

Research Article

Original Research Article Feasibility and Acceptability of a Mother- Daughter Intervention to Prevent Disordered Eating in Girls with Type 1 Diabetes

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Abstract

Disordered eating behavior (DEB) is correlated with development of eating disorders and other psychological illnesses. Adolescent females with Type-1 diabetes (T1DM) are at higher risk for developing DEB and have a two-fold higher incidence of DEB than their non-diabetic counterparts. Individuals with T1DM have the unique ability to omit insulin as a weight reduction strategy. DEB in T1DM adolescent females significantly increases the risk for premature nephropathy, neuropathy, retinopathy, and death. Despite strong evidence to support the association between DEB and negative health outcomes, little research has focused on interventions to prevent the development of DEB in this population. The purpose of this study was to develop and test the feasibility and acceptability of a mother-daughter intervention addressing three of the major risk factors for DEB: low self-esteem, poor body image, and maternal-daughter communication. Intervention development was guided by feminist, cognitive behavioral, and current diabetic theoretical frameworks and input from a mother-daughter dyad with the daughter having T1DM. Data was collected from 10 mother-daughter dyads (n=20) on intervention effectiveness and overall acceptability. Feasibility and acceptability of the intervention was high in both mothers and daughters. Positive gains noted by participants included increased knowledge of mother-daughter communication, self-esteem, and deciphering media messages. A pre/post-test design was utilized to examine changes in depression, self-esteem, body image, mother-daughter relationship, and disordered eating risk from pre to post-intervention. Encouraging changes in the clinically desired direction were seen in body image and disordered eating risk post-intervention.

ABBREVIATIONS

DEB: Disordered Eating Behavior T1DM: Type 1 Diabetes Mellitus

INTRODUCTION

For the adolescent female with Type 1 diabetes mellitus (T1DM), presence of disordered eating behavior (DEB) creates an increased risk of poor health outcomes, including early and more frequent retinopathy, nephropathy, hospitalizations, and increased risk of mortality [1-3]. Treatment of DEB is difficult, with relapse rates ranging from 33 to 41% depending on

behavior type [4]. Focus by clinicians on prevention may arrest development of DEBs among adolescent females with T1DM and decrease poor health outcomes. Nurses are poised to not only identify T1DM girls who are at risk for DEB, but are well suited to deliver educational interventions aimed at DEB prevention in this population. This paper reviews a pilot study to investigate the feasibility and acceptance of a mother-daughter intervention aimed at prevention of DEB in adolescent females with T1DM.

BACKGROUND

DEBs are unhealthy and maladaptive eating behaviors, which

do not occur at a frequency to meet the criteria for a formal *DSM-IV-TR* eating disorder diagnosis [5]. Among adolescent females with T1DM insulin omission is the unique and frequent method of DEB, ranging in documented omission rates in research populations from 7.4% to 74% [1,6]. Omission or dose reduction of insulin causes blood glucose levels to rise, with subsequent 'purging' of glucose and calories through the urine. For adolescent females with T1DM even infrequent DEB can increase the risk of negative health outcomes [7]. Adolescent girls with T1DM and DEB not only develop complications of diabetes at higher rates, but also develop them more quickly [8].

Adolescent girls with T1DM have a two-fold higher incidence of DEB than their non-diabetic counterparts [6,10-12]. There is some variability in reported rates of DEB among adolescent T1DM girls, ranging from no difference when compared to the general population of adolescent girls, to as much as four times greater [12-14]. Even in research with reduced rates of DEB among adolescents with T1DM, insulin omission is still present [13]. The combination of T1DM and DEB places adolescent females at higher risk for negative health outcomes such as blindness, renal failure, acute ketoacidosis, and premature death [1-3,7-9,15-17].

Several factors increase the risk for development of DEB in adolescent girls with T1DM including low self-esteem, poor body image, increased drive for thinness, elevated body mass index (BMI), depression, psychological disease, negative family cohesion/communication, maternal weight/shape concerns, and poor maternal-daughter relationship [7,17-19] (Table 1). Adolescent females with T1DM who engage in DEB also are more likely to have mothers who also display low self-esteem, poor body image, and high drive for thinness [18-20]. T1DM adolescent females without DEB have less depression and higher body image and self-esteem scores on standardized testing, further suggesting that having a healthy body image, elevated self-esteem, functional family relationships, and lack of depression may actually protect diabetic girls from developing DEB behavior [5]. These associated factors may actually be protective against development of DEB as girls who score highest on measures of body image, self-esteem, and depression measures did not exhibit DEB [5]. To date, the effect of mothers as a protective factor in prevention of development of DEBs in this population has not been researched. Despite evidence acknowledging the problem of DEBs [21], subsequent negative health outcome [1,7,9,22], and insulin omission [17,20,22,23] among adolescent females with T1DM, prevention interventions for this population have yet to be developed and researched [5,21].

THEORETICAL FRAMEWORKS

Diabetic theoretical frameworks underpinning DEB are grounded in feminist and cognitive behavioral theories. In constructivist feminist theory, body image is engendered through interactions and relationships, being constructed from social interactions, cultural influences, and changing gender ideals [24]. Engendered messages of an 'ideal body' prompt adolescent girls to scrutinize their bodies to evaluate how they measure up to internalized standards, thus creating an objectified body consciousness [25-27]. Culture teaches women to view their bodies as objects and to evaluate and describe themselves by physical traits [28]. Media drives objectification through visual

Table 1: Risk Factors Associated with DEB in T1DM Adolescent Females.

Risk Factor	Measured As
Self-Esteem	<ul style="list-style-type: none"> • Feeling Ineffective • Low Self-Concept • Low Self-Esteem [18,20]
Body Image	<ul style="list-style-type: none"> • Body Image • Drive for thinness • Weight preoccupation [12,17-20]
BMI	<ul style="list-style-type: none"> • Elevated BMI [18,20]
Depression	<ul style="list-style-type: none"> • Depression • Signs of Psychological Disease [5,8,18]
Family/Maternal Relationships	<ul style="list-style-type: none"> • Negative family cohesion/negative home communication • Feeling less trust and greater alienation within the family • Mothers: maternal weight-shape concerns, increased body weight, currently on a diet and more controlling, maladaptive eating attitudes • Poor maternal-daughter relationship [17,20]

emphasis on women's bodies, which fuels body evaluation and improvement. Women, both mothers and daughters, gain a sense of self-worth based on their internalized body ideal and proximity to achieving it. In DEB, interactions between cognitive processes, emotions and behaviors are affected by history and experiences in a continual reciprocal feedback loop, which results in specific behaviors to control weight [29].

MATERIALS AND METHODS

Methods

The purpose of this study was to develop and pilot test a mother-daughter group intervention for feasibility and acceptability. The intervention aimed to reduce DEB risk through enhancement of known protective factors among T1DM adolescent girls. The proposed intervention, Beautiful YOU Team Intervention (BEYOUTI), was designed to increase knowledge about DEBs among adolescent females living with T1DM, to enhance self-esteem and body image, and to improve the mother-daughter relationship through improved communication skills. Poor self-esteem, body image, and mother-daughter relationship are three of the major risk factors for DEBs in this population [5,21].

The research questions were: (1) Is it feasible and acceptable to implement a mother-daughter group intervention to prevent DEB development among T1DM adolescent girls receiving care in a hospital-based pediatric endocrinology practice? (2) What is the impact of the intervention on depression, perceptions of the mother-daughter relationships, body image, and self-esteem? With the premises that effective mother-daughter communication [4,30] is protective and reduces the risk for DEB in the adolescent girl with T1DM and diabetes, family, sociocultural gender/body messages, weight gain associated with insulin, and dietary management all interact to increase the risk of DEB [21].

DESIGN

BEYOUTI was developed in conjunction with a mother and her T1DM daughter. The feasibility and acceptability of BEYOUTI was evaluated using a pre/post-test, no control group design with a cohort of mother-daughter dyads and three data collection

time points: pre-intervention/baseline, immediately post-intervention, and 6-weeks post-intervention. Data collection included verbal and written feedback on acceptability, feasibility, suggestions for improvement in the intervention, and change in study variables. Psychosocial measures and variables included self-esteem, body image, depression, maternal relationship, and insulin omission behavior. Human subjects protections were in place throughout the research and IRB approval through full review was established at all research sites prior to research initiation. All study personnel completed human subjects training and Health Insurance and Portability and Accountability Act education specific to research site requirements.

SAMPLE

Adolescent females living with T1DM and their mothers were recruited from a large pediatric hospital-based endocrinology practice in the Midwest. Inclusion criteria for enrollment were (a) diagnosis of T1DM for at least 18 months, (b) female gender, (c) 13 to 18 years old, (d) ability to fluently speak/read English, and (d) mother available to participate and able to fluently speak/read English. Potential participants were recruited via an informational brochure while waiting for clinic appointments. Of 32 potential participant dyads that met study criteria, 24 expressed interest in the mother-daughter intervention, with successful contact made with 22 dyads. Of these, one mother-daughter dyad reported they were no longer on speaking terms, three reported illness, three canceled due to school or work obligations, and five were lost to follow up, leaving 10 mother-daughter dyads participating in the intervention. Four mothers and one daughter did not return six-week post survey questionnaires. Attrition from time of enrollment to actual intervention was 42%. Daughter participants ranged in age from 14 to 17 years with a mean age of 15 years 4 months. Age of diagnosis with diabetes among the daughters ranged from 2 to 13 with a mean age at diagnosis of 8 years 11 months. Mother participants ranged in age from 36 to 47 years with a mean age of 41 years 3 months.

MEASURES

Outcome measures were; Body Esteem Scale (BES) as a measure of body image, Rosenberg Self Esteem Scale as a measure of self-esteem, Major Depression Inventory (MDI) as a measure of depression, and the Inventory of Parent and Peer Attachment (IPPA) maternal scale as a measure of mother-daughter relationship (Table 2). Predictor variables were; Eating Attitudes Test (EAT-26) as a measure of eating disorder risk and insulin omission questions developed by the researcher. Descriptive statistics and paired t-test comparisons were used to examine outcome measures at three time points: pre-intervention, post intervention, and six-week post intervention. Mothers and daughters completed all measures, with the exception of the insulin omission measure, which was completed only by the daughter. Additional qualitative information about the intervention was also collected pre and post intervention.

INTERVENTION

In an effort to increase participation the BEYOUTI intervention was designed as a single two-hour session. Mother-daughter communication was the center of emphasis

Table 2: Evaluation Measures/Questionnaires.

Risk Factor	Questionnaire	Items	Reliability/Validity
DEB Risk	Eating Attitudes Test-26 (EAT-26)	26	$\alpha = 0.90$, Good construct validity
Self-Esteem	Rosenberg Self-Esteem Scale	10	$\alpha = 0.80$, Good construct validity
Body Image	Body Esteem Scale (BES)	23	$\alpha = 0.92$ Test-retest correlations - 0.89 Appearance, 0.92 Weight, 0.83 Attribution
Depression	Major Depression Inventory (MDI)	12	Consistent correlation to Beck depression inventory Good reliability, sensitivity and specificity
Maternal Relationship	The Inventory of Parent and Peer Attachment (IPPA)	25 (Maternal scale)	Mother $\alpha = 0.87$ Test-retest reliability: 0.93
Insulin Omission	Research specific self-report items	2	-Yes/No item-omitting insulin -self-report # of insulin omissions -open ended question as to why

throughout each focus area of the intervention. The intervention consisted of interactive, educational, and skill building activities. Audiovisual content was included to keep participants engaged and to provide multiple content delivery methods for learning. Focus areas included: (a) DEB in T1DM, (b) deciphering media messages, (c) body-image and self-esteem building, and (d) open communication. Each component included information, an open group discussion, and specific mother-daughter activities.

RESULTS

Acceptability of the Intervention

Mother and daughter feedback regarding the BEYOUTI intervention was positive with 70% of participants responding positively on post-intervention questionnaires (Table 3). Verbal feedback provided by participants after the intervention included statements such as "This was a real eye opener," and "We have never talked about these things before." Mothers and daughters suggested that the intervention should be replicated. Most felt this was an approach that all mothers and daughters living with T1DM could benefit from to improve daughters' self-esteem, to help them decipher media messages, and to enhance communication between mothers and daughters. Mothers and daughters also suggested a larger venue and coupling with a large diabetes organizational event. They also suggested that the age for the target audience be lowered to pre-adolescent years in order to "catch them before any of this starts."

IMPACT OF THE INTERVENTION

For all participants, EAT-26 scores decreased immediately post-intervention and further decreased at six weeks post intervention. BES scores rose throughout post-intervention

testing (Tables 4 and 5). The changes in the clinically desired direction on the outcome measures of body image, as measured by BES, and DEB risk, as measured by EAT-26, are promising. The BES, EAT-26, and IPPA maternal scale outcome measures all had subscales. The BES Appearance, BES Weight, and EAT Dieting subscales showed change in the desired direction from baseline to the immediate post-intervention and six-week post-intervention time points, but were driven by changes in mother scores. Both BES Appearance and BES Weight showed increases in the desired direction for all participants at both the immediate post- and six-week post-intervention time points. There was also a non-significant increase in BES scores at both the immediately post-intervention and six-week post-intervention time points, although the six-week time point increase was not as high as the immediate post-intervention increase.

For mothers, significant results were found for the EAT-26 at six weeks post intervention, for the BES Appearance subscale at the immediate post-intervention time point, and the EAT Dieting, BES Appearance, and BES Appearance subscales at six weeks post intervention. Overall, changes in the desired direction for body image and DEB risk were strongest in mothers, and mothers' scores on the EAT-26 appeared to be the driving factor in results. Pilot sample results are difficult to interpret at this point in time given the small participant number. However, the changes noted in the clinically desired direction on the EAT-26, BES, and MDI total scores, as well as BES Appearance and EAT Dieting subscales measures, are promising.

Insulin Omission and BMI

T1DM adolescents were asked on each questionnaire if they had ever omitted insulin and how many times. At pre- and immediate post-intervention time points 70% of girls indicated that they had missed an insulin dose in the previous 3 months and 67% that they had missed an insulin dose at the six-week

post-intervention time point. No participant reported missing more than three doses. The most common reason for missing dosing was forgetting to take insulin, and the most common insulin noted was glargine insulin.

Findings from Qualitative Data

On immediate post-intervention questionnaires, participants were asked to share what they had gained from the intervention. Four themes emerged in responses: improved communication, becoming media savvy, improved self-esteem, and improved diabetes care.

Theme 1: Improved Communication

Throughout responses, communication was a dominant theme. The theme of improved communication emerged in responses from both mothers and daughters, with emphasis on open communication and participants better trying to see the other person's perspectives as noted priorities. One mother wrote, "I need to talk with my daughter more and find out how she is really feeling." A daughter expressed she was more hopeful about "the whole idea of communication" and that she and her mother could "better understand each other." Daughters reported they were talking more openly with mothers, and mothers reported they were trying to be "better" listeners. One daughter wrote, "I try to be more open with my mom about everything. Even though I was open before, it helped me to know that I can even be more open with her." A mother expressed, "My goal was to listen/hear more of what was being said. Although it is a challenge sometimes, we are making progress."

Theme 2: Becoming Media Savvy

The theme of becoming media savvy was prominent. Several participants recognized as magazine and television advertising as an unrealistic representation of the female body. Post-

Table 3: Results of Feasibility Data Provided as Written Feedback by Participants.

Area	Intervention Condition
Attrition	-Attrition 42% from baseline interest
Measures	-Time to complete questionnaires acceptable -Mothers felt IPPA mother subscale did not serve a significant purpose -Mothers suggested use of a social support, communication, or daughter relationship tool instead -Positive changes with measures
Intervention	-70% responded positively regarding intervention content -95% set a positive goal based on intervention content -Mothers suggested a larger venue through family activities sponsored by a diabetes organization -Mothers suggested target audience be expected to include preadolescents

(n = 20)

Table 4: Mean Change of Outcome Measures Immediately Post Intervention.

Variable / Measure	Pre-intervention Mean	Pre- S.D	Post-intervention Mean	Post-S.D.	Change	t-score	p-value
Rosenberg Self-Esteem Scale	23.55	6.21	24.14	6.58	+ 0.58	-1.737	0.099
MDI	7.57	6.49	7.35	6.69	-0.22	0.811	0.428
BES*	51.6	21.08	55.34	21.00	+ 3.74	-2.682	0.015
EAT-26	5.95	3.53	5.25	3.11	- 0.70	1.113	0.279

n = 20

*significant in paired t-test $p < 0.5$

Table 5: Mean Change of Outcome Measures Six-Week Post Intervention.

Variable / Measure	Pre-intervention Mean	Pre- S.D	6-week Post Mean	6-week Post S.D.	Change	t-score	p-value
Rosenberg Self-Esteem Scale	23.00	6.77	21.75	8.15	-1.25	1.692	0.111
MDI	8.09	7.02	9.56	11.64	+1.47	-1.025	0.321
BES	49.73	22.19	52.52	25.07	+ 2.79	-1.641	0.122
EAT-26 ^{^*}	6.13	3.62	4.13	3.36	- 2.00	2.382	0.032

n = 16

*significant in paired t-test $p < 0.5$

intervention goals set by participants reflected this theme. One daughter set a goal not purchasing fashion magazines. Daughters also set goals of looking at media advertising more closely for subliminal messages that might affect their body image or diabetes care.

Theme 3: Improved Self-Esteem

Both mothers and daughters noted improved personal self-esteem and recognition of personal importance as post intervention gains. One daughter wrote that she discovered that she was not different from others, "and not awful". Another daughter enthusiastically commented, "I've played more softball and my attitude is changing and getting better! And everyone has noticed."

Theme 4: Improved Diabetes Care

Daughters' responses included learning about diabetes, eating healthier, and consequences of DEB. In the immediate post-intervention responses two daughters set goals of improving home diabetes management and HgbA1C levels. Both mothers and daughters noted knowledge of the long-term impact of DEBs on health outcomes in adolescent females with T1DM as a post-intervention gain. Overall field notes and written responses about the intervention included statements about prior of lack of knowledge about rates and impact of DEBs and insulin omission for adolescent girls living with T1DM, nor the importance of mother-daughter communication, self-esteem, media, and body image in regards to DEBs prior to participating in this study. Many voiced concerns, based on their new knowledge of DEBs in adolescent females living with T1DM, about the long-term impact of DEBs on health outcomes. Most participants expressed appreciation for the intervention and information presented. Participants felt the intervention provided a mechanism for improved communication between mothers and daughters and that the knowledge they had gained on all topic areas was important.

CONCLUSION

Limitations and Implications for practice

The purpose of this study was to develop and test the feasibility and acceptability of a mother-daughter intervention, BEYOUTI, aimed to prevent DEB among adolescent females living with T1DM. Participants in this study found the intervention to be both feasible and acceptable. The single two-hour intervention session design provided participants with information on DEB in T1DM, deciphering media, body image, self-esteem, and improved mother-daughter communication.

Participants were highly enthusiastic about the intervention. Even though some daughters noted a degree of trepidation about spending time with their mothers at the outset of the intervention, which may be a cultural variant, written and verbal responses post intervention were overwhelmingly positive. The primary goal of this study was intervention development and to examine feasibility and acceptability of the intervention by the target population. Findings showed changes in the clinically desired direction on several outcome measures from pre to post intervention time points.

Although the pilot sample size was small, making significant interpretation of statistics difficult and giving more weight to outliers, several paired t-test results showed statistically significant changes post intervention. Mothers had some of the most significant changes in outcome measures at the post intervention time points, which may be critical in changing home environments and in their ability to assist their daughters in building up traits that may prevent the development of DEB.

Additional limitations included homogeneity of the sample, attrition in original recruitment, and recruitment from only a single pediatric endocrinology practice. The research also appeared to have more affect on significant changes in desired outcome measures for mothers. A larger sample size is needed not only to verify findings, but involvement of more adolescents in refinement of the intervention and inclusion of content and activities that are relevant to daughters is suggested. Longitudinal research is also suggested, as it may be that effect on mothers may in fact change home environmental factors and maternal relationship enough to have lasting effect on daughters within a household or family. Finally, a sensitive measure is needed to examine changes in communication at home for both daughters and mothers. Future research should include a measure of communication or home environment.

Qualitative findings indicated that the intervention was well received by the target population and that participants found the intervention valuable and helpful. Participants reported gains from the intervention, which included improved communication, improved ability to decipher media, and improved self-esteem. At the post intervention time point the majority of mothers set goals of improving communication with their daughters. Daughters also set goals of improved communication, but also desired better scrutiny of media messages, and improvement in their home diabetes management. All of these goals target some aspect of the desired outcomes. Interestingly, some daughters set post intervention goals to improve diabetes care and hemoglobin A1c values when these were not the focus of the education.

BEYOUTI intervention was found to be feasible and findings indicated a high acceptability by both mothers and their daughters living with T1DM. Findings from this study may be helpful to health care providers who are caring for adolescent females with T1DM as a point of possible intervention. Education about DEBs in T1DM along with family skill building to strengthen factors such as mother-daughter communication, body image, and self-esteem may prevent the development of DEBs in this population and thus prevent negative health outcomes associated with DEBs among adolescent females living with T1DM. Findings from this study may also inform future research that focuses on prevention education in this population. The next step in the program of research is to refine the intervention and to determine effect size in a controlled pilot study.

For the adolescent female living with T1DM, the risk of DEBs is higher than in general adolescent populations [6,10-12]. DEBs among this population result in higher rates of negative health outcomes that include retinopathy, nephropathy, and premature death [2,7-9,15,17]. Insulin omission, the most common form of DEB among adolescent females living with T1DM causes both significant rises in HbA1c and negative health outcomes such as nephropathy, retinopathy, and premature death [5,7-9,20]. Given the high rate of DEBs and insulin omission among adolescent girls with T1DM, the high rate of negative health outcomes [7], and the possible contribution of risk factors to strengthen or prevent onset of DEBs in this population [5], intervention research targeting prevention should continue.

There are strong correlations between BMI, self-esteem, body image, maternal eating attitudes and body image, parental relationships, DEBs, and HbA1c elevations [5,7,17,19]. Health care providers who treat adolescent females living with T1DM need to recognize the importance of the mother-daughter relationship, the acceptability of receiving information about DEBs and risk factors, the strong desire of both mothers and daughters to improve their own health outcomes, and the strong desire of both mothers and daughters to improve their own relationship. Strengthening protective factors for prevention of DEBs in adolescent females with T1DM should begin early in their diabetes care and be included in all interactions with their health care providers. Simple educational activities can be provided in a multitude of settings and can be easily incorporated into the educational practices of pediatric endocrinology clinics. Involving the entire family in this process and strengthening mother-daughter relationships may be key to the prevention of DEB development.

For providers caring for adolescent females with both T1DM recognized risk factors for development of DEBs like depression, elevated BMI, poor self-esteem, poor body image, or difficulties in the mother-daughter relationship, early screening for DEBs and open conversations with patients and families should be encouraged. Ultimately, prevention will result in improved diabetes health outcomes for adolescent females, decreased overall health care costs, and possibly an improved quality of life.

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