



Published in final edited form as:

Child Health Care. 2009 ; 38(2): 91–106. doi:10.1080/02739610902813229.

Coping and Psychosocial Adjustment in Mothers of Young Children with Type 1 Diabetes

Margaret Grey

Abstract

This study examined symptoms of anxiety and depression in mothers of young children with type 1 diabetes (T1D) in relation to mothers' fears of hypoglycemia, perceptions of coping, and children's metabolic control. Sixty-seven mothers of children less than 8 years of age diagnosed with T1D completed self-report measures, and children's metabolic control was measured with glycosolated hemoglobin (HbA1c). Twenty-one percent of mothers reported clinically significant levels of symptoms of anxiety, and twenty-four percent reported clinically significant levels of depression. Lower income level and finding it more upsetting to cope with diabetes-related stress accounted for higher symptoms of anxiety and depression in mothers. Mothers' symptoms were not related to children's metabolic control. Recommendations are made for screening mothers and providing supportive interventions to alleviate their distress.

Keyterms

diabetes; stress and coping; maternal adjustment

Type 1 diabetes (T1D) is one of the most common chronic childhood illnesses. Overall rates have increased significantly over the last half century, with particularly steep rises in rates for children younger than 5 years of age (Gale, 2002; Karvonen et al., 2000). The treatment regimen for type 1 diabetes (T1D) is complex and demanding, requiring frequent monitoring of blood glucose levels (at least 4/day), monitoring and control of carbohydrate intake, frequent insulin administration (3–4 injections/day or infusion from a pump), altering insulin dose to match diet and activity patterns, and checking urine for ketones when necessary (American Diabetes Association, 2007). This intensive regimen places great demands on caregivers of children with T1D, particularly mothers, who are responsible for the majority of treatment management (Kovacs et al., 1990).

Mothers of young children with T1D may face additional challenges related to the child's age. First, the diagnostic presentation is often more severe in younger children than in older children, in that a high proportion of young children present as critically ill at the time of diagnosis (Quinn, Fleischman, Rosner, Nigrin, & Wolfsdorf, 2006). Disease management is also complicated by developmental and physiological factors unique to this age group; caregivers' efforts to achieve optimal T1D management are complicated by young children's rapid growth, erratic eating and changing insulin demands, limited communication of hypoglycemic/hyperglycemic symptoms, and efforts to gain mastery and control in the environment (Halverson, Yasuda, Carpernter, & Kaiserman, 2005; Kushion, Salisbury, Seitz, & Wilson, 1991). Thus, there is a need to identify possible effects of the demands of treatment management on mothers of young children with T1D in order to support them and promote the best adjustment to the illness.

Mothers of young children with T1D experience high levels of stress related to treatment management. Researchers describe a common theme of “constant vigilance” among parents of young children with T1D, a sense of continuous responsibility to maintain metabolic control and prevent episodes of hypoglycemia (Sullivan-Bolyai, Deatrck, Gruppuso, Tamborlane, & Grey, 2003). Mothers of young children may have particularly high levels of worry because their children have a form of “hypoglycemic unawareness;” they do not have the cognitive ability to recognize and respond to symptoms of hypoglycemia (American Diabetes Association, 2007). Studies of parents of older children and adolescents with T1D reveal significant fears of hypoglycemia (e.g., Clarke, Gonder-Frederick, Snyder, & Cox, 1998; Green, Wysocki, & Reineck, 1990; Marrero, Guare, Vandagriff, & Fineberg, 1997), which have been linked with parenting stress (Streisand, Swift, Wickmark, Chen, & Holmes, 2005). While some evidence suggests that parents manage these fears by maintaining higher blood glucose levels than recommended (e.g., Marrero et al., 1997), other studies have failed to find an association between parental fear of hypoglycemia and poorer metabolic control (Clarke et al., 1998; Green et al., 1990; Marrero et al., 1997). In fact, one study found that greater perceived diabetes-related stress in caregivers of young children was related to *better* metabolic control (Stallwood, 2005). These mixed findings point to the need for further research on parenting stress and fear of hypoglycemia in mothers of young children with T1D to determine their relation to maternal psychological symptoms and children’s metabolic control.

The ways in which mothers cope with the stress of treatment management are likely to have important implications for maternal and child adjustment to the illness; however, few studies have examined the coping strategies used by mothers of children with T1D. The extent to which mothers find coping with diabetes upsetting has been related to current maternal distress and level of distress after diagnosis (Kovacs et al., 1990) and to child’s reported quality of life in school-age and older children (Whittemore, Urban, Tamborlane, & Grey, 2003). Maternal perceptions of coping were also found to mediate the relationship between maternal and child depressive symptoms in school-age children with T1D (Jaser, Whittemore, Ambrosino, Lindemann, & Grey, in press). While greater use of approach coping (e.g., problem solving) was related to fewer depressive symptoms in mothers (Blankfeld & Holahan, 1996), other researchers found that maternal coping was unrelated to child’s metabolic control (Stallwood, 2005). More research is needed to examine the relationship between coping with diabetes-related stress in mothers of young children with T1D and psychosocial and health outcomes.

Moreover, relatively little is known about rates of anxiety and depression in mothers of young children with T1D. In research with mothers of older children (ages 8–16), 17% of mothers reported moderate to severe depression shortly after diagnosis (Kovacs et al., 1985), and mothers who initially presented as depressed were more likely to remain depressed years later (Kovacs et al., 1990). Similarly, a more recent study found that 22% of mothers of school-age children (8–12 years old) reported clinically significant levels of depressive symptoms (Jaser et al., in press). Other researchers found that 20.4% of mothers of children ages 6–15 exhibited clinically significant symptoms of posttraumatic stress disorder one year after their child’s diagnosis (Landolt, Vollrath, Laimbacher, Gnehn, & Sennhauser, 2005). These findings suggest that mothers of children with T1D are at risk for significant psychological distress; however, it is unknown whether mothers of younger children experience similar levels of distress.

Maternal symptoms of depression and anxiety have important implications for children’s health outcomes, including both metabolic control and psychological adjustment. Recently, a study of mothers of adolescents with T1D found that maternal anxiety was related to poorer metabolic control (L. D. Cameron, Young, & Wiebe, 2007), but it is unknown whether this holds true for mothers of younger children. Similarly, depressive symptoms in mothers of older children with T1D have been related to depressive symptoms and poorer quality of life in children (Jaser et

al., in press; Kovacs, Goldston, Obrosky, & Bonar, 1997) but the effects of maternal depressive symptoms on younger children with T1D are unknown. Taken together, these findings suggest that maternal depression and anxiety and their relationship with children's metabolic control and psychosocial functioning warrant further attention in this population of younger children with T1D.

In sum, parents of young children with T1D are likely to experience high levels of stress related to managing their children's treatment, related to the sense of "constant vigilance" and fears of hypoglycemia. While other factors are likely to contribute to maternal stress, fear of hypoglycemia may be one of the most salient sources of stress for mothers of young children with T1D (Streisand et al., 2005). Maternal perceptions of coping with this stress may determine whether symptoms of anxiety and depression develop. Given the demands of treatment management, greater attention needs to be paid to this population of parents to document their psychosocial distress and better characterize its likely impact on metabolic control.

The purpose of this study was to examine the relationship between mothers' stress related to fears of hypoglycemia, perceptions of coping with diabetes-related stress, and maternal symptoms of anxiety and depression. We expected to find that mothers of young children with T1D were experiencing increased symptoms of anxiety and depression. Second, we expected that mothers' who perceived coping with the stress of diabetes management to be more difficult and more upsetting, and mothers who reported greater fear of hypoglycemia would have higher levels of anxiety and depression. Finally, we wanted to examine the relationship between children's metabolic control and maternal symptoms of anxiety/depression.

METHODS

This study was a secondary analysis of baseline data from an intervention study on coping skills training (CST) for the parents of young children with T1D. A prospective, randomized clinical trial was conducted utilizing CST for the intervention group and diabetes education for the control cohort. Approval was obtained from the Human Subjects Review Committee of the Institutional Review Board at a university in southern Connecticut. Sample

Of 177 families who were approached at the university's pediatric diabetes center, which treats an estimated 1,000 children and adolescents, 40% consented to participate in the intervention study. An additional 7% were ineligible, and 10% declared interest but never participated. The most common reasons for refusal were that groups were too far away (38.8%), families were too busy (34.7%) and parents were not interested (26.5%). Inclusion criteria required that parents have a child who had not yet reached the age of 8 with T1D, had no health problems other than T1D and related conditions, and had T1D for a minimum of 6 months. Parental eligibility requirements included the ability to speak and write in English or Spanish and be without diagnosed mental illness that would interfere with the ability to participate in a group intervention. Parents were given a brief screening questionnaire to determine whether they had been diagnosed with a mental illness and whether or not they were receiving treatment.

Demographic information for the parents and children is shown in Table 1. Of the 70 participating parents, 97% were mothers, 2% were fathers, and 1% were guardians. Given the small number of fathers and guardians, only mothers were included in further analyses ($n = 67$). Mean age of mothers was 37.2 ± 5.6 years, mean child age was 4.8 ± 1.5 years, and 52% of children were female. The sample was representative of the clinic population from which it was drawn, consisting of 85.5% White, 12.9% Black and 1.6% Asian; 9% were Hispanic. The annual income level of participants included 18% under \$40,000, 27% between \$40–80,000, and the remainder over \$80,000.

The mean duration of T1D was 1.4 years ($SD = 1.3$). The mean age of diagnosis was 3.3 years ($SD = 1.7$), and 68% of children were on pump therapy. The average glycosylated hemoglobin (HbA1c) was 6.86% ($SD = .86$), indicating that most of the children in the sample were *below* the treatment goals recommended for this age group (the goal for children under 6 is less than 8.5% but greater than 7.5%) (American Diabetes Association, 2007).

Procedures

Parents were approached at the pediatric diabetes center of a large university medical center during their child's quarterly visit. When parents indicated interest in the study, they were scheduled for a separate appointment held at the university's school of nursing. After giving informed consent, parents completed questionnaires and were randomized to CST or a control condition of diabetes education. CST consisted of 6 weekly sessions in which social problem solving skills, conflict resolution, stress management, cognitive behavioral modification, and communication skills were taught in an interactive way, via role-playing and dialogue (Grey, Boland, Davidson, Li, & Tamborlane, 2000). Diabetes education covered intensive regimen regimes (injections and pump), carbohydrate counting, sports and sick days, and new technologies in 4 weekly sessions. Only data collected prior to the interventions were used in this study.

Measures

Self-report data were collected from mothers to measure current symptoms of depression and anxiety, fear of hypoglycemia, coping, and demographic variables. Clinical data and illness parameters (e.g., time since diagnosis, episodes of diabetic ketoacidosis) were collected from the child's chart at the clinic visit closest to the completion of questionnaire data.

Maternal Depressive Symptoms—The Center for Epidemiologic Studies Depression Scale (CES-D) was used to assess mothers' current depressive symptoms. It is a brief, 20-item, self-report screening measure developed by the National Institutes of Mental Health (Radloff, 1977), with scores ranging from 0–60. Higher scores indicate more depressive symptoms, and the authors recommend that a score of 16 serve as a criterion for which further evaluation is warranted. This measure is widely used with both clinical samples and community surveys. Internal consistency for the present sample was $\alpha = .88$.

Maternal Anxiety Symptoms—The State Trait Anxiety Inventory (STAI, Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) was used to assess mothers' current symptoms of anxiety. It is a widely-used measure of anxiety in adults with well-established levels of reliability and validity (Watson & Clark, 1984). The State scale asks respondents to report on how they are feeling "right now, at this moment." Scores range from 20–80, with higher scores indicating a greater level of anxiety. The cutoff score for high anxiety for the age range that includes the mean age of mothers in the study (40–49 years) is 44. In the current analyses, the State Anxiety scale was used to assess current symptoms of anxiety, and internal consistency for this scale was $\alpha = .93$.

Maternal Coping—The Issues in Coping with IDDM- Parent scale (ICC, Kovacs, Brent, Feinberg, Paulauskas, & Reid, 1986) was used to measure mothers' perceptions of coping with the stress of their child's diabetes. It consists of two scales: (1) how hard or difficult it is for the parent to handle issues related to the child's diabetes (14 items; total score 0–42, e.g., "making child follow meal plan") and (2) how upsetting issues related to child's diabetes are for the parent (12 items; total score 12–36, e.g., "visiting diabetes clinic"). Higher scores indicate that parents find it more difficult or upsetting to cope with their child's diabetes. Internal reliability for the present sample was $\alpha = .87$ for the How Hard scale and $\alpha = .88$ for the How Upsetting scale.

Fear of Hypoglycemia—The Hypoglycemia Fear Survey (HFS, Cox, Irvine, Gonder-Frederick, Nowacheck, & Butterfield, 1987) was used to measure maternal concerns related to a child experiencing symptoms of hypoglycemia. The Worry subscale (13 items) assesses parents' worries about a child with diabetes experiencing hypoglycemic symptoms (e.g., "my child passing out in public"). Scores range from 0–52, with higher scores indicating greater parental worry about diabetes. Internal reliability for the present sample was $\alpha = .90$ for the Worry scale.

Child's Metabolic Control—Metabolic control was assessed with hemoglobin A1c (HbA1c), a measure of the child's average blood sugar over the past 3 months. Levels were assessed using the DCA 2000® (Tarrytown, NY) at the child's usual clinic visit. Average HbA1c levels for populations without diabetes are <6%. The ADA recommendation for children from birth to age 6 is between 7.5–8.5% and for children ages 6–12 is <8% (American Diabetes Association, 2007).

Analysis Plan

Frequency distributions, means, and standard deviations were examined for each item. Bivariate correlations were conducted to examine the associations between symptoms of depression and anxiety with fear of hypoglycemia, coping, and demographic and illness variables. Multiple regression analyses were used to determine the predictive validity of maternal coping with diabetes-related stress on maternal symptoms of anxiety and depression, after accounting for demographic and illness variables and fear of hypoglycemia.

RESULTS

Descriptive Statistics

The descriptive statistics for maternal reports of current symptoms of anxiety and depression, coping with diabetes, fear of hypoglycemia, and child's metabolic control are shown in Table 2. In terms of psychological symptoms, 20.9% ($n = 14$) of the mothers met the cutoff score for clinically significant symptoms of anxiety (STAI-S > 44), and 24.2% ($n = 16$) of the mothers met the cutoff score for clinically significant symptoms of depression (CES-D score ≥ 16). There was a high degree of comorbidity; the association between symptoms of anxiety and depression was $r = .75$ ($p < .001$), and 71% ($n = 10$) of the mothers who met the cutoff of clinically significant symptoms of anxiety also met the cutoff score for clinically significant symptoms of depression. In general, mothers found coping with diabetes somewhat difficult and upsetting, and they reported moderate fears of hypoglycemia.

Preliminary Analyses

Preliminary analyses were conducted to determine if there was a relationship between child gender or age, clinical variables, and other psychosocial variables (i.e., fear of hypoglycemia, coping, maternal symptoms of anxiety and depression). There were no significant relationships between child age and key variables, and there were no significant group differences on any of the key variables for boys and girls. Further, child age at diagnosis was not associated with any key variables, and there were no significant differences on key variables between children who received insulin via pump or injections.

Correlational Analyses

Bivariate correlations were conducted with maternal symptoms of anxiety and depression and psychosocial and clinical variables. As shown in Table 2, higher levels of maternal depressive symptoms were related to finding it more upsetting and harder to cope with diabetes and greater fear of hypoglycemia. Similarly, higher levels of maternal anxiety symptoms were related to

finding it more upsetting and harder to cope with diabetes and greater fear of hypoglycemia. Maternal symptoms of anxiety and depression were not related to child's metabolic control.

Regression Analyses

Several multiple linear regression equations were estimated to test the second hypothesis, that parental perceptions of coping with diabetes would predict symptoms of anxiety and depression. Given concerns about multicollinearity between the two coping variables (how upsetting and how hard, $r = .80$), separate analyses were conducted to test for the effect of each. In the first step, demographic variables were entered, including child age, gender, and family income. In the second step, fear of hypoglycemia was entered, as a measure of parenting stress. Finally, parents' perceptions of how upsetting or how hard it was to cope with their child's diabetes were entered in the last step to determine the predictive value of each.

Table 3 indicates the equations predicting maternal symptoms of depression. Demographic variables accounted for about 27% of the variance (R^2 change = .27), fear of hypoglycemia accounted for about 7% of the variance (R^2 change = .07), how upsetting it was to cope with diabetes accounted for about 11% of the variance (R^2 change = .11), and how hard it was to cope with diabetes accounted for about 5% (R^2 change = .05) of the variance in maternal symptoms of depression. In the full model, lower family income and higher levels of upset in coping with diabetes were significant predictors of higher maternal symptoms of depression.

Table 4 indicates the regression equations for maternal symptoms of anxiety. Demographic variables accounted for about 18% of the variance (R^2 change = .18), fear of hypoglycemia accounted for about 6% of the variance (R^2 change = .06), how upsetting it was to cope with diabetes accounted for about 11% of the variance (R^2 change = .11), and how hard it was to cope with diabetes accounted for about 2% (R^2 change = .02) in maternal symptoms of anxiety. In the full model, lower family income and higher levels of upset in coping with diabetes were significant predictors of higher maternal symptoms of anxiety.

DISCUSSION

Results from the current study indicate that, as expected, a considerable number of mothers were experiencing clinically significant levels of symptoms of anxiety and depression, and these symptoms were related to fears of hypoglycemia and perceptions of coping with diabetes. In addition, how upsetting it was for mothers to cope with the stress of their children's treatment management emerged as the strongest psychosocial predictor of both anxiety and depression symptoms in mothers. This study extends previous research with mothers of older children and adolescents to mothers of younger children with T1D, suggesting that this population is also at risk for significant psychosocial distress.

In our sample, rates of depression and anxiety were consistent with other reports of maternal psychological distress in mothers of chronically ill children (Drotar, 1997), which suggests that mothers of young children with T1D may not be at higher risk than mothers of older children. Mothers of young children are typically the responsible for the majority of treatment management. While this may increase the caregiving burden on mothers, there may be less conflict related to treatment responsibility than there is with adolescents (Anderson, Auslander, Jung, Miller, & Santiago, 1990).

Caring for a young child with T1D can be incredibly stressful for mothers, and the need for "constant vigilance" may contribute to emotional distress in mothers, including symptoms of anxiety and depression (Sullivan-Bolyai et al., 2003). Results from the current study indicate that how upsetting mothers find coping with the stress of treatment management predict symptoms of anxiety and depression. This finding is consistent with research reporting that it

is not the intensity of the treatment management or the severity of the illness that affects quality of life or depression, but rather, how the stress of treatment management is perceived (Edgar & Skinner, 2003; Laffel et al., 2003). Therefore, mothers are likely to benefit from emotional support and concrete suggestions for coping so that caring for their children is less overwhelming.

Maternal symptoms of anxiety and depression were not related to poorer metabolic control in the current study. This may be due, in part, to the fact that the average HbA1c levels for this sample were lower than the recommended levels for this age group of children, with limited variability. These low levels may be related to the high percentage of the children using insulin pumps (68%), which has been associated with lower blood glucose levels than insulin injections (Doyle et al., 2004). A significant relationship between maternal symptoms and metabolic control may be evident in a sample with greater variability in HbA1c levels. On the other hand, it may be that mothers experience higher levels of stress and psychological distress as they work to keep blood sugar levels low (Stallwood, 2005). Another consequence of maintaining tight metabolic control may be increased fear of hypoglycemia (Wild et al., 2007), as keeping blood sugar levels low could increase the likelihood of a hypoglycemic episode. Fear of hypoglycemia, which may be seen as a measure of stress for parents of children with T1D, was related to maternal symptoms of depression and anxiety in our sample. Thus, there appears to be an optimal level of stress – enough to motivate mothers to adhere to treatment, but not so much that they feel overwhelmed and helpless.

It is important to note that the demographic variables (family income, child age, and child gender) accounted for a greater percentage of the variance in the final models predicting maternal symptoms than the psychosocial variables (27% for maternal symptoms of depression and 18% for maternal symptoms of anxiety). Of the demographic variables, lower family income was the strongest predictor of maternal symptoms of both anxiety and depression. This is in line with findings in the general population, which indicate that low income is associated with a greater prevalence of depressive disorders (Kessler et al., 2003). While the current sample had relatively high income (only 18% reported a yearly income less than \$40,000), it is likely that low-income families are experiencing even greater levels of stress, which are likely to exacerbate symptoms of anxiety and depression (Wadsworth, Raviv, Compas, & Connor-Smith, 2005). This is an area for future research to examine further.

Limitations

Despite the importance of the current findings, several limitations must be mentioned. First, the study is cross-sectional, so we are unable to determine the direction of the effects. For example, it is possible that increased symptoms of maternal anxiety and depression cause coping with stress to seem more difficult or upsetting. Next, given the small number of fathers who participated (2%), the current analyses included only mothers. While mothers are typically the primary caretakers for children with T1D, (Kovacs et al., 1990) there is still a need to better understand the role fathers play in treatment management (Phares, Lopez, Fields, Kamboukos, & Duhig, 2005). In addition, we do not have information about mothers' mental health history or their social support from family or other sources, which are likely to impact their psychological adjustment (Mistry, Stevens, Sareen, De Vogil, & Halfon, 2007). Finally, the sample may be biased, as parents were required to commit to a 6-week intervention, and it is unknown whether parents who chose to participate differed from those who did not.

Implications for Practice

Results from the current study suggest the need to screen mothers for symptoms of anxiety and depression, in line with a recent review (F. J. Cameron, Northam, Ambler, & Daneman, 2007). Although maternal symptoms of anxiety and depression were not related to metabolic

control in the current sample, mothers' distress is likely to have negative effects on children's psychosocial adjustment and family functioning (Drotar, 1997; Jaser et al., in press). Recent studies (e.g., Olson, Dietrich, Prazar, & Hurley, 2006) have demonstrated the feasibility of pediatricians screening for maternal depression, discussing the impact on maternal depression on the child, and providing appropriate referrals. Similarly, there is a need to assess and improve parents' stress and coping with diabetes, as results from the current study suggest that maternal perceptions of coping with diabetes impact symptoms of anxiety and depression.

Interventions that target parental distress in mothers of young children with T1D are likely to improve family functioning and child adjustment. Coping skills training (Grey et al., 1998) and family-based interventions (Wysocki, Greco, Harris, Bubb, & White, 2001) for adolescents with T1D and their parents have been successful in improving family communication and child physiological and psychosocial outcomes. However, few interventions have focused on targeting maternal distress, particularly for mothers of young children with T1D. One such intervention, a parent mentoring program that provided mothers with informational, affirmational, and emotional support, was shown to reduce mothers' diabetes-related concerns and negative perceptions of the impact of the illness on the family (Sullivan-Bolyai et al., 2004). Mothers with more significant levels of distress may benefit from cognitive behavioral interventions to address their symptoms of anxiety and depression. Caring for a young child with diabetes is stressful for mothers, and screening for and treating maternal distress is likely to improve the child's and family's adjustment to T1D.

References

- American Diabetes Association. Standards of medical care in diabetes - 2007. *Diabetes Care* 2007;30:S4–S41. [PubMed: 17192377]
- Anderson BJ, Auslander WF, Jung KC, Miller JP, Santiago JV. Assessing family sharing of diabetes. *Journal of Pediatric Psychology* 1990;15:477–492. [PubMed: 2258796]
- Blankfelf DF, Holahan CJ. Family support, coping strategies, and depressive symptoms among mothers of children with diabetes. *Journal of Family Psychology* 1996;10(2):173–179.
- Cameron FJ, Northam EA, Ambler GR, Daneman D. Routine psychological screening in youth with type 1 diabetes and their parents: A notion whose time has come? *Diabetes Care* 2007;30(10):2716–2724. [PubMed: 17644619]
- Cameron LD, Young MJ, Wiebe DJ. Maternal trait anxiety and diabetes control in adolescents with type 1 diabetes. *Journal of Pediatric Psychology* 2007;32(7):733–744. [PubMed: 17264087]
- Clarke WL, Gonder-Frederick A, Snyder AL, Cox DJ. Maternal fear of hypoglycemia in their children with insulin dependent diabetes mellitus. *Journal of Pediatric Endocrinology* 1998;11(Suppl 1):189–194.
- Cox DJ, Irvine A, Gonder-Frederick L, Nowacke G, Butterfield J. Fear of hypoglycemia: Quantification, validation, and utilization. *Diabetes Care* 1987;10:617–621. [PubMed: 3677982]
- Doyle EA, Weinzimer SA, Steffen AT, Ahern JA, Vincent M, Tamborlane W. A randomized, prospective trial comparing the efficacy of continuous subcutaneous insulin infusion with multiple daily injections using insulin glargine. *Diabetes Care* 2004;27:1554–1558. [PubMed: 15220227]
- Drotar D. Relating parent and family functioning to the psychological adjustment of children and with chronic health conditions: What have we learned? What do we need to know? *Journal of Pediatric Psychology* 1997;22:149–165. [PubMed: 9114640]
- Edgar KA, Skinner TC. Illness representations and coping as predictors of emotional well-being in adolescents with type 1 diabetes. *Journal of Pediatric Psychology* 2003;28:485–493. [PubMed: 12968040]
- Gale EAM. The Rise of Childhood Type 1 Diabetes in the 20th Century. *Diabetes* 2002;51(12):3353–3361. [PubMed: 12453886]
- Green LB, Wysocki T, Reineck BM. Fear of hypoglycemia in children and adolescents with diabetes. *Journal of Pediatric Psychology* 1990;15(5):633–641. [PubMed: 2283572]

- Grey M, Boland EA, Davidson M, Li J, Tamborlane WV. Coping skills training for youth with diabetes mellitus has long-lasting effects on metabolic control and quality of life. *Journal of Pediatrics* 2000;137:107–113. [PubMed: 10891831]
- Grey M, Boland EA, Davidson M, Yu C, Sullivan-Bolyai S, Tamborlane WV. Short-term effects of coping skills training as an adjunct to intensive therapy in adolescents. *Diabetes Care* 1998;21:902–908. [PubMed: 9614605]
- Halverson M, Yasuda P, Carpernter S, Kaiserman K. Unique challenges for pediatric patients with diabetes. *Diabetes Spectrum* 2005;18(3):167–173.
- Jaser SS, Whitemore R, Ambrosino J, Lindemann E, Grey M. Mediators of depressive symptoms in children with type 1 diabetes and their mothers. *Journal of Pediatric Psychology*. in press.
- Karvonen M, Vilkk-Kajander M, Moltchanova E, Libman I, LaPorte R, Tuomilehto J. Incidence of childhood type 1 diabetes worldwide. *Diabetes Care* 2000;23:1516–1526. [PubMed: 11023146]
- Kessler RC, Berglund P, Demler O, Jin R, Koretz D, Merikangas KR, et al. The epidemiology of major depression. *JAMA* 2003;289:3095–3105. [PubMed: 12813115]
- Kovacs M, Brent D, Feinberg TF, Paulauskas S, Reid J. Children's self-reports of psychological adjustment and coping strategies during the first year of insulin-dependent diabetes mellitus. *Diabetes Care* 1986;9:472–479. [PubMed: 3769717]
- Kovacs M, Finkelstein R, Feinberg TL, Crouse-Novak M, Paulauskas S, Pollock M. Initial psychological responses of parents to the diagnosis of insulin-dependent diabetes mellitus in their children. *Diabetes Care* 1985;8:568–575. [PubMed: 4075942]
- Kovacs M, Goldston D, Obrosky DS, Bonar LK. Psychiatric disorders in youth with IDDM: Rates and risk factors. *Diabetes Care* 1997;20:36–44. [PubMed: 9028691]
- Kovacs M, Iyengar S, Goldston D, Obrosky DS, Steward J, Marsh J. Psychological functioning among mothers of children with insulin-dependent diabetes mellitus: A longitudinal study. *Journal of Consulting and Clinical Psychology* 1990;58:189–195. [PubMed: 2335636]
- Kushion W, Salisbury PJ, Seitz KW, Wilson BE. Issues in the care of infants and toddlers with insulin-dependent diabetes mellitus. *Diabetes Educator* 1991;17(2):107–110. [PubMed: 1995279]
- Laffel LMB, Connell A, Vangness L, Goebel-Fabbri A, Mansfield A, Anderson BJ. General quality of life in youth with Type 1 Diabetes: Relationship to patient management and diabetes-specific family conflict. *Diabetes Care* 2003;26:3067–3073. [PubMed: 14578241]
- Landolt MA, Vollrath M, Laimbacher J, Gnehn HE, Sennhauser FH. Prospective study of posttraumatic stress disorder in parents of children with newly diagnosed type 1 diabetes. *Journal of the American Academy of Child and Adolescent Psychiatry* 2005;44:682–689. [PubMed: 15968237]
- Marrero DG, Guare JC, Vandagriff JL, Fineberg NS. Fear of hypoglycemia in the parents of children and adolescents with diabetes: Maladaptive or healthy response? *Diabetes Educator* 1997;23(3):281–286. [PubMed: 9257618]
- Mistry R, Stevens GD, Sareen H, De Vogil R, Halfon N. Parenting-related stressors and self-reported mental health of mothers with young children. *American Journal of Public Health* 2007;97(7):1261–1268. [PubMed: 17538058]
- Olson AL, Dietrich AJ, Prazar G, Hurley J. Brief maternal depression screening at well-child visits. *Pediatrics* 2006;118(1):207–216. [PubMed: 16818567]
- Phares V, Lopez E, Fields S, Kamboukos D, Duhig AM. Are fathers involved in pediatric psychology research and treatment? *Journal of Pediatric Psychology* 2005;30:631–643. [PubMed: 15772363]
- Quinn M, Fleischman A, Rosner B, Nigrin DJ, Wolfsdorf JI. Characteristics at diagnosis of type 1 diabetes in children younger than 6 years. *The Journal of Pediatrics* 2006;148(3):366–371. [PubMed: 16615969]
- Radloff LS. The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement* 1977;1:385–401.
- Spielberger, CD.; Gorsuch, RL.; Lushene, RE.; Vagg, PR.; Jacobs, JG. *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press; 1983.
- Stallwood L. Influence of caregiver stress and coping on glycemic control of young children with diabetes. *Journal of Pediatric Health Care* 2005;19:293–300. [PubMed: 16202837]

- Streisand R, Swift E, Wickmark T, Chen R, Holmes CS. Pediatric parenting stress among parents of children with type 1 diabetes: The role of self-efficacy, responsibility, and fear. *Journal of Pediatric Psychology* 2005;30:513–521. [PubMed: 16055489]
- Sullivan-Bolyai S, Deatrick J, Gruppuso P, Tamborlane W, Grey M. Constant vigilance: Mothers' work parenting young children with type 1 diabetes. *Journal of Pediatric Nursing* 2003;18:21–29. [PubMed: 12610784]
- Sullivan-Bolyai S, Grey M, Deatrick J, Gruppuso P, Giraitis P, Tamborlane W. Helping other mothers effectively work at raising young children with type 1 diabetes. *Diabetes Educator* 2004;30(3):476–484. [PubMed: 15208845]
- Wadsworth ME, Raviv T, Compas BE, Connor-Smith JK. Parent and adolescent responses to poverty-related stress: Tests of mediated and moderated coping models. *Journal of Child and Family Studies* 2005;14:285–300.
- Watson D, Clark LA. Negative affectivity: The disposition to experience aversive emotional states. *Psychological Bulletin* 1984;96:465–490. [PubMed: 6393179]
- Whittemore R, Urban AD, Tamborlane WV, Grey M. Quality of life in school-age children with type 1 diabetes on intensive treatment and their parents. *The Diabetes Educator* 2003;29:847–854. [PubMed: 14603873]
- Wild D, von Maltzahn R, Brohan E, Christensen T, Clauson P, Gonder-Frederick L. A critical review of the literature on fear of hypoglycemia in diabetes: Implications for diabetes management and patient education. *Patient Education and Counseling* 2007;68:10–15. [PubMed: 17582726]
- Wysocki T, Greco P, Harris MA, Bubb J, White NH. Behavior therapy for families of adolescents with diabetes: Maintenance of treatment effects. *Diabetes Care* 2001;24:441–446. [PubMed: 11289465]

Table 1

Demographic Information (n = 67)

	Range	Mean	Standard Deviation
Mother Age	26–51	37.24	5.64
Mother Education	10–21	15.56	2.62
Child Age	1–8	4.77	1.50
Child Age at Diagnosis	1–7	3.28	1.73
Number of Children	1–6	2.27	1.10
Family Income	18% under \$40,000, 27% \$40–80,000, 55% over \$80,000		
Child Gender	52% female		
Race/Ethnicity	12.9% African American, 1.6% Asian, 9% Hispanic,		

Table 2
Descriptive Statistics and Correlations among Maternal Symptoms of Depression and Anxiety and Key Variables

	1	2	3	4	5	6
1. CES-D $M = 10.86$ (6.98)	--					
2. State Anxiety $M = 35.09$ (10.88)	.75 ^{***}	--				
3. ICC Coping Upset $M = 47.03$ (12.71)	.52 ^{***}	.50 ^{***}	--			
4. ICC Coping Hard $M = 30.45$ (10.03)	.41 ^{***}	.31 ^{**}	.80 ^{***}	--		
5. Fear of Hypoglycemia $M = 14.96$ (9.59)	.36 ^{**}	.34 ^{**}	.50 ^{***}	.46 ^{***}	--	
6. HbA1c $M = 6.86$ (.86)	.11	.14	-.07	-.03	-.08	--

**
 $p < .01$.

 $p < .001$

Table 3

Regression Analyses for Predictors of Parental Symptoms of Depression

Equation 1 – CES-D	Final $R^2 = .39$	$F (5, 53) = 8.45^{***}$
Step 1: R^2 change = .27 ^{***}	β	sr
Child Age	-.23	-.23
Child Gender	-.20	-.20
Family Income	-.48 ^{***}	-.47
Step 2: R^2 change = .07 [*]		
Child Age	-.22	-.21
Child Gender	-.13	-.13
Family Income	-.45 ^{***}	-.44
Fear of Hypoglycemia	.27 [*]	.26
Step 3: R^2 change = .11 ^{**}		
Child Age	-.20	-.19
Child Gender	-.13	-.13
Family Income	-.41 ^{***}	-.40
Fear of Hypoglycemia	.10	.08
Coping – Upset	.37 ^{**}	.33
Equation 2 – CES-D	Final $R^2 = .32$	$F (5, 53) = 6.55^{***}$
Step 1: R^2 change = .27 ^{***}	β	sr
Child Age	-.23	-.23
Child Gender	-.20	-.20
Family Income	-.48 ^{***}	-.47
Step 2: R^2 change = .07 [*]		
Child Age	-.22	-.21
Child Gender	-.13	-.13
Family Income	-.45 ^{***}	-.44
Fear of Hypoglycemia	.27 [*]	.26
Step 3: R^2 change = .05		
Child Age	-.21	-.21
Child Gender	-.14	-.13
Family Income	-.42 ^{***}	-.41
Fear of Hypoglycemia	.16	.14
Coping – Hard	.24	.21

Note: β = standardized beta. sr = semi-partial correlation.

* < .05.

** < .01.

< .001.

Table 4

Regression Analyses for Predictors of Parental Symptoms of Anxiety

Equation 1 – State Anxiety	Final $R^2 = .29$	$F(5, 54) = 5.83^{***}$
Step 1: R^2 change = .18*	β	sr
Child Age	-.26*	-.25
Child Gender	-.10	-.10
Family Income	-.38**	-.38
Step 2: R^2 change = .06*		
Child Age	-.26	-.24
Child Gender	-.04	-.04
Family Income	-.36**	-.35
Fear of Hypoglycemia	.25*	.24
Step 3: R^2 change = .11**		
Child Age	-.23	-.22
Child Gender	-.05	-.04
Family Income	-.31**	-.30
Fear of Hypoglycemia	.08	.07
Coping – Upset	.38**	.33
<hr/>		
Equation 2 – State Anxiety	Final $R^2 = .19$	$F(5, 54) = 3.77^{**}$
Step 1: R^2 change = .18*	β	sr
Child Age	-.26*	-.25
Child Gender	-.10	-.10
Family Income	-.39**	-.38
Step 2: R^2 change = .06*		
Child Age	-.24	-.24
Child Gender	-.04	-.04
Family Income	-.36**	-.35
Fear of Hypoglycemia	.25*	.24
Step 3: R^2 change = .02		
Child Age	-.24	-.23
Child Gender	-.05	-.05
Family Income	-.34**	-.32
Fear of Hypoglycemia	.18	.16
Coping – Hard	.16	.14

Note: β = standardized beta. sr = semi-partial correlation.

* < .05.

**
< .01.

< .001.