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Differences in the associations between body dissatisfaction and eating outcomes by gender? A Lebanese population study

Différences dans les associations entre l'insatisfaction corporelle et les troubles alimentaires selon le sexe ? Une étude sur la population Libanaise

Maha Zakhour¹, Chadia Haddad^{2,3}, Hala Sacre^{4,5}, Christina Tarabay⁶, Rouba Karen Zeidan^{4,7,8}, Marwan Akel^{4,9}, Rabih Hallit⁶, Nelly Kheir¹⁰, Sahar Obeid^{2,4,11,*}, Pascale Salameh^{4,12,13,*}, Souheil Hallit^{4,6,*}

1 Faculty of Science, Lebanese University, Fanar, Lebanon

2 Research Department, Psychiatric Hospital of the Cross, Jal Eddib, Lebanon

3 INSERM, Univ. Limoges, CHU Esquirol, IRD, U1094 Tropical Neuroepidemiology, Institute of Epidemiology and Tropical Neurology, GEIST, Limoges, France.

4 INSPECT-LB: Institut National de Santé Publique, Epidemiologie Clinique et Toxicologie, Beirut, Lebanon

5 Drug Information Center, Order of Pharmacists of Lebanon, Beirut, Lebanon

6 Faculty of Medicine and Medical Sciences, Holy Spirit University of Kaslik (USEK), Jounieh, Lebanon

7 CERIPH: Center for Research in Public Health, Pharmacoepidemiology Surveillance Unit, Faculty of Public Health, Lebanese University, Fanar, Lebanon.

8 Faculty of Public Health, Lebanese University, Fanar, Lebanon

9 School of Pharmacy, Lebanese International University, Beirut, Lebanon

10 Faculty of Pedagogy, Holy Family University, 5534 Batroun, Lebanon

11 Faculty of Arts and Sciences, Holy Spirit University of Kaslik (USEK), Jounieh, Lebanon

12 Faculty of Pharmacy, Lebanese University, Hadat, Lebanon

13 Faculty of Medicine, Lebanese University, Hadat, Lebanon

***Last co-authors**

Corresponding author: Chadia Haddad. Psychiatric Hospital of the Cross, P.O. Box 60096, Jall-Eddib, Lebanon. Cell: +96103240119. Email address: Chadia_9@hotmail.com Souheil Hallit. Building 560, Street 8, Biakout, Lebanon. Cell: +96171199660. Email address: souheilhallit@hotmail.com and Sahar Obeid. Psychiatric Hospital of the Cross, P.O. Box 60096, Jall-Eddib, Lebanon. Cell: +96170235248. Email address: saharobeid23@hotmail.com

Abstract

Background: The objective of this study was to evaluate the impact of the interaction between body dissatisfaction and gender on eating disorders (restrained eating, binge eating, orthorexia nervosa, and emotional eating) among a sample of Lebanese adults.

Methods: This cross-sectional study, conducted between January and May 2018, enrolled 811 participants selected randomly from all Lebanese Mohafazat. The mean age of the participants was 27.6 ± 11.8 years. The majority were females (66.5%), had a high level of education (73.2%), and low income (77.9%). This study used the following scales: body dissatisfaction subscale of the Eating Disorder Inventory-second version, binge eating scale, Dutch restrained eating scale, orthorexia nervosa scale (ORTHO-15 scale), emotional eating scale, perceived stress scale, Hamilton Anxiety Rating Scale, and Hamilton Depression Rating Scale.

Results: Body dissatisfaction was positively correlated to restrained eating ($r=0.293$, $p<0.001$), emotional eating ($r=0.073$, $p=0.042$) and binge eating ($r=0.250$, $p<0.001$). The interaction between body dissatisfaction and gender was significantly associated with more restrained eating (Beta=0.01, $p<0.001$) and orthorexia nervosa (Beta=-0.09, $p<0.001$), but not with emotional (Beta=-0.43, $p=0.103$) and binge eating (Beta=-0.08, $p=0.358$). When stratifying the analysis by gender, the results revealed that higher body dissatisfaction was significantly associated with more restrained eating in both genders, but particularly among women. Body dissatisfaction was significantly associated with higher emotional eating in men only and with higher orthorexia nervosa tendencies and behaviors in females only

Conclusion. The interaction between body dissatisfaction and gender was significantly associated with orthorexia nervosa and restrained eating but not with binge or emotional eating. Higher body dissatisfaction was significantly associated with higher restrained eating, more pronounced in women, while it was significantly associated with higher orthorexia tendencies (lower ORTO-15 scores) in women only. Body dissatisfaction was associated with emotional eating in men only.

Keywords: restrained eating; binge eating; orthorexia nervosa; body dissatisfaction; gender.

Résumé

Contexte : L'objectif de cette étude était d'évaluer les différences dans l'association entre l'insatisfaction corporelle et les troubles alimentaires selon le sexe (restriction alimentaire, hyperphagie boulimique, orthorexie nerveuse et alimentation émotionnelle) dans un échantillon d'adultes libanais.

Méthodes : Une étude transversale a été menée entre janvier et mai 2018 et a recruté 811 participants sélectionnés aléatoirement dans les régions libanaises. L'âge moyen des participants était de $27,6 \pm 11,8$ ans. La majorité étaient des femmes (66,5%), avaient un niveau d'éducation élevé (73,2%) et un faible revenu (77,9%). Les échelles suivantes ont été utilisées : la sous-échelle d'insatisfaction corporelle de la deuxième version de l'inventaire des troubles de l'alimentation, l'échelle de consommation excessive, l'échelle de restriction alimentaire, l'échelle d'orthorexie, l'échelle d'alimentation émotionnelle, l'échelle de stress, l'échelle d'évaluation de l'anxiété et l'échelle d'évaluation de la dépression.

Résultats : L'insatisfaction corporelle était positivement corrélée à une alimentation restreinte ($r = 0,293$, $p < 0,001$), une alimentation émotionnelle ($r = 0,073$, $p = 0,042$) et à l'hyperphagie boulimique ($r = 0,250$, $p < 0,001$). L'interaction entre l'insatisfaction corporelle et le sexe était significativement associée à une alimentation plus restreinte (Beta = 0,01, $p < 0,001$) et à l'orthorexie (Beta = -0,09, $p < 0,001$), mais n'était pas associée à une alimentation émotionnelle (Beta = -0,43, $p = 0,111$) ni à l'hyperphagie boulimique (Beta = -0,08, $p = 0,358$). L'analyse stratifiée en fonction du sexe a montré qu'une insatisfaction corporelle plus élevée était significativement associée à une alimentation plus restreinte dans les deux sexes, particulièrement chez les femmes. L'insatisfaction corporelle était significativement associée à une alimentation émotionnelle plus élevée chez les hommes seulement, tandis qu'elle était associée de manière significative à plus de tendances et de comportements orthorexiques chez les femmes uniquement.

Conclusion : L'interaction entre l'insatisfaction corporelle et le sexe était associée de manière significative à l'orthorexie nerveuse et à une alimentation restreinte, mais pas à une hyperphagie boulimique ou à une alimentation émotionnelle. L'analyse stratifiée par sexe a montré qu'une insatisfaction corporelle plus élevée était significativement associée à une alimentation plus restreinte, plus prononcée chez les femmes, alors qu'elle était significativement associée à des tendances à l'orthorexie plus élevées chez les femmes uniquement. L'insatisfaction corporelle était associée à l'alimentation émotionnelle chez les hommes uniquement.

Mots clés : restriction alimentaire; hyperphagie boulimique; orthorexie nerveuse; insatisfaction corporelle; sexe.

Background

Eating disorders (ED) are known as chronic eating patterns or behavioral disruptions intended to regulate weight that significantly impairs psychosocial and physical functioning [1]. Anorexia nervosa, bulimia nervosa, binge eating disorder (BED), and other specified or unspecified feeding or ED like orthorexia nervosa (ON) [2] are recognized as ED by the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5) [3, 4]. Individuals with ED have disordered eating but not all those with disordered eating have an ED [2]. Disordered eating behaviors are typically not considered a mental illness but rather a risk factor or a symptom of an ED, where people of all genders showed an abnormal or unnatural eating habit. These types of behaviors might be due to biological, environmental, or cultural factors, which lead to an obsession with food and body weight [5]. Individuals with disordered eating will not express the psychological characteristics typically associated with clinical cases of an ED [5]. The DSM-V states that a mental illness is conceptualized as a clinically relevant behavioral or psychological condition that occurs in persons and is associated with distress, discomfort, or disability [6]. This study will address four types of ED, i.e., restrained eating, emotional eating, binge eating, and ON.

Restrained eating or dietary restraint not only refers to the effort of reducing the calorific intake but also reducing the consumption of certain macronutrients, like carbohydrates or fats, followed by occasional overeating behavior. Generally, it is interchangeably used with dieting, but it is worth noting that not all restrained eaters can be considered as dieters; they can be referred to as weight watchers or people concerned about their food intake [7]. Another ED is binge eating characterized by a lack of control over the amount of food consumed, where the individual eats large amounts of food rapidly until discomfort, resulting in feelings of shame and disgust after each episode. Another unspecified ED, which has seen a rise lately due to the focus on healthy eating and dieting is ON, characterized by taking diet and healthy eating to the extreme until it starts interfering with the individual's life, leading to malnutrition and anxiety [8].

ED affect both men and women, but little is known about gender differences in the psychopathology of ED. The majority of studies are usually conducted among young women, with females representing 90-95% of the ED patients, while 5% to 15% are males [9]. Experimentally, research has demonstrated that women are more prone to restraint eating due to the greater body shame they feel [10]; this gender difference may be due to the societal upbringing of girls and the perfect image created by advertisers [11]. Some studies showed that BED is more common among women [12, 13] and that it is associated with self-efficacy, weight control, and depression [14-16]. As for ON, it was comparable between the genders, although tendencies toward pathologically healthful eating are more pronounced in women [17].

ED are associated with different psychological, personality characteristics (negative emotionality/perfectionism, neuroticism, and negative urgency) and sociocultural factors (media exposure, thin-

ideal internalization, pressures for thinness, and thinness expectancies) [18]. One of these characteristics is body dissatisfaction [19, 20], a robust predictor of ED [21-23]. It consists of the negative thoughts that people of all genders develop regarding their own body [24]. Those thoughts are primarily due to cultural influence through family, friends/acquaintances, and from the Hollywood depiction of bodies along with the ever-growing effect of social media [25]. Different studies showed that patients with ED had higher levels of body dissatisfaction compared to others [20]; indeed, body dissatisfaction was positively related to restrained eating [26]. Also, higher rates of BED are correlated with the overvaluation of shape and weight [27, 28]. Some studies demonstrated that ON, recently added to ED, was associated with body image concerns [29, 30], while others reported the absence of this correlation [31, 32]. Females have more body dissatisfaction than males [33, 34]. Body Mass Index (BMI) and body dissatisfaction were positively associated in women, while in men, this relationship is more intricate; whatever the BMI, the level of body dissatisfaction can be high [35]. A longitudinal study showed that body dissatisfaction and BMI were the predictors of ED in girls, whereas low social support and BMI were the predictors of ED in boys [36]. The relationship between body dissatisfaction and BMI differs by gender [37]. Women internalize the ideal image from fashion magazines, while men base their ideal image on fitness magazines [38]. Briefly, women seek more to be thin while men look more to be muscular, resulting in higher body dissatisfaction [39]. When exposed to a slim model, women may feel shame and anxiety about not looking similar. Men feel pressure from the media regarding their body image, leading to lower self-esteem [40] and higher body dissatisfaction [41]. This influence can lead individuals to focus on changing their body type using unhealthy practices of food and exercises, which can lead to more intense adverse emotions of disappointment, shame, and guilt, in addition to putting them at higher risk of developing ED [25]. Many discrepancies in the findings of studies addressing this topic showed that the cultural differences in ED still require more research to understand gender and cultural differences [42]. A prominent cultural concern with weight loss and dieting exists in Lebanon [43]. Lebanese media, similar to Western cultures, promotes the culture of “thinness” and “perfection”. A study among students showed that Lebanese are more sensitive than Cypriots to the media, which encourages them to eat less and exercise more, to become slimmer or more muscular [44]. They are also more sensitive to peer opinions and fear social judgment. Moreover, Lebanese females are more concerned with their body size compared to their Cypriot peers [44].

Emotional eating is the “propensity to eat in response to positive and negative emotions” [45]. Negative feelings like anxiety, depression, anger, loneliness, body dissatisfaction, and other psychopathology factors can lead to emotional eating, known as overeating in response to negative emotions [46]. Emotional eating is a triggering factor of ED like bulimia nervosa and binge eating disorder [47, 48]. It is also a mediator between depression and weight gain and a predictor for a high BMI. Emotions (negative affect) and behaviors (dietary restraint) act as mediators between body dissatisfaction and ED [49]. On multiple occasions, ED can be accompanied by other psychiatric

disorders, which alters the effect on the mental and physical state of individuals. If treatment is not individualized to relieve both physical and emotional symptoms, more severe conditions can develop, such as life-threatening heart problems [5].

To our knowledge, previous studies have focused either on the impact of gender on body dissatisfaction or on ED [50-52]. Body dissatisfaction and how it affects and predicts ED were extensively explored [8]. However, no studies have yet demonstrated the effect of the interaction between gender and body dissatisfaction on ED. In light of the importance given to body dissatisfaction as a public health problem and the lack of studies assessing ED by gender in Lebanon compared to other countries, the objective of this study was to evaluate the effect of the interaction between body dissatisfaction and gender on ED (restrained eating, BED, ON, and emotional eating) among a sample of adults of the general Lebanese population.

Methods

Participants

This cross-sectional study conducted between January and May 2018 enrolled 811 participants selected randomly from all Lebanese Mohafazat (Beirut, Mount Lebanon, North, South, and Beqaa). Out of the 1000 questionnaires distributed, 811 (81.1%) were completed and collected back. In each Caza (a division of the Mohafaza), two villages were randomly selected from the list provided by the Central Agency of Statistics in Lebanon. All participants above 18 years of age were eligible to participate. The study excluded those with a clinical mental impairment affecting cognition and their ability to comprehend participation or to answer the questionnaire, as reported by a family member. In each selected village, the questionnaire was randomly distributed to the households, where all eligible members were invited to participate by completing the questionnaire via a face-to-face interview. Participants were briefed on the objectives and methodology and were guaranteed the anonymity of their participation before enrollment. They had the right to accept or refuse to participate and received no financial compensation in exchange for participation. Those who agreed to participate were asked to read and sign the written informed consent form. The methodology used in this study is similar to those used in previous papers [53-55].

Procedure

Data collection was performed through personal interviews with participants by two well-trained, study-independent personnel. The questionnaire was in Arabic, the native language of Lebanon, and included closed-ended questions.

Questionnaire

The questionnaire consisted of two parts. The first part assessed the sociodemographic features and health behaviors of participants. The questions gathered data about age, gender, marital status, educational level, monthly income, divided into no income, low (less than 1000 USD), intermediate

(between 1000 and 2000 USD), and high (2000 USD and more). On the time of the data collection, it was considered that 1 USD = 1500 LBP (Lebanese Pound).

Self-reported weight and height were used to calculate the BMI (Kg/m^2). The family history of close family members with diagnosed ED was categorized into dichotomous variables (yes/no).

The second part of the questionnaire included the following scales:

Dutch Restrained Eating Scale

The Dutch restrained eating scale recently validated in Lebanon [56] is a 10-item tool rated on a 5-point Likert scale from 1 (never) to 5 (always), used to assess the frequency of dieting behaviors [57]. Examples of items: “When you have put on weight, do you eat less than you usually do?”, “How often do you refuse food or drink offered because you are concerned about your weight?”, “How often do you try not to eat between meals because you are watching your weight?”, “Do you take into account your weight with what you eat?”. The score is calculated by dividing the sum of all responses by the number of items [57]. Higher scores indicate higher restrained eating (Cronbach’s $\alpha=0.896$).

Emotional eating scale (EES)

The EES recently validated in Lebanon [58] consists of 25 items, with three derived subscales: anger, anxiety, and depression. Participants rate the extent to which certain feelings lead to the urge to eat, using a 5-point Likert scale from 0 (no desire to eat) to 4 (an overwhelming urge to eat). Examples of emotion-related items: “discouraged”, “excited”, “jealous”, “frustrated”. The total score was calculated by summing all the items, with the highest possible score being 100. Participants are then divided into three categories, according to their score: a healthy relationship with the food (0-25), reliance on food to help manage emotions, probably impacting the quality of life (25-46), and very significant reliance on using food to help manage emotions, which may risk the long-term health (47-100) [46] (Cronbach’s $\alpha=0.957$).

ORHTO-15

The ORHTO-15, recently validated in Lebanon [59], is a 15-item multiple-choice self-reported scale used to assess orthorexia nervosa [60]. It uses a 4-point Likert scale (never, sometimes, often, and always). Example of items: “When eating, do you pay attention to the calories of the food?”, “Are your eating choices conditioned by your worry about your health status?”, “Do you think your mood affects your eating behavior?”, and “Do you think that on the market there is also unhealthy food?”. The total score was calculated by summing all the items. The lower the scores, the higher the levels of orthorexia tendencies and behaviors (Cronbach’s $\alpha=0.853$).

Binge Eating Scale (BES)

The BES, validated in Lebanon [61] and initially developed to identify binge eating behavior in obese people [62], is a 16-item self-report questionnaire widely used to identify compulsive eaters. It does not specify a time frame and presents a series of differently weighted statements for each item, from which respondents select one of three or four response options describing best their attitudes and

behaviors, coded zero to two or three, respectively. Example of items: “I don’t feel self-conscious about my weight or body size when I’m with others”, “I don’t have any difficulty eating slowly in the proper manner”, “I feel capable to control my eating urges when I want to”, “I’m usually physically hungry when I eat something”. The sum of responses yields a continuous measure of BED pathology from 0-46. Scores of ≥ 27 are considered a cutoff value for identifying severe BED, while values below 17 indicate mild or no BED [63] (Cronbach’s $\alpha=0.836$).

Body dissatisfaction subscale of the Eating Disorder Inventory-second version (EDI-2)

The body dissatisfaction subscale of the EDI-2 is used to evaluate the level of dissatisfaction with the overall body shape and specific body parts. It consists of nine items, measured in 4-point Likert scales, ranging from 0 (sometimes, rarely, never) to 3 (always). Example of items: “I think that my stomach is too big”, “I think that my thighs are too large”, “I feel satisfied with the shape of my body”. The sum of all items yields a total score ranging from 0-27, with higher scores indicating greater body dissatisfaction [64] (Cronbach’s $\alpha=0.743$).

Perceived stress scale (PSS)

The PSS is a 10-item self-report questionnaire widely used to evaluate the perception of stress [65]. It consists of direct questions about current levels of experienced stress during the last month rated on a 5-point Likert scale from never (0) to almost always (4). Example of items: “In the last month, how often have you been upset because of something that happened unexpectedly?”, “In the last month, how often have you felt that you were unable to control the important things in your life?”, “In the last month, how often have you felt that you were on top of things?” and “In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?”. The total score is the sum of the 10 items and ranges from 0-40 [65]. According to the score, perceived stress can be low (0-13), moderate (14-26), and high (27-40) (Cronbach’s $\alpha= 0.709$).

Hamilton Anxiety Rating Scale (HAM-A)

The HAM-A, validated in Lebanon [66], is one of the first scales to measure the severity of perceived anxiety symptoms. The Arabic version of the HAM-A showed good validity and adequate internal consistency (Cronbach’s $\alpha =0.921$). It consists of 14 symptom-defined elements, identifying both psychological and somatic symptoms [67], scored on a Likert scale from 0 (not present) to 4 (severe). Example of items: “Anxious mood”, “Tension”, “fears” and “Insomnia”. The total score, calculated by summing the 14 items, ranges from 0-56, where values below 17 indicate mild severity, 18–24 mild to moderate severity, 25–30 moderate to severe, and 30-54 very severe anxiety (Cronbach’s $\alpha=0.912$).

Hamilton Depression Rating Scale (HAM-D)

The HAM-D is a 21-item tool validated in Lebanon used to assess the severity of depression in patients already diagnosed as depressed [68, 69] by probing mood, feelings of guilt, suicide ideas, insomnia, agitation or retardation, anxiety, weight loss, and somatic symptoms. The total score is calculated by summing the first 17 items and ranges from 0 to a maximum of 52 points. According to

their scores, individuals were classified with no depression (0-7), mild (8-16), moderate (17-23), and severe depression (≥ 24) (Cronbach's alpha was 0.879).

Statistical analysis

Data were analyzed on SPSS software version 25.0. Cronbach's alpha measured the internal consistency and reliability of all the scales. In descriptive analyses, means and standard deviations were presented for continuous variables, while percentages were presented for categorical variables. In the absence of cut-off points for body dissatisfaction, ORTHO-15, and restrained eating scales, the medians were considered as cut-offs between low and high scores. The mean percentage of missing data was less than 5.0% of the database; thus, values were not replaced. Non-parametric tests were used, as the Shapiro Wilk test showed that the four outcome variables (restrained eating, emotional eating, ON, and BED) were not normally distributed. Also, no outliers and residuals were found for the four outcomes. Spearman correlation analyses were used for continuous variables, and Mann-Whitney and Kruskal-Wallis tests for categorical variables with two or more levels to assess the association of variables with the continuous scales. Four stepwise linear regressions were conducted, taking the restrained eating, emotional eating, ON, and BED as the dependent variables and taking gender only, body dissatisfaction only, and the interaction between gender and body dissatisfaction as independent variables (multiplicative interaction analysis). The unstandardized values of the predictor variables were considered for interpretation of the effect of the independent variable on the dependent variable. Afterward, another two stepwise linear regressions were conducted, taking the restraint eating and ON as dependent variables but stratified over gender (stratification analysis). All variables were considered of equal importance to be entered in the regression analysis model. Correlation coefficient values of $|0.1 - 0.23|$, $|0.24 - 0.36|$, and $> |0.37|$ indicate low, intermediate, and high correlations, respectively [70]. Effect sizes of $|0.2 - 0.4|$, $|0.5 - 0.7|$, and $> |0.8|$ indicate small, moderate, and large effects, respectively [70]. In all cases, a value of $p < 0.05$ was considered statistically significant.

Results

Table 1 summarizes the sociodemographic characteristics of the participants. The results showed that the mean age of the participants was 27.6 ± 11.8 years, with 66.5% females.

Table 1 : Sociodemographic characteristics of the study sample (N=811)	
	Frequency (%)
Gender (n=806)	
Male	270 (33.3%)
Female	536 (66.1%)
Missing data	5 (0.6%)
Marital status (n=796)	
Single/widowed/divorced	566 (69.8%)
Married	230 (28.4%)
Missing data	15 (1.8%)
Education level (n=784)	

Primary	24 (3.0%)
Complementary	61 (7.5%)
Secondary	125 (15.4%)
University	574 (70.8%)
Missing data	27 (3.3%)
Monthly income* (n=774)	
No income	340 (41.9%)
Low income < 1000 USD	247 (30.5%)
Intermediate 1000 – 2000 USD	117 (14.4%)
High > 2000 USD	70 (8.63%)
Missing data	37 (4.57%)
Family history of eating disorders (n=807)	
Yes	170 (21.0%)
No	637 (78.5%)
Missing data	4 (0.5%)
Mean ± SD	
Age (in years) (n=806)	27.59 ± 11.76
Body Mass Index (kg/m²) (n=785)	24.35 ± 5.28
*Monthly income: 1 USD = 1500 LBP (Lebanese Pound)	

Table 2 describes the scales used in this study. Of the total number of participants, 391 (48.3%) had high scores of restrained eating, and 386 (47.8%) had high scores of body dissatisfaction. The results of the EES showed that 35.6% had a healthy relationship with the food, 32% relied on food to help manage their emotions, and 32.4% had a very significant reliance on using food to help manage their emotions. As for the BES, 84.4% had no binge eating, 13.8% had mild binge eating, and 1.8% had severe binge eating. Moreover, the results showed that 15.5%, 76.5%, and 7.9% had low, moderate, and high perceived stress, respectively. Regarding the anxiety scale, 76% had no anxiety, 12.3% had mild anxiety, 7.1% had moderate anxiety, and 4.6% had severe anxiety. As for the depression scale, 58.7% had no depression, 27.7% had mild depression, 7.7% had moderate depression, and 5.9% had severe depression.

	Median	Mean	SD	Minimum	Maximum
Restrained eating scale	2.60	2.55	0.96	0.50	5.00
Emotional eating scale (EES)	34.00	35.16	20.22	0.00	100.00
Orthorexia Nervosa (ORTHO – 15 scale)	38.00	37.50	4.32	18.00	49.00
Binge eating scale (BES)	7.00	8.96	7.64	0.00	43.00
Body dissatisfaction scale	11.00	10.70	5.77	0.00	27.00
Perceived stress scale (PSS)	19.00	18.72	5.82	0.00	39.00
Anxiety scale (HAM-A)	9.00	11.28	9.93	0.00	50.00
Depression scale (HAM-D)	6.00	7.98	7.76	0.00	42.00

Bivariate analysis

More restrained eating was significantly associated with female gender, married status, a high monthly income (>2000 USD), and a positive family history of eating disorders, while higher emotional eating was significantly associated with a positive family history of ED. ON tendencies and behaviors (lower ORTHO-15 scores) were significantly associated with male gender and a positive

family history of ED. Furthermore, higher binge eating was significantly associated with an intermediate monthly income and a positive family history of ED.

A moderate positive correlation was found between body dissatisfaction and restrained eating ($r=0.293$; $p<0.001$), while a weak positive correlation was found between age ($r=0.136$; $p<0.001$), BMI ($r=0.238$; $p<0.001$) and restrained eating. A weak positive correlation was found between body dissatisfaction ($r=0.073$; $p=0.042$), anxiety ($r=0.076$, $p=0.035$), and emotional eating. However, a weak negative correlation was found between age and emotional eating ($r=-0.088$; $p=0.015$). A weak negative correlation was found between depression and ORTHO-15 scores ($r=-0.110$; $p=0.002$). A strong positive correlation was found between depression ($r=0.402$; $p<0.001$) and BED. A moderate positive correlation was found between body dissatisfaction ($r=0.250$; $p<0.001$), anxiety ($r=0.359$; $p<0.001$), and BED. A weak positive correlation was found between BMI ($r=0.189$; $p<0.001$), stress ($r=0.191$; $p<0.001$), and BED (Table 3).

Table 3. Bivariate analysis of factors associated with eating disorders.				
	Restrained eating	Emotional eating	Orthorexia nervosa	Binge eating
	Mean \pm SD	Mean \pm SD	Mean \pm SD	Mean \pm SD
Sociodemographic factors				
Gender				
Male	2.35 \pm 0.93	36.48 \pm 21.38	38.17 \pm 4.19	9.10 \pm 7.84
Female	2.65 \pm 0.97	34.37 \pm 19.60	37.14 \pm 4.37	8.92 \pm 7.5
<i>P</i>	<0.001	0.190	0.002	0.964
Effect Size d_{Cohen}	0.285	0.095	0.221	0.003
Marital status				
Single	2.49 \pm 0.98	35.60 \pm 20.49	37.57 \pm 4.30	8.65 \pm 7.43
Married	2.71 \pm 0.92	34.05 \pm 19.54	37.39 \pm 4.20	9.75 \pm 8.10
<i>P</i>	0.004	0.338	0.288	0.119
Effect Size d_{Cohen}	0.202	0.069	0.076	0.112
Education level				
Primary	2.67 \pm 1.03	33.74 \pm 16.88	38.95 \pm 3.66	13.04 \pm 9.37
Complementary	2.51 \pm 0.85	35.18 \pm 20.53	37.26 \pm 4.38	8.65 \pm 6.86
Secondary	2.56 \pm 0.98	34.57 \pm 19.97	37.69 \pm 4.27	9.96 \pm 8.25
University	2.55 \pm 0.97	35.11 \pm 20.23	37.45 \pm 4.34	8.65 \pm 7.44
<i>P</i>	0.914	0.969	0.510	0.071
Effect Size d_{Cohen}	0.02	0.012	0.05	0.09
Monthly income*				
No income	2.49 \pm 0.98	34.85 \pm 20.04	37.53 \pm 4.17	9.45 \pm 7.64
<1000 USD	2.51 \pm 0.97	36.59 \pm 20.99	37.63 \pm 4.46	7.67 \pm 7.07
1000-2000 USD	2.74 \pm 0.92	33.85 \pm 20.97	37.50 \pm 4.32	9.64 \pm 8.85
>2000 USD	2.80 \pm 0.83	34.83 \pm 17.40	37.86 \pm 4.05	9.26 \pm 7.75
<i>P</i>	0.022	0.656	0.809	0.028
Effect Size d_{Cohen}	0.091	0.038	0.014	0.088
Psychological and eating disorders risk factors				
Family history of eating disorders				
	Mean \pm SD	Mean \pm SD	Mean \pm SD	Mean \pm SD
No	2.47 \pm 0.97	33.88 \pm 19.93	37.73 \pm 4.23	8.17 \pm 7.33
Yes	2.85 \pm 0.90	39.74 \pm 20.60	36.77 \pm 4.45	11.86 \pm 8.09
<i>P</i>	<0.001	0.001	0.019	<0.001
Effect Size d_{Cohen}	0.305	0.243	0.167	0.397
	Correlation coefficient	Correlation coefficient	Correlation coefficient	Correlation coefficient
Age	0.136	-0.088	-0.017	-0.066

<i>P</i>	<0.001	0.015	0.636	0.067
BMI	0.238	0.042	-0.020	0.189
<i>P</i>	<0.001	0.249	0.578	<0.001
Body dissatisfaction	0.296	0.088	-0.082	0.245
<i>P</i>	<0.001	0.015	0.021	<0.001
Anxiety	0.018	0.067	0.045	0.344
<i>P</i>	0.612	0.063	0.206	<0.001
Depression	0.019	0.066	-0.065	0.399
<i>P</i>	0.590	0.067	0.070	<0.001
Stress	0.004	0.032	-0.017	0.194
<i>P</i>	0.917	0.368	0.633	<0.001
* Monthly income: 1 USD = 1500 LBP (Lebanese Pound). Post hoc analysis: Binge eating: monthly income (no income vs <1000 USD p=0.038). Values marked in bold were significant.				

Multivariate analysis

The interaction between body dissatisfaction and gender (B=0.01), higher BMI (B=0.02), an intermediate (B=0.28) and high (B=0.34) income, and a positive family history of ED (B=0.19), were significantly associated with more restrained eating (Table 4, Model 1).

A positive family history of ED (B=4.81) and higher body dissatisfaction (B=0.91) were significantly associated with more emotional eating. Older age (B=-0.19) was significantly associated with lower emotional eating (Table 4, Model 2).

The interaction between body dissatisfaction and gender (B=-0.09) was significantly associated with lower ORTHO-15 scores (more orthorexia tendencies and behaviors), while higher body dissatisfaction (B=0.12) was significantly associated with higher ORTHO-15 scores (Table 4, Model 3).

Higher depression (B=0.29), higher body dissatisfaction (B=0.35), higher anxiety (B=0.10), BMI (B=0.16) and a positive family history of ED compared to not (B=1.47) were significantly associated with more binge eating. A low income (as compared to no income) was significantly associated with lower binge eating (B=-1.71) (Table 4, Model 4).

Table 4. Multivariate analysis.					
Model 1: Linear regression taking the restrained eating score as the dependent variable.					
	Unstandardized Beta	Standardized Beta	<i>p</i>	95% Confidence Interval	
Interaction body dissatisfaction-gender	0.01	0.17	<0.001	0.002	0.045
Gender (females vs males*)	0.23	0.11	0.113	-0.05	0.51
Body dissatisfaction	0.01	0.08	0.492	-0.02	0.05
BMI	0.02	0.10	0.005	0.006	0.03
Low vs no* income	-0.02	-0.01	0.791	-0.16	0.12
Intermediate vs no* income	0.28	0.10	0.006	0.08	0.48
High vs no* income	0.34	0.08	0.019	0.05	0.63
Family history of eating disorders (yes vs no*)	0.19	0.08	0.016	0.03	0.35
Marital status (Married vs single*)	-0.05	-0.02	0.566	-0.23	0.13

Age	0.006	0.06	0.124	-0.02	0.01
Variables entered in the models: gender, body dissatisfaction, marital status, monthly income, age, BMI, family history of eating disorders and interaction between gender and body dissatisfaction. Adjusted R ² =0.143, p-value<0.001.					
Model 2: Linear regression taking the emotional eating score as the dependent variable.					
Variable	Unstandardized Beta	Standardized Beta	<i>p</i>	95% Confidence Interval	
Interaction body dissatisfaction-gender	-0.43	-0.24	0.103	-0.96	0.08
Gender (females vs males*)	2.45	0.05	0.449	-3.91	8.82
Body dissatisfaction	0.91	0.26	0.043	0.03	1.85
Family history of eating disorders (yes vs no*)	4.81	0.09	0.010	1.17	8.45
Age	-0.19	-0.11	0.003	-0.32	-0.06
BMI	0.29	0.07	0.067	-0.02	0.60
Variables entered in the models: gender, body dissatisfaction, age, BMI, family history of eating disorders and interaction between gender and body dissatisfaction. Adjusted R ² =0.032, p-value<0.001.					
Model 3: Linear regression taking the Orthorexia nervosa scale (ORTHO-15) as the dependent variable.					
Variable	Unstandardized Beta	Standardized Beta	<i>p</i>	95% Confidence Interval	
Interaction body dissatisfaction-gender	-0.09	-0.25	<0.001	-0.15	-0.04
Gender (females vs males*)	-0.02	-0.003	0.966	-1.38	1.32
Body dissatisfaction	0.12	0.17	0.049	0.001	0.21
BMI	-0.03	-0.04	0.355	-0.09	0.03
Family history of eating disorders	-0.58	-0.05	0.134	-1.35	0.18
Variables entered in the models: gender, BMI, body dissatisfaction, family history of eating disorders and interaction between gender and body dissatisfaction. Adjusted R ² =0.020, p-value=0.001.					
Model 4: Linear regression taking the binge eating score as the dependent variable.					
Variable	Unstandardized Beta	Standardized Beta	<i>P</i>	95% Confidence Interval	
Interaction body dissatisfaction-gender	-0.08	-0.12	0.358	-0.26	0.09
Gender (females vs males*)	0.29	0.01	0.785	-1.84	2.44
Body dissatisfaction	0.35	0.27	0.026	0.04	0.66
Depression	0.29	0.30	<0.001	0.21	0.37
Anxiety	0.10	0.13	0.001	0.03	0.16
Perceived stress	0.01	0.009	0.809	-0.08	0.10
BMI	0.16	0.11	0.002	0.05	0.26
Family history of eating disorders (yes vs no*)	1.47	0.07	0.019	0.23	2.70
Low vs no* income	-1.71	-0.10	0.002	-2.81	-0.60
Intermediate vs no* income	-0.16	-0.08	0.822	-1.64	1.30
High vs no* income	-1.06	-0.03	0.329	-3.21	1.08
Complementary vs primary* level of education	-0.84	-0.03	0.531	-3.48	1.79
Secondary vs primary* level of education	0.82	0.03	0.493	-1.52	3.16
University vs primary*	0.36	0.02	0.733	-1.73	2.47

level of education					
Variables entered in the models: gender, body dissatisfaction, educational level, monthly income, BMI, family history of eating disorders, anxiety, depression, stress and interaction between gender and body dissatisfaction. Adjusted R ² =0.245, p-value<0.001 Abbreviation: BMI= Body Mass Index.					
*Reference group.					

When the interaction between body dissatisfaction and gender was significant (restrained eating, ORTO-15 scores) or close to significance (emotional eating, $P \leq 0.103$), a stratified analysis was conducted based on gender (Table 5). The results showed that higher body dissatisfaction was significantly associated with more restrained eating in both genders, but this association was stronger in women (Table 5, Model 1). Body dissatisfaction was significantly associated with higher emotional eating in men only (Table 5, Model 2). More body dissatisfaction was significantly associated with higher orthorexia nervosa tendencies and behaviors (lower ORTHO-15 scores) in women only (Table 5, Model 3).

Table 5. Multivariable analysis stratified by gender.										
Model 1: Linear regression taking the restrained eating score as the dependent variable.										
Variable	Male gender					Female gender				
	UB	SB	p	95% CI		UB	SB	p	95% CI	
Body dissatisfaction	0.03	0.18	0.003	0.01	0.05	0.05	0.28	<0.001	0.03	0.06
Family history of eating disorders (yes vs no*)	0.39	0.17	0.007	0.11	0.68	0.12	0.05	0.229	-0.07	0.32
Intermediate vs low* income	0.34	0.15	0.037	0.02	0.67	0.36	0.12	0.005	0.11	0.61
BMI	0.02	0.15	0.019	0.004	0.04	0.02	0.11	0.023	0.003	0.04
High vs low* income	0.38	0.14	0.021	0.06	0.71	0.23	0.04	0.322	-0.23	0.70
Marital status (Married vs single*)	0.002	0.001	0.991	-0.30	0.31	-0.09	-0.04	0.398	-0.32	0.13
Age	-0.003	-0.04	0.577	-0.01	0.008	0.01	0.11	0.036	0.001	0.019
Variables entered in the models: body dissatisfaction, marital status, monthly income, age, BMI and family history of eating disorders. Adjusted R ² =0.130, p<0.001 of the male model. Adjusted R ² =0.123, p-value<0.001 of the female model.										
Model 2: Linear regression taking the emotional eating scale as the dependent variable.										
	Male gender					Female gender				
	UB	SB	p	95% CI		UB	SB	p	95% CI	
Body dissatisfaction	0.59	0.16	0.011	0.14	1.04	0.03	0.009	0.858	-0.29	0.35
Family history of eating disorders (yes vs no*)	1.81	0.03	0.599	-4.97	8.60	7.03	0.15	0.001	2.93	11.13
Variables entered in the models: body dissatisfaction, age, BMI and family history of eating disorders. Adjusted R ² =0.033, p=0.016 of the male model. Adjusted R ² =0.025, p-value=0.003 of the female model.										
Model 3: Linear regression taking the Orthorexia nervosa scale (ORTHO-15) as the dependent variable.										
Variable	Male gender					Female gender				
	UB	SB	p	95% CI		UB	SB	p	95% CI	
Body dissatisfaction	0.018	0.024	0.713	-0.079	0.115	-0.09	-0.12	0.006	-0.16	-0.03
BMI	-0.007	-0.01	0.887	-0.105	0.091	-0.05	-0.05	0.228	-0.13	0.03
Family history of eating disorders (yes vs no*)	-1.36	-0.12	0.050	-2.735	0.003	-0.38	-0.03	0.423	-1.32	0.55
Variables entered in the models: body dissatisfaction, BMI and family history of eating disorders. Adjusted R ² =0.005, p-value=0.015 of the male model. Adjusted R ² =0.014, p-value=0.019 of the female model.										

*Reference group; UB=Unstandardized Beta; SB=Standardized Beta; CI=Confidence Interval; BMI=Body Mass Index.

Discussion

This study examined the effect of the interaction between body dissatisfaction and gender on ED (restrained eating, BED, ON, and emotional eating). The interaction between body dissatisfaction and gender was significantly associated with more restrained eating and ON but not with emotional eating and BED. The interaction between body dissatisfaction and gender was significant with restrained eating and ORTHO-15 scores. The stratified analysis based on gender showed that higher body dissatisfaction was significantly associated with more restrained eating in both genders but this association was stronger in women. Body dissatisfaction was significantly associated with more ON tendencies and behaviors (lower ORTHO-15 scores) in women only.

Interaction between body dissatisfaction and gender

The interaction between body dissatisfaction and gender seen in restraint eating and ON highlights the importance of the gender effect. Lebanese women are more prone to lose weight, eat less, and have a body image concern [43, 44]. Previous studies reported that women with weight dissatisfaction were more predisposed to restraint diet than men [71]. Indeed, gender had a different effect on body satisfaction, with women dieters reporting lower life satisfaction and more food restrictions compared to men [72]. Disordered eating in women tends to be linked to a perceived and not tangible overweight while dieting in men appears to be related to actual weight. Women overestimate their weight, contrary to men who underestimate it thus, attempting less to lose weight [73]. A recent study showed that weight dissatisfaction and weight loss diets were more prevalent in women, while binge eating was equally present in both genders [74].

Further studies are necessary to evaluate and to understand the feelings and perceptions of body image according to gender and age and how these factors affect ED. If body dissatisfaction increases with gender and age, it will affect the physical and psychological health of the individual [75].

Restraint eating

The results showed that higher body dissatisfaction was significantly associated with more restrained eating in both genders, consistent with other studies reporting the association between weight concern and body dissatisfaction with restrained eating among males and females [33, 76, 77], more pronounced in women. Restraint eating seems to affect women more than men, as the latter control their weight by exercising [78, 79]. Other variables were also associated with restraint eating, such as BMI, income, and family history of ED. Higher BMI was significantly associated with more restrained eating, in agreement with previous findings showing that BMI affects eating habits [80], restraint eating in particular [81, 82]. Moreover, participants with a high income had more restrained eating compared to those with low income, in line with previous studies showing that individuals with high restraint eating consumed calorie-reduced and low-fat foods, which are more expensive than other products [83]. Also, a positive family history of ED increased the restraint eating

behavior, consistent with previous findings showing that restraint eating is a heritable behavior [84], with significant parent-child associations [85].

Emotional eating

A positive family history of ED was significantly associated with more emotional eating, in agreement with previous findings [84, 86] showing that children of mothers with a past or current disordered eating had higher levels of emotional eating and global ED symptoms than other children [86]. BMI and body dissatisfaction were also associated with emotional eating. High BMI was positively linked to higher emotional eating. Consistent with previous studies [87, 88], depression, distress, and other factors contribute to emotional eating, leading to a higher BMI. Moreover, body-dissatisfied people have a higher risk of emotional eating [89-91]. Also, improved emotional eating is associated with an enhanced body image [92]. Furthermore, emotional eating was being more associated with body dissatisfaction among men than women. Conversely, previous publications showed that emotional eating and body dissatisfaction were more associated among women than men [93]. Others showed no gender differences in emotional eating: for girls, emotional eating was correlated to anxiety and depression while for men, confused mood was correlated to emotional eating [94]. We should note that the literature discussed more the correlates of emotional eating and eating disorders in females more than males. Indeed, all the results showing that females had more emotional eating than males could be due to the measurement issues. It may depend on what is assessed and how it is asked to detect whether or not males are affected [94].

As eating issues increased in males [95], further studies should be realized to understand the issues and the correlates for emotional and eating disorder.

Orthorexia nervosa (ON)

Our results showed a significant association between the interaction body dissatisfaction-gender and ON, with higher body dissatisfaction significantly associated with higher orthorexia tendencies and behaviors in women only, consistent with previous findings [96-99]. A study among a representative sample of the Lebanese population had shown that higher levels of orthorexia tendencies and behaviors were correlated with the female gender, thinking that eating out is unhealthy, persuading others to follow a diet, starving oneself to lose weight, and increased eating attitude tests scores [53]. However, gender association with ON is still controversial; a recent systematic review concluded that ON tendencies and behaviors are similar between genders, whatever the tool used to measure ON, with pathologically healthful eating being a little more pronounced in women [100]. Furthermore, our results revealed that a positive family history of ED was significantly associated with more ON tendencies and behaviors, consistent with previous research reporting that participants living with

their family were significantly more predisposed to ON [101]. Further studies are needed to confirm this association.

Binge eating

Our study showed that body dissatisfaction, BMI, and a family history of ED were positively associated with BED, in agreement with previous findings showing that individuals with BED reported an over-concern with weight and shape and had a higher BMI [102-106]. BED is a familial disorder [107, 108] likely predicted by maternal or family emphasis on food, shape, and weight [109-111]. Also, BED was positively correlated with depression, anxiety, and stress, in line with previous findings among the Lebanese population. Indeed, negative affect is an essential feature of cognitive-behavioral theories of BED [112, 113].

Limitations

Our study has several limitations. First, its cross-sectional design does not allow to infer causality from the association between body dissatisfaction and ED [25]. Second, our results are not generalizable, and it is warranted to study the effect of body dissatisfaction on ED within the two genders with larger sample size. Third, the body dissatisfaction scale was not validated in Lebanon. Also, an information bias could occur since the questionnaires were collected by an interviewer and not self-reported, thus increasing the risk of social desirability bias [114]. More women than men were included in our survey, reflecting the fact that women are more likely to engage in studies than men [115]. Although the association between the variables and outcomes were significant, a small effect has been detected. Future prospective studies of groups at risk for ED may help in elucidating patterns of familial transmission. Nonetheless, the authors believe that their findings are noteworthy since they are consistent with other recent studies.

Conclusion

The interaction between body dissatisfaction and gender was significantly associated with ON and restrained eating but not binge or emotional eating. Also, the presence of a family history of ED could worsen the ED. The results of the stratification analysis by gender showed that higher body dissatisfaction was significantly associated with higher restrained eating, more pronounced in women, while it was significantly associated with higher orthorexia tendencies (lower ORTHO-15 scores) in women only. Also, body dissatisfaction was associated with emotional eating in men only. Further longitudinal studies are necessary to confirm our findings and explain the association between body dissatisfaction and eating disorders among men and women.

List of abbreviations

ED: Eating disorder

BED: Binge eating disorder

ON: Orthorexia nervosa
BMI: Body mass index
EES: Emotional eating scale
BES: Binge eating scale
PSS: Perceived stress scale
HAM-A: Hamilton anxiety rating scale
HAM-D: Hamilton depression rating scale
DSM-5: Diagnostic and statistical manual of mental disorders, 5th Edition
EDI-2: Eating disorder inventory
BES: Binge eating scale

Declarations

Ethics Approval and Consent to Participate

The Psychiatric Hospital of the Cross Ethics and Research Committee approved this study protocol (HPC-020-2018). A written informed consent was obtained from each participant.

Consent for publication

Not applicable.

Availability of data and materials

All data generated or analyzed during this study are not publicly available to maintain the privacy of the individuals' identities. The dataset supporting the conclusions is available upon request to the corresponding author.

Competing interests

The authors have nothing to disclose.

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Author contributions

MA was responsible for the data collection. SH and SO designed the study; MZ, CH and SH drafted the manuscript; SH, PS and CH carried out the analysis and interpreted the results; CT assisted in drafting; RH, HS, RKZ and NK reviewed the manuscript; HS edited the paper for English language; all authors reviewed the final manuscript and gave their consent; SH and SO were the project supervisors.

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