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Diabetes distress may adversely affect the eating styles of women with type 1 diabetes

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Abstract

The aim of this study was to determine the relationships among diabetes distress, fear of hypoglycemia, and eating styles in women with type 1 diabetes (T1DM). Fifteen women (mean age 37 ± 13.5 years) with T1DM completed surveys measuring diabetes distress, fear of hypoglycemia (FOH), and eating style. Height, weight, and A1C were obtained, and open-ended comments regarding hypoglycemic concerns and experiences were recorded. Diabetes distress was positively associated with A1C (r = .655, p = .008). High levels of external (73 %), emotional (47 %), and restrained (53 %) eating styles were reported. Emotional and external eating styles were positively associated with diabetes distress (r = .575 and r = .622; p <.05). Those with poorer glycemic control (A1C ≥ 7 %; 53 mmol/mol) had higher levels of restrained eating behavior (F = 10.69, p = .006) and greater interpersonal distress (F = 5.916, p = .03) than those with better glycemic control (A1C < 7 %; 53 mmol/mol). A nonlinear relationship was identified between

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Conflict of interest Pamela Martyn-Nemeth, Laurie Quinn, Eileen Hacker, Hanjong Park and Amber S. Kujath declare they have no conflict of interest.

Human and Animal Rights disclosure This study was reviewed and approved by the appropriate ethics committee for the protection of human subjects at the University of Illinois. All procedures were followed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

Informed consent All participants provided written informed consent prior to the inclusion in the study.

interpersonal distress and FOH (behavior subscale, $p = .0383$) indicating that fewer behavioral approaches were employed to avoid hypoglycemia at higher distress levels. The women in this sample were emotionally burdened by their disease. Distress was associated with eating styles linked with overeating and poor glycemic control. High levels of emotional and external eating styles may have important clinical implications for those with T1DM.

Keywords

Diabetes mellitus type 1; Diabetes distress; Eating style; Fear of hypoglycemia

Introduction

Among people with type 1 diabetes (T1DM), fear of hypoglycemia (FOH) may have unintended consequences, including unhealthy eating styles. The complexities of diabetes management and fears of complications contribute to psychosocial distress and may lead to poor glycemic control. Hypoglycemia is the limiting factor in attaining glycemic control [1]. The negative consequences of hypoglycemia may result in psychological distress and fear of future similar episodes of hypoglycemia [2] and initiate a cycle of over-compensatory behaviors that lead to poor glycemic control. Thus, FOH continues to be a critical barrier to achieving glycemic control.

Compared to men with T1DM, women with T1DM report higher levels of FOH [3]. Greater FOH may lead to greater psychological distress and unhealthy eating patterns. In healthy populations, psychological distress can alter eating patterns and lead to unhealthy dietary intake [4]. The influence of psychological stress and eating behavior has been studied in T2DM women [5], but few studies have been conducted in T1DM adults. To date, studies have primarily focused on eating disorders [6] in children and adolescents with diabetes. Therefore, the purpose of this study was to determine the relationships among diabetes distress, FOH, and eating styles in women with T1DM. Understanding is needed of the barriers and factors related to the occurrence of diabetes distress and FOH in order to help individuals with T1DM achieve glycemic control.

Methods

This was a cross-sectional descriptive and qualitative study performed using a convenience sample of T1DM women ($n = 15$) greater than 18 years of age. The study was approved by the Institutional Review Board of the University of Illinois. Demographic and health information was obtained through self-report. Diabetes-related emotional distress was measured using the Diabetes Distress Scale (DDS) [7]. The DDS is a 17-item, 6-point, Likert-style instrument comprised of four subscales: emotional burden, physician-related distress, regimen-related distress, and diabetes-related interpersonal distress. Higher total DDS scores reflect greater distress (2.0–2.9 moderate; ≥3.0 high distress) [8]. FOH was measured using the Hypoglycemia Fear Scale-II (HFS-II) [9]. The HFS-II is a 5-point, Likert-style instrument composed of two subscales: an 18-item worry subscale and a 15-item behavior subscale. Higher scores reflect greater levels of fear. In addition, subjects were asked to describe their concerns and experiences with hypoglycemia, and their

responses were recorded. Eating style was measured with the Dutch Eating Behavior Questionnaire (DEBQ), a 33-item, 5-point, Likert-style scale with three subscales that measure external, restrained, and emotional eating styles known to affect adherence to a healthy diet [10]. A validated English version of the DEBQ was used for this study [11]. The Cronbach's alpha for the subscales ranged from .844 to .946 in this study. Body mass index (BMI) was calculated from measured height and weight [weight (kg)]/[height (m^2)]. Glycemic control was determined by the measurement of A1C (A1CNow®; Bayer).

Associations among diabetes-related distress, FOH, eating styles, and A1C were examined using Pearson correlation techniques with bootstrapping to accommodate the small sample size and potential for non-normality for the overall group. The sample was then subdivided by A1C into two groups: A1C < 7 % (53 mmol/mol) and A1C ≥ 7 %. Comparisons of diabetes-related distress, FOH, and eating style for each group were conducted using ANOVA.

Results

Among the subjects (mean age 37 ± 13.5 years, mean diabetes duration 23 ± 13 years), 80 % used an insulin infusion pump and 47 % were overweight or obese (i.e., BMI ≥ 25). The mean A1C was 6.98 % (53 mmol/mol; range 6–8 %/42–64 mmol/mol). Fifty-three percent of the women reported moderate or higher distress levels. The greatest distress occurred over feelings of failure, feeling overwhelmed, and feeling fatalistic concerning the development of future complications. One-third of the women reported feeling angry, scared, and/or depressed when thinking about living with diabetes. The DDS total scores and regimen-related distress subscale scores were positively associated with A1C levels (r = .655, p = .008; r = .583, p = .023, respectively). Moderate levels of FOH were reported (total score mean 1.1 ± .43). Worry over hypoglycemia (worry subscale scores; mean 1.2 ± .53) contributed a greater degree to the overall fear score than behaviors instituted to avoid hypoglycemia (behavior subscale scores; mean 1.0 ± .37).

The subjects reported high degrees of external (73 %), emotional (47 %), and restrained (53 %) eating styles. Attempts to lose weight over the past 6 months were significantly related to restrained eating (r = .713, p = .003), but not BMI. Emotional and external eating styles (respectively) were positively associated with total distress (r = .575 and r = .622), emotional burden (r = .614, r = .635), and interpersonal distress (r = .577, r = .539) (p < .05, Table 1). When comparing eating styles between the two A1C groups, those with poorer glycemic control (A1C ≥ 7 %; 53 mmol/mol) had significantly higher levels of restrained eating behavior (F = 10.69, p = .006) and experienced greater interpersonal distress (F = 5.916, p = .03) than those in whom blood glucose was controlled (A1C < 7 %; 53 mmol/mol).

Fear of hypoglycemia was not associated with total diabetes distress or any eating style. Interestingly, a nonlinear relationship (p = .0383) was identified between interpersonal distress and the FOH behavior subscale. The distribution of scores showed an inverted ''U-shaped'' curve, with fewer behavioral approaches employed to avoid hypoglycemia at higher distress levels. Statements made by the participants reflected links between

hypoglycemia and eating behavior: for example, ‘‘I worry about getting low. I have had bad lows when I had to walk and get food or call and have someone bring food.’’ ‘‘I get frustrated about having to eat after a good work-out.’’

Discussion

The women in this sample were emotionally burdened by their disease, and analysis revealed that their diabetes-related distress was associated with eating styles linked to overeating and poor glycemic control. Diabetes distress was positively related to A1C. This finding is congruent with previous studies [12] and highlights the serious psychological burden of managing this complex chronic disease and the effect that burden may have on behaviors. However, FOH was not significantly related to diabetes distress, eating styles, or A1C. Polonsky et al. [6] observed a significant association among diabetes distress, FOH, eating disordered behavior, and A1C. The discrepancy between our findings and those of Polonsky et al. may relate to our small sample size and the psychopathologic eating behaviors measured by Polonsky et al., which may not be comparable to eating styles influenced by normative psychological factors. In addition, in the current study, a nonlinear relationship was identified between interpersonal distress and FOH avoidance behaviors (e.g., more frequent blood glucose monitoring or adjusting insulin dosages). Further exploration of this relationship is warranted to determine whether there is a level at which greater diabetes distress becomes immobilizing and does not translate into further behavior change.

The women in this study had high levels of external, emotional, and restrained eating styles. Emotional and external eating styles were associated with greater overall distress, interpersonal distress, and emotional burden. Emotional and external eating style have been found to be associated with negative feelings, overeating, and resistance to behavior change in adults with T2DM [5], but have not been explored in women with T1DM. The few studies of eating behavior in women with T1DM focused primarily on eating disorders. There is a theoretical difference in the conceptualization of emotional and external eating styles compared to eating disorders. An emotional eating style is derived from psychosomatic theory, in which psychological stress diminishes normal appetite-regulating mechanisms and stimulates ingestive behavior in vulnerable individuals [10]. External eating style is derived from externality theory, in which the individual responds to external stimuli such as sensory cues and environmental and social stimuli for dietary intake [10]. Our data suggest that external cues necessary for diabetes self-management may directly influence eating style. Although external eating is typically defined as eating in response to cues such as sight and smell of food [10], for individuals with diabetes, external cues may be broader and may include eating in response to insulin dose and time effects, capillary blood glucose levels, and/or planned physical activity, which have little to do with typical stimuli such as hunger and sensation.

Those with poorer glycemic control had significantly higher levels of restrained eating and interpersonal distress, suggesting that attempting to maintain near-normal blood glucose levels results in a high degree of distress. High restraint is consistent with dieting behavior which has resulted in loss of control with overeating when upset or stressed [13]. If this

occurs in women with T1DM, the impact on glycemic control may lead to a greater risk for complications.

Though the sample size was small, strong associations were observed between diabetes distress and eating styles that should be investigated further. Potential nonlinear relationships between distress and self-management behaviors instituted to avoid hypoglycemia should also be examined for identification of possible targets for interventions.

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Table 1

Diabetes distress item mean scores correlated with hypoglycemia fear, eating style, and A1C

	Total distress	Emotional distress	Interpersonal distress	Regimen distress	Physician distress
Measures					
Hypoglycemia fear total	.290	.352	−.042	.185	.226
Hypoglycemia behavior	.104	.209	−.166	−.023	.171
Hypoglycemia worry	.368	.399	.035	.287	.233
Emotional eating	.575*	.614*	.577*	.140	.396
External eating	.622*	.635*	.539*	.369	.283
Restrained eating	.360	.342	−.020	.199	.399
A1C	.655**	.431	.474	.583*	.409

*Correlation is significant at the .05 level (2-tailed)

**Correlation is significant at the .01 level (2-tailed)