Multidisciplinary Residential Treatment of Type 1 Diabetes Mellitus and Co-Occurring Eating Disorders

5 authors, including:

Yani Dickens
University of Nevada, Reno
10 PUBLICATIONS   **213** CITATIONS

SEE PROFILE

Ann Haynos
University of Minnesota Twin Cities
77 PUBLICATIONS   **1,677** CITATIONS

SEE PROFILE

John Dolores
Valley Recovery Center of California
5 PUBLICATIONS   **38** CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:

Feasibility of Adaptive Treatments for Suicidal College Students: a SMART Design (R34 MH104714; Sponsor: National Institute of Mental Health or NIMH; Co-Investigator: David Jobes, Ph.D, Catholic University of America) View project

Initial Development and Validation of the Impulsive-Compulsive Index (ICI) View project

Multidisciplinary Residential Treatment of Type 1 Diabetes Mellitus and Co-Occurring Eating Disorders

Yani L. Dickens,
Counseling Services, University of Nevada, Reno; and Center for Hope of the Sierras, Reno, Nevada, USA

Ann F. Haynos,
Department of Psychology, University of Nevada, Reno, Reno, Nevada, USA

Shannon Nunnemaker,
Center for Hope of the Sierras; and Department of Psychology, University of Nevada, Reno, Reno, Nevada, USA

Lorraine Platka-Bird, and
Center for Hope of the Sierras, Reno, Nevada, USA

John Dolores
Center for Hope of the Sierras, Reno, Nevada, USA

Abstract

Research on treatment for diabetes and co-occurring eating disorders is sparse. We examined outcomes from multidisciplinary residential treatment for women with type 1 diabetes and eating disorders and the impact of treatment duration on outcomes. Participants were 29 women with type 1 diabetes and eating disorders receiving residential treatment. Repeated measures analyses of variance examined changes in blood glucose and psychological symptoms over treatment. Analyses were repeated to include treatment by duration interactions. Treatment produced significant reductions in blood glucose, eating disorder symptoms, and psychological concerns. Longer treatment duration was associated with greater improvements in psychological symptoms.

Disordered eating is alarmingly common among individuals with type 1 diabetes mellitus, with rates of co-occurring diabetes and eating disorders estimated as high as 40% (Young et al., 2012; Young-Hyman & Davis, 2012). The most commonly noted link between type 1 diabetes and eating disorders is in the form of purging through insulin omission for weight loss purposes (Darbar & Mokha, 2008), which has been noted for individuals with diabetes co- occurring with anorexia nervosa (AN), bulimia nervosa (BN), and eating disorder not otherwise specified (EDNOS; Nielsen, 2002; Peveler & Fairburn, 1989). However, even among individuals with diabetes who do not omit insulin, eating disorder symptoms are elevated (Jones, Lawson, Daneman, Olmsted, & Rodin, 2000).

This high co-occurrence rate is particularly concerning given the elevated rates of morbidity when diabetes and eating disorders co-occur. The link between disordered eating and poor metabolic control for individuals with diabetes is well documented (Affenito & Adams, 2001; Goodwin, Hoven, & Spitzer, 2003; Pinar, 2005). Individuals with diabetes and co-occurring eating disorders are at increased risk for life-threatening diabetic complications, including repeated diabetic ketoacidosis (DKA), kidney failure, diabetic retinopathy, neuropathy, cardiovascular disease, stroke, and coma (Larrañaga, Docet, & García-Mayor, 2011; Rodin et al., 2002). Most troubling is the impact of comorbid diabetes and eating disorders on mortality. Individuals with diabetes and an eating disorder are estimated at three times greater mortality risk than individuals with diabetes alone (Larrañaga et al., 2011), with mortality rates for this population estimated as high at 34.8% (Nielsen, Emborg, & Mølbak, 2002). Clearly, this is a high-risk group in need of effective treatment.

Individuals with type 1 diabetes and eating disorders will not likely improve without intensive medical, nutritional, and psychological management. In a longitudinal study of 36 individuals with diabetes and co-occurring eating disorder, the majority of which were not receiving psychological treatment, no significant improvements in eating disorder symptoms were found at a two-year follow-up, with 73% of the sample demonstrating no symptom change or worsening (Herpertz et al., 2001). However, few studies have examined interventions for individuals with co-occurring diabetes and eating disorders, and existing studies are limited by very small sample sizes. Peveler and Fairburn (1989) conducted a case study of a 22-year-old female with type 1 diabetes and AN, indicating successful use of cognitive behavioral therapy including diabetes specific components (e.g., education, self-monitoring of glycemic control). The same authors described a case series evaluating a modified cognitive behavioral therapy approach for six patients with BN and diabetes (Peveler & Fairburn, 1992). Descriptive statistics revealed decreases in glycated hemoglobin (HbA1c) levels and eating disorder symptoms following treatment. Only one small study has examined the impact of intensive treatment for this population. A group in Japan used a non-equivalent control group design to compare the effects of integrative inpatient therapy for patients choosing inpatient treatment to those opting to manage their diabetes and eating disorder on an outpatient basis (Takii et al., 2003). The inpatient group had significantly decreased HbA1c levels and eating disorder, mood, and anxiety symptoms after treatment compared to the outpatient group. Though these findings suggest that intensive treatment can positively impact eating habits and metabolic control, the inpatient sample was small (n = 9) and only consisted of individuals with BN, making it difficult to know whether the findings generalize to other populations with diabetes and eating disorders.

Due to the paucity of studies on treatment of individuals with diabetes and co-occurring eating disorders, and the fact that most eating disorder treatment studies exclude this population (Herzog et al., 2000), it remains unclear how to treat this high-risk group. The present study constitutes the largest case series examining the impact of a multidisciplinary residential treatment program on physical and psychological outcomes among women with co-occurring type 1 diabetes and eating disorders. Since it has been suggested by some that dietary restriction may put individuals with diabetes at risk for eating disorders by disrupting awareness of hunger and satiety cues (Goebel-Fabbri, Fikkan, Connell, Vangsness, &

Anderson, 2002), this program included an intuitive eating nutrition approach to restore awareness and responsiveness to internal hunger and satiety cues (Tribole & Resch, 1995). It was hypothesized that residential treatment would result in significant reductions in blood sugar and eating disorder and psychological symptoms. A secondary aim of the study was to examine the impact of duration of residential treatment on physical and psychological outcomes among the sample, as no standards exist to suggest adequate treatment length for individuals with co-occurring diabetes and eating disorders.

Methods

Participants and Procedures

Archival data was collected from all females with co-occurring eating disorders and type 1 diabetes consecutively admitted to a residential eating disorder treatment center located in the Western United States between January 1, 2008 to March 14, 2012. From these selection criteria, 29 were identified who had data available on blood sugar and eating disorder symptoms at both admission and discharge from the residential program and were included in this study. A local institutional review board approved all procedures.

Measures

Blood Glucose—Diabetes management was assessed pre- and post- treatment through measure of HbA1c (average blood glucose level over a three-month period) and fructosamine (average blood glucose level over a three-week period). Blood samples were collected at LabCorps© centers in the community.

Psychological Symptoms—Participants were given the Eating Disorder Inventory – 3 (EDI-3; Garner, 1991) to assess eating disorder and psychological symptoms pre- and post-treatment. The EDI-3 has been demonstrated to have high reliability and good construct validity (Garner, 1991). The following subscales were examined in order to evaluate change on eating disorder and psychological indices: Drive for Thinness, Bulimia, Body Dissatisfaction, Eating Disorder Risk Composite (EDRC), and General Psychological Maladjustment Composite (GPMC).

Treatment Approach

In line with current treatment recommendations (Goebel-Fabbri, 2009), clinical staff at the multi-disciplinary residential treatment center included licensed psychotherapists and their supervisees, registered dieticians, psychiatrists, physicians (including an endocrinologist), registered nurses, and mental health technicians. Therapeutic approaches included cognitive behavioral, person-centered, family, and feminist approaches. The primary goal of treatment was to teach patients cognitive and emotional skills to manage eating disorder thoughts and urges that interrupted diabetes management. Patients received medical monitoring of blood sugar levels several times daily by nursing staff. Patients who used an insulin pump temporarily suspended its use at admission for safety reasons, and restarted use later in treatment when clinically and medically appropriate.

Patients received two to three individual therapy sessions per week and family sessions once or twice a month. Patients met with a nutritionist and psychiatrist each once per week. Intuitive eating was the primary nutrition approach utilized by all staff. Diabetic patients were taught to practice intuitive eating by administering insulin dose for half of their portion prior to eating, and then administering the remainder of the dose following the meal according to the amount they consumed while attending to internal hunger and satiety cues. Meals were eaten under supervision of trained staff. Patients participated in up to three different therapeutic groups daily, including a diabetes management group, were encouraged to engage in light physical activity (e.g., yoga, walks) if medically stable, and attended weekly meetings in which their progress and goals were reviewed by multi-disciplinary treatment team.

Data Analytic Plan

Data were examined to determine if variables displayed normal distribution and appropriate levels of skew and kurtosis. Variables not adequately meeting these criteria were transformed. Any missing data was imputed using "hot deck" data imputation (Myers, 2011). This method of data imputation involves replacing missing values on a given variable with an observed response from a "similar" unit (i.e., another case with data available matched on particular variables). For this study, the "deck" from which blood sugar indices were computed was a matching blood sugar index at the same assessment point and the "deck" from which psychological indices were computed was a matching psychological index at the same assessment point.

To examine the main research question of whether residential treatment impacted physical and psychological outcomes, repeated measures analyses of variance (ANOVAs) were conducted to examine changes in blood sugar indices (hbA1c, fructosamine) and EDI-3 scores (Body Dissatisfaction, Bulimia, Drive for Thinness, EDRC, GPMC) from admission to discharge from residential treatment. Partial eta squared effect sizes are reported for ANOVAs and interpreted according to standard convention (Cohen, 1988). In order to examine the secondary research question of whether outcomes were impacted by length of treatment, repeated measures ANOVAs were repeated with duration of treatment entered as a covariate in order to examine treatment by duration interactions. Pearson's correlations were conducted to examine the association between treatment duration and change (discharge score subtracted from admission score) on all clinical variables. The alpha standard was set at $p < .05$ and all tests were two-tailed.

Results

Sample Characteristics

At admission, mean patient age was 25.55 years ($SD = 9.03$), average duration of diabetes was 13.00 years ($SD = 7.01$), and BMI was 23.57 kg/m^2 ($SD = 5.47$). Twenty-one participants identified as Caucasian (72.4%), two as Hispanic (6.9%), and one as more than one race (Caucasian and Hispanic; 3.5%). Twenty-three of the patients were single/never-married (79.3%) and two were divorced (6.9%). Five participants did not report race or marital status. Twenty-three participants (79.3%) were diagnosed with BN, three (10.3%)

with AN binge eating/purging subtype, and three (10.3%) with EDNOS. Treatment duration ranged from 21 to 86 days, with an average treatment length of 52.97 days *(SD* = 16.49).

Blood Glucose

As highlighted in Table 1, significant improvements in HbA1c and fructosamine (*ps* < .001) were observed from pre- to post- treatment, indicating improvements in metabolic control of a moderate effect size. No treatment by duration interaction effects were noted for HbA1c, $F(1, 27) = 1.54$, $p = .23$, or fructosamine, $F(1, 27) = 0.18$, $p = .67$.

Psychological Symptoms

As highlighted in Table 1, statistically significant reductions following treatment were found on all EDI-3 scales (*ps* < .001), indicating improvement in eating disorder and psychological symptoms of moderate effect sizes. Treatment by duration interactions were significant for Body Dissatisfaction, $F(1, 27) = 6.15$, $p = .020$, $\eta_p^2 = .19$; Bulimia, $F(1, 27) = 8.01$, $p = .009$; $\eta_p^2 = .23$; EDRC, $F(1, 27) = 7.27$, $p = .012$, $\eta_p^2 = .21$; and GPMC, $F(1, 27) = 5.16$, $p = .031$, $\eta_p^2 = .16$. As highlighted in Table 2, longer duration of treatment was associated with greater improvements on each of these variables.

Discussion

This is the first study to examine the impact of multidisciplinary residential eating disorder treatment on medical and psychological outcomes for females with co-occurring type 1 diabetes and eating disorders, as well as the largest case series for individuals with co-occurring diabetes and eating disorders. This constitutes a step forward in the literature, as the need for treatment research for high-risk eating disorder patients has long been recognized with little progress towards this goal (Herzog et al., 2000). Few studies have been conducted this population and all have had very small and homogenous samples (Peveler & Fairburn, 1989; 1992; Takii et al., 2003).

In line with the authors' hypotheses, statistically significant improvements of moderate effect sizes were detected for blood glucose, eating disorder symptoms, and general psychiatric concerns among women with type I diabetes mellitus and eating disorders following multidisciplinary residential treatment. Residential treatment may be particular advantageous for such a high-severity and medically compromised group. The advantages of the residential level of care include quicker medical stabilization, greater ease in coordinating multidisciplinary treatment, and higher initial treatment "dose." This study also lends credence to the largely untested recommendation that individuals with diabetes and eating disorders receive treatment by a multidisciplinary team (Goebel-Fabbri, 2009). Further, because an intuitive eating approach to nutrition was used in this study, the findings suggest such an approach can be safely employed and associated with positive outcomes in this population, though more research is needed on this approach.

Although the study suggests clear benefits of residential treatment for this population, it remains unknown whether this approach indeed confers advantage over treatment through different approaches and levels of care; therefore, comparative studies of treatment methods and intensities are needed. Future studies should also conduct cost benefit analyses. The cost

of uncontrolled diabetes is quite high. In 2003, the mean cost per hospitalization for diabetic ketoacidosis was $10,876 (+$11,024) and 59% of cases of hospitalization were related to noncompliance (Maldonado, Chong, Oehl, & Balasubramanyam, 2003). Therefore, it is probable that effective residential treatment of co-occurring diabetes and eating disorders would yield substantial health care cost reductions over time.

Another important set of findings pertains to the relationship between treatment duration and outcomes. Significant treatment by duration interactions were detected for all EDI-3 subscales other than Drive for Thinness, indicating that greater length of residential treatment was associated with greater improvements in eating disorder and other psychological symptoms in this population. Changes in managed care have resulted in dramatic shifts in treatment utilization for individuals with eating disorders. While in 1984 the average length of inpatient treatment for individuals with eating disorders in the United States was 149.5 days, by the early 1990s, the average length of inpatient and residential care dropped precipitously to 24 days due to decreased insurance coverage for eating disorders (Wiseman, Sunday, Klapper, Harris, & Halmi, 2001). Dramatic increases in readmissions for eating disorder treatment have resulted from decreased insurance coverage. The average treatment duration for our sample was higher than the typical length of treatment for an eating disorder (51.34 days), likely due to the concomitant diagnosis of type 1 diabetes. However, these results highlight the importance of an adequate duration of residential treatment in order to impact eating disorder symptoms and psychological concerns of individuals with diabetes and eating disorders.

Strengths of this study include use of a larger sample size than prior case series and inclusion of an ecologically valid, heterogeneous sample. Many eating disorder treatment studies routinely exclude individuals with diabetes; therefore, this investigation fills in gaps in current eating disorder treatment literature. Further, the effectiveness nature of this case series, which was conducted in a pre-existing eating disorder residential setting, provides external validity, suggesting that a multidisciplinary residential approach to treatment of diabetes and co-occurring eating disorders can be feasibly implemented in real-world settings.

With enhanced external validity comes decreased internal validity; therefore, without a comparison group, it cannot be fully determined whether to attribute outcomes to a specific treatment approach, provision of any psychological service, or effects of time. However, it is unlikely that effects are solely due to time, as previously reports suggest persistence of untreated eating disorders in diabetic samples (Herpertz et al., 2001). The purpose of this study was to examine initial effectiveness of a multidisciplinary residential treatment for individuals with co- occurring diabetes and eating disorders, rather than to compare effectiveness of treatment for this group compared to eating disordered individuals without diabetes. However, it still remains unknown whether individuals with co-occurring diabetes respond differently to treatment that other eating disordered groups. Finally, while there are strengths of an integrated treatment approach, such an approach makes it difficult to identify active components of treatment. Future research should include a control or comparison treatment group, control group of individuals with eating disorders without co-occurring

diabetes, long-term follow-up measures of symptom change, and examination of treatment moderators (e.g., eating disorder diagnosis) and mediators (e.g., intuitive eating).

The present findings provide a promising direction in the pursuit of effective treatment for the high-risk and under-researched group of individuals with type 1 diabetes and eating disorders. This case series is the first to demonstrate that multidisciplinary residential treatment approach confers significant physical and psychological benefits to this population. This study also highlights the importance of adequate treatment duration in the effective treatment of psychological symptoms among individuals with co-occurring diabetes and eating disorders. These findings have important treatment and policy implications, suggesting that residential treatment, ideally of longer duration, is recommended for individuals with co-occurring type 1 diabetes mellitus and eating disorders to facilitate metabolic control and symptom improvement, thus avoiding life-threatening medical complications.

Acknowledgements

References

Affenito SG, Adams CH. Are eating disorders more prevalent in females with type 1 diabetes mellitus when the impact of insulin omission is considered? Nutrition Review. 2001; 59:179–182.

Cohen, J. Statistical power analysis for the behavioral sciences. 2nd ed.. Lawrence Earlbaum Associates; Hillsdale, NJ: 1988.

Darbar N, Mokha M. Diabulimia: A body-image disorder in patients with type 1 diabetes mellitus. Athletic Therapy Today. 2008; 13:31–33.

Garner, DM. Psychological Assessment Resources. Lutz; 1991. EDI-3, Eating Disorder Inventory-3: Professional Manual..

Goebel-Fabbri AE. Disturbed eating behaviors and eating disorders in type 1 diabetes: Clinical significance and treatment recommendations. Current Diabetes Reports. 2009; 9:133–139. [PubMed: 19323958]

Goebel-Fabbri AE, Fikkan J, Connell A, Vangsness L, Anderson BJ. Identification and treatment of eating disorders in women with type 1 diabetes mellitus. Treatments in Endocrinology. 2002; 1:155–162. [PubMed: 15799208]

Goodwin RD, Hoven CW, Spitzer RL. Diabetes and eating disorders in primary care. International Journal of Eating Disorders. 2003; 33:85–91. [PubMed: 12474203]

Herpertz S, Albus C, Kielmann R, Hagemann-Patt H, Lichtblau K, Köhle K, et al. Comorbidity of diabetes mellitus and eating disorders: a follow-up study. Journal of Psychosomatic Research. 2001; 51:673–678. [PubMed: 11728508]

Herzog D, Greenwood DN, Dorer DJ, Flores AT, Ekeblad ER, Richards A, et al. Mortality in eating disorders: A descriptive study. International Journal of Eating Disorders. 2000; 28:20–26. [PubMed: 10800010]

Jones J, Lawson ML, Daneman D, Olmsted MP, Rodin G. Eating disorders in adolescent females with and without type 1 diabetes: Cross sectional study. British Medical Journal. 2000; 320:1563–1566. [PubMed: 10845962]

Larrañaga A, Docet MF, García-Mayor RV. Disordered eating behaviors in type 1 diabetic patients. World Journal of Diabetes. 2011; 2:189–195. [PubMed: 22087355]

Maldonado MR, Chong ER, Oehl MA, Balasubramanyam A. Economic impact of diabetic ketoacidosis in a multiethnic indigent population: Analysis of costs based on the precipitating cause. Diabetes Care. 2003; 26:1265–1269. [PubMed: 12663608]

Myers TA. Goodbye, listwise deletion: Presenting hot deck imputation as an easy and effective tool for handling missing data. Communication Methods and Measures. 2011; 5:297–310.

Nielsen S. Eating disorders in females with type 1 diabetes: An update of a meta-analysis. European Eating Disorder Review. 2002; 10:241–254.

Nielsen S, Emborg C, Mølbak AG. Mortality in concurrent type 1 diabetes and anorexia nervosa. Diabetes Care. 2002; 25:309–312. [PubMed: 11815501]

Peveler RC, Fairburn CG. Anorexia nervosa in association with diabetes mellitus – a cognitive-behavioural approach to treatment. Behavior Research and Therapy. 1989; 27:95–99.

Peveler RC, Fairburn CG. The treatment of bulimia nervosa in patients with diabetes mellitus. International Journal of Eating Disorders. 1992; 11:45–53.

Pinar R. Disordered eating behaviors among Turkish adolescents with and without Type 1 diabetes. Journal of Pediatric Nursing. 2005; 20:383–388. [PubMed: 16182098]

Rodin G, Olmsted MP, Rydall AC, Maharaj SI, Colton PA, Jones JM, et al. Eating disorders in young women with type 1 diabetes mellitus. Journal of Psychosomatic Research. 2002; 53:943–949. [PubMed: 12377307]

Takii M, Uchigata Y, Komaki G, Nozaki T, Kawai H, Iwamoto Y, et al. An integrated inpatient therapy for type 1 diabetic females with bulimia nervosa: A 3-year follow-up study. Journal of Psychosomatic Research. 2003; 55:349–356. [PubMed: 14507546]

Tribole, E.; Resch, E. Intuitive eating: A recovery book for the chronic dieter. St. Martin's Press; New York: 1995.

Wiseman CV, Sunday SR, Klapper F, Harris WA, Halmi KA. Changing patterns of hospitalization in eating disorder patients. International Journal of Eating Disorders. 2001; 30:69–74. [PubMed: 11439410]

Young V, Eiser C, Johnson B, Brierley S, Epton T, Elliott J, et al. Eating problems in adolescents with Type 1 diabetes: A systematic review with meta-analysis. Diabetes Medicine. 2012; 30:189–198.

Young-Hyman DL, Davis CL. Disordered eating behavior in individuals with diabetes: Importance of context, evaluation, and classification. Diabetes Care. 2010; 33:683–689. [PubMed: 20190297]

Table 1

Change in physical and psychological outcomes from admission to discharge among individuals with co-occurring diabetes mellitus and eating disorders participating in a multidisciplinary, integrated residential treatment

Measure	Admission *Mean (SD)*	Discharge *Mean (SD)*	*df*	*F*	*p*	η_p^2
HbA1c (%)	11.55 (3.29)	9.00 (1.99)	(1, 28)	40.78	<.001**	.59
Fructosamine (μmol)	518.34 (151.95)	360.72 (69.04)	(1, 28)	53.28	<.001**	.67
EDI-3 Body Dissatisfaction	45.28 (10.91)	36.55 (9.59)	(1, 28)	17.22	<.001**	.38
EDI-3 Bulimia	48.07 (11.89)	30.93 (8.76)	(1, 28)	54.14	<.001**	.66
EDI-3 Drive for Thinness	46.35 (10.32)	30.52 (11.33)	(1, 28)	37.07	<.001**	.57
EDI-3 Eating Disorder Risk Composite	45.17 (11.65)	27.35 (11.42)	(1, 28)	45.09	<.001**	.62
EDI-3 General Psychological Maladjustment	49.83 (12.04)	36.69 (11.62)	(1, 28)	31.04	<.001**	.53

Note: HbA1c = glycated hemoglobin; EDI = Eating Disorder Inventory-3

**
$p < .001$

Table 2

Correlations between duration of residential treatment and change ( ) on physical and psychological variables from treatment admission to discharge

Measure	Duration of treatment (days)		
	r	*n*	*p*
HbA1c (%)	.232	29	.226
Fructosamine (μmol)	.082	29	.671
EDI-3 Body Dissatisfaction	.431	29	.020[*]
EDI-3 Bulimia	.478	29	.009[*]
EDI-3 Drive for Thinness	.322	29	.088
EDI-3 Eating Disorder Risk Composite	.461	29	.012[*]
EDI-3 General Psychological Maladjustment	.401	29	.031[*]

Note: HbA1c = glycated hemoglobin; EDI = Eating Disorder Inventory-3

[*] $p < .05$