

Insulin Withholding for Weight Control in Women With Diabetes

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OBJECTIVE — To provide a description of the clinical characteristics that distinguish individuals who withhold insulin for weight control from those who do not. Some individuals with insulin-dependent diabetes mellitus (IDDM) control their weight by withholding insulin and purging excessive calories. This process places patients at risk for developing severe hyperglycemia, diabetic ketoacidosis, and increases the risk of long-term complications of diabetes.

RESEARCH DESIGN AND METHODS — Forty-two women with IDDM, ages 16–40, were interviewed and divided into two groups: insulin withholders (IWs) and non-insulin withholders (non-IWs). These groups were compared on physiological, behavioral, psychological, and psychiatric variables.

RESULTS — Compared with non-IWs, patients who withheld insulin to control their weight exhibited poorer glycemic control, reported more negative attitudes toward diabetes, were more likely to have pathological scores on the Eating Disorder Inventory 2, and were more likely to report current or past symptoms of anorexia or bulimia nervosa. IWs were also more likely to report lying to physicians about their degree of compliance with their diabetes regimens.

CONCLUSIONS — The results of this study indicated that IWs exhibit more symptoms associated with the spectrum of eating disorders than non-IWs. This study showed that insulin withholding for weight control not only exists, but is associated with some maladaptive symptoms and behaviors that need to be addressed by diabetes treatment teams.

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IDDM, insulin-dependent diabetes mellitus; IW, insulin withholder; non-IW, non-insulin withholder; df, degrees of freedom; EDI-2, Eating Disorder Inventory 2; IBW, ideal body weight; DICA-R-A, Diagnostic Interview for Children and Adolescents, Revised Adolescent Version; SCID-OP, Structured Clinical Interview for DSM-III-R, Outpatient Version; ANOVA, analysis of variance.

Some women with insulin-dependent diabetes mellitus (IDDM) reduce their insulin dose and/or omit their insulin injections to manage their weight. Insulin withholding can interfere with diabetes management by placing patients at risk for developing severe hyperglycemia and diabetic ketoacidosis and may increase the risk of long-term complications of diabetes. Most studies that have assessed insulin withholding have focused on patients with concurrent eating disorders (1). However, insulin manipulation for weight control is not restricted to those patients who have a concurrent eating disorder and may, in fact, be a common behavior among weight-conscious patients with diabetes. However, the current literature does not provide a description of the clinical characteristics that distinguish insulin withholders (IWs) from non-insulin withholders (non-IWs), regardless of the presence of a formal eating disorder. The present study extended the existing work by comparing IWs to non-IWs on behavioral, physiological, psychological, and psychiatric variables.

RESEARCH DESIGN AND METHODS

Women with IDDM, ages 16–40, were asked to participate in a research study that assessed attitudes toward diabetes, eating, weight, level of glycemic control, and diabetes regimen. Subjects with IDDM were recruited from four private diabetes practices ($n = 42$), American Diabetes Association support groups ($n = 24$), and a newspaper advertisement ($n = 4$). Forty-two subjects (60%) agreed to participate and completed the study. Twenty-eight subjects either declined, were excluded because of severe medical complications that could have confounded the total glycated hemoglobin assay (e.g., insulin resistance), failed to complete the study, or had a past but no current history of insulin manipulation for weight control.

The study sample consisted of 38 Caucasians, two African-Americans, and

two Latin-Americans. There were no significant differences between the IW group and the non-IW group with regard to age ($t[40] = 0.14$, NS), years of education ($t[40] = -0.82$, NS), age at onset of IDDM ($t[40] = -0.35$, NS), marital status ($\chi^2 = 1.49$, degrees of freedom [df] = 3, NS), or employment status ($\chi^2 = 0.002$, df = 1, NS).

Clinical interview

During a semi-structured interview, patients who reported intentionally withholding insulin for weight loss within the last 3 months were assigned to the IW group ($n = 15$). Within the IW group, eight subjects endorsed omitting insulin injections and reducing insulin doses, while seven subjects only reported reducing insulin doses for weight control. Subjects were placed in the non-IW group if they reported no current or past insulin manipulation to control weight ($n = 27$). Information on subjects' diabetes and medical histories and whether subjects lied to physicians about their treatment adherence was obtained at the interview. The interviewer was masked to subjects' levels of glycemic control.

Attitudes toward diabetes

The ATT39 is a 39-item self-report measure that assesses attitudes toward diabetes, its treatment, its effect on lifestyle, and the future (2). Low scores suggest a more negative attitude toward diabetes.

Eating Disorder Inventory 2 (EDI-2)

The EDI-2 is a widely used self-report instrument that assesses the psychological characteristics and symptomatology of eating disorders (3). It consists of 64 standard items and 27 provisional items that are divided into eight standard and three provisional subscales. The eight standard subscales are 1) Drive for thinness, 2) Bulimia, 3) Body dissatisfaction, 4) Ineffectiveness, 5) Perfectionism, 6) Interpersonal distrust, 7) Interoceptive awareness, and 8) Maturity fears. The three provisional subscales include 1) Asceti-

cism, 2) Impulse regulation, and 3) Social insecurity.

Glycemic control

The total glycosylated hemoglobin assay was used to measure glycemic control over the preceding 3 months (4). Blood samples were analyzed using a fully automated, high-performance boronate affinity liquid chromatography system. The lab's total glycosylated hemoglobin levels for nondiabetic control subjects range from 3.7 to 7.1, while the mean total glycosylated hemoglobin level for IDDM patients is 10 ± 3 .

Weight

Subjects were weighed using a balance beam medical scale that measures weight in pounds. Participants' ideal body weights (IBWs) were calculated using the Metropolitan Life Insurance Company standards (5).

Assessment of eating disorders

Diagnosis of eating disorders, based on the DSM-III-R criteria, were made using the Diagnostic Interview for Children and Adolescents, Revised Adolescent Version (DICA-R-A) or the Structured Clinical Interview for DSM-III-R, Outpatient Version (SCID-OP) (6-8). The administration procedures for both the DICA-R-A and the SCID-OP were modified so that each symptom for each disorder was assessed.

RESULTS— A one-tailed Student's t test comparing the IW group with the non-IW group on total glycosylated hemoglobin levels revealed that the mean concentration of total glycosylated hemoglobin was significantly higher in the IW group ($n = 15$) (15.31 ± 6.34) (mean \pm SD) than the non-IW group ($n = 27$) (10.28 ± 2.71) ($t[17] = 2.93$, $P < 0.01$).

A univariate analysis of variance (ANOVA) was conducted on ATT39 total scores for the IW and non-IW groups. The two-group comparison revealed that the IW group reported significantly lower ATT39 scores (120 ± 18.32) than did the

non-IW group (138 ± 14.25) ($F[1,40] = 12.64$, $P < 0.01$).

Table 1 presents the number and percentages of subjects in the IW and non-IW groups that met DSM-III-R criteria for a formal eating disorder either currently or in the past and that reported ever having experienced subsyndromal symptoms of anorexia and bulimia nervosa. No subjects met criteria for a current diagnosis of anorexia nervosa. χ^2 analyses indicated that compared with the non-IW group, the IW group was more likely to endorse current or past symptoms of anorexia or bulimia nervosa.

The EDI-2 was used to assess psychological symptoms commonly associated with eating disorders. A one-way multivariate ANOVA on EDI-2 subscale raw scores was used. An overall group effect was found with the IW group exhibiting more of the psychological symptoms common to eating disorders than the non-IW group (Wilks' $\lambda = 0.47539515$, $F(11,30) = 3.00$, $P < 0.01$). Table 2 presents the mean and SD for EDI-2 subscale raw scores for women in the IW and non-IW groups. The IW group displayed significantly higher scores than the non-IW group on 7 of the 11 EDI-2 subscales. The multivariate ANOVA was followed by Bonferroni-corrected Student's t tests to determine between group differences on the EDI-2 subscales while controlling for the per experiment-wise error rate ($t[40] = 2.02$, $P = 0.05$). The correction analysis revealed that the IW group displayed significantly higher mean scores than the non-IW group on the same 7 of 11 EDI-2 subscales.

The χ^2 analyses indicated that the IW group reported a significantly higher frequency of lying to physicians than the non-IW group with regard to checking blood glucose levels (IW group: $n = 8$, 53.33%; non-IW group: $n = 3$, 11.11%) ($\chi^2 = 8.89$, df = 1, $P < 0.01$) and following an insulin regimen (IW group: $n = 10$, 66.67%; non-IW group: $n = 1$, 3.70%) ($\chi^2 = 19.77$, df = 1, $P < 0.001$), but did not differ on following a meal plan (IW group: $n = 6$, 40.00%; non-IW

Table 1—Between-group comparisons on DSM-III-R eating disorder syndromes and symptoms

| | IW _s (n = 15) | | Non-IW _s (n = 27) | | χ^2 |
|---|--------------------------|-------|------------------------------|-------|----------|
| | n | % | n | % | |
| Past diagnosis of anorexia | 5 | 33.33 | 0 | 0.00 | 7.41* |
| Current diagnosis of bulimia | 4 | 26.67 | 0 | 0.00 | 7.95* |
| Past diagnosis of bulimia | 8 | 53.33 | 2 | 7.41 | 11.21* |
| Anorexia nervosa | | | | | |
| Refusal to maintain weight | 7 | 46.67 | 1 | 3.70 | 11.54* |
| Intense fear of weight gain | 9 | 60.00 | 3 | 11.11 | 11.29* |
| Body image disturbance | 10 | 66.67 | 3 | 11.11 | 13.92† |
| Amenorrhea | 6 | 40.00 | 2 | 7.41 | 6.64† |
| Bulimia nervosa | | | | | |
| Recurrent bingeing | 14 | 93.33 | 12 | 44.44 | 9.77* |
| Lack of control over eating | 11 | 73.33 | 9 | 33.33 | 6.18† |
| Regularly engages in purging | 10 | 66.67 | 5 | 18.52 | 9.73* |
| Minimum of two binge episodes per week for 3 months | 11 | 73.33 | 3 | 11.11 | 16.80† |
| Overly concerned with body shape and weight | 14 | 93.33 | 6 | 22.22 | 19.54† |

*P < 0.01. †P < 0.001. ‡P < 0.05. df = 1.

group: n = 4, 14.81%) ($\chi^2 = 3.37$, df = 1, NS).

The mean percentage difference between actual weight and IBW for the IW and non-IW groups was compared using two-tailed Student's *t* test. No statistically significant differences were found between the IW group (1.04 ± 0.22) and the non-IW group (1.03 ± 0.15; *t*[21] = 0.15, NS).

CONCLUSIONS— Compared with the non-IW group, the IW group was significantly more concerned with dieting and weight gain and reported a higher frequency of problems with body image disturbance, but were more likely to think about and engage in binge eating. Women in the IW group reported more psychological problems than the women in the non-IW group. Their psychological difficulties were evidenced by more feelings of inadequacy, dysfunctional self-perceptions, negative self-evaluations, feelings of alienation, and negative attitudes toward their illness. They also reported a reluctance to develop close relationships and described their social relationships as tense and disappointing.

An examination of the diagnostic

interview and EDI-2 responses revealed some inconsistencies. Interview responses indicated significant degrees of binge eating in the IW group, while mean scores on the Bulimia subscale for this group were not in the clinical range. Most IWs acknowledged being overly concerned with weight and body shape, but group differences on the Body Dissatisfaction subscale were not statistically signif-

icant, but in fact, both groups were within the clinical range. These inconsistencies may reflect the differences in the methods of measurement or sampling bias. Given the high refusal rate and small sample size, this sample may not be representative of all women who manipulate insulin. Thus, the reader is cautioned against generalizing the results of this study to the entire population of women with IDDM.

Table 2—Multivariate ANOVA on EDI-2 subscale mean raw scores for the IW and non-IW groups

| | IW _s (n = 15) | Non-IW _s (n = 27) | F |
|-------------------------|--------------------------|------------------------------|--------|
| EDI-2 subscales | | | |
| Drive for thinness | 10.33 ± 6.71 | 5.29 ± 5.01 | 7.62* |
| Bulimia | 5.13 ± 4.54 | 1.00 ± 1.64 | 18.32† |
| Body dissatisfaction | 18.33 ± 8.95 | 14.77 ± 8.44 | 1.64 |
| Ineffectiveness | 7.40 ± 7.74 | 2.59 ± 4.27 | 6.78† |
| Perfectionism | 7.26 ± 3.15 | 5.14 ± 4.00 | 3.11 |
| Interpersonal distrust | 4.60 ± 5.01 | 1.88 ± 2.04 | 6.16† |
| Interoceptive awareness | 8.46 ± 6.24 | 2.59 ± 3.72 | 14.69† |
| Maturity fears | 1.46 ± 2.23 | 2.00 ± 2.49 | 0.47 |
| Provisional subscales | | | |
| Asceticism | 6.66 ± 3.67 | 3.88 ± 2.30 | 9.07* |
| Impulse regulation | 3.46 ± 5.38 | 1.62 ± 2.48 | 2.30 |
| Social insecurity | 7.66 ± 5.00 | 3.59 ± 3.18 | 10.40* |

Data are means ± SD. *P < 0.01. †P < 0.001. ‡P < 0.05. df = (1,40).

In conclusion, this study supports the idea that insulin withholding for weight control occurs in young women with IDDM and that these women manifest certain maladaptive characteristics and behaviors that not only distinguish them from those who do not withhold insulin, but also need to be addressed by diabetes treatment teams. Future research needs to focus on the identification and treatment of patients who withhold insulin to control their weight.

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References

1. Rodin GM, Daneman D: Eating disorders and IDDM: a problematic association. *Diabetes Care* 15:1402-1412, 1992
2. Dunn SM, Smartt HH, Beeney LJ, Turtle JR: Measurement of emotional adjustment in diabetic patients: validity and reliability of ATT39. *Diabetes Care* 9:480-489, 1986
3. Garner S: *Eating Disorder Inventory-2: Professional Manual (EDI-2)*. Odessa, FL, Psychological Assessment Resources, 1991
4. Nathan DM, Singer DE, Hurxthal K, Goodson JD: The clinical information value of the glycosylated hemoglobin assay. *N Engl J Med* 310:341-346, 1984
5. Society of Actuaries and Association of Life Insurance Medical Directors of America: *Build Study, 1979*. Chicago, IL, Author, 1980
6. American Psychiatric Association: *Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R)*. 3rd ed. Washington, DC, Author, 1987
7. Reich W, Shayka JJ, Taibleson C: *Diagnostic Interview for Children and Adolescents, Revised Adolescent Version (DICA-R-A)*. St. Louis, MO, Washington Univ. Press, 1991
8. Spitzer RL, Williams JBW, Gibbons M, First MB: *Structured Clinical Interview for DSM-III-R, Outpatient Version (SCID-OP)*. New York, Biometrics Research Department, New York State Psychiatric Institute, 1989