



Original article

Prevalence of a History of Overweight and Obesity in Adolescents With Restrictive Eating Disorders


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Article history: Received March 7, 2014; Accepted June 10, 2014

Keywords: Eating disorders; Obesity; Adolescence

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A B S T R A C T

Purpose: Although the relationship between increased body weight and eating disorders such as bulimia nervosa and binge eating disorder is well established, the relationship between overweight or obesity and eating disorders characterized by dietary restriction and/or weight loss such as anorexia nervosa (AN) is less well known.

Methods: To understand the prevalence of a history of overweight or obesity among treatment-seeking adolescents with restrictive eating disorders, a retrospective cohort study was conducted on all new patients aged 9–22 years diagnosed with either anorexia nervosa or eating disorder not otherwise specified characterized by weight loss and/or dietary restriction, seen in a specialty eating disorder clinic from January 2007 to July 2013.

Results: Of 179 adolescents, 36.7% were found to have a body mass index (BMI) history above the 85th percentile. Patients with a BMI history above the 85th percentile had a larger BMI decrease at presentation ($p < .0001$) and a longer duration of illness before presentation ($p < .0001$). There were no differences in the number of physical symptoms or eating disorder severity.

Conclusions: Findings suggest that adolescents with a history of overweight or obesity represent a substantial portion of treatment-seeking adolescents with restrictive eating disorders, underscoring that extreme weight loss in adolescents is not healthy, regardless of whether the end weight is theoretically within a healthy range. Because eating disorders in adolescents who have history of overweight take longer to be identified, they consequently may have a poorer prognosis.

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IMPLICATIONS AND CONTRIBUTION

Formerly obese or overweight adolescents represent a substantial proportion of treatment-seeking adolescents suffering from restrictive eating disorders (eating disorders characterized by dietary restriction and/or unhealthy weight loss). Despite similar severity of symptoms as their thinner counterparts, the findings of this study suggest that these adolescents are diagnosed at a later and more severe point in their disease.

Given the increasing prevalence of overweight and obesity in children and adolescents, as well as the associated long-term risk for morbidity and mortality in adulthood, there is a strong

impetus for medical providers to prevent obesity in their encounters with young patients [1,2]. Providers are encouraged to take time during routine well-child visits to identify patients at risk for obesity by tracking body mass index (BMI) percentile and addressing concerns with both the patient and their parents [3]. Disordered eating and unhealthy weight control practices are also widespread among adolescents [4] which may place them at risk for an eating disorder. Given that eating disorders are associated with a chronic course, high recidivism rates, and

Conflicts of Interest: The authors have no conflicts of interest relevant to this article to disclose.

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numerous medical and psychological comorbidities, as well as the fact that eating disorders share many risk factors with obesity, a similar primary care focus on early identification and prevention of eating disorders merits consideration [5–7].

Although providers are likely to identify and refer adolescents for eating disorder treatment who show obvious signs of emaciation and malnutrition, they may not be attuned to the more subtle presentations of eating disorder symptomatology. Although the relationship between obesity and binge eating is somewhat intuitive, providers may not appreciate that obese adolescents' attempts to lose weight may also place them at risk for developing a restrictive eating disorder (an eating disorder characterized by dietary restriction or weight loss) [8]. This is of concern as there is a well-established relationship between dietary restriction, obesity, and eating disorders [9–12]. As overweight and obese adolescents are frequently the targets of public health campaigns, many of which are perceived to contain inherent weight stigma [13], these adolescents may be more likely to take drastic measures to try to control their weight [11,12,14–16]. In fact, research has found that obesity and weight-related teasing is a significant risk factor for the development of later eating disorders [17,18]. In addition, in a population-based sample of adolescents, researchers found that approximately 25% of girls with obesity were found to be using extreme weight control behaviors such as inducing vomiting, abusing laxatives, or using diet pills, a statistic that did not even account for “less-extreme” but still unhealthy weight control behaviors such as fasting or smoking for weight control [14].

Although weight loss in an obese adolescent may be a positive health outcome, it also may signal the onset of restrictive eating or other eating disorder behaviors that may precipitate a serious eating disorder and/or potential medical complications. For example, a sample of adolescents who lost greater than 25% of their antecedent weight but who were above 90% of median body weight for their age had lost a significantly higher percentage of their body weight and at a faster rate, when compared with adolescents with anorexia nervosa (AN) who had a BMI in the underweight range [19]. Furthermore, these teens were found to be more medically compromised than the patients presenting at a much lower median body weight [19]. Research with adult patients with a diagnosis of AN found that the degree of weight suppression, defined as the difference between a patient's current weight and his or her highest past weight, corresponds to more severe symptoms of AN, as well as binge eating, depression, and menstrual abnormalities [20]. Consequently, providers should be aware of the potential problems associated with unhealthy weight control practices or significant weight loss and monitor for both [10,21].

Historically, the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) diagnosis of Eating Disorder Not Otherwise Specified (EDNOS) has been given to individuals who meet many of the criteria for AN, including severe dietary restriction and overvaluation of shape and weight but do not have a BMI that falls into the underweight range. Studies have found an elevated mortality rate in individuals with EDNOS, comparable to those with AN [22], and in many cases, similar or more severe levels of impairment and pathology [23,24]. There is no empirical support for the common belief that EDNOS is less dangerous than full threshold AN [22–24]. Given this widely held misperception, however, it is likely that many patients with concerning behavioral symptoms of AN but who

fail to present at a low weight may be not seen as having a potentially life-threatening condition. Data described in a case report of two adolescents with AN who also had a history of obesity illustrated that, in the case of these patients, practitioners missed signs of serious restrictive eating disorders until symptoms had progressed for many months [8].

Based on research that suggests significant overlap in risk factors for restrictive eating disorders and obesity, including dieting behaviors, media influence, and body dissatisfaction [9–12,14], we hypothesized that adolescents with a weight history above the 85th percentile would be equally represented in a sample of patients with restrictive eating disorders as compared with the general population. Although it is somewhat intuitive that eating disorders characterized by binge eating might overlap with a higher weight status, the goal of this study was to clarify the less-obvious relationship between overweight or obesity and eating disorders characterized by dietary restriction and/or weight loss. With this in mind, this study sought to evaluate the prevalence of antecedent overweight and obesity in a sample of treatment-seeking adolescents with restrictive eating disorders. In addition, the clinical characteristics of these adolescents were evaluated, including illness course, eating disorder symptom severity, and physical symptom severity.

Methods

A retrospective cohort review of consecutive adolescent patients presenting for an eating disorder intake evaluation at the Mayo Clinic eating disorders clinic between January 2007 and July 2013 was performed. The eating disorders clinic at the Mayo Clinic in Rochester, Minnesota is a multidisciplinary hospital-based specialty clinic affiliated with a teaching tertiary medical center. Treatment teams at the clinic may include psychologists, psychiatrists, and pediatricians. The study received approval by the Mayo Clinic Institutional Review Board. Patients included in the study provided informed consent that their medical record could be used for research purposes.

As part of the eating disorder intake evaluation (referred to from this point as “eating disorder intake”), clinical staff collected information from both parents and teens regarding adolescents' presenting BMI, decrease in BMI from reported symptom onset to eating disorder intake, presenting physical symptoms, menstrual status, and duration of illness from reported symptom onset to eating disorder intake. In addition, during the eating disorder intake, adolescents completed the Eating Disorder Examination–Questionnaire (EDE-Q) [25] to assess eating disorder symptomatology including dietary restraint, weight, shape, and eating concerns. The EDE-Q is a validated self-report questionnaire that has been shown to perform as well as investigator-based interviews in the assessment of eating disorder symptoms [25]. The EDE-Q was scored for each patient on both the EDE-Q Global Scale and each subscale (Restraint, Weight Concerns, Shape Concerns, Eating Concerns).

A primary reviewer who was blind to group status evaluated the medical records from eligible patients and extracted data that included patient demographics, self-reported BMI at time of eating disorder intake, self-reported BMI decrease at time of eating disorder intake, number of months between symptom onset and eating disorders intake, and number of physical symptoms. Antecedent BMI information, or information regarding the patient's BMI before eating disorder intake, was also obtained from the patients' developmental growth chart, in

which data from patient self-report, parent report, and, where applicable, from previous visits to the Mayo Clinic or outside growth charts obtained from previous providers, had been recorded. If there was a discrepancy between patient or parent report and data collected from clinical record review, priority was given to the data collected by medical professionals. Outcome variables assessed included illness course, eating disorder symptom severity, and number of physical sequelae. Illness course was defined as time between the first-reported eating disorder symptom (either cognitive or behavioral) per patient or parent report and eating disorder intake. Eating disorder symptoms were defined as cardinal symptoms of AN (e.g., drive for thinness, restrictive eating, fear of weight gain, amenorrhea).

Eating disorder severity was assessed at intake, based on the EDE-Q global and subscale scores. Higher EDE-Q scores indicate greater eating disorder severity. Number of physical sequelae was calculated as a total of symptoms reported by the patient, parent, and, where relevant, other medical professionals at intake. Sequelae reported included the following: amenorrhea or irregular menstruation, enuresis, lanugo, cold intolerance, fatigue, dizziness, bradycardia, orthostatic intolerance, syncopal episodes, dry skin, dry mouth, dehydration, increased thirst, hair loss, headache, abdominal pain, muscle cramps, bruising, slurred speech, edema, constipation, dental caries, bloating, low body temperature, chest pain, low pulse, dark circles under eyes, blurred vision, reflux or heartburn, stress fractures, osteoporosis, hypothyroidism, metabolic derangements, and nausea.

Patients were excluded from review if they did not qualify for an eating disorder diagnosis (AN, bulimia nervosa, or EDNOS) based on DSM-IV criteria during their eating disorder intake ($n = 23$), if they had an incomplete weight history or if their baseline BMI percentile (as reported by patient, parent, or medical professional) was not able to be determined based on available records ($n = 19$). Weight history was considered incomplete if patient's, parent's, or medical professional's report of previous BMI was not included in the medical record and/or if target weight for treatment was unclear. This determination was made by consensus between two authors (J.L. and L.S.). Because this study was concerned with restrictive eating disorders (AN and subthreshold AN/EDNOS characterized by dietary restriction per DSM-IV diagnostic criteria), participants were also excluded if they did not have weight restoration or weight gain as part of their treatment plan; this included those who were seen for an eating disorder that was primarily characterized by binge eating, or by binge or purge symptoms without successful restriction and/or whose treatment goals included weight maintenance or loss ($n = 27$).

Statistical analysis

Patients were divided into two groups based on their BMI history. Patients with antecedent BMIs falling at or above the 85th percentile for age and gender based on Centers for Disease Control and Prevention (CDC) growth charts [26] were designated as part of the overweight history group; technically, this group included both patients with BMI in the overweight range and patients with BMI in the obese-weight range. Patients with antecedent BMIs falling below the 85th percentile for age and gender based on CDC growth charts [26] were allocated to the average-weight history group.

Independent t tests and chi-square analyses were used to compare group differences. Independent t tests using least

significant differences were conducted to compare participants in the overweight and the average-weight history groups on age, BMI at consult, BMI decrease at time of intake, months to evaluation, and number of recorded physical symptoms. Chi-square analyses were conducted to assess group differences in gender, diagnosis, and menstrual status. To examine differences in self-reported eating disorder symptoms between adolescents in the overweight history group and patients in the average-weight history group, independent t tests were conducted using the scores from the EDE-Q subscales and global scale. All analyses were performed with IBM (Armonk, NY) SPSS Statistics version 21.0.

Results

A total of 248 adolescent patients presented for an eating disorder intake between January 1, 2007 and July 31, 2013. Overall, 69 patients were excluded; 23 patients did not qualify for an eating disorder diagnosis, 27 patients were seen for an eating disorder that was primarily characterized by binge eating or by binge or purge symptoms without successful restriction, and 19 had incomplete weight histories. The final sample consisted of 179 patients, ages ranging from 10 to 20 years with a mean of 15.3 years (standard deviation = 2.26). Of these 179 patients, 85.2% were female, 63.7% had a BMI before the onset of eating disorder symptoms falling in the average-weight range, 17.7% had an antecedent BMI falling in the overweight range (BMI for age \geq 85th percentile but $<$ 95th percentile, as defined by CDC growth chart [26]) and a further 19.0% had former BMI in the obese-weight range (BMI for age $>$ 95th percentile, as defined by CDC growth chart [26]). Patients with BMI in the overweight range and patients with BMI in the obese-weight range were combined into a single group, referred to as the overweight group (a combined 36.7% of the sample). Table 1 compares characteristics of patients in the average-weight history group to those in the overweight history group.

With regard to BMI at time of presentation, the mean BMI in the average-weight group was 16.89, whereas the mean BMI in the overweight group was 20.03 ($p < .001$). There were significant differences between the two groups with regard to both duration of illness and amount of BMI decrease at time of eating disorder intake (Table 2). The overweight group had a mean duration of illness of 19.86 months before eating disorder intake compared with 11.15 months for the average-weight group ($p < .001$). The overweight history group had a BMI decrease of 5.37 kg/m² by time of eating disorder intake, whereas the

Table 1
Patient characteristics by study group

	Patients, n (%)		<i>p</i> value
	Average-weight history (n = 114)	Overweight history (n = 65)	
Age (years), mean (standard deviation)	15.26 (2.37)	15.20 (2.08)	.90
Female	102 (89.5)	54 (83.5)	.22
Met full criteria for			
Anorexia nervosa ^a	76 (66.7)	34 (52.3)	.06
Amenorrhea, in postmenarcheal females at intake ^b	65 (57.0)	35 (53.8)	.08

^a Fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV).

^b Amenorrhea defined as no menses for ≥ 3 months.

Table 2

Differences at time of eating disorder intake

	Average-weight history (mean)	Overweight history (mean)	Mean difference (95% CI)	p value
Number of months to evaluation	11.15	19.86	8.71 (5.09–12.32)	<.001
BMI at presentation	16.89	20.03	3.14 (–3.87 to 2.40)	<.0001
BMI change (from symptom onset to intake)	3.57	5.37	1.79 (1.08–2.51)	<.001
Reported number of physical symptoms	2.99	3.42	.43 (–1.127 to .26)	.22

BMI = body mass index (kg/m²); CI = confidence interval.

average-weight history group had a 3.57 kg/m² BMI decrease ($p < .001$). There was no significant difference in the number of reported physical sequelae at time of eating disorder intake between the two groups (Table 2).

Differences in self-reported eating disorder symptoms between adolescents in the overweight history group and patients in the average-weight history group were compared using EDE-Q scores (Table 3). There were no significant differences between the two groups on the EDE-Q Subscale for Dietary Restraint or the EDE-Q Subscale for Weight Concerns. There was a trend toward a difference between the two groups with regard to the EDE-Q Subscale for Shape Concerns, where the overweight history group had a trend toward higher scores, although it was not significant. In addition, there was no significant difference between the two groups on the EDE-Q Global Scale, which measures global eating disorder symptoms. To put mean EDE-Q values into context, compared with a normative sample of 808 adolescent girls [27], adolescents with a weight history above the 85th percentile scored >1 standard deviation above the mean on all the EDE-Q subscales and the EDE-Q global scale. Compared with the same normative sample, adolescents with a weight history in the average range scored 1 standard deviation above the mean on the EDE-Q Restraint Subscale and the EDE-Q Eating Concerns Subscale but not the rest of the subscales.

Discussion

Findings from this study suggest that approximately 36% of adolescents presenting for treatment for a restrictive eating disorder have a weight history above the 85th BMI percentile for age and gender. To break this down further, 17% of adolescents in this sample were previously overweight, and a further 19% of adolescents had a history of obesity. These rates are largely comparable to the rates of adolescent overweight and obesity in the general population, where it is estimated as approximately 17% of adolescents are obese and >33% are either obese or overweight [28]. Because patients in this study represent treatment-seeking adolescents and because many patients with eating disorders do not seek treatment [29], the prevalence found in this study of formerly overweight adolescents with

eating disorders might actually represent a significant underestimate of those in the general population.

This study also found that compared with adolescents with eating disorders without a history of overweight, adolescents with a weight history in the overweight range experienced a significantly greater drop in BMI and took approximately 10 months longer to be identified. These findings are consistent with a recent case study that highlighted significant delays in identification of eating disorders in two adolescents with a weight history in the obese-weight range and the tendency for providers to disregard or misdiagnose physical symptoms of semistarvation and weight loss [8]. Given that early identification and treatment is the best predictor of full recovery [30,31], this delay in identification and potential for misdiagnosis is concerning and may have implications for prognosis in this group of patients. Certainly, future prospective research regarding treatment outcome in adolescents with preceding overweight or obesity is warranted.

Despite losing a higher percentage of their body weight, most patients with antecedent overweight presented in a so-called “healthy” weight range (e.g., BMI between 18.5 and 24.9). They showed similar levels of eating disorder pathology, similar prevalence of amenorrhea, and no difference in number of reported physical symptoms when compared with adolescents who did not have a preceding history of overweight. These findings underscore the danger of emphasizing weight as the sole indicator of health and the importance of assessing a patient’s physical functioning or symptoms rather than body weight to determine their health status. If an adolescent presents in a BMI category that is theoretically considered healthy but is not menstruating because of restrictive eating, or is exhibiting eating disordered cognitions, this teen is demonstrating unhealthy behaviors that will undoubtedly influence their overall well-being. Medical consequences of these unhealthy behaviors are numerous and severe, including cardiovascular complications (e.g., arrhythmias, syncope, corrected Q-T interval (QTc) prolongation, pericardial effusion), seizure, orthostatic hypotension, hypokalemia, pancreatitis, pneumothorax, and other conditions, regardless of weight status [19]. Furthermore, patients who have lost a larger percentage of their baseline BMI, despite presenting in a BMI category that is not technically “underweight,” have been shown to have an equally, or, in some cases, more medically serious presentation than patients who present at a lower BMI, but who have lost less weight overall [19]. Similarly, adult patients who have a larger discrepancy between their current and the highest past weight have been found to have more severe eating disorder and psychiatric symptoms [20].

Because many adolescents with antecedent overweight or obesity did not present in the underweight range and were not endorsing symptoms such as binge-eating behavior, it is not surprising that it took longer for these patients to be identified with eating disorders. The absolute weight requirement (<85% of

Table 3

Comparison of self-reported eating disorder symptoms at intake, using EDE-Q

	Average weight history (mean)	Overweight history (mean)	p value
EDE-Q Restraint Subscale	2.94	3.14	.70
EDE-Q Weight Concerns Subscale	2.94	3.65	.17
EDE-Q Shape Concerns Subscale	3.10	4.02	.08
EDE-Q Eating Concerns Subscale	2.31	2.61	.54
EDE-Q Global Scale	2.82	3.36	.25

EDE-Q = Eating Disorder Examination–Questionnaire (EDE-Q; Fairburn and Beglin, 2004).

ideal body weight) necessary to meet criteria for AN in the DSM-IV [32] has informed many providers' views of the typical patient with AN or restrictive eating disorders, thereby obscuring recognition of restrictive symptoms in patients who do not meet this criterion. It is possible that defining low weight as <85% of ideal weight for age and height has resulted in patients' eating disorders going undetected, or being diagnosed as EDNOS, which might not convey the seriousness of the symptomatology to other practitioners or to the patients themselves. Fortunately, the recently published version of the APA diagnostic manual, the DSM-V, [33] has eliminated the absolute weight criteria and now defines low weight in the context of a patient's developmental trajectory. This revision will hopefully facilitate a greater recognition of serious eating disorders in patients with a wide range of developmental weight histories.

There are several limitations of this study including the retrospective design and the clinic-based sample that restricts generalizability and limits an understanding of the true prevalence of patients with a history of overweight or obesity who develop restrictive eating disorders. Because this sample entirely comprised treatment-seeking adolescents, the selection bias of this group suggests that these findings can only be generalized to patients in specialty eating disorder clinic settings. Furthermore, because many patients in the community may never be identified [29], and this may be especially true for patients with preceding obesity, the prevalence found in this study may represent a significant underestimate of those in the general population.

Another limitation is that BMI history was largely determined through self-report. Although some patients had a full medical history on record and some had their past growth charts transferred to the Mayo Clinic as part of their clinical treatment, this was not the case for every patient. For patients without comprehensive past growth charts, weight history largely depended on the retrospective report of either the patient or parent. Retrospective reports are subject to recall bias regarding when symptoms were first noticed. Although the chart reviewer was blind to group status and reviewers applied the same criteria to each chart, it is possible that parent and adolescent reports of onset of the first symptoms were biased. That is, the initial onset of eating disorder symptoms among obese adolescents may have been misinterpreted by these adolescents and their parents as a normal and healthy attempt to lose weight and thus not identified until quite severe and impairing. Clearly, this may have skewed these adolescents' reports. In spite of these limitations, this study highlights an important area for future prospective research and clinical attention.

Clinical implications

In our nationwide push to reduce the prevalence of pediatric obesity and overweight, we need to recognize the relationship between prior history of overweight and eating disorders. Pediatricians are in a crucial position to facilitate early eating disorder detection, as research has shown that even a single consultation with a primary care provider about eating, shape, or weight concerns is a strong predictor of the subsequent development of AN [34]. Providers must recognize that serious restrictive eating disorders are possible in youth presenting at any BMI.

To accurately assess degree of weight loss, providers are advised to look at an adolescent's full developmental growth curve, as opposed to their static weight at one point in time [7]. Deviations from a patient's typical pattern of growth should be

noted with concern, regardless of BMI. Specific questions with regard to menstrual history in female patients, dietary history, and exercise history may help differentiate healthy weight loss from unhealthy behaviors. Interviews may need to be conducted without parental presence to better ascertain details of weight loss behaviors. Even in the absence of patient low weight, practitioners should remain attuned to the presence of eating disordered behaviors, physical sequelae of malnutrition, or disordered cognitions which should prompt providers to make appropriate referrals for eating disorder assessment and intervention as immediately as possible [7,15].

When providers have legitimate concerns about a patient's health in the context of their weight status, they must fully evaluate the child's functioning to identify specific maladaptive health behaviors. Providers should not simply assume the patient is healthy or unhealthy because of their weight status alone. To accomplish the goal of improving the child's health while not inadvertently placing adolescents at risk for the development of eating disorders, interventions should focus on modifiable behaviors that have been proven to positively impact children's health. Setting behavioral goals (such as increasing fruit and/or vegetable intake, reducing soft drinks, and so forth) is preferable to placing emphasis on a nonbehavioral variable such as weight and has potential to be much more effective in prompting healthy lifestyle changes in teens [7,15]. Finally, providers can take an active role in preventing eating disorders in children and adolescents by educating patients about healthy nutrition required for growth and development, physical activity, and the harms of unhealthy weight loss practices. Providers can also help adolescents build body acceptance by educating them about physical changes associated with pubertal development [9].

In summary, adolescents with a history of overweight and obesity represent at least 36% of patients presenting for treatment of serious restrictive eating disorders. Furthermore, compared with normal weight adolescents, these adolescents experience a delay in identification. Because early identification and treatment of adolescents with eating disorders predicts a good prognosis, better and faster detection of eating disorders in these patients is of paramount importance. By eliminating the faulty assumption that obesity and restrictive eating disorders are mutually exclusive diagnostic categories, health care providers can begin to increase early detection of eating disorders in adolescents with a history of overweight or obesity and minimize the substantial negative impact of these disorders on patients' health and well-being.

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