

In Brief

Eating disorders are more common in individuals with type 1 diabetes than in the general population. Although limited research has been conducted in this area, existing evidence shows that these conditions significantly affect the physical and emotional health of individuals with diabetes and are associated with impaired metabolic control and a high risk of medical complications, including higher mortality rates. New nomenclature was recommended at an international focus group held in Minneapolis, Minn., in September 2008. Composed of individuals with interest and expertise in eating disorders among individuals with diabetes, the group recommended that the term ED-DMT1 be used to designate those with an eating disorder and type 1 diabetes and ED-DMT2 be used for those with an eating disorder and type 2 diabetes. This article provides an overview of clinical features, consequences, and pathways of risk associated with ED-DMT1.

Eating Disorders and Diabetes: Introduction and Overview

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A close relationship exists between the physical and mental health of individuals with diabetes, likely related to the complex and constant requirements of diabetes management and to the influence of the experience of living with a chronic medical condition on psychosocial functioning. One example of such an effect is the increased risk of eating disorders in women with type 1 diabetes and the psychosocial and medical consequences of this association. The clinical features of an eating disorder can interfere directly with an individual's ability to attend to the daily tasks of diabetes management. This can compromise the individual's efforts to achieve optimal metabolic control and can lead to an increased risk of both immediate and long-term diabetes-related medical complications. The treatment of eating disorders and other mental health problems in individuals with diabetes has the potential to greatly improve both physical health and overall well-being and functioning.

Clinical Features

Eating disorders are a group of conditions characterized by disturbed eating behavior and a range of psychological traits and symptoms. The term "disturbed eating behavior" encompasses milder and more extreme dieting behavior, binge eating episodes, and compensatory behavior for weight control. Binge eating refers to eating a

large amount of food in a short period of time, with an associated sense of loss of control.¹ Compensatory behavior for weight control includes purging behavior, such as self-induced vomiting and the abuse of laxatives, diuretics, and enemas, as well as nonpurging behavior, such as fasting, diet-pill abuse, and excessive, compulsive exercise for weight control. Individuals with type 1 diabetes, unfortunately, have an additional purging behavior available to them, which is particularly dangerous. These individuals sometimes engage in insulin omission to promote weight loss. This behavior has recently been referred to as "diabulimia,"² although we prefer to avoid this term because it excludes other eating problems in individuals with diabetes and implies that eating problems in those with diabetes are essentially distinct from those in individuals without diabetes.

With insulin omission, whether by decreasing, delaying, or completely omitting prescribed insulin doses, an individual can induce hyperglycemia and rapidly lose calories in the urine in the form of glucose. Less dramatic neglect of insulin therapy, such as sporadic blood glucose monitoring and inadequate insulin dosage titration, is very common and may occur both intentionally and unintentionally, the latter often related to a sense of demoralization regarding diabetes self-care.

Eating disorders are associated with underlying disturbances in emotional regulation and body image. Individuals with eating disorders often manifest high levels of concern and distress about body weight and shape, distortions of body image (e.g., believing that they are overweight when at a normal or low weight), overvaluation of weight and shape in the determination of self-concept, fears of gaining weight or becoming fat, and disturbed attitudes towards food, calories, and eating.¹ Thoughts about food, weight, and shape may constantly preoccupy the individual, and the perceived success in controlling his or her eating behavior and weight can become a primary determinant of self-esteem. Eating disorders have substantial psychiatric comorbidity; mood disorders, substance use disorders, and personality disorders are all more common in those with eating disorders than in the general population.³⁻⁶

More severe eating disorders are also associated with medical complications such as electrolyte abnormalities, edema, cardiac conduction abnormalities, and gastrointestinal complications,¹ all of which may be worse in the presence of type 1 diabetes. Anorexia nervosa in particular is associated with an elevated mortality rate. In a meta-analysis of outcome studies of anorexia nervosa, crude mortality rate was found to be 5% at the 4- to 10-year follow-up and 9% at follow-up after 10 years.⁷

Disturbances of body image, eating attitudes, and eating behavior exist along a continuum in terms of severity and degree of related distress and impairment, making it difficult to define a threshold above which they can be considered “full-syndrome” disorders. As such, diagnostic criteria for eating disorders used in clinical and research settings have fluctuated during the past two decades. This partially reflects the tension between defining phenotypic groups for study and identifying more heterogeneous eating disturbances in the general population. More severe symptoms at one end of this continuum often meet diagnostic criteria for a full-syndrome eating disorder.¹ These full-syndrome disorders are categorized into three primary groupings: anorexia nervosa, bulimia nervosa, and eating disorder not otherwise specified (ED-NOS). Table 1 presents descriptions of these disorders. Comprehensive diagnostic

Table 1. Eating Disorder Definitions and Descriptions¹

Anorexia Nervosa

- Refusal to maintain body weight above minimally normal weight (85% of that expected for height and age)
- Severely disturbed body image with fears of gaining weight or getting fat despite being underweight
- Undue influence of body weight or shape on self-evaluation
- Amenorrhea of at least 3 months’ duration in postmenarcheal females

Bulimia Nervosa

- Binge eating episodes and compensatory behavior for weight control, which occur, on average, twice weekly over a period of at least 3 months
- Self-evaluation is unduly influenced by body shape and weight

Eating Disorder Not Otherwise Specified (ED-NOS)

- Broad group of disorders that are of clinical significance but do not meet the full diagnostic criteria for anorexia nervosa or bulimia nervosa
- Examples of variants of bulimia nervosa:
 - Binge eating disorder
 - Binge eating and purging occurring less frequently than twice a week
 - Individuals purge after eating normal amounts of food
- Examples of variants of anorexia nervosa:
 - Amenorrhea of 3 months’ duration is not present
 - Significant weight loss has occurred but individual remains above 85% of expected weight

criteria are discussed in the article on p. 143 of this issue.

Epidemiology

There has been controversy in the literature about the association of eating disorders and type 1 diabetes. However, interview-based studies and a meta-analytic review⁸ support the view that there is an increased risk for both subthreshold and full-syndrome eating disorders in girls and women with type 1 diabetes. In more rigorous studies using a validated diagnostic interview rather than a self-report questionnaire, the prevalence of full-syndrome eating disorders in girls and women with type 1 diabetes ranged from 0 to 11%, and the prevalence of subthreshold eating disorders ranged from 7 to 35%.⁹⁻¹⁷ In a three-site, case-control prevalence study,¹² eating disorders were twice as common in teenage girls with type 1 diabetes as in their nondiabetic peers. Using a standardized diagnostic interview, full-syndrome eating disorders were diagnosed in 10% of teenage girls with type 1 diabetes and 4% of age-matched girls without type 1 diabetes. Subthreshold eating disorders were even more common, diagnosed in 14% of girls with type 1 diabetes and 8% of the nondiabetic comparison group. An increased risk of disturbed

eating behavior in girls with type 1 diabetes can be detected even in the pre-teen years, with disturbed eating behavior reported by girls as young as 9 years of age.⁹ In a case-controlled study of pre-teen girls with type 1 diabetes aged 9–13 years, full-syndrome or subthreshold eating disorders were identified in 8% of pre-teen girls with type 1 diabetes, compared to only 1% of their nondiabetic peers.⁹

Deliberate insulin omission is the most common method of purging in girls with type 1 diabetes and becomes progressively more common through the teen years. This behavior is reported by 2% of pre-teen girls,⁹ 11–15% of girls in the mid-teen years,^{12,17-19} and 30–39% of those in the late teenage and early adult years.^{19,20} The reason most frequently cited by young women with type 1 diabetes for deliberate insulin omission is weight control. Other motivating factors include fear of hypoglycemia, denial of having diabetes, embarrassment about blood glucose testing or insulin administration in front of others, desire to have a break from diabetes management, fear of needles, and secondary weight gain.^{20,21} These additional factors can operate in combination with a desire to control weight to worsen and entrench the insulin omission behavior.

There are currently four published longitudinal studies of disturbed eating behavior in individuals with type 1 diabetes²² but none in individuals with type 2 diabetes. A study by Bryden et al.²³ had a small sample size ($n = 33$) and insufficient power to detect a significant association between disturbed eating behavior and diabetes-related medical outcomes. A study by Colton et al.⁹ showed that disturbed eating behavior is common and highly persistent in pre-teen and teenage girls with type 1 diabetes. Ninety-two percent of girls with disturbed eating behavior early in the study continued to report disturbed eating behavior at subsequent follow-up. By the age of 14–18 years, half of the participants reported current disturbed eating behavior, and 13% of the sample met criteria for a full-syndrome or subthreshold eating disorder. Rydall et al.¹⁹ found that disturbed eating behavior at baseline was associated with a tripled rate of diabetic retinopathy at 4-year follow-up in 91 young women with type 1 diabetes. Peveler et al.²² also found high rates of medical complications and significant mortality in young women with type 1 diabetes and previously identified eating disorders. Others have reported similar findings in smaller, cross-sectional samples of young women with type 1 diabetes.^{24–27}

In contrast to findings in studies of girls and women with type 1 diabetes, there is not a clear association between type 2 diabetes and disturbed eating behavior, although this relationship has been less studied in type 2 diabetes than in type 1 diabetes. This makes sense because disturbed eating behavior typically begins many years before the onset of type 2 diabetes, and the reverse sequence is much less common. Binge eating disorder appears to be the most common eating disorder in those with type 2 diabetes.²⁸ It has been suggested that the diagnosis and management of type 2 diabetes generally does not worsen or precipitate an eating disorder,²⁹ but that eating disorders, predominantly binge eating disorder, are more likely to be found in those with type 2 diabetes because of the association of both conditions with being overweight.

Clinical Consequences

Disturbed eating behavior in individuals with diabetes is of clinical concern because it increases the risk of diabetic ketoacidosis, hospitalization,

and diabetes-related medical complications, particularly retinopathy and neuropathy.^{19,21,25,26} Both subthreshold and full-syndrome eating disorders are associated with poor metabolic control³⁰ and blood lipid abnormalities.³¹ Each of these can independently increase the risk of long-term diabetes-related complications, affecting multiple body systems.

Eating disorders are also associated with elevated mortality in those with diabetes. In a Scandinavian registry-based study,⁸ after ~ 10 years of follow-up, mortality rates were 2.2 per 1,000 person-years for individuals with type 1 diabetes without anorexia nervosa, 7.3 for individuals with anorexia nervosa but not diabetes, and 34.6 for individuals with both type 1 diabetes and anorexia nervosa.

Pathways of Risk

Prospective longitudinal studies in the general population have consistently identified a number of risk factors for the development of eating disorders. These include female sex; dietary restraint and dieting; weight gain and being overweight; early puberty compared to peers; low self-esteem; disturbed family functioning; disturbed parental eating attitudes; peer and cultural influences; and a range of personality traits.^{32–36} Considerable evidence has also accumulated to suggest that living with type 1 diabetes is a risk factor for disturbed eating behavior and eating disorders.^{8,9,12}

Eating disorders are much more common among girls and women than among boys and men. They are 10–12 times more frequent among adult females than males in the general population,^{8,37} although the sex difference may be less dramatic among younger individuals.³⁸ There appears to be a gradient of disturbed eating attitudes, with the highest disturbances in females with type 1 diabetes, the lowest in males without type 1 diabetes, and intermediate disturbances in nondiabetic females and males with type 1 diabetes.^{39–41}

Adolescent boys with type 1 diabetes have higher BMI values and an elevated drive for thinness compared to their nondiabetic peers, but eating disorders are very rare in this group.⁴² These findings suggest that type 1 diabetes increases the risk of disturbed eating attitudes in both males and females, but additional factors are present in females with type 1 diabetes

that shift them over a threshold from disturbed eating attitudes into overtly disturbed eating behavior. These likely include individual, family, and socio-cultural factors, perhaps including an amplified effect of increased BMI on body dissatisfaction among females. Consistent with this, the body shape of most girls increasingly diverges from Western cultural body ideals during puberty, as they gain weight and develop adult female body contours. Many girls and women, with and without diabetes, now experience contradictory environmental pressures regarding dietary intake. There are pervasive influences for women in many cultures to strive for unrealistic body weight and shape goals through dieting, whereas individuals are simultaneously exposed to large quantities of high-calorie, palatable foods that promote overeating and weight gain.

The most consistent longitudinal predictors of the emergence of eating disorders are dieting and dietary restraint,^{43,44} both of which tend to persist and worsen over time.^{45–48} Similarly, the presence of eating problems in childhood and adolescence strongly predicts the development of an eating disorder in adulthood.⁴⁹ These longitudinal findings suggest that dieting may be viewed as either a risk factor for the onset of an eating disorder or as an early stage in its clinical presentation. Although most dieters never go on to develop an eating disorder, dieting is an almost universal first step in those who do eventually develop a full-syndrome eating disorder.

Diabetes management may be an iatrogenic factor that encourages dietary restraint and increased attention to food intake. This can eventually trigger dietary dysregulation, with overeating and binge eating episodes. A vulnerable individual may then intensify efforts to control food intake and weight, thereby becoming trapped in a cycle of dieting, further binge eating, and weight control behavior.

Although recent innovations in diabetes management have enabled many individuals to adopt a more flexible eating plan, carbohydrate counting still commonly underlies diabetes meal planning and insulin dosage titration. Individuals with diabetes, particularly those with type 2 diabetes, often receive medical recommendations to reduce body weight and to limit

cholesterol and carbohydrate intake. Diabetes meal plans are more flexible than many weight loss diets, but they still increase the focus on food and calories, may suggest the restriction of certain food types, and can be experienced as restrictive. The encouragement to follow an imposed eating plan rather than to eat in response to internal cues for hunger and satiety may constitute a pathway of risk for the development of disturbed eating behavior.

Comprehensive diabetes management may also inadvertently contribute to an increased risk of eating disorders in some individuals because intensive insulin therapy is associated with weight gain.⁵⁰ In that regard, it has been shown that adolescent girls and adult women with type 1 diabetes, on average, have significantly higher BMI values than their nondiabetic peers.^{50–53} This increased weight may heighten body dissatisfaction in young women and increase the risk of dieting, an entry into the cycle of disturbed eating behavior.

Evidence-based treatment guidelines for the management of eating disorders have been published, including those from the American Psychiatric Association.⁵⁴ However, there is limited evidence regarding the effectiveness and efficacy of the various treatment modalities to support the application of these guidelines in special populations, such as individuals with diabetes. There are few treatment studies in this population, although a small, uncontrolled study of cognitive behavioral therapy for eating disorders in women with type 1 diabetes¹⁷ suggested that treatment may be more difficult in women with diabetes than in those without diabetes. A small study of “integrated inpatient treatment” of individuals with type 1 diabetes and an eating disorder showed promising reductions in eating disorder symptoms⁵⁵ maintained at the 3-year follow-up. However, validation of these results would require a study with a larger sample and the inclusion of a control group. In a randomized, controlled treatment study of disturbed eating attitudes and behavior in teenage girls with type 1 diabetes,⁵⁶ a brief psycho-educational intervention was associated with reductions in dieting, body dissatisfaction, and preoccupation with thinness and eating. These improvements were maintained at

the 12-month follow-up. However, the intervention did not result in significant improvements in metabolic control or insulin omission for weight control.

Conclusion

Eating disorders are more common in individuals with type 1 diabetes than in the general population. These conditions significantly affect the physical and emotional health of individuals with diabetes and are associated with impaired metabolic control and a high risk of medical complications, including higher mortality rates. Brief self-report screening measures are available for the detection of eating disorders. (These tools are discussed in the article on p. 143 of this issue.)

Clinicians should maintain a high index of suspicion for eating disorders, particularly when there is unexplained poor metabolic control. A low threshold for referral to mental health professionals is warranted. Attention to eating problems may be life-saving in a condition such as diabetes, in which outcomes are so dependent on behavioral adherence.

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