

Eating Disorders and IDDM

A problematic association

GARY M. RODIN, MD
DENIS DANEMAN, MB

IDDM and eating disorders are common conditions in young women. Whether a specific association exists between these two disorders remains controversial. Some studies have suggested an increased incidence of eating disorders in young women with IDDM, whereas others have not detected such an increase. These differences may be attributable, at least in part, to methodological issues in study design, measurement tools, and relatively small sample sizes. Whether the prevalence of eating disorders in IDDM is increased will be resolved only by larger studies that use standardized diagnostic interviews. We suspect that certain aspects of IDDM and its management may trigger the expression of an eating disorder in susceptible individuals. Required dietary restraint and weight gain related to diabetes management are the factors most likely to be implicated. Eating disorders are relatively common in young women with IDDM and may contribute to impaired metabolic control with hypoglycemia and DKA, and to long-term microvascular complications of diabetes. Omission or reduction of required insulin, an extremely common means of weight control in these young women, is likely an important factor in this regard. Further research is required to determine more precisely the relationship between IDDM and eating disorders, and the effects of eating disorders on metabolic control and chronic complications of IDDM.

IDDM is a life-long condition that requires predictability and regularity in eating habits and in monitoring and managing glycemic control. A variety of factors may interfere with the capacity to

achieve or maintain such regularity of dietary habits and compliance with other aspects of IDDM treatment (1). Prominent among these factors in young women with IDDM are clinical and sub-

clinical eating disorders. We address here the consequences and interrelationships of such disorders in individuals with IDDM, and also touch on the question of whether eating disorders are more common in young women with IDDM than without. The latter is the subject of the surveys reported in this issue by Peveler et al. (p. 1356) and Striegel-Moore et al. (p. 1361).

EPIDEMIOLOGY OF IDDM AND EATING DISORDERS

— Eating disorders and IDDM often may be associated coincidentally in young women because both are relatively common conditions. Indeed, IDDM is one of the most common chronic disorders of children and adolescents, affecting ~1 in 300–600 children by 20 yr of age (4). The incidence of IDDM varies greatly worldwide from <1 new case per 100,000 people/yr in Japan, to 10–15 new cases per 100,000 people/yr in North America, to nearly 30 new cases per 100,000 people/yr in Finland (5). Both sexes are equally susceptible. Although IDDM may have its onset at any age, it presents most commonly in childhood and adolescence.

The reported prevalence of eating disorders has varied considerably depending upon the population, the response rate in the sample studied, and the measures, methods, and diagnostic criteria used. In a previous study using a two-stage epidemiological strategy, with screening tests and validated semistructured interviews (6), lifetime diagnoses of anorexia nervosa and bulimia based on DSM-III criteria were made in 0.5 and 4.2%, respectively, of high-school students aged 14–17 yr. A review of the epidemiology of bulimia nervosa suggests that the prevalence of this disorder in adolescent and young adult women is ~1%, based on the stricter DSM-III-R criteria (7). The DSM-III (8) and DSM-III-R (9) criteria for anorexia nervosa, bulimia, and bulimia nervosa are illus-

FROM THE DEPARTMENT OF PSYCHIATRY, THE TORONTO HOSPITAL, UNIVERSITY OF TORONTO; AND THE DEPARTMENT OF PEDIATRICS, THE HOSPITAL FOR SICK CHILDREN, UNIVERSITY OF TORONTO, ONTARIO, CANADA.

ADDRESS CORRESPONDENCE AND REPRINT REQUESTS TO DR. G. RODIN, DEPARTMENT OF PSYCHIATRY, 8 EATON NORTH RM. 222, THE TORONTO HOSPITAL, 200 ELIZABETH STREET, TORONTO, ONTARIO, CANADA M5G 2C4.

IDDM, INSULIN-DEPENDENT DIABETES MELLITUS; DKA, DIABETIC KETOACIDOSIS; DSM-III, DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS (3RD EDITION); DSM-III-R, DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS (3RD EDITION, REVISED); EAT, EATING ATTITUDES TEST; BES, BINGE-EATING SCALE; EDI, EATING DISORDER INVENTORY; EDE, EATING DISORDER EXAMINATION; CBT, COGNITIVE-BEHAVIORAL TREATMENT.

THIS ARTICLE IS ONE OF A SERIES PRESENTED AT THE MEETING ON THE BEHAVIORAL ASPECTS OF DIABETES MELLITUS.

Table 1—Summary of diagnostic criteria for anorexia nervosa

DSM-III	DSM-III-R
WEIGHT LOSS OF 25% OF ORIGINAL BODY WEIGHT AND/OR OF PROJECTED WEIGHT GAIN IN INDIVIDUALS <18 YR.	WEIGHT LOSS AND MAINTENANCE OF BODY WEIGHT 15% BELOW THAT EXPECTED FOR AGE AND HEIGHT.
REFUSAL TO MAINTAIN BODY WEIGHT OVER A MINIMAL NORMAL LEVEL FOR AGE AND HEIGHT.	
DISTURBANCE OF BODY IMAGE, (E.G., "FEELS FAT" EVEN WHEN EMACIATED).	DISTURBANCE IN THE WAY IN WHICH ONE'S BODY WEIGHT, SIZE, OR SHAPE IS EXPERIENCED, (E.G., "FEELS FAT" EVEN WHEN EMACIATED).
INTENSE FEAR OF BECOMING OBESE, WHICH DOES NOT DIMINISH AS WEIGHT LOSS PROGRESSES.	INTENSE FEAR OF GAINING WEIGHT OR BECOMING FAT, EVEN THOUGH UNDERWEIGHT.
NO KNOWN PHYSICAL ILLNESS TO ACCOUNT FOR WEIGHT LOSS.	ABSENCE OF ≥ 3 MENSES WHEN OTHERWISE EXPECTED TO OCCUR.

trated in Tables 1 and 2. With regard to the diagnosis of bulimia nervosa in the DSM-III-R, the specification of the frequency of the binges and the criterion that the individual has engaged in regular self-induced vomiting, strict dieting or fasting, the use of laxatives or diuretics, and/or vigorous exercise to prevent weight gain define a more homogeneous and more uniformly severe disorder than that defined by bulimia in the DSM-III.

Marcus and Wing (10) recently summarized the 57 reported cases in which both IDDM and an eating disorder were documented. In 90% of the cases, IDDM

onset occurred before the eating disorder was diagnosed, and 95% of reported cases were female. Weight loss by means of self-induced glycosuria was documented in 62% of reported cases. Poor metabolic control was reported in 75% and major diabetes-related complications in 48% of the cases. These case reports helped stimulate interest in the study of eating disorders in IDDM.

In this paper, we focus on the systematic studies that have sought to define the association between IDDM and eating disorders, the short- and long-term metabolic and psychological

consequences, and possible approaches to treatment. The systematic studies in which eating disorders have been reported in association with IDDM are discussed below according to the research strategy used or the nature of the sample studied.

SURVEYS OF PATIENTS WITH EATING DISORDERS

— One strategy to assess the association of IDDM with eating disorders is to survey the prevalence of IDDM in patients with eating disorders. Nielsen et al. (11) retrospectively reviewed 242 consecutive

Table 2—Summary of diagnostic criteria for bulimia (DSM-III) and bulimia nervosa (DSM-III-R)

BULIMIA (DSM-III)	BULIMIA NERVOSA (DSM-III-R)
RECURRENT EPISODES OF BINGE-EATING (RAPID CONSUMPTION OF A LARGE AMOUNT OF FOOD IN A DISCRETE TIME PERIOD, USUALLY <2 H).	RECURRENT EPISODES OF BINGE-EATING (RAPID CONSUMPTION OF A LARGE AMOUNT OF FOOD IN A DISCRETE PERIOD OF TIME).
AT LEAST THREE OF THE FOLLOWING:	A FEELING OF LACK OF CONTROL OVER EATING BEHAVIOR DURING THE EATING BINGES.
CONSUMPTION OF HIGH CALORIC, EASILY INGESTED FOOD DURING A BINGE.	
INCONSPICUOUS EATING DURING A BINGE.	
TERMINATION OF BINGES BY ABDOMINAL PAIN, SLEEP, SOCIAL INTERRUPTION, OR SELF-INDUCED VOMITING.	
REPEATED ATTEMPTS TO LOSE WEIGHT BY RESTRICTIVE DIETING, SELF-INDUCED VOMITING, OR USE OF CATHARTICS OR DIURETICS.	REGULAR SELF-INDUCED VOMITING, USE OF LAXATIVES OR DIURETICS, STRICT DIETING OR FASTING, OR VIGOROUS EXERCISE TO PREVENT WEIGHT GAIN.
FREQUENT WEIGHT FLUCTUATIONS >10 LBS CAUSED BY ALTERNATING BINGES AND FASTS.	
AWARENESS THAT THE EATING PATTERN IS ABNORMAL AND FEAR OF NOT BEING ABLE TO STOP EATING VOLUNTARILY.	≥ 2 BINGES/WK FOR ≥ 3 MO.
DEPRESSED MOOD AND SELF-DEPRECATING THOUGHTS AFTER EATING BINGES.	PERSISTENT OVERCONCERN WITH BODY SHAPE AND WEIGHT.
BULIMIC EPISODES ARE NOT CAUSED BY ANOREXIA NERVOSA OR ANY KNOWN PHYSICAL DISORDER.	

cases of eating disorders that had been treated between 1960 and 1984 at the Psychiatric and Child Psychiatric Clinics at Rigshospitalet (Copenhagen, Denmark). They found that IDDM was present in 5 cases (.02%), all female. Four of these patients were diagnosed with anorexia nervosa and one with bulimia, based on DSM-III criteria. Growth failure was evident in two of these patients. The authors considered that the prevalence of eating disorders in this sample was six times what might be expected on a chance basis, although the sample studied may not have been representative of patients with eating disorders in that community.

SURVEYS OF PATIENTS WITH

IDDM — A more common research approach has been to assess eating and weight psychopathology in patients with IDDM. As described below, these include surveys of psychological disturbances and of diagnosable eating disorders.

Self-reported psychological disturbances in IDDM patients compared with control subjects

Some researchers have compared psychological disturbances not necessarily associated with diagnosed eating disorders in patients with IDDM versus control subjects. Although some studies (12) suggest that self-esteem is not more impaired and depressive symptoms are not more common in adolescent girls with IDDM, other research suggests that subtle disturbances may be present. For example, Hauser et al. (13) found that ego development and self-image complexity are impaired in adolescents with IDDM compared with similar nondiabetic individuals. These differences may not be specific to diabetes, as similar difficulties may be found in children with other medical illnesses (14).

Findings with regard to eating and weight psychopathology in individuals with IDDM also have been conflicting. Using the EAT-26 and the BES, Wing et al. (15) studied 101 IDDM girls and 101 IDDM boys aged 12–18 yr. The

EAT-26 (16) is a 26-item abbreviated version derived from factor analysis of the original 40-item EAT-40 scale (17). It consists of three factors or subscales that measure eating attitudes and habits related to dieting, bulimia and food preoccupation, and oral control. It is an objective, reliable, and well-validated self-report measure of eating disorder symptoms (16,17). Wing et al. (15) compared EAT-26 scores in the IDDM patients with those of 65 nondiabetic girls and 77 nondiabetic boys who were studied separately by Hsu et al. (18). Although it is not clear to what extent the control group is comparable with the IDDM sample, higher scores on the EAT-26 were found in diabetic girls compared with normal control subjects. However, these increased scores were attributable only to the dieting subscale, which contains many items that would be scored positively by individuals with diabetes. Wing et al. (15) suggested at that time that IDDM patients may have even less eating pathology than their nondiabetic peers. However, Marcus and Wing (10) concluded 4 yr later that available data strongly suggest that adolescent and young adult women with IDDM may be at an increased risk for developing eating disorders.

Robertson and Rosenvinge (19) reported elevated EAT-40 scores in 56 IDDM females aged 16–40 yr and living in the hospital catchment area in Notodden, Norway, compared with 60 age-matched gynecology outpatients. These differences on the EAT-40 were significant on both the dieting and oral control subscales of the EAT-40. However, the difference remained significant only on the dieting subscale after 4 diabetes-related items were removed. As a result, these authors concluded that eating problems may not be more frequent in IDDM patients than in the general population.

Other studies suggest that eating and weight psychopathology may be more common in young women with IDDM. Rosmark et al. (20) studied consecutive patients attending a diabetes

clinic at a university hospital in Sweden. Their sample included 41 female and 45 male IDDM patients and a student control group consisting of 60 females and 33 males. They found higher EAT-40 and EAT-26 scores in the female IDDM group compared with all other groups; however, the male IDDM group did not differ from the female or male normal control subjects. Although some of the elevated scores in the female IDDM group were attributable to IDDM-related items, these authors suggest that this could not be the complete explanation, because the male IDDM patients did not have higher scores than male nondiabetic control subjects. They concluded that IDDM is likely one risk factor for the development of anorexia nervosa or bulimia.

Steel et al. (21) studied 138 females and 73 males aged 16–25 yr who had attended a diabetes clinic in 1985. They found that the diabetic women scored higher than control subjects on the total EAT-40 and all of its subscales, and on the following EDI subscales: drive for thinness, body dissatisfaction, interoceptive awareness, ineffectiveness, and interpersonal distrust. All of these differences, except the oral control subscale of the EAT, remained significant in the females, even after the diabetes-related items were removed. In males, the differences were smaller between the IDDM patients and control subjects and, except for the ineffectiveness subscale of the EDI, were not significant when the diabetes-related items were deleted. These authors consider that the higher scores in women represent a psychological disturbance related to eating disorders, perhaps triggered by concerns about weight, which tended to be greater in IDDM females than in control subjects. Body dissatisfaction related to weight has been shown to be a central psychological disturbance in patients with eating disorders (22) and may be common in young women with IDDM. In this regard, Striegel-Moore et al. (3) compared 46 IDDM girls aged 8–18 yr, recruited from the Yale Pediatric Endo-

crine Clinic, with 46 age-matched control subjects, recruited from local schools. Based on the EDE interview and the EDI, the girls with IDDM reported significantly higher drive for thinness, more shame about their bodies, more anxiety about eating in public, and a tendency to eat secretly.

In conclusion, some, but not all, studies suggest that psychological disturbances related to eating disorders are more common in young women with IDDM than in their nondiabetic peers. These disturbances tend not to be found in young men with IDDM, and do not appear to be an artefact related to items that would be scored positively because of the dietary requirements of IDDM.

Another approach to investigating psychological disturbances associated with IDDM is to assess the psychological changes that occur over time after the onset of IDDM. In this regard, Steel et al. (23) administered the EAT-40 to 32 women and 15 men <40 yr of age soon after the onset of IDDM, and again 12 mo later. The most striking findings from this study were 1) a mean weight gain of 6.9 kg in the women and 8.6 kg in the men; 2) an increase in the total EAT and dieting subscale of the EAT, and in the drive for thinness subscale of the EDI in both the women and men; and 3) an increase in the body dissatisfaction subscale of the EDI in women. Although some of these changes could be attributed to the realistic demands of IDDM, Steel et al. suggest that the increased weight gain after diagnosis and treatment of IDDM may be a risk factor both for body image disturbances and for the development of eating disorders.

Diagnostic surveys

The studies referred to here have reported the clinical diagnoses of eating disorders based on standardized criteria. The data have been obtained from self-report questionnaires or from clinical interviews. The reliability of the diagnoses is usually greatest when structured diag-

nostic interviews and standardized criteria are used.

Self-report. A higher prevalence of eating disorders has been found in studies using self-report measures than in those using structured diagnostic interviews. In one of the early studies, Hudson et al. (24) reported findings from a questionnaire based on the DSM-III criteria for anorexia nervosa and bulimia. This questionnaire was sent to all female IDDM patients aged 14–25 yr and attending either one physician at the Joslin Clinic in Boston or a country hospital, drawing from a small town/rural practice setting (Danville, IN). However, the response rate was extremely low (38 and 26% from the two groups, respectively), and clinical diagnoses were based only on a self-report questionnaire. None of the subjects in either sample met full DSM-III criteria for anorexia nervosa, but 35% met DSM-III criteria for bulimia. A lower prevalence was reported by Powers et al. (25) in a study of 51 male and 46 female pediatric patients, with mean ages of 15.5 and 15.7 yr, respectively, attending a university diabetes clinic in Florida. Patients were administered the Eating Habits Questionnaire with questions related to the DSM-III and DSM-III-R. They found that none of the boys met criteria for eating disorders; and among the girls, two subjects (4%) met DSM-III criteria for anorexia nervosa, and one (2%) met DSM-III-R criteria for bulimia nervosa. Powers et al. (25) speculate that the prevalence of eating disorders may be less in their sample compared with other reports because of the relatively young age of their subjects, and the fact that they were not drawn from a tertiary care center.

Stancin et al. (26) studied 59 IDDM women aged 18–30 yr, representing a participation rate of 65%, although they did not specify how subjects were recruited. Based on a bulimia screening form, which included DSM-III criteria, 7 women (12%) met DSM-III criteria for bulimia. Twenty-three (39%) reported underdosing with insulin to lose weight,

and >13% reported purging by other means. Birk and Spencer (27) assessed the frequency of eating disorders in 385 females aged 13–45 yr with IDDM attending one of several endocrinologists in a group medical practice. The sample represented 70% of those who were sent the Pyle Eating Behaviour Survey. Although the age range of this sample (13–45 yr) extends well beyond the age of greatest risk for eating disorders, the diagnosis of anorexia nervosa was made in 1% and bulimia in 10% of the sample, based on DSM-III criteria.

Using an amended version of the Diagnostic Survey for Eating Disorders, we studied 103 of 121 girls aged 13–18 yr who made quarterly visits to a large children's hospital diabetes clinic (28). We found that eating disorders based on DSM-III criteria were present in 13% of the sample (anorexia nervosa in 1% and bulimia in 12%) and in 5% based on DSM-III-R criteria (all bulimia nervosa). These findings were similar to those of our earlier study in which diagnoses were confirmed by clinical interviews (29). Noncompliance with diabetes management was significantly more common, and HbA_{1c} levels were significantly higher in subjects with eating disorders based on the more loosely defined DSM-III criteria compared with the rest of the sample (28).

Clinical interviews. Diagnoses that are substantiated by clinical interviews are likely to provide greater reliability and validity. In a two-stage procedure, we screened 58 females, aged 15–22 yr, with IDDM for >1 yr using the EAT-26 and the EDI (29). Subjects were drawn from a diabetes clinic in a large children's hospital and from the adult hospital to which older patients are referred. Clinical interviews were conducted in patients with elevated scores on the self-report measures. Based on DSM-III criteria, a present or past history of eating disorders was identified in 13.8% of the sample, equally distributed between anorexia nervosa and bulimia. Based on clinical interviews, Steel et al. (30) reported that

7% of 208 16–25 yr-old females with IDDM, who had attended a diabetes clinic over the preceding 8 yr, could be diagnosed with eating disorders (anorexia nervosa in 6% and bulimia nervosa in 1%) using diagnostic criteria similar to the DSM-III-R. In this issue of *Diabetes Care*, Peveler et al. (2) and Striegel-Moore et al. (3) both report on the prevalence of eating disorders in girls and young women with IDDM. A strength of these studies is that both have used the EDE (31) to establish the diagnoses. This semistructured diagnostic interview has established reliability and validity (32,33) for the assessment of the specific psychopathology of eating disorders based on DSM-III-R criteria.

In the study by Peveler et al. (2), data are reported on 33 girls with IDDM, aged 11–18 yr (mean 15.4 ± 2.0 yr); 28 were ≥ 13 yr, the initial age of risk for eating disorders identified by these authors. They diagnosed a clinical eating disorder according to DSM-III-R criteria in 9% of this sample compared with 6% of a control group. The diabetic patients with eating disorders in this study were 16–18.4 yr old. The diagnoses made in both groups were all “Eating disorders not otherwise specified”. This category in the DSM-III-R refers to eating disorders that do not meet the criteria for a specific disorder. The difference between the IDDM and nondiabetic groups was not statistically significant, although these authors note that a sample size 10-fold greater than theirs would have been necessary to detect a 2-fold difference in the prevalence of eating disorders at the 5% level of significance. Of note, the IDDM girls with eating disorders all had elevated HbA_{1c} levels $>13\%$. Peveler et al. (2) believe that eating disorders are not more common in women with diabetes, although they acknowledge that a larger sample size in the age of risk is needed to confirm this opinion. In a related report, Fairburn et al. (34) diagnosed eating disorders in 11.1% of 54 women with IDDM aged 17–25 yr and in 7.5% of nondiabetic, control women. This differ-

ence was not statistically significant either, although the diabetic women with evidence of eating disorders had significantly higher mean concentrations of HbA_{1c} than the rest of the women with IDDM.

The current study by Striegel-Moore et al. (3) reports diagnostic findings in 46 girls aged 8–18 yr, 28 of whom were 12–18 yr, with IDDM for ≥ 1 yr and an age-matched control group. None of these individuals were diagnosed with an eating disorder. They did note a significant age effect such that only 19% of the girls aged 8–11 yr reported a clinically relevant symptom related to body image, compared with 64% of the girls aged 12–18. As in the study by Peveler et al. (2), the use of a structured diagnostic interview in this study is a methodological strength, although these authors also note that a larger sample in the age of risk is needed to confirm whether or not IDDM is a risk factor for eating disorders in young women.

The recent trend in the psychiatric literature has been to tighten the diagnostic criteria for eating disorders to define more uniformly severe psychiatric disorders. This has merit for numerous research and clinical purposes. Unfortunately, however, eating disorders of lesser severity from a psychiatric point of view still may have significant metabolic and other clinical implications in individuals with IDDM. Indeed, the association of impaired metabolic control with clinical and subclinical eating disorders has been a relatively consistent finding in the literature. Many researchers (27,21) have reported significantly higher HbA_{1c} levels in IDDM patients with eating disorders compared with those without. This impaired metabolic control in IDDM may be the direct effect of binge eating, or deliberate underdosing or omission of insulin to lose weight or to compensate for a binge. Stancin et al. (26) reported that 39% of 59 women aged 18–30 yr with IDDM admitted to decreasing the dose of insulin intentionally to lose weight, and Fairburn et al.

(34) reported that 37% of 54 diabetic women aged 17–25 yr and about two-thirds of those with eating disorders engaged in similar behaviors. In a sample of 103 girls aged 13–18 yr with IDDM, we found that 12% of the total sample and 54% of those with eating disorders underdosed with insulin to lose weight (28).

The impaired metabolic control produced by an eating disorder may contribute to the long-term medical complications of IDDM. Steel et al. (30) reported that only 4 of 15 women with IDDM and eating disorders were free of diabetes complications, and that 4 patients with anorexia nervosa developed acute polyneuropathy when the eating disorders started. The complications noted included 6 with neuropathy, 6 with nephropathy, and 11 with retinopathy (6 with proliferative changes). Colas et al. (35) reported more severe retinal lesions in IDDM patients with eating disorders compared with patients with IDDM only, matched for age, duration of disease, and age of onset of diabetes. The patients with eating disorders also had higher HbA_{1c} levels.

METHODOLOGICAL ISSUES

Several methodological issues need to be addressed, both to interpret the studies on IDDM and eating disorders and to consider in the planning of further research. The concerns that relate more generally to research on eating disorders in nondiabetic populations have been addressed recently in review articles by Shaw and Garfinkel (36) and by Fairburn and Beglin (7). We will refer only briefly to issues that relate to diagnostic methods in IDDM patients.

The validity of screening tests

Some confusion in the literature has arisen when screening tests have been used for diagnostic purposes. Tests such as the EAT and the EDI were designed as screening tools for identifying groups in which a high proportion of subjects have formal eating disorders. As Garner et al.

(37) stressed, such psychological tests should not be regarded as a substitute for clinical diagnoses. Indeed, the confounding effect of diabetes-related behavior on the diagnosis of eating disorders is most problematic when screening tests are used inappropriately for diagnostic purposes. However, when standardized interviews are employed, the core syndromal features of a clinical eating disorder can be distinguished from the dietary restriction and food preoccupation of diabetes.

Structured diagnostic interviews

Although self-report measures, such as the EAT and the EDI, are valuable in screening for eating disorders and following their longitudinal course, structured diagnostic interviews, such as the EDE (31), have greater reliability and validity in identifying cases (32,33). The wider use of such standardized methods of assessment of eating disorders would permit a more meaningful comparison of results from different studies.

Diagnostic criteria

In response to the apparent overdiagnosis of eating disorders in the general population, more stringent diagnostic criteria were adopted in the DSM-III-R compared with its predecessor, the DSM-III. The DSM-III-R criteria for diagnosing bulimia nervosa, unlike the DSM-III criteria for diagnosing bulimia, require that the individual regularly engage in self-induced vomiting; laxative use, strict dieting or fasting, or rigorous exercise to prevent weight gain; have a minimum of two eating binges per week for ≥ 3 mo; and report persistent overconcern with body shape and weight. These more rigorous criteria led to a 10-fold reduction in the reported prevalence in the general population of bulimia nervosa (1.7%) based on the DSM-III-R compared with bulimia (12.7%) based on the DSM-III (38). We found an almost 60% reduction in cases of bulimia (12%) diagnosed by DSM-III compared with bulimia nervosa (5%) diagnosed by DSM-III-R criteria in

young women with IDDM (28). However, some cases that do not meet DSM-III-R criteria nevertheless may warrant therapeutic intervention, particularly in those with poor metabolic control.

Application to IDDM

We believe that too little attention has been given to the possibility that the usual diagnostic criteria for eating disorders may exclude individuals with IDDM who require some assistance or intervention. In particular, objectively small amounts of food eaten during a binge by individuals with IDDM may be associated with profound psychological consequences, including feelings of guilt and self-disparagement. Also, insulin omission or reduction of the required dose, which may be the most common method of inducing weight loss in individuals with eating disorders and IDDM, is not included in the DSM-III-R criteria. (It has been proposed for inclusion in the DSM-IV, which is currently being developed.) Perhaps judgments about clinical severity of an eating disorder in individuals with IDDM should take into account the short-term metabolic and long-term medical consequences of an eating disorder. In individuals with IDDM, eating disorders that do not necessarily satisfy DSM-III-R criteria nevertheless may be associated with impaired metabolic control (28,29), insulin omission, and non-compliance with all aspects of diabetes management (28). Furthermore, many cases of eating disorders may be unrecognized in the medical setting because they present with poor metabolic control rather than with the other features of an eating disorder.

We suspect that the requirements and complications of diabetes lower the threshold for the appearance of eating disorders only in young women who already are predisposed. If so, the magnitude of this effect may be no larger in absolute terms than that reported by Peveler et al. (2) or Fairburn et al. (34). The size of the sample studied in the age of greatest risk is critical to detect a signif-

icant difference of this magnitude. It may be that multicenter studies are necessary to achieve an adequate sample size to resolve this issue.

CLINICAL PRESENTATIONS OF EATING DISORDERS IN IDDM

Whatever the specificity of the association between eating disorders and IDDM, it is likely that numerous young women with both conditions will come to medical attention because both conditions are relatively common. Furthermore, eating disorders that are subclinical, from a psychiatric point of view, may still pose a medical risk in individuals with IDDM. The common clinical presentations and medical problems associated with these two coexisting conditions are listed below.

Impaired metabolic control

We and others have shown that HbA_{1c} levels are significantly higher in IDDM patients with eating disorders compared with those without (28–30,34,39). For example, in a group of 103 adolescent girls with IDDM, we found that mean HbA_{1c} levels were $10.0 \pm 1.9\%$ in the subgroup of 13 with eating disorders, which was significantly higher than in the remainder of the sample, $8.9 \pm 1.7\%$ (28). The difference in HbA_{1c} level between these two groups represents 1.5–2 mM difference in mean blood glucose concentration. This, we believe, reflects a difference that is not only statistically significant, but also clinically meaningful in terms of metabolic control (28). This difference is similar to that reported by Steel et al. (30) in their group of young diabetic women. In that study, the mean HbA_{1c} of 14.8% over the previous 3 yr in the group with eating disorders was appreciably higher than the mean HbA_{1c} of 12% in those without eating disorders.

Diabetes noncompliance

Our studies suggest that the impairment in metabolic control in IDDM patients with eating disorders is likely attribut-

able not only to the increased and erratic caloric intake associated with binge-eating, but also to insulin misuse and noncompliance with virtually all aspects of the diabetes treatment regimen (28,29). In a recent survey, the eating disorder group rated themselves as less compliant on a self-rating instrument in areas including testing blood and urine, taking insulin on schedule, following a meal plan, maintaining adequate blood glucose control, fitting exercise into their treatment regimen, and remembering all components of their treatment (28). Insulin omission to produce glycosuria (also called insulin purging) provides a potent means for weight loss or prevention of weight gain in patients with IDDM. This behavior was significantly more common in the 12% diagnosed with bulimia, but also was reported by other patients (28). Similarly, Stancin et al. (26) found that 39% of 59 women aged 18–30 yr with IDDM reported underdosing with insulin to lose weight.

In our study of 103 girls aged 13–18 yr with IDDM, 13 were diagnosed as having eating disorders based on the DSM-III criteria, one with anorexia nervosa and 12 with bulimia (28). Methods for inducing weight loss in this eating-disordered group included insulin omission with induced glycosuria ($n = 7$), excessive dieting ($n = 9$), and self-induced vomiting ($n = 4$). These three behaviors were all significantly more common in the group with eating disorders. Extreme exercise to lose weight (>3 h/day) and laxative abuse were infrequent findings in both groups. In the same vein, Stancin et al. (26) reported the results of a study of 59 women with IDDM aged 18–30 yr: only 12% met DSM-III criteria for bulimia, but 58% admitted to eating binges. Eight (13.5%) of their subjects reported purging for weight control by means of self-induced vomiting, laxatives, diuretics, or enemas. Twenty-three (39%) used insulin omission or underdosing as their means of weight reduction; this behavior was significantly more common in the bulimic

group, but also occurred in others. The frequencies of some of the disordered eating behaviors were higher in the report of Stancin et al. (26) than in our series (28). However, our subjects were younger at the time of study, and the frequency of the various behaviors may increase with advancement to early adulthood.

Short-term and medium-term medical complications

A number of individual case reports attest to some of the more immediate medical consequences of eating disorders in IDDM. These include unstable and poor metabolic control (often called brittle diabetes), frequent episodes of DKA (from insulin omission), recurrent episodes of severe hypoglycemia (from food restriction with continuing insulin administration), and growth retardation and pubertal delay in girls who have not yet completed their pubertal growth spurt. All of these are likely to be associated with the need for more frequent hospitalization than is usual in girls of this age with IDDM. Although high HbA_{1c} levels are common in bulimia patients, extreme food restriction in patients with clinical or subclinical anorexia nervosa may, in fact, be associated with low HbA_{1c} levels and recurrent and severe bouts of hypoglycemia.

In our clinical experience, anorexia nervosa in females with IDDM carries a risk for major short-term diabetes-related complications. One patient with features of anorexia nervosa reported frequent episodes of severe hypoglycemia, including passing out on the street. Another reported frequent hypoglycemic convulsions associated with excessive dieting. A third patient with anorexia suffered from striking growth failure and delayed sexual maturation, despite an HbA_{1c} level close to the nondiabetic range. On the other hand, bulimia is more likely to be associated with hyperglycemia, recurrent DKA, and elevated HbA_{1c} levels. In our studies, the severity of bulimic symptoms correlated well

with impairment in metabolic control (28,29,39). We believe that the proximate event leading to episodes of recurrent DKA in such patients is omission or reduction of the required insulin dose. Because IDDM patients with eating disorders commonly use insulin omission as a means to lose weight, the index of suspicion of eating disorders in all females with recurrent DKA should be high.

Long-term medical complications

Steel et al. (30) found clinically apparent eating disorders in 15 of 208 (7%) young women with IDDM. Most of the patients with eating disorders (11 of 15) had a prolonged history of poor metabolic control. They also reported a high incidence and early onset of diabetes-related complications: 11 had retinopathy, 6 with proliferative changes; 6 had nephropathy; and 6 had neuropathy. Four patients diagnosed with anorexia nervosa developed acute painful neuropathy, with pain remitting as weight gain was reestablished. Whether a direct relationship exists between the eating disorder and these complications, or whether the latter are related to the poor metabolic control consequent to the disordered eating remains speculative. Steel et al. (30) postulated that nutritional factors may contribute to this rather high rate of early-onset diabetes-related complications.

MECHANISMS AND EXPLANATIONS FOR THE ASSOCIATION OF EATING DISORDERS WITH IDDM

Several possible explanations might account for the association of IDDM with eating disorders. Most obvious is that the association of these two relatively common conditions in young women is coincidental. Indeed, the question of whether the prevalence of the most severe eating disorders is increased in IDDM remains controversial. If so, it is likely that IDDM lowers the threshold for the clinical appearance of eating disorders in young

women who are vulnerable or at risk for these disorders. It is also possible that IDDM contributes to the occurrence of subclinical eating disorders that do not meet the threshold for the diagnosis of a clinical eating disorder but do have significant metabolic consequences. Some of the ways in which IDDM might be associated specifically with eating disorders are discussed below. None of these possible explanations can be substantiated at present, although research has been conducted that makes some of these hypotheses more or less likely.

Effects of IDDM on psychological development

IDDM may be a risk factor for the development of eating disorders via its subtle influences on the development of the sense of self. Indeed, disturbances in the sense of self are regarded by some (40,41) as central to the development of eating disorders. Although IDDM is not necessarily associated with overt psychological disturbances in adolescents and young adults (42,43), more subtle disturbances in ego development and self-image complexity have been found in young adolescents with IDDM compared with nondiabetic individuals (13). In this regard, impairment of ego function has been reported by some to be a poor prognostic factor in anorexia nervosa and bulimia (44).

Food preoccupation

The food preoccupation that is inevitable with IDDM may be a risk factor for the development of an eating disorder. However, it should be noted that patients with cystic fibrosis, a condition in which preoccupation with dietary intake is inherent in the illness and its treatment, do not share the psychopathological features of eating disorders (45) and may suffer from eating disorders even less than their peers without this condition (46). Cystic fibrosis differs from IDDM in that the illness results in the need to increase rather than restrain dietary intake.

Chronic dietary restraint

Some evidence, such as that Polivy and Herman (47) have gathered, suggests that chronic dietary restraint may itself be a risk factor for subsequent bulimia. This may apply to the chronic dietary restraint recommended for patients with IDDM, which may require them to ignore internal cues for hunger and satiety. This circumstance may cause some individuals to be deficient in their awareness of satiety and to be prone to disinhibited eating, particularly in response to emotionally upsetting stimuli (47,48). Presumably, the dietary restraint of IDDM would have most impact of this kind in individuals who already were vulnerable in this regard.

Weight gain associated with insulin treatment

It is a common observation that weight gain follows the institution of appropriate insulin treatment in individuals with IDDM (49,23). This may occur because of malnutrition that was present before treatment was begun and/or because of the effects of insulin, which enters the systemic rather than portal circulation. This weight gain may trigger increased body dissatisfaction and a cycle of dieting and binge-eating (22). Weight loss is difficult to achieve in IDDM, particularly with tight metabolic control (49), and appropriate insulin use may lead to weight gain (23). Furthermore, efforts to achieve optimal glycemic control with intensive insulin therapy may promote weight gain (49), thereby enhancing the feeling of body dissatisfaction and poor self-esteem.

Availability of a potent method of weight loss

Individuals with diabetes may learn quite quickly that omission or reduction of the required dosage of insulin results in weight loss. Not surprisingly, such insulin purging has been shown to be a common behavior in women with IDDM and was the most common means of inducing weight loss in individuals with both

IDDM and an eating disorder (28). This behavior is usually covert and may result in unexplained refractory metabolic control. Indeed, it has been shown that factitious behavior is one of the most common causes or reasons for unexplained refractory metabolic control (50). The wish to lose weight (rather than be ill) may be responsible for insulin omission in some cases of apparent factitious impairment of metabolic control. Such behavior may perpetuate an eating disorder, delay treatment, and certainly contribute to the likelihood of adverse medical consequences as a result of the diabetes.

Role of metabolic factors in precipitating eating pathology

No evidence exists to suggest that any of the metabolic disturbances typical of IDDM (e.g., hyperglycemia, insulin deficiency at diagnosis, or peripheral hyperinsulinemia during treatment with subcutaneous insulin injections, DKA, etc.) are direct triggering factors in the expression of eating disorders. It would appear that the impact of weight gain on eating disorders is secondary to the psychological consequences of an altered body shape.

Altered family dynamics

It has been observed that a chronic illness such as diabetes may affect parental attitudes and parent-child interactions (51). However, many of the interactions observed in the families of children with IDDM are constructive (52) and, at least early in the illness, may be associated with better metabolic control (53). Disturbances in family dynamics have been observed in families of patients with eating disorders (54,55). However, evidence is insufficient to indicate whether altered family dynamics in IDDM increase the risk for development of an eating disorder. It is possible in an illness such as IDDM that family consequences, such as preoccupation with food, increased rigidity of family interactions, or difficulty permitting age-appropriate au-

onomy in the diabetic child, are risk factors for eating disorders, but further research is necessary to substantiate this.

MANAGEMENT OF EATING DISORDERS IN IDDM PATIENTS

Detection of eating disorders

In a small proportion of cases, the signs and symptoms of anorexia and/or bulimia in patients with IDDM are so obvious that the diagnosis of eating pathology is made easily. However, the combination of eating pathology and IDDM more commonly presents in an occult manner with poor metabolic control, repeated episodes of hypoglycemia or DKA, or fluctuations in weight (either loss or gain) (10,29,39). A typical presentation is that of noncompliance with self-management in an adolescent female with IDDM. The diagnosis of an eating disorder in this context usually depends on a high index of suspicion of eating pathology. Administration of a screening test such as the EDI or EAT to young women with IDDM in the at-risk age-group may help in earlier detection and more successful management of eating disorders. However, a psychiatric assessment is indicated to confirm the diagnosis of an eating disorder in individuals in whom it is suspected.

We suggest that refractory metabolic control, reports of binge-eating, weight preoccupation, insulin purging, laxative or diuretic abuse, or self-induced vomiting should all raise the index of suspicion in young women with IDDM. In addition, collateral information from family members may help identify those at risk in a diabetes clinic. Experts are not agreed as to what defines binge-eating in terms of either frequency of episodes or amount of calories ingested (56). However, in individuals with IDDM, even occasional binge-eating and small increases in caloric intake may wreak havoc on metabolic control.

Flexible approach to diabetes management

When an eating disorder is suspected, a flexible, individualized approach to diabetes management becomes particularly important. Guidelines that are too strict regarding diet and blood glucose control actually may potentiate binge-eating. Furthermore, insistence on strict metabolic control may result in weight gain that is disturbing to the patient and that leads to insulin omission as a means of weight loss.

Family intervention

Because family functioning may be a complicating factor in IDDM, whether or not the patient has an eating disorder, patients with both conditions should undergo a thorough family assessment. In some cases, brief family interventions may improve the approach of the patient and family to diabetes management, facilitate acceptance of the eating problem, identify the appropriate balance of autonomy permitted and care provided for the child, and help to moderate judgmental attitudes that some parents may have regarding dietary lapses of the patient.

Hospitalization

Medical hospitalization is necessary in IDDM patients who also have eating disorders, particularly anorexia nervosa, when malnutrition or metabolic or electrolyte abnormalities are pronounced. Psychiatric hospitalization also may be indicated in more severe cases to normalize eating behavior and/or to treat associated psychiatric problems, including depression, suicidal tendencies, and impulsivity.

Psychotherapy

Group treatments in the diabetes clinic setting may be valuable and may have been underused. Specific expertise in both group therapy and IDDM is needed to conduct such groups, which may be conducted jointly by medical and mental health staff associated with the clinic.

Such treatments may be valuable both for those with eating disorders and for other young women with diabetes who share some of the same concerns about eating, weight, and body shape.

Various individual psychotherapies, conducted by trained mental health professionals, have been shown to be effective, although these are suitable for only a minority of patients with eating disturbances. CBT has been reported most widely, and benefit has been demonstrated in a significant proportion of cases (57), although Peveler et al. (58) suggest that the success rate may be somewhat lower in individuals with IDDM. The application of CBT to IDDM patients with eating disorders includes self-monitoring of weight, daily insulin dose, frequency of hypoglycemia, and HbA_{1c} levels; nonspecific psychological symptoms and specific eating and weight psychopathology; a dietary plan; education about eating disorders and diabetes, monitoring behavior, and related thoughts (59). This treatment aims to modify extreme beliefs about weight and body shape and self-defeating attitudes about diabetes management through a process of cognitive restructuring. By contrast, insight-oriented therapy in such patients is directed toward exploring underlying feelings and increasing the patient's ability to identify and tolerate emotional experience. Pharmacotherapy has only a modest place in the outpatient treatment of eating disorders. As Freeman noted in a recent review (57), antidepressant medications have been used with only limited success in bulimia. More promising results in alleviating the symptoms of bulimia nervosa have been obtained with fluoxetine, a newer antidepressant that specifically blocks neuronal serotonin uptake (60).

CONCLUSIONS — Eating disturbances are common in young women with IDDM and are associated with impaired metabolic control, noncompliance with diabetes management, and more severe long-term medical complications of IDDM. Significant eat-

ing disturbances may be present in up to 20% of patients with IDDM, most often associated with binge-eating. Psychiatric diagnoses of eating disorders have been made in >10% of such patients, using looser diagnostic criteria, but the prevalence may be much lower when structured diagnostic interviews are used with DSM-III-R criteria. In patients with eating disorders and IDDM, partial or complete omission of the required insulin dose is used more commonly to prevent weight gain than are behaviors such as laxative or diuretic abuse or self-induced vomiting. Most cases of eating disorders associated with IDDM are mild, easily diagnosed, and can be managed in the diabetes clinic. However, we suspect that eating disorders commonly are undetected in young women with IDDM that are in poor metabolic control.

Acknowledgments—This paper was partially funded by Ontario Mental Health Foundation Grant 992–87–91.

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