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Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity (2022) 27:847–851
https://doi.org/10.1007/s40519-021-01184-7

BRIEF REPORT

Orthorexia among patients with eating disorders, student dietitians and general population: a pilot study

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Received: 3 December 2020 / Accepted: 26 March 2021 / Published online: 14 April 2021

Abstract

Purpose Orthorexia is a recent construct describing an unhealthy and extreme concern for healthy food. To date, its relationship with other eating disorders (EDs) remains unclear, and little is known about the development of this condition. Current literature suggests that a thorough knowledge about nutrition and alimentation, as in the case of experts in the field of dietetics, could foster the development of orthorexic tendencies. The aim of this study was to compare orthorexia between ED patients, student dietitians and general population.

Methods A total of 90 female participants (age: 18–29 years) were recruited: 30 ED patients, 30 student dietitians and 30 control subjects, matched for age and sex. Orthorexia, ED-specific and general psychopathology were evaluated using self-report questionnaires (ORTO-15, Eating Disorder Examination Questionnaire and Symptom Checklist-90-Revised).

Results Eating disorder patients had significantly higher orthorexic tendencies than other groups ($p < 0.001$), while student dietitians and general population showed no difference between each other ($p = 0.96$). Moreover, orthorexia positively correlated to ED psychopathology in ED patients ($p = 0.004$), but not in control groups.

Conclusion Our data do not confirm previous suggestions that experts in the field of dietetics may display a higher level of orthorexia.

Level of evidence Level IV, cross-sectional observational study (case series).

Keywords Orthorexia · Eating disorders · Dietitians · Anorexia nervosa · Bulimia nervosa

Introduction

The term "Orthorexia" (coined from Ancient Greek words ὀρθός (right) and ὄρεξις (appetite), literally meaning "correct appetite") was first used by American physician Steven Bratman in 1997 [1] and quickly gathered attention not only among clinicians but also among non-insiders, being now rightfully part of both clinical and common lexicon. According to Bratman, it describes a condition characterized by extreme concern about physical health, specifically focused on healthy food and eventually leading to intrusive thoughts about this topic, self-imposed dietary rules with avoidance of considered-unhealthy foods and time-consuming eating habits (e.g. carefully planning every meal, obsessive searching for healthy food, cooking exclusively in some specific ways or with precise ingredients) [1]. While attention towards the healthiness of food may be considered as a positive attitude, it may also cause subjective distress when too pervasive, even leading to an impairment in social, occupational or educational functioning.

Growing attention about orthorexia has led to the publication of an increasing number of studies that better describe this recent construct, report information about its prevalence and clarify this relationship with other eating disorders (EDs) [2, 3]. Researchers have also developed specific instruments such as ORTO-15 [4], a validated self-report psychometric questionnaire that since its publication has been used by many authors and validated in many languages, being to date the most common instrument used to assess orthorexia [2]. Even so, questions have been raised about the development process of ORTO-15, and psychometric

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properties of this scale and its translations have been frequently criticized [2].

The typical features of orthorexia partially overlap with the psychopathological core of other EDs, such as anorexia nervosa (AN), bulimia nervosa (BN) and restricting/avoidant food intake disorder (ARFID) [5]. On the other hand, orthorexia seems also to display some very specific traits that suggest it should be considered as conceptually different (e.g. drive for thinness may or may not be present and the attention seems to be more focused on the quality of food, rather than quantity). Although orthorexia is not enlisted among EDs in the current version of diagnostic and statistical manual of mental disorders (DSM-5) [5], many authors suggested that it should be considered as a mental disorder per se, even proposing its name (orthorexia nervosa) and diagnostic criteria [2, 3].

Some authors suggest that orthorexia may represent a risk factor for EDs onset [2]. On the other hand, a longitudinal study [6] conducted on a group of ED patients found out that orthorexia was more frequent at the end of treatment, suggesting that it may be independent of ED psychopathology and associated to food-related acquaintance, and this hypothesis is also supported by a more recent study [7]. In this perspective, shifting from high ED psychopathology to higher orthorexic levels could be considered as a deep change in coping strategies and orthorexia may represent for ED patients a less pathological way to control body weight and shape.

Literature suggests that people with a broad knowledge about nutrition are more prone to exercise control on their eating behaviour; specifically, individuals trained in the field tend to focus on a healthy approach towards eating attitudes and weight control [8]. Thus, not surprisingly some authors suggested that orthorexia could be not related to eating psychopathology, but rather to the amount of general knowledge about food and alimentation of the subject [9]. Few studies provide results that support this hypothesis, showing that orthorexic tendencies seem to be more represented in people trained in the field of nutrition (such as dietitians), than in general population [2]. A recent review reported orthorexia prevalence rates derived from studies conducted in eight different countries. This study confirms a great difference among groups, with prevalence varying from 6.9% in general population to over 80% in specific groups (such as dietitians or student dietitians) [3].

Our hypothesis was that student dietitians would display higher orthorexic levels than general population. The aim of the present pilot study is, therefore, to investigate the relationship between orthorexia, eating psychopathology and knowledge about food and alimentation in three group of subjects (ED patients, student dietitians and other healthy control subjects). To our knowledge, this is the first study that investigates orthorexia in three matched samples.

Methods

The present study was conducted in Careggi Teaching Hospital in Florence between June and December 2019. Approval for the study was obtained from the competent Ethics Committee.

An initial power analysis was performed, and a total sample size of 84 was sufficient to detect a medium to large effect size ($f = 0.35$) using one-way analysis of variance (ANOVA) with three groups (power = 0.80, $\alpha = 0.05$). Three groups of female subjects were enrolled, each one consisting of 30 people in the age 18–29 years: ED patients, student dietitians and healthy control subject. Patients were recruited among inpatients in our Psychiatric Day Hospital. The inclusion criterion was the diagnosis of AN or BN (according to DSM-5 diagnostic criteria [5]) which had to be confirmed by an expert psychiatrist (FR or VR) by means of a clinical interview. Exclusion criteria were comorbidity with bipolar disorder or schizophrenia spectrum disorders [5], as well as intellectual disability and illiteracy. Student dietitians and healthy control subjects were recruited among students attending the University of Florence; individuals with an actual or former diagnosis of any ED, bipolar disorder or schizophrenia spectrum disorder [5] were excluded. We only included student dietitians from the third year of formation onwards to select individuals with a broad knowledge about food and nutrition. Data about exclusion criteria were gathered by clinical records for patients and self-reported for other groups.

The signing of written informed consent was necessary to be enrolled in the study. All subjects were female and were matched by age (± 2 years). Data gathering comprehend personal information such as age, gender, education, height and weight. Data were collected through a written form under the supervision of one of the authors. Other features of the sample are better described in Table 1.

Three different psychometric scales, described below, were then administered to assess, respectively, orthorexia, eating psychopathology and general psychopathology.

- **ORTO-15**
  This is a self-reported questionnaire which consists of 15 multiple choice items. Each item describes a different orthorexic thought or behaviour that must be valued by the subject in a 4-points Likert scale, depending on how frequent it is (points are labelled as always, often, sometimes and never); lower scores indicate higher orthorexia. Scoring 40 points or below has been proposed by the authors as a diagnostic cut-off [4].
- **Eating Disorder Examination Questionnaire (EDE-Q)**
  EDE-Q is a self-reported scale based upon the homonym interview (EDE), evaluating eating psychopa-

Table 1 Sociodemographic and clinical characteristics of the sample

	ED patients ($n=30$)	Student dietitians ($n=30$)	Healthy controls ($n=30$)
Age (years) (mean ± SD)	21.89 ± 3.17	22.70 ± 3.10	22.41 ± 3.11
Education (years) (mean ± SD)	14.77 ± 2.73*	16.26 ± 1.05	15.75 ± 1.82
BMI (kg/m^2) (mean ± SD)	17.90 ± 2.89*†	19.97 ± 1.46†	21.69 ± 2.77
EDE-Q total (median [IQR])	2.60 [3.91]*†	1.05 [1.57]	1.08 [1.12]
SCL-90-R GSI (median [IQR])	1.29 [1.00]*†	0.62 [0.67]	0.46 [0.50]
ORTO-15 score (mean ± SD)	33.23 ± 5.58*†	38.23 ± 3.28	38.47 ± 3.64

*Different from student dietitians ($p<0.05$)

†Different from healthy controls ($p<0.05$)

thology and abnormal behaviours. The questionnaire is composed of 28 items describing eating-related thoughts or behaviours; each item must be scored from 0 to 6 according to how frequent that thought or behaviour was in the last 28 days. Scoring comprises four subscales (restraint, eating concern, shape concern and weight concern) and a global score [10]. The Italian version of EDE-Q demonstrated a good reliability, with a Cronbach's alpha value of 0.94 for total score [11].

– **Symptom Checklist-90-Revised (SCL-90-R)**

SCL-90-R is a questionnaire for the assessment of general psychopathology, widely used due to its simpleness and relative briefness (consisting of 90 self-reported items to be valued in a 0–4 Likert scale). It investigates a broad spectrum of psychopathological dimensions, namely somatization, obsessive–compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation and psychoticism. Outputs are given not only by final scores obtained in these dimensions, but also as three general indexes: global severity index (GSI), positive symptom total (PST) and positive symptom distress index (PSDI) [12]. The Italian translation of SCL-90-R demonstrated high reliability, with a Cronbach's alpha value of 0.96 for total score [13].

Statistics

Normality was assessed by Shapiro–Wilk's test. Comparisons between groups for normally distributed variables were performed using Welch's analysis of variance (ANOVA) with Games-Howell post hoc analysis. Comparisons between groups for non-normally distributed continuous variables were performed using independent-samples Mann–Whitney *U* test or Kruskal–Wallis *H* test, with post hoc analysis using Dunn's procedure with a Bonferroni correction for multiple comparisons (adjusted *p* values are presented, values are mean ranks unless otherwise stated). Spearman's rank-order correlation was used to assess associations between variables. Given the small sample size, main analyses were carried out only on the total scores of the questionnaires to reduce the probability of type I error. Statistical analysis was performed with SPSS version 26 [14].

Results

The final group of ED patients consisted of 22 individuals with AN and 8 with BN; of these, 7 also suffered from a comorbid major depressive disorder and 1 from a generalized anxiety disorder. No statistically significant differences were found between AN and BN in terms of EDE-Q ($p=0.85$), SCL-90-R ($p=0.61$) or ORTO-15 ($p=0.28$).

Welch's ANOVA was statistically significant for education (Welch's F [2, 48.89] = 3.78, $p=0.030$) and BMI (Welch's F [2, 48.06] = 12.33, $p<0.001$), with post hoc test revealing that patients had fewer years of education than student dieticians, whereas all groups differed in terms of BMI. There were no outliers in ORTO-15 data, as assessed by inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box. ORTO-15 score was normally distributed for ED patients, student dietitians and other healthy controls, as assessed by Shapiro–Wilk's test ($p>0.05$).

The assumption of homogeneity of variances was violated, as assessed by Levene's test for equality of variances ($p=0.002$). Welch's ANOVA was statistically significant: Welch's F (2, 55.95) = 10.45, $p<0.001$. Games-Howell post hoc analysis revealed that ED patients had significantly lower ORTO-15 scores as compared to both student dietitians (mean difference = −5.00, 95% CI [−7.64, −2.36], $p<0.001$) and healthy controls (mean difference = −5.23, 95% CI [−7.87, −2.59], $p<0.001$), while student dietitians did not significantly differ from other controls (mean difference = −0.23, 95% CI [−2.38, 1.92], $p=0.96$).

As assessed by Shapiro–Wilk's test, EDE-Q had non-normal distributions for patients and student dietitians ($p=0.012$ and $p=0.003$, respectively), while SCL-90-R scores were non-normally distributed in student dietitians and other healthy controls ($p=0.034$ and $p<0.001$, respectively), therefore, nonparametric tests were used for comparisons

between groups. Distributions of both scores were not similar for all groups, as assessed by visual inspection of boxplots. Thus, only differences in mean ranks were possible.

The distributions of EDE-Q scores were statistically significantly different between groups, $H(2) = 12.42$, $p = 0.002$. Post hoc analysis revealed statistically significant differences in EDE-Q mean ranks between patients (56.56) and student dietitians (35.12) ($p = 0.003$), and between patients and controls (37.07) ($p = 0.010$), but not between students and controls ($p = 1.00$). Regarding general psychopathology, distributions of SCL-90-R GSIs were different between groups, $H(2) = 18.06$, $p < 0.001$. Moreover, patients had higher mean ranks (59.48) than student dietitians (39.42) ($p = 0.007$) and controls (31.93) ($p < 0.001$).

In patients, ORTO-15 score was negatively correlated to EDE-Q total score but not to SCL-90-R GSI, while no correlations were found neither in students nor in controls (Table 2).

Discussion

This design of the present study allowed us to directly compare orthorexia and ED psychopathology among three groups: ED patients, student dietitians and other healthy control subjects. In our sample, ED patients showed higher levels of orthorexia than both control subjects and student dietitians, whereas student dietitians did not significantly differ from the other control group.

These data are not in line with previous findings suggesting the hypothesis that orthorexia may be related to higher knowledge in the field of nutrition and alimentation [2]. The fact that patients with a diagnosis of AN or BN resulted to have higher orthorexic levels than other groups suggests that this dimension seems to be strictly associated with EDs psychopathology. Longitudinal studies are necessary to identify a possible causal relationship between these two constructs.

ORTO-15 scores (higher scores indicate lower orthorexia) negatively correlated with EDE-Q total score in ED patients, while the same correlation was absent in the other groups. This result suggests that patients with higher orthorexic tendencies showed a more severe ED psychopathology, while healthy subjects (either student dietitians or other controls) do not display any correlation between these two dimensions. This result is not in line with the theory that considers orthorexia as an "iatrogenic-like side effect" of cognitive-behavioural therapy, meaning that patients may adopt orthorexic behaviours at the end of a therapeutic course, as less-unhealthy coping strategies to control body weight or shape [6]. In fact, our data show that orthorexia is already present in acute-phase EDs. Moreover, this result is coherent with part of the previous literature [3] and consistent with daily clinical practice, that orthorexic tendencies could be more frequent in the more severe stages of AN or BN, rather than at the end of treatment, when patients are generally obsessively focused on food.

Finally, we must address some important limitations of this study. In dietitians and control groups, the presence of a psychiatric disorder different from EDs, bipolar disorder and schizophrenia did not represent an exclusion criterion. Even if data collected from SCL-90-R allow us to exclude the presence of high general psychopathology in these groups, this represents a possible confounding factor. Furthermore, ORTO-15 may not be a completely valid instrument to assess orthorexia [2]. In fact, the authors did not provide any evidence that they followed an adequate method for test construction [4], and this should be considered a major flaw. However, ORTO-15 is to date the most widely used questionnaire to evaluate orthorexia [2, 3]. It could be speculated that the reason why the literature has already not drawn any conclusive result over orthorexia is that researchers are using a blunt tool. The development of a more reliable instrument seems to be a necessary step to make a step forward in this field. Recently, a revised version of ORTO-15 was proposed: ORTO-R [15]. This new, shorter version was created eliminating items that seem not to measure orthorexic tendencies; as a result, only six of the original fifteen items were maintained. ORTO-R, compared to the former questionnaire, may represent a more precise instrument to assess orthorexia and, even if a formal validation is still required, it could be a promising starting point for further research.

Table 2 ORTO-15 correlates in all groups

	ED patients ($n = 30$)	Student dietitians ($n = 30$)	Healthy controls ($n = 30$)
EDE-Q total	$r_s = -0.57$	$r_s = -0.12$	$r_s = 0.04$
	$p = 0.004$	$p = 0.54$	$p = 0.85$
SCL-90-R GSI	$r_s = -0.39$	$r_s = 0.01$	$r_s = 0.18$
	$p = 0.051$	$p = 0.97$	$p = 0.35$

What is already known on this subject?

The nature of orthorexia and its relationship with EDs are still unclear. Many theories coexist, one of them claiming that orthorexia may be independent of eating psychopathology and linked instead to a thorough knowledge about food and alimentation.

What does this study add?

Orthorexia seems to be strictly correlated to EDs psychopathology. Our results do not confirm the theory, that orthorexia may be linked to food-related acquaintance.

Funding None.

Data availability Research data are not shared.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the local Ethics Committee (Comitato Etico Regione Toscana, sezione Area Vasta Centro).

Consent to participate Informed consent was obtained from all individual participants included in the study.

Consent for publication Informed consent for publication was obtained from all individual participants included in the study.

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