Clinical and psychological features of normal-weight women with subthreshold anorexia nervosa: a pilot case-control observational study

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Abstract

OBJECTIVE: Weight preoccupations have been frequently reported in normal-weight subjects. Subthreshold anorexia nervosa (s-AN, all DSM IV TR criteria except amenorrhea or underweight) is a form of eating disorder not otherwise specified that has received scarce scientific attention. Under a case-control design we compared the general characteristics, body composition, and psychopathological features of normal-weight patients with s-AN with those of BMI- and sex-matched controls.

DESIGN: Participants in this pilot study included 9 normal-weight women who met the DSM IV TR criteria for s-AN and 18 BMI-matched normal-weight controls. The general characteristics of the study participants were collected by questionnaire. Body composition was measured by bioelectrical impedance. Behavioral and psychological measures included the standardized symptom checklist (SCL-90-R) and the eating disorder inventory (EDI-2).

RESULTS: There were no differences in age, education, employment status, marital status, and history of previous slimming treatment in the two study groups. In addition, anthropometric measures and body composition of s-AN patients and BMI-matched normal weight controls were not significantly different. In the s-AN subgroup, we found a significant relationship between waist circumference and the SCL-90-R obsessivity-compulsivity scale (n=9, r=–0.69, $p<0.05$). After multiple regression analysis, the SCL-90-R obsessivity-compulsivity scale (beta = 0.61, t=2.7, $p=0.017$) was the only independent predictor of the presence s-AN in our study cohort.

CONCLUSIONS: These pilot results suggest that psychopathological criteria (particularly related to the obsessivity-compulsivity dimension) may be more useful than anthropometric measures for screening of s-AN in normal-weight women.

CASE REPORT

INTRODUCTION

Eating disorders (EDs) are the most prevalent psychiatric disorders in young females and are associated with significant physical and psychological morbidity (Dalle Grave 2011; Miller & Golden 2010). In the last decades, the frequency of EDs has greatly increased, representing a major challenge for physicians and significantly impacting health care in the female population (Keel & Brown 2010; Treasure *et al.* 2010). The main features of EDs are eating patterns such as refusal to eat enough food or loss of control, followed by counter-regulatory measures (Treasure *et al.* 2010). In addition, preoccupation with weight, body shape, and food is a common feature of EDs. According to the criteria of the Diagnostic and Statistical Manual of Mental Disorders, fourth edition, text revision (DSM IV TR), EDs not otherwise specified are a heterogenous group of disorders that do not meet the criteria for any specific eating disorder (Castellini *et al.* 2011; Kjelsås *et al.* 2004; Peebles *et al.* 2010; Thomas *et al.* 2009). Although this heterogenous diagnostic category has received scarce scientific attention so far, a substantial number of individuals with EDs fit into this classification. In this regard, Machado *et al.* (2007) reported that EDs not otherwise specified account for three quarters of all community cases with eating disorders.

Subthreshold anorexia nervosa (s-AN, all DSM IV TR criteria except amenorrhea or underweight) is a form of eating disorder not otherwise specified that has been poorly investigated (Crow *et al.* 2002; Ricca *et al.* 2010). This gap of knowledge may be due by several reasons, including diagnostic difficulties and the fact the boundaries between normal and disordered eating may be difficult to delineate at times (Crow *et al.* 2002). However, the impairment of patients with s-AN and their heightened risk of developing a full-blown anorexia (Machado *et al.* 2007) point to the clinical relevance of this concept in terms of both distress and disability. Unfortunately, detailed information about the characteristics, development, and outcome of s-AN is still lacking. What also seems critical is the problematic discrimination of s-AN and "normal" preoccupation with weight and food in normal-weight subjects. In this regard, we have previously shown that the wishing to lose weight is common even in normal-weight individuals, a finding that is associated with high rates of psychiatric comorbidities (Martinelli *et al.* 2011). The identification of the specific and most discriminative features associated with normal-weight s-AN (versus normal-weight controls) may help inform prevention and intervention efforts and guide the development of etiological theories of anorexia. Starting from these premises, we designed this pilot study to compare under a case-control design the general characteristics, body composition, and psychopathological features of normal-weight patients with s-AN with those of BMI- and sex-matched controls.

MATERIALS AND METHODS

Study participants

All participants were recruited consecutively from the outpatients referred for a suspected eating disorder to the Human Nutrition and Eating Disorders Research Center, University of Pavia, Pavia, Italy. All participants first underwent a nutritional visit; thereafter, a board-certified psychiatrist conducted a clinical interview in order to verify the presence of an eating disorder in accordance to the criteria of the Diagnostic and Statistical Manual of Mental Disorders, fourth edition, text revision (DSM IV TR). For the purpose of this study, participants were considered to be eligible if they had a DSM IV TR diagnosis of eating disorder not otherwise specified (DSM IV TR 307.50), met the DSM IV TR criteria for subthreshold anorexia nervosa (s-AN, all DSM IV TR criteria except amenorrhea or underweight), and had a body mass index (BMI) >18.5 kg/m^2. Exclusion criteria included past or present psychotic disorders, drug and alcohol abuse, severe somatic diseases, a BMI lower than 18.5 kg/m^2, an age lower than 18 years, and pregnancy. Of the 221 patients who were screened for suspected EDs between 2003 and 2008 in our center, 9 normal-weight women aged between 18 and 39 years (mean 26.2 years of age, SD 6.9 years) who met the DSM IV TR criteria for s-AN were identified and participated in the study as cases (mean BMI 20.8 kg/m^2, SD 1.3 kg/m^2). All s-AN cases enrolled in this study had regular menses. A case:control ratio of 1:2 was planned. The control group was formed by 18 BMI-matched normal-weight women (mean age 26.9 years, SD 5.7 years) with a mean BMI of 21.8±1.9 kg/m^2 who were free of any DSM IV TR diagnosis and in apparent good physical health. The study protocol complied with the tenets of the Helsinki Declaration and the Institutional Review Board of the University of Pavia approved all procedures. All subjects gave their written informed consent.

Data collection and anthropometry

The following data were collected by questionnaire: age, education, working status, marital status, and history of previous slimming treatment. Height was measured with subjects not wearing footwear and standing erect against a vertical backboard, and measurements were taken to the nearest 0.1 cm using a stadiometer. Weight was measured with women not wearing footwear and wearing minimal clothing; measurements were to the nearest 0.1 kg using a balance beam scale. The BMI calculated as weight (kg) divided by height squared (m^2). Waist and hip circumferences were measured with a flexible steel tape and recorded to the nearest 1 mm. Skinfold thickness was determined to the nearest 0.2 cm at the triceps and biceps, in the suprailiac area and just below the angle of the scapula on the left side using a skinfold caliper (Holtain Ltd, Crymych, Dyfed, Wales, UK). The Holtain skinfold caliper was used throughout

and the measurement recorded on each occasion was the average of three readings. All anthropometric measurements were performed using the same equipment and the same observer. Measurements of bioelectrical impedance were performed at rest with a multifrequency (1, 5, 10, 50, 100 kHz) device (Human IM-Scan, Dietosystem, Milan, Italy).

Psychological questionnaires

The SCL-90-R test contains 90 items which measure nine primary symptom dimensions (Prunas *et al.* 2011). This test is a widely used instrument with sufficient reliability, validity, and utility designed to provide an overview of a patient's symptoms and their intensity at a specific point. The subscales aim to assess somatization, obsessive-compulsive symptoms, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation and psychoticism, whereas the global severity index (GSI) is designed to measure overall psychological distress. Higher scores indicate more psychological symptoms in each subscale as well as a higher degree of distress, higher intensity of symptoms, and more self-reported symptoms (Prunas *et al.* 2011).

The Eating Disorder Inventory (EDI)-2 is a self-report measure of psychological features commonly associated with anorexia nervosa and bulimia nervosa which has become a standard tool in studies investigating EDs (Garner 1991). The EDI-2 consists of 64 items and additional 27 items which assess behavioral and psychological traits on eleven scales. These scales are drive for thinness, bulimia, body dissatisfaction, ineffectiveness, perfectionism, interpersonal distrust, interoceptive awareness, maturity fears, asceticism, impulse regulation and social insecurity. The EDI-2 has good internal consistency reliability and show appropriate content, convergency, and discriminant validity. Higher scores are related to poorer psychological functioning and a higher prevalence and/or intensity of eating disorder-related symptoms (Garner 1991).

Data analysis

Results are expressed as means ± standard deviations for continuous variables and as counts for categorical data. When the data were skewed (non-normal), they were log-transformed to improve normality before analysis and then back-transformed to their natural units for presentation in the tables. Comparisons between groups were performed using the Student's t-test or the Mann–Whitney U test, as appropriate. Chi-square tests were used to compare categorical variables. Correlation analyses were performed using the Spearman correlation coefficients. The independent relationships between the study variables were investigated by means of multivariate linear regression analyses. All calculations were carried out using the SPSS 14.0 package (SPSS Inc., Chicago, IL, USA). A two-tailed p-value <0.05 was considered a statistically significant result.

Tab. 1. Sociodemographic characteristics of s-AN patients and BMI-matched normal weight controls.

	s-AN patients	Controls	*p*-value
Number of subjects	9	18	–
Age (years)	26.2±6.9	26.9±56.7	0.87
Education (years)			0.35
0–8	2	1	
9–18	4	12	
>18	2	5	
Employment (n)			0.76
Student	4	7	
Unemployed/retired	0	0	
Employed	5	10	
Homemaker	0	1	
Marital status (n)			0.23
Married or living with a partner	2	8	
Separated, widowed, or divorced	1	0	
Single	6	10	
Previous slimming treatments (n)			0.44
Yes	8	12	
No	1	6	

RESULTS

General characteristics and body composition

Table 1 summarizes the sociodemographic characteristics of women with s-AN and BMI-matched controls. We found no significant differences in age, education, employment status, marital status, and history of previous slimming treatment in the two study groups. In addition, anthropometric measures and body composition of s-AN patients and BMI-matched normal weight controls were not significantly different (Table 2).

Psychological measures

Table 3 shows the SCL-90-R subscale scores for the s-AN patients and the controls. The scores in the s-AN group were significantly higher compared to the controls for 8 of 10 SCL-90-R subscales. Only the somatization and hostility dimensions were similar in the two study groups. With the exception of bulimia, the s-AN group showed a trend toward higher scores in all the EDI-2 subscales when compared to the controls, but the differences failed to reach the statistical significance threshold (Table 4).

The relationship between the general characteristics of the study participants, body composition, and psychological scores

In the s-AN subgroup, we found a significant relationship between waist circumference and the SCL-90-R obsessivity-compulsivity scale (n=9, r=–0.69, $p<0.05$). After multiple regression analysis, the SCL-90-R obsessivity-compulsivity scale (beta = 0.61, t=2.7, $p=0.017$) was the only independent predictor of the presence s-AN in our study cohort.

DISCUSSION

Because no DSM IV TR boundary clearly differentiates between specific subgroups of EDs not otherwise specified from patterns of unusual but non-pathological eating behavior (Crow *et al.* 2002; Machado *et al.* 2007), s-AN caseness can only be identified in practice through idiosyncratic clinical judgments (Thomas *et al.* 2009). Starting from these premises, there is a growing need for nosologic improvement across the officially recognized categories of EDs not otherwise specified, including s-AN (Fairburn & Bohn 2005; Larrañaga *et al.* 2012; Le Grange *et al.* 2012). Compared with full-blown anorexia nervosa, the s-AN category has been created by relaxing the diagnostic criteria with the omission of the amenorrhea criterion or increasing the BMI cut-off (Thomas *et al.* 2009). There has been debate as to whether full-blown anorexia represents the endpoint of an eating disorder continuum or is nosologically different from s-AN or an absence of eating disorders (Castellini *et al.* 2011; Machado *et al.* 2007; Thomas *et al.* 2009). The need to discriminate between s-AN and controls is particularly excruciating from a clinical standpoint because weight preoccupations are frequently being reported in normal weight subjects (Martinelli *et al.* 2011). A sensitive and specific method for distinguishing normal weight s-AN from non-pathological eating behavior may help us to define the phenotype and reduce heterogeneity in clinical studies of EDs and facilitate early detection and intervention. Toward this aim, the present study sought to investigate the differences between s-AN and normal-weight control women in terms body composition and psychopathology variables. There are two principal find-

Tab. 2. Anthropometric measures and body composition of s-AN patients and BMI-matched normal weight controls.

	s-AN patients (n=9)	Controls (n=18)	*p*-value
Weight (kg)	59.1±6.1	59.8±7.7	0.82
Height (cm)	168±8	165±7	0.36
Body mass index (kg/m^2)	20.8±1.3	21.8±1.9	0.20
Biceps skinfold thickness (mm)	7.2±4.2	6.9±2.5	0.79
Triceps skinfold thickness (mm)	15.1±5.9	17.8±4.1	0.21
Suprailiac skinfold thickness (mm)	21.6±8.1	18.8±10.1	0.50
Subscapular skinfold thickness (mm)	13.1±4.9	13.9±5.3	0.71
Waist circumference (cm)	74.1±6.2	77.9±4.7	0.12
Hip circumference (cm)	93.1±16.6	97.7±5.6	0.36
Waist-hip ratio	0.83±0.20	0.79±0.04	0.52
Fat mass (skinfold thickness, %)	28.6±4.6	28.1±5.6	0.82
Body impedance (ohm)	598±93	589±77	0.81
Fat mass (impedance, %)	27.4±5.1	29.1±3.7	0.38

Tab. 3. SCL-90 dimensions of s-AN patients and BMI-matched normal weight controls.

	s-AN patients (n=9)	Controls (n=18)	*p*-value
Somatization	0.55±0.72	0.38±0.51	0.57
Obsessive-compulsive	1.05±0.57	0.33±0.29	0.006
Interpersonal sensitivity	0.99±0.86	0.16±0.10	0.017
Depression	0.87±0.73	0.27±0.18	0.039
Anxiety	0.70±0.57	0.25±0.08	0.045
Hostility	0.48±0.35	0.27±0.20	0.15
Phobic anxiety	0.53±0.50	0.06±0.15	0.021
Paranoid ideation	1.11±0.93	0.25±0.47	0.032
Psychoticism	0.53±0.44	0.12±0.19	0.029
Global severity index	0.75±0.43	0.23±0.10	0.005

Tab. 4. EDI-2 dimensions of s-AN patients and BMI-matched normal weight controls.

	s-AN patients (n=9)	Controls (n=18)	*p*-value
Drive for thinness	11.3±6.7	5.1±5.6	0.07
Bulimia	2.1±2.9	2.3±4.7	0.92
Body dissatisfaction	9.2±8.3	10.5±7.6	0.77
Ineffectiveness	5.1±4.8	1.1±1.2	0.06
Perfectionism	4.1±4.2	0.7±1.1	0.07
Interpersonal distrust	2.3±1.9	1.8±1.6	0.61
Interoceptive awareness	5.7±6.2	1.3±1.5	0.11
Maturity fears	3.6±2.7	1.6±2.1	0.15
Ascetism	4.5±3.4	1.3±1.6	0.06
Impulse regulation	3.9±4.8	2.3±1.4	0.46
Social insecurity	4.7±4.2	2.8±4.6	0.41

ings in our report. First, the s-AN and control groups were not distinguishable in terms of anthropometric parameters and bioelectrical impedance. Second, we have shown that the SCL-90-R obsessivity-compulsivity subscale was the only independent predictor of the presence s-AN in our sample of normal-weight women. Notably, we found an association between the waist circumference and the SCL-90-R obsessivity-compulsivity scale in the s-AN group. Although subject to future confirmation, these pilot results suggest that psychopathological criteria (particularly related to the obsessivity-compulsivity dimension) may be more useful than anthropometric measures for identifiying normal-weight women with s-AN. Thomas *et al.* (2009) have previously demonstrated that EDs not otherwise specified represent a set of disorders associated with substantial psychological morbidity. In addition, we have previously highlighted the need for careful psychiatric assessment of normal-weight subjects wishing to lose weight (Martinelli *et al.* 2011). Elevated obsessive-compulsive scores defined by the obsessive-compulsive subscale of the SCL-90-R were independently associated with a s-AN diagnosis in this pilot study of normal-weight women. These findings are in accordance with those of Zubieta *et al.* (1995), who showed that elevated obsessionality is associated with more severe eating disorder symptomatology. In addition, Holtkamp and coworkers (2005) reported that obsessive-compulsive behaviors can persist even after more than 3 years of complete remission and resolution of core eating disorder psychopathology in patients with adolescent-onset anorexia nervosa. A classical study by Thiel *et al.* (1995) demonstrated a high prevalence of obsessive-compulsive disorder among patients with anorexia, and that this prevalence could be correlated with the severity of the eating disorder. Our findings showing that elevated obsessive-compulsive scores discriminated best between normal weight s-AN and control women who were referred to a specialized center for a suspected eating disorder may have clinical implications. Indeed, based on our results, it is feasible to hypothesize that elevated obsessionality may be one critical domain when screening for the presence of a subthreshold ED in normal-weight women.

Though our study presents promising results this work has several limitations. First, our sample is representative of consecutive patients attending an academic outpatient clinical nutrition service in Italy; therefore, the results are not generalizable to other settings. Second, our study has a case-control design that does not allow any inference to be drawn on the causal relationship between obsessionality and s-AN. Third, further research should also include a greater number of patients in order to highlight possible differences in obsessionality between s-AN and other EDs not otherwise specified.

In conclusion, our pilot study demonstrates that, as a group, s-AN patients are best characterized by high obsessive-compulsive scores compared with normal-weight control women referred to a specialized center for a suspected eating disorder. Psychopathological criteria, particularly if related to the obsessivity-compulsivity dimension, may be more useful than anthropometric measures for identifiying normal-weight women with s-AN.

Competing Interests

The authors declare that they have no competing interests.

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