinian refugees, particularly among children. This study aimed to explore sex-based differences in eating disorders among Palestinian adolescent refugees and to investigate potential associations with central obesity, depression, and disordered eating behaviors.

**Methods** A cross-sectional study was conducted among refugee teenagers aged 13–16 years in four West Bank refugee camps. A total of 313 teenagers were interviewed. Data, including waist circumference (WC) and body mass index (BMI), were collected through structured interviews and anthropometric measurements. The interviews included the Birleson Depression Self-Rating Scale and the Eating Attitudes Test-26 (EAT-26), a screening tool used to detect individuals at risk for disordered eating behaviors but who are not diagnosed with specific eating disorders. Behavior-related questions were also included.

**Results** Among the 313 participants, 51.7% were boys, 9.5% had increased WC, 22.3% were overweight, and 24.4% were obese. Additionally, 16.8% reported tobacco smoking, with a significantly higher prevalence among boys (26.6%) than girls (3.1%) (P value < 0.001). The prevalence of depression was 36.3%, and 27.5% of the participants scored ≥ 20 on the EAT-26. Moreover, 17.2% of the adolescents were identified as needing evaluation by a mental health professional. Girls had higher diet subscale scores (P value = 0.002), whereas boys had higher total behavior scores (P value = 0.004). Adjusted binary logistic regression identified several risk factors for disordered eating behaviors: female sex (OR = 2.25, P value = 0.004), high depression scores (OR = 2.251, P value = 0.004), working after school (OR = 2.492, P value = 0.028), and central obesity (OR = 5.83, P value = 0.003).

**Conclusion** This study revealed a significant prevalence of disordered eating behaviors and depression among adolescent refugees in the West Bank. Gender differences were evident, with girls showing more cognitive dietary concerns and boys displaying more behavioral risk patterns. These findings highlight the importance of early identification of at-risk individuals via tools such as the EAT-26, and they call for targeted, gender-sensitive mental health and nutritional interventions to support the well-being of refugee adolescents.

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## Background

Eating disorders (EDs) are major mental health problems capable of seriously compromising a person's well-being. Eating disorders, according to the American Psychological Association, are characterized by unusual eating behaviors comprising either too little or too much food, as well as a major preoccupation with body image [1]. The three main categories of eating disorders accepted by the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) are anorexia nervosa (AN), bulimia nervosa (BN), and binge eating disorder (BED) [2]. Self-imposed fasting, a body mass index (BMI) of less than 18.5, and strong anxiety about weight gain are the three ways that anorexia nervosa manifests itself [3, 4]. The American Psychiatric Association and Guarda (2021) define two varieties of binge eating: the restricting type, in which individuals drastically restrict their food intake or exercise excessively, and the binge-eating/purging type, in which periods of binge eating are followed by purging activities [3]. Typical of bulimia nervosa (BN), binge eating disorder (BED) is typified by repeated bouts of binge eating without accompanying behaviors, including excessive activity, vomiting, fasting, or laxative usage. According to the study by Qian et al. (2021), BED is considered to be 1.53% prevalent.

Furthermore, their research emphasized major health issues related to eating disorders, including metabolic abnormalities and possibly lethal cardiac arrhythmias [5]. According to 2019 research by Gerdjikov et al., 80% of those suffering from binge eating disorders are affected by binge eating disorders; these illnesses are frequently accompanied by psychological illnesses [6]. Globally, eating disorders are a major public health issue. The projected lifetime frequency of 13% (Kohn & Golden, 2001; R. Mairs & D. Nicholls, 2016) highlights the severity of the problem, particularly among young people and teenagers [1, 7]. Gravina et al. and Qian et al. compared the prevalence of AN in children aged 9–10 years to that of healthy persons in the same age group; the death rate was as high as 5–6% [5, 8]. Adolescents with BN have a mortality rate of approximately 2%, a significantly increased risk of suicide attempts, and a prevalence of 0.9–3% [9]. Different racial, cultural, and socioeconomic groups are becoming increasingly aware of eating disorders [10]. Although studies in Arab countries are still lacking, EDs are becoming increasingly widespread in adolescents, especially in girls, based on observations [11].

Typically classified as predisposing, triggering, or perpetuating, eating disorders result from a combination of variables [12]. Genetic vulnerabilities, psychological problems, including low self-esteem and body dissatisfaction, and sociocultural pressures, including effects from media and societal expectations, define predisposing factors [13]. Triggering events or experiences that start or aggravate an illness include trauma, negative remarks about looks, bullying, or major emotional pain [14]. Both as a key risk factor and a possible result, eating disorders are well known to be strongly correlated with depression. Common among depressed people are emotional pain and poor self-perception, which increase their vulnerability to eating disorders as poor coping mechanisms [15, 16]. Moreover, there are psychological and biological similarities between eating disorders and depression that could complicate therapy. Common risk factors for eating disorders in children and teens are developmental vulnerability, depression, childhood obesity, and bullying. These elements can have a rather important influence [7]. Bullying intensifies emotional pain and depression symptoms, therefore increasing the likelihood of eating disorders; childhood obesity is significantly associated with the development of eating disorders through negative body image and peer victimization [17].

Snoubar et al. (2023) [18] reported that adolescent Palestinian refugees face many factors that lead to mental health problems. A total of 72.1% of Palestinian youth were depressed [19]. More than 15% of Palestinian children are overweight or obese, which is more than double the world average [20]. Nonetheless, few studies have investigated the impact of physical and mental stressors on eating habits, particularly during adolescence, an age characterized by significant concerns regarding body image, peer pressure, and emotional turbulence. Additionally, while the discrepancies in eating disorders (EDs) between males and females are widely recognized globally, their manifestations in traditional or traumatized environments may differ markedly. Different regions of studies indicate that females tend to cope with stress by restricting their food intake or developing dissatisfaction with their bodies. In contrast, males may exhibit externalizing behaviors such as binge eating or excessive exercising [21, 22]. Within refugee populations, the cultural stigma surrounding mental health and gender roles may further obscure these patterns. Therefore, it is essential to examine gender-based disparities in ED risk to devise practical and culturally relevant solutions.

Furthermore, research conducted on other refugee groups, such as Syrians in Lebanon and Jordan, has identified analogous correlations between depression, emotional eating, and obesity [23], underscoring the necessity of comparing statistics across divergent regions. Nevertheless, a significant gap exists in the understanding of

these issues in areas inhabited by Palestinian refugees. This study aims to address that gap by examining the prevalence of eating disorder behaviors among Palestinian teenage refugees and their relationships with depression, central obesity, and gender differences.

## Methods

### Study design and enrolled participants

A cross-sectional study examined refugee adolescents aged 13–16 years in four refugee camps in two large governorates in the West Bank in 2022. Approximately 20,000 refugee children reside in these camps, constituting approximately 70% of the refugees in the north of the West Bank. The study aimed to recruit 254 participants, comprising both boys and girls, based on a 5% margin of error and a 95% confidence interval, with a 21.2% prevalence of positive Eating Attitude Test-26 (EAT-26) results among Palestinian university students [20]. A stratified proportional sampling technique was used. Six refugee camps are located in three governorates on the West Bank. First, four out of six refugee camps located north of the West Bank were chosen randomly. A proportional sample (50% boys and 50% girls) was then chosen from each refugee camp and governorate located north of the West Bank. Refugee adolescents aged 13–16 years were invited to participate in the study at refugee camp service centers through flyers and social media. Eye-catching posters and flyers were used to attract interest, and age-appropriate language and materials were employed to maintain cooperation throughout the study. Informed consent was obtained from teenagers and their parents or guardians, and a safe and respectful environment was created for their participation. The exclusion criteria included cognitive impairment, auditory or verbal dysfunction, and lack of parental informed consent.

### Tools, validity, reliability, and operational definitions

Owing to the stigma related to eating disorders and depression, two trained social workers interviewed the children in refugee camp service centers. Social workers of both genders were selected for this research, as collecting data such as weight and height could be uncomfortable for participants if the social worker was of the opposite gender. The social workers conducted these interviews in a private setting to ensure comfort and openness. They read the statements neutrally, indicating no preference for what the children wished to hear. The researchers provided training for social workers interviewing children in refugee camps. They taught social workers to use open-ended questions and active listening to encourage sharing while maintaining neutrality, thereby creating a safe environment. Ethical considerations regarding confidentiality and the child's autonomy were emphasized, along with familiarization with the study tools. The structured interview questionnaire included a sociodemographic section, the Eating Attitudes Test-26 (EAT-26), behavior-related questions, and a depression section, the Beck Depression Inventory. A pilot study was conducted to ensure the validity and reliability of the tools. Each participant was interviewed privately and anonymously, lasting approximately 20 to 30 min.

#### *The sociodemographic and health section*

The sociodemographic and health section includes inquiries about age, sex (male, female), working status (yes, no), presence of chronic diseases (yes, no), height in meters, weight in kilograms, waist circumference in centimeters, and tobacco smoking in the last 30 days (yes, no). Central adiposity was measured using waist circumference (WC), and abdominal obesity was defined in children aged 10–16 years as having a WC at or above the 90th percentile or a value below the adult cutoff [24]. During minimal inspiration, the measurement is taken at the midpoint between the lower margin of the rib cage and the superior border of the iliac crest. Previous research has focused on anthropometric measurements, the accuracy of measurement tools, and precision assessment [25]. The World Health Organization (WHO) defines overweight as one standard deviation (85th percentile) of body mass index (BMI) for age and sex and obesity as two standard deviations (97th percentile) of BMI for age and sex.

#### *The eating attitudes Test-26 (EAT-26)*

The EAT-26 is a widely used self-administered questionnaire for screening eating disorders, primarily intended for adolescents and adults [26]. It comprises 26 questions scored on a 6-point scale ranging from always to never. Scores range from 0 to 78 points, and the cutoff point (positive EAT – 26) is 20; a score of 20 or more indicates a disordered eating attitude, prompting further investigation [26].

#### *The EAT-26 subscales include the following*

(1) Dieting, (2) Bulimia and Food Preoccupation, and (3) Oral Control. The subscale scores are computed by summing all the items assigned to that scale. Dieting scale items: 1, 6, 7, 10, 11, 12, 14, 16, 17, 22, 23, 24, 26. Bulimia and Food Preoccupation Scale items: 3, 4, 9, 18, 21, 25. Oral control scale items: 2, 5, 8, 13, 15, 19, 20.

#### *Behavioral questions*

The EAT-26 includes five behavioral questions to determine the presence of extreme weight-control behaviors and estimate their frequency. These questions assess self-reported binge eating, self-induced vomiting, use of laxatives, exercising more than 60 min a day to lose or

control weight, and losing 9 kg in the last six months. The scoring system for behavioral questions 1–4 ranges from "never" to "once a month or less," "2–3 times a month," "once a week," "2–6 times a week," and "once a day or more," whereas behavior 5 includes the answers "yes" and "no." A positive result for behavior 1 includes all scores except "never" and "once a month," whereas positive results for behaviors 2 and 3 include all scores except "never." A positive result for behavior 4 includes only the score "once a day or more," and for behavior 5, a positive result includes the answer "yes". The behavioral questions indicate possible eating disorder symptoms or recent significant weight loss. Generally, a referral is recommended if a respondent scores "positive" on the EAT-26 items or meets the threshold on one or more behavioral criteria.

The Arabic EAT-26 has shown high sensitivity and specificity in the early detection of eating disorders [27, 28]. Cronbach's alpha for the EAT-26 was measured in the study and was found to be reliable. The overall Cronbach's alpha for the scale was 0.848; for girls, it was 0.874; and for boys, it was 0.866. The Cronbach's alpha values for the three subscales were as follows: the diet scale was 0.833 overall, 0.825 for girls and 0.834 for boys; the Food Preoccupation scale was 0.726 overall, 0.747 for girls and 0.705 for boys; and the Oral Control scale was 0.618 overall, 0.634 for girls and 0.59 for boys. The EAT-26 has been reproduced with permission from Garner et al. (1982) [26].

#### *Depression scale*

The Birleson Depression Self-Rating Scale (DSRS) is utilized for assessing depressive symptoms in children [29]. The Arabic-language version of the DSRS has been demonstrated to be reliable and valid [30]. This self-rating scale consists of 18 items and is employed to evaluate depression in children and adolescents. The children were asked to rate their condition over the past week via a 3-point scale. The scoring system for the scale is "2" for most of the time, "1" for some of the time, or "0" for never. The item scores were summed to obtain the total score. Scores range between 0 and 36, and a DSRS cutoff score of 15 points is utilized to identify the risk of depression in refugee adolescents [29, 31].

### Data analysis

Descriptive statistics, including means, standard deviations (SDs), percentiles, and frequency distributions, were computed to summarize the sample characteristics. The normality of continuous variables was assessed via the Kolmogorov–Smirnov test. For subgroup comparisons, an independent samples t-test was used for normally distributed continuous variables, whereas the Mann–Whitney U test was applied for non-normally distributed variables. The chi-square ($\chi^2$) test was used to assess differences in categorical variables. All analyses were performed via IBM SPSS Statistics for Mac, version 27 (IBM Corp., Armonk, NY, USA) and were stratified by sex. Crude odds ratios (cORs) and adjusted odds ratios (aORs) were calculated along with 95% confidence intervals (CIs). Statistical significance was defined as a p value $< 0.05$. Binary logistic regression analysis was conducted to examine the associations between EAT-26 scores (categorized as $\geq 20$ vs. <20) and sex (girls vs. boys) while controlling for relevant covariates, including depression status (yes/no), employment status (yes/no), body mass index (underweight, normal weight, overweight, obese), and central obesity (based on waist circumference: increased vs. normal). Variables with a p value $< 0.25$ in univariate analyses were included in the multivariable model. Model fit was evaluated using the Hosmer–Lemeshow goodness-of-fit test, which yielded a $p$-value of 0.084, indicating an acceptable model fit.

### Ethical approval

Ethical approval for the study protocol was obtained from the Institutional Review Board (IRB) (Ref: 16, Nov. 2019) at An-Najah National University (ANNU). The study was conducted by the ethical standards outlined in the Declaration of Helsinki. Before the study, written informed consent was obtained from the parents on behalf of the children and from the children themselves. The participants were assured that their participation was voluntary, that their contributions were highly valued, and that they could either assent to or dissent from participation. All the collected data were kept confidential. During data analysis and presentation, coded numbers were used instead of names to protect anonymity. The interviews were conducted privately to ensure comfort and encourage honest responses. To reduce the stigma associated with discussing mental health and eating behaviors, the interviewers used nonjudgmental, culturally sensitive language. The participants were informed that the study aimed to understand adolescent well-being better and that their responses would not be used to diagnose or label them in any way. The EAT-26 has been reproduced with permission. Garner et al. (1982) [26].

## Results

In this study, 412 teenagers were recruited, 333 agreed to participate, and 313 met the eligibility criteria. The sample consisted of 170 boys (51.4%) with a mean age and standard deviation (SD) of 13.65 (0.77) years and 161 girls (48.6%) with a mean age and SD of 13.52 (0.71) years. A significantly greater percentage of boys (26.6%) reported smoking tobacco than girls did (3.1%), with a p value of $< 0.001$. Regarding working status, 14.1% of boys and 5.0% of girls reported being employed ($p$-value = 0.005). Moreover, 9.5% of the boys had high waist circumferences,

whereas 1.3% of the girls had high waist circumferences (p value = 0.001). The study also reported that 5.4% of boys and 3.1% of girls were underweight, but there was no significant difference in these rates. However, there was a high prevalence of overweight and obesity, with 22.3% classified as overweight and 24.4% classified as obese overall. Among the boys, 22.6% were overweight and 25% were obese, whereas among the girls, 21.9% were overweight and 23.8% were obese (Table 1).

#### EAT-26 items and subscales based on sex

More girls (38.5%) than boys (25.3%) were terrified about being overweight (p value = 0.01). Additionally, more girls (28.0%) than boys (13.5%) were aware of the caloric content of the foods they ate (p value = 0.001). In terms of feeling guilty after eating, more girls (18.0%) than boys did (8.8%) (p value = 0.009), and more girls (19.9%) reported eating diet foods than boys did (11.2%) (p value = 0.028). The most frequent item in the dieting subscale for boys was "Think about burning calories when I exercise" (28.2%), whereas for girls, it was "Am terrified about being overweight" (38.5%). For the bulimia and food preoccupation scale, the item "have the impulse to vomit after meals" was the most common item for both boys (35.3%) and girls (28.0%). For the oral control subscale, the most frequent item for both boys (32.9%) and girls (42.2%) was "Other people think that I am too thin" (Table 2).

#### Gender-based differences in EAT-26 scores, depression, and behaviors among refugee adolescents

The prevalence of EAT-26 scores ≥ 20 was 27.5%, which was significantly higher in girls (32.9%) than in boys (22.4%) ($p = 0.036$). Girls exhibited a greater prevalence of binge eating behavior than boys did (30.6% vs. 19.9%) (p value of 0.031). Compared with girls, more boys tended to induce vomiting to control their weight and shape (13.3%), exercise more than 60 min per day to lose weight and control their weight (16.5%) and lose weight in the previous six months (14.7%) (7.5%, 9.9%, and 11.2%, respectively), with no significant differences. More girls (4.8%) than boys (4.1%) used laxatives, diet pills, or diuretics (water pills) to control their weight or shape, with no significant differences. Moreover, 17.2% of adolescent boys should seek an evaluation from a trained mental health professional, with a higher prevalence among boys (21.2%) than among females (13.3%). The prevalence of depression was 36.3%, with no significant sex differences between boys (34.1%) and girls (38.5%) (p value 0.406) (Table 3).

**Table 1** Gender-based differences in the sociodemographic data and health characteristics of refugee adolescents

| | | Boys *n* (%) | Girls *n* (%) | *p* value |
|---|---|---|---|---|
| Tobacco smoking | Yes | 45(26.6) | 10(3.1) | < 0.001* |
| Working status | Yes | 24(14.1) | 8(5.0) | 0.005* |
| Waist circumferences | Increased | 16(9.5) | 2(1.3) | 0.001* |
| BMI based on WHO (kg/m$^2$) | Underweight | 9(5.4) | 5(3.1) | 0.723 |
| | Overweight | 38(22.6) | 35(21.9) | |
| | Obese | 42(25.0) | 38(23.8) | |

Note: Data are shown as n (%); *Significant

#### Gender-based differences in EAT-26 scores, subscale scores, and depression scores among refugee adolescents

The Mann–Whitney U test demonstrated significant differences in the mean ranks for the EAT-26 score and various subscale scores. The diet subscale score was significantly higher in girls than in boys ($p$ value = 0.002). Additionally, the total behavior score was higher for boys than for girls, with a significant $p$-value (0.004) (Table 4).

#### Risk factors associated with positive screening results for the EAT-26 score

According to the univariate analysis, girls had a greater prevalence of positive EAT-26 screening results (32.9%) than boys did (22.4%). The participants who reported depression also had a higher prevalence of positive EAT-26 screening results (36.7%) than those who did not report depression (22.3%) ($p$-value 0.005). Among those who worked after school, 43.8% had positive EAT-26 screening results, whereas 25.8% did not (p value 0.005). Compared with those with a normal waist circumference, those with a high waist circumference had a significantly greater percentage of positive EAT-26 screening tests (61.1%) (25.3%) (p value 0.037).

Univariate and adjusted binary logistic regression analyses for risk factors associated with positive EAT-26 screening results revealed that sex, depression, working after school, and increased waist circumference were significantly associated with increased positive EAT-26 screening results (p values < 0.05). The adjusted logistic regression revealed that girls were at greater risk of having positive EAT-26 screening results, with an odds ratio (OR) of 2.251, a 95% CI of 1.301–3.894, and a p value of 0.004; high depression scores (OR of 2.251, 95% CI of 1.301–3.894 and a p value of 0.004); working after school (OR of 2.492, 95% CI of 1.104–5.622 and a p value of 0.028); and central obesity (OR of 5.83, 95% CI of 1.819–18.684, and a p value of 0.003). According to the univariate and adjusted models, body mass index (BMI) and age were not significantly associated with a positive EAT-26 screening score compared to the normal BMI category ($p$-value ≥ 0.05). Importantly, the reference value is an EAT-26 score < 20 (Table 5).

**Table 2** The EAT-26 items based on gender for three subscales: dieting, bulimia, and food preoccupation, and the food control scale

| Question number | Question | Boys | Girls | *P* value |
|---|---|---|---|---|
| Dieting scale items | | | | |
| 1 | I am terrified of being overweight. | 43(25.3) | 62(38.5) | 0.01* |
| 6 | I am aware of the calorie content of the foods that I eat. | 23(13.5) | 45(28.0) | 0.001* |
| 7 | I particularly avoid foods with a high carbohydrate content (e.g., bread, rice, potatoes). | 33(19.4) | 34(21.1) | 0.699 |
| 10 | I feel extremely guilty after eating. | 15(8.8) | 30(18.6) | 0.009* |
| 11 | I am preoccupied with a desire to be thinner. | 45(26.5) | 56(34.8) | 0.101 |
| 12 | I think about burning calories when I exercise. | 48(28.2) | 59(36.3) | 0.102 |
| 14 | I am preoccupied with the thought of having fat on my body. | 26(15.3) | 38(23.6) | 0.056 |
| 16 | I avoid foods that contain sugar. | 30(17.6) | 41(25.5) | 0.083 |
| 17 | I eat diet foods. | 19(11.2) | 32(19.9) | 0.028* |
| 22 | I feel uncomfortable after eating sweets. | 30(17.6) | 34(21.1) | 0.424 |
| 23 | I engage in dieting behavior. | 34(20.0) | 27(16.8) | 0.449 |
| 24 | I like my stomach to be empty. | 38(22.4) | 36(22.4) | 0.999 |
| 26 | I enjoy trying new rich foods. | 27(15.9) | 18(11.2) | 0.212 |
| Bulimia and food preoccupation scale items | | | | |
| 3 | I find myself preoccupied with food. | 30(17.6) | 28(17.4) | 0.951 |
| 4 | I have gone on eating binges where I feel that I may not be able to stop. | 29(17.1) | 21(13.0) | 0.308 |
| 9 | I vomit after I have eaten. | 12(7.1) | 17(10.6) | 0.260 |
| 18 | I feel that food controls my life. | 25(14.7) | 30(18.6) | 0.337 |
| 21 | I give too much time and thought to food. | 28(16.5) | 25(15.5) | 0.815 |
| 25 | I have the impulse to vomit after meals. | 60(35.3) | 45(28.0) | 0.151 |
| Oral control subscale items | | | | |
| 2 | I avoid eating when I am hungry. | 35(20.6) | 37(23.0) | 0.598 |
| 5 | I cut my food into small pieces. | 46(27.1) | 49(30.4) | 0.497 |
| 8 | I feel that others would prefer if I ate more. | 39(22.9) | 46(28.6) | 0.24 |
| 13 | Other people think that I am too thin, | 56(32.9) | 68(42.2) | 0.081 |
| 15 | It takes longer than others to eat my meals. | 38(22.4) | 46(28.6) | 0.194 |
| 19 | I display self-control around food. | 57(17.2) | 40(12.1) | 0.083 |
| 20 | I feel that others pressure me to eat. | 36(21.2) | 44(27.3) | 0.191 |

## Discussion

This study explored the relationship between eating disorders and depression among Palestinian refugee adolescents and identified the main risk factors. The findings revealed that 27.5% of the participants had eating disorder behaviors, and the rates were higher among girls (32.9%) than among boys (22.4%). Depression was also common, with 36.3% of the participants showing symptoms. The results of this study suggest that eating disorders and depression are connected and that both conditions may be influenced by sex, obesity, and working conditions.

Compared with boys, girls in this study had higher EAT-26 scores and more diet-related behaviors. These results are similar to those reported in other studies, such as those of Gibson–Smith et al. (2020) [32], who reported that girls often experience more body image pressure. In contrast, boys were more likely to engage in compensatory behaviors, such as vomiting or excessive exercise, despite having lower EAT-26 scores. These gender differences may be related to the way boys and girls experience social expectations about their bodies.

Depression was found in more than one-third of the participants and was strongly linked to disordered eating. This is consistent with earlier research by Radwan et al. (2021) [19] and Damiri et al. (2021) [20], who noted that refugee adolescents often experience depression due to trauma, displacement, and poor social or economic support. In this study, adolescents with depression were more likely to score high on EAT-26. Emotional distress may influence eating habits, leading to harmful behaviors such as binge eating or extreme dieting.

Central obesity is another important factor connected to disordered eating. This finding agrees with those of Lister et al. (2023) [33] and Rao et al. (2020) [16], who reported that central obesity is not only a physical health concern but also linked to psychological issues. The results of this study highlight the importance of considering core obesity as a central point of the spectrum of eating disorders in teenagers. According to the findings of this study, Lister et al. (2023) and Rao et al. (2020) noted that central obesity is associated with psychological and social issues in addition to physical issues. From the body mass index, how is the waist circumference different? Conversely, waist circumference reflects the distribution and amount of fat in the abdomen quite precisely. Adolescents who have this type of abdominal fat may suffer from metabolic disorders, low self-esteem,

**Table 3** Differences in EAT-26 scores, eating behaviors, and depression among refugee adolescents by sex

| | | Total *n* (%) | Boys *n* (%) | Girls *n* (%) | *p* value |
|---|---|---|---|---|---|
| EAT-26 | Score ≥ 20 | 91(27.5) | 38(22.4) | 53(32.9) | 0.036* |
| EAT-26 Behaviors | Behavior 1: Have you gone on eating binges where you feel that you may not be able to stop? | 84(25.7) | 52(30.6) | 32(19.9) | 0.031* |
| | Behavior 2: Have you ever made yourself sick (vomited) to control your weight or shape? | 35(10.6) | 23(13.5) | 12(7.5) | 0.077 |
| | Behavior 3: Have you ever used laxatives, diet pills, or diuretics (water pills) to control your weight or shape? | 16(4.8) | 7(4.1) | 9(5.6) | 0.613 |
| | Behavior 4: Exercise more than 60 min a day to lose or control your weight. | 44(13.3) | 28(16.5) | 16(9.9) | 0.105 |
| | Behavior 5: Lost 9 kg in the past six months | 43(13.0) | 25(14.7) | 18(11.2) | 0.414 |
| | Total behaviors score ≥ 2: Should seek an evaluation from a trained mental health professional | 57(17.2) | 36(21.2) | 21(13.0) | 0.058 |
| Depression | Score ≥ 15 | 120(36.3) | 58(34.1) | 62(38.5) | 0.406 |

Note: Data are shown as n (%); *Significant

**Table 4** Gender-based differences in EAT-26 and subscale scores and depression scores among refugee adolescents

| | Boys | | Girls | | | |
|---|---|---|---|---|---|---|
| | Mean Rank | Sum of Ranks | Mean Rank | Sum of Ranks | Z score | p value |
| Total depression score | 159.13 | 27,052 | 173.25 | 27,894 | -1.346 | 0.178 |
| Total EAT-26 score | 155.46 | 26428.5 | 177.13 | 28517.50 | -2.061 | 0.039* |
| Dieting subscale score | 149.94 | 25,490 | 182.96 | 29,456 | -3.160 | 0.002* |
| Bulimia and Food Preoccupation subscale score | 166.66 | 28,333 | 165.30 | 28,333 | -1.41 | 0.888 |
| Oral control subscale score | 160.05 | 27,209 | 172.25 | 27,737 | -1.172 | 0.241 |
| Total behavior score | 179.16 | 30457.50 | 152.10 | 24488.50 | -2.920 | 0.004* |

Note: *Significant <0.05

**Table 5** Univariate and adjusted binary logistic regression for the associations between positive eating status (EAT-26 score ≥ 20) and sex, depression, obesity, central obesity, and other factors among refugee schoolchildren

| | | Univariate analysis *n*(%) | | | Adjusted binary logistic regression | | |
|---|---|---|---|---|---|---|---|
| | | EAT-26 ≥ 20 | EAT-26 < 20 | P value | OR | 95% CI | P value |
| Gender | Girls | 53(32.9) | 108(67.1) | 0.031* | 2.251 | 1.30–3.89 | 0.004* |
| | Boys | 38(22.4) | 132(77.6) | | 1 | | |
| Depression | Yes | 44(36.7) | 76(63.6) | 0.005* | 1.778 | 1.05–3.01 | 0.032* |
| | No | 47(22.3) | 164(77.7) | | 1 | | |
| Working after school | Yes | 14(43.8) | 18(56.30) | 0.037* | 2.492 | 1.10–5.62 | 0.028* |
| | No | 77(25.8)) | 222(74.2) | | 1 | | |
| Waist Circumference | High | 11(61.1) | 7(38.9) | 0.002* | 5.83 | 1.82–18.68 | 0.003* |
| | Normal | 78(25.3) | 230(74.7) | | 1 | | |
| Body Mass Index | Low | 3(16.7) | 15(83.3) | 0.31 | 0.982 | 0.442-1.8 | 0.75 |
| | Overweight | 20(29.9) | 47(70.1) | | 0.837 | 0.197–3.55 | 0.809 |
| | Obese | 23(35.4) | 42(64.6) | | 0.562 | 0.26–1.23 | 0.148 |
| | Normal | 45(25.3) | 133(74.7) | | 1 | | |
| Age | | | | | 0.947 | 0.668–1.34 | 0.751 |

The reference value is an EAT-26 score <20

and loneliness. According to Arslan et al. (2022), adolescents who are centrally obese may experience higher levels of stress, irritability, and weight stigma, all of which can lead to mental health problems and the emergence of eating disorders. This study should also carefully consider the potential effects of residual and ambient factors that were not specifically examined. Particularly crucial for refugees are issues such as long-term stress, food scarcity, and bullying among classmates. A lack of emotional regulation and adequate coping mechanisms may increase the risk of developing eating disorders, such as bingeing or disordered eating [34]. Other locations where violence has occurred have also revealed similar connections. Rizk et al. reported that adolescents residing in Syrian refugee camps have unhealthy eating habits and are highly susceptible to psychosocial pressures, according to Rizk et al. (2023) [23]. These findings indicate that adolescents residing in unstable or dislocated

environments are disproportionately prone to experiencing both psychological and social stressors concurrently. These results suggest that central obesity is more closely associated with symptoms of eating disorders than the two are causally related. This explanation provides a clearer picture of the data and is consistent with the methodology of cross-sectional studies. From this vantage point, we can gain a better understanding of the state of adolescent health during crises. The results highlight the need for comprehensive strategies that look at the emotional well-being, nutritional status, and social welfare of immigrant youth simultaneously.

Given the common overlap of obesity and depression in refugee adolescents, a comprehensive treatment approach is necessary. This should include mental health support and nutritional assistance to address this dual challenge effectively.

Working after school was also found to be a factor linked with eating disorder behaviors. As shown by Rizk et al. (2023) [35], adolescents who work might face more stress and have less time for self-care, which may increase the likelihood of unhealthy eating habits. This highlights the need for supportive programs in schools and communities, especially for working youth.

Higher smoking and work rates among boys may help explain their specific risk patterns. Boys in this study were more likely to use coping behaviors such as vomiting or overexercising. These behaviors may be hidden signs of stress or emotional pressure. Studies such as Hawash et al. (2022) [36], Abu Seir, Kharroubi, & Ghannam 2020 [37], and Ata et al. (2007) [21] have shown that boys often face social pressure that leads them to express emotional struggles through physical or risky behaviors rather than emotional expression. This finding supports the idea of having mental health strategies that are sensitive to gender differences.

Clarification is necessary regarding the use of the EAT-26, which does not diagnose a specific eating disorder. A score of 20 or more means that the participant may be at risk and should be referred for clinical evaluation. In total, 17.2% of the adolescents in the study were found to need mental health evaluation. This finding supports the need for screening tools that are accessible, culturally sensitive, and inclusive of gender. Even though boys had lower EAT-26 scores, they still exhibited high-risk behaviors, which highlights the need for careful screening and early intervention.

These findings align with and extend recent research on the behavioral and emotional factors associated with eating patterns in overweight individuals. Given the focus of the current study on the relationship between eating behaviors, emotional factors, and obesity among adolescents, it would significantly strengthen the manuscript to reference recent and relevant works that address similar interconnections in different populations. Arslan et al.'s study [22] explored the associations between food and cooking skills and eating behaviors in individuals with overweight or obesity, providing valuable insights into the behavioral patterns that influence weight management. Additionally, investigations into weight self-stigma, emotional eating, and diet satisfaction among obese individuals [38] offer important perspectives that align closely with the psychological dimensions discussed in the present study. Finally, the study of the effects of social media use on emotional eating in women aged 19–45 years [39] highlights emotional triggers relevant to younger populations, which could provide further context and depth to the analysis of emotional eating behaviors among adolescent refugees. Incorporating these references enhances the theoretical foundation and situates the current findings within a broader framework of contemporary research.

Based on these results, mental health and nutrition programs should be established in schools and communities, particularly within refugee camps and other vulnerable populations. These programs should include screenings for eating and emotional problems, peer-led workshops, and educational sessions for parents and teachers. Examples of successful programs in other refugee settings, such as those in Lebanon and Jordan, were also discussed to show what could work in Palestine. Future research should investigate the effectiveness of these ideas over time and determine whether they can be adapted to other refugee settings.

This study has several limitations that must be considered. First, the reliance on self-reported data may introduce bias, and the cross-sectional design limits the ability to draw causal conclusions. Second, the sample was sourced from four refugee camps in the West Bank, which may restrict the applicability of the results to the broader population of Palestinian adolescent refugees. Despite these limitations, this research provides valuable insights into the mental health and eating disorders experienced by this specific group. It highlights important gender differences in these issues, which are crucial for developing effective interventions. This is the first study to examine these relationships within this specific population, thereby filling a critical gap in the literature.

## Conclusions

This study uniquely contributes to the literature by being one of the first to investigate the associations between central obesity, disordered eating behaviors, and mental health among adolescent refugees. By focusing on this vulnerable population, we highlight the intricate interplay of psychological and physical health challenges. This study revealed significant sex differences in the prevalence of eating disorders and their associated behaviors.

It identifies critical risk factors for disordered eating, including sex, levels of depression, central obesity, and after-school employment, which can guide the development of targeted interventions and health policies for at-risk populations. Notably, eating disorders and depression are prevalent among Palestinian refugee adolescents, particularly among girls and those who exhibit central obesity or higher depression scores. These results have important implications for public health policies and school-based mental health programs aimed at the early identification and prevention of eating disorders.

Additionally, implementing school-based screening initiatives will help identify mental health and eating disorder issues early, facilitating timely support for affected adolescents. The findings emphasize the urgent need for comprehensive mental and physical health programs that address the specific needs of these populations, taking into account both gender and the unique conditions faced by refugees. Future research should focus on evaluating the effectiveness of these programs over time and determining the necessity of ongoing support to promote the well-being of refugee adolescents. Longitudinal research is recommended to track changes over time. Furthermore, developing training programs for teachers and social workers can equip them with the necessary skills to recognize signs of distress and provide appropriate interventions, ultimately fostering a supportive environment for vulnerable youth.

Overall, the results highlight the importance of gender-sensitive mental health and nutritional strategies, paving the way for more personalized and effective health solutions to assist refugee adolescents in overcoming these challenges.

#### Abbreviations

| | |
|---|---|
| ED | Eating disorder |
| AN | Anorexia nervosa |
| BN | Bulimia nervosa |
| BED | Binge eating disorder |
| DSM | 5-Diagnostic and statistical manual of mental disorders, fifth edition |
| BMI | Body mass index |
| WC | Waist circumference |
| EAT | 26-Eating attitudes test-26 |
| OR | Odds ratio |

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#### Author contributions

BD conceptualized and designed the study, supervised the data collection and analyzed the data. BD and AH drafted the manuscript and AH critically revised the manuscript for important intellectual content. All authors read, commented on, and approved the final manuscript, agreeing to be accountable for all aspects of the work.

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#### Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

## Declarations

#### Ethics approval and consent to participate

Ethical approval for the study protocol was obtained from the Institutional Review Board (IRB) (Ref: 16, Nov. 2019) at An-Najah National University (ANNU). The study was conducted by the ethical standards outlined in the Declaration of Helsinki. Before the study, written informed consent was obtained from the parents on behalf of the children and from the children themselves. The participants were assured that their participation was voluntary, that their contributions were highly valued, and that they could either assent to or dissent from participation. All the collected data were kept confidential. During data analysis and presentation, coded numbers were used instead of names to protect anonymity. The interviews were conducted privately to ensure comfort and encourage honest responses. To reduce the stigma associated with discussing mental health and eating behaviors, the interviewers used nonjudgmental, culturally sensitive language. The participants were informed that the study aimed to understand adolescent well-being better and that their responses would not be used to diagnose or label them in any way. The EAT-26 has been reproduced with permission. Garner et al. (1982) [26].

#### Consent for publication

Not applicable.

#### Competing interests

The authors declare no competing interests.

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