Comparison of Single-Mother and Two-Parent Families on Metabolic Control of Children With Diabetes

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OBJECTIVE — To understand the impact of family structure on the metabolic control of children with diabetes, we posed two research questions: *1*) what are the differences in sociodemographic, family, and community factors between single-mother and two-parent families of diabetic children? and *2*) to what extent do these psychosocial factors predict metabolic control among diabetic children from single-mother and two-parent families?

RESEARCH DESIGN AND METHODS — This cross-sectional study included 155 diabetic children and their mothers or other female caregivers. The children were recruited if they had been diagnosed with diabetes for at least 1 year, had no other comorbid chronic illnesses, and were younger than 18 years of age. Interviews and self-report questionnaires were used to assess individual, family, and community variables.

RESULTS — The findings indicate that diabetic children from single-mother families have poorer metabolic control than do children from two-parent families. Regression models of children's metabolic control from single-mother families indicate that age and missed clinic appointments predicted HbA_{1c} levels; however, among two-parent families, children's ethnicity and adherence to their medication regimen significantly predicted metabolic control.

CONCLUSIONS — This study suggests that children from single-mother families are at risk of poorer metabolic control and that these families have more challenges to face when raising a child with a chronic illness. Implications point to a need for developing strategies sensitive to the challenges of single mothers.

Diabetes Care 24:234–238, 2001

Households headed by only one parent have dramatically increased in number during the past 3 decades; the number of children living in these households more than doubled from 12% in 1970 to 27% in 1994 (1). Some reports estimate that 59–70% of children born today will spend time in a one-parent home at some point during their childhood or adolescence (2). Research examining the developmental outcomes of children growing up in these households has identified a variety of negative consequences, such as behavioral, social, emotional, and academic problems (3,4). This growing population of single-parent families has led researchers to examine the various experiences of children in these households by examining individual and interpersonal factors that contribute to differences in child outcomes across diverse family structures. One area of this research concerns children who have a chronic illness, such as diabetes.

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Received for publication 21 March 2000 and accepted in revised form 19 October 2000.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

Previous research indicates that family environments are related to coping strategies used by families and children with diabetes (5,6). Studies have demonstrated that diabetic youths from one-parent families are in poorer metabolic control than those from two-parent families (5,8,9). A recent investigation indicated that even when researchers control for race, age, family socioeconomic status, and adherence to the diabetes regimen, children from single-parent families are found to be in poorer metabolic control than their peers from two-parent families (10). Few studies, however, have identified the unique stressors associated with single parenthood and caring for a diabetic child.

The purpose of the study is to increase knowledge concerning the mechanisms that operate within one- and two-parent families in relation to children's metabolic control. The Double ABCX Model of Family Stress (11) guided this study's conceptualization of individual, family, and environmental factors' influence on health outcomes of diabetic youth. This model provides a framework for examining stressors that change, or have the potential to change, the family system. A child's diagnosis of diabetes often initiates a family crisis to which the family must adapt for the child to achieve positive health outcomes. The adaptation after the crisis can be understood by examining individual, family, environmental, and community factors.

To understand the impact of family structure on the metabolic control of diabetic children, we posed two research questions: *1*) what are the differences in sociodemographic, family, and community factors within one- and two-parent families of diabetic children? and *2*) to what extent do these psychosocial factors predict metabolic control among children within single-mother and two-parent families?

RESEARCH DESIGN AND METHODS

Participants

The subjects for this study were a convenience sample of 155 diabetic children and

Table 1—*Differences between single-mother and two-parent families in sociodemographic, family, and community factors*

	Single mother	Two parents	χ^2	*P*	*t*
n (%)	52 (33.5)	103 (66.5)			
Race of child			40.0	≤0.001	—
African-American	35 (67.3)	17 (16.5)			
Caucasian	17 (37.7)	86 (83.5)			
Sex of child			0.9	≤0.33	—
Female	23 (44.2)	54 (52.4)			
Male	29 (55.8)	49 (47.6)			
Mother's education			13.0	≤0.001	—
High school graduate	27 (51.9)	27 (26.2)			
>High school graduate	25 (48.1)	76 (73.8)			
Age (years)					
Child	12.7 ± 3.8	12.4 ± 3.4	—	≤0.65	0.5
Mother	39.5 ± 9.8	39.4 ± 5.7	—	≤0.96	0.1
Metabolic control	9.96 ± 2.1	8.7 ± 1.4	—	≤0.002	3.9
Adherence*	1.7 ± 0.5	1.9 ± 0.41	—	≤0.04	−2.1
Number of clinic visits attended	5.7 ± 2.0	6.2 ± 1.4	—	≤0.07	−1.8
Number of clinic visits missed	0.6 ± 0.9	0.4 ± 0.9	—	≤0.13	1.5
Medicaid receipt	24.0 ± 46.2	6.0 ± 5.9	—	≤0.001	35.6
Monthly income ($)	1,417.0 ± 961	3,425.0 ± 2,448	—	≤0.001	−7.2
Socioeconomic status*	28.0 ± 13.6	41.6 ± 12.1	—	≤0.001	−6.2
Total family stress*	482.2 ± 347.0	368.1 ± 226.1	—	≤0.03	2.1
Total family resources*	84.7 ± 16.7	92.6 ± 15.6	—	≤0.004	−2.9
Esteem and communication*	32.1 ± 7.8	35.2 ± 6.7	—	≤0.01	−2.6
Mastery and health*	23.8 ± 11.3	20.8 ± 9.0	—	≤0.10	1.7
Financial well-being*	22.7 ± 7.7	29.9 ± 6.7	—	≤0.000	−6.0
Extended social support*	6.1 ± 2.3	6.7 ± 1.8	—	≤0.08	−1.8
Family cohesion*	0.8 ± 0.2	0.9 ± 0.2	—	≤0.006	−2.8
Family conflict*	0.3 ± 0.2	0.3 ± 0.2	—	≤0.46	−0.7
Neighborhood stressors*	15.5 ± 3.9	14.1 ± 3.5	—	≤0.02	2.4
Perception of community treatment*	11.9 ± 2.8	10.0 ± 2.5	—	≤0.00	4.2

Data are *n* (%) or means ± SD, unless otherwise stated. *Higher scores indicate higher levels of attribute measured.

their mothers or other female caregivers. Participants were recruited if they had been diagnosed with diabetes for at least 1 year, had no other comorbid chronic illnesses that might influence their metabolic control, and were younger than 18 years of age. Youth participants were receiving medical treatment at the outpatient diabetes clinic of St. Louis Children's Hospital, a university-affiliated pediatric hospital that treats a large proportion of the children with diabetes in the greater St. Louis area. Unlike some clinics that specialize in treating youths with metabolic control problems or only those with good control, this diabetes clinic treats children regardless of metabolic control level. The children participating in this study represent those who attended the clinic for diabetes management. All families whose children attended the clinic during a 3-year recruitment period were asked to participate in the study. Although there are no national norms that describe youth in clinic populations, these subjects were similar to the participants from other pediatric hospitals in urban areas (12,13). Of the mothers who were contacted, 85% agreed to participate in the study; refusal rates were similar for single and married mothers.

The sample of children and their female caregivers was predominantly two-parent families (66.5%) and Caucasian (66.5%). Half of the youths were female (49.7%) and averaged 12.5 ± 3.5 years of age. Most of the mothers had more than a high school education (65.2%) and averaged 39.4 ± 7.3 years of age. The caregivers were middle class (37.2 ± 14.1), with income averaging $2,738.50 per month

Procedure

Mothers and children completed face-to-face interviews and self-report questionnaires; concurrently, a licensed registered nurse drew blood samples from the child participant. A blood assay for HbA_{1c} was tested using the DCA 2000 method (Miles Laboratories, Elkhart, IN). This study was reviewed and approved by the Human Studies Committee of Washington University School of Medicine, and parental consent was obtained for children to participate in the study; the youths also gave their consent. Each mother/child dyad was compensated $30.

Measures

The sociodemographic factors recorded for each child included sex, age, ethnicity, length of time diagnosed with diabetes, number of diabetes-related hospitalizations, and number of clinic appointments missed and attended. The sociodemographic factors for the mother consisted of age, ethnicity, education, type of current employment, Medicaid recipient status, family income, and socioeconomic status. Educational level was coded (0 = high school graduate or less; 1 = advanced training or some college), and socioeconomic status was determined using the Hollingshead Four-Factor Index of Social Status (14). Family structure was assessed by asking mothers if they were single, separated, or divorced (0 = single mother), or married, remarried, or living with a significant other (1 = two parents). The following measures included in this study are described briefly; they are described in more detail in a previous publication (8).

Children's metabolic control. Children's metabolic control was assessed by their HbA_{1c}, which provides a reliable estimate of the average blood glucose during the previous 6- to 8-week period (15). Using the DCA 2000 method, which shows excellent correlation and nearly identical values to those reported in the Diabetes Control and Complications Trial (16), the mean HbA_{1c} value for nondiabetic individuals was 5.9 ± 0.64% and the mean for diabetic children treated at the clinic was 8.8%.

Adherence and IDDM Questionnaire-R. The Adherence and IDDM Questionnaire-R (13), a 15-item measure, was administered through face-to-face interviews with the mothers. It assessed the degree to which the child followed medical advice in several areas, such as blood glucose and

urine testing, diet, treating hypoglycemia, as well as a total of these areas. For the total score, Cronbach's α was 0.70.

Family Inventory of Life Events and Changes. The Family Inventory of Life Events and Changes (17), a 71-item self-report instrument, was designed to record normative and nonnormative family stressors. It includes nine subscales: intrafamily strains, marital strains, pregnancy and childbearing strains, finance and business strains, work/family transitions, illness and family care strains, family losses, family transitions, and family legal violations. For the total family stress, Cronbach's α was 0.76.

Family Inventory of Resources for Management. The Family Inventory of Resources for Management (18), a 69-item self-report instrument, measures a given family's resources in four areas: family esteem and communication, sense of mastery and health, financial well-being, and extended family social support. A score for the total family resources is derived from adding these four subscales; Cronbach's α coefficient for total family resources was 0.92.

Family Environment Scale. The Family Environment Scale (19), a self-report instrument, consists of 90 true/false items that measure 10 dimensions of the family. Only two nine-item subscales—"cohesion" (Cronbach's α = 0.72) and "conflict" (Cronbach's α = 0.69)—were used in these analyses, because they have been found in previous studies to relate to metabolic control and adherence (5,17).

Neighborhood stressors. Eight items from Dressler's Survey Interview Schedule (20) were used to assess neighborhood stressors. Using a four-point scale from 1 (bad) to 4 (very good), mothers rated their neighborhood on police protection, neighborhood cooperation, protection of property, personal safety, friendliness, delivery of goods and services, cleanliness, and quietness. For this measure, Cronbach's α was 0.85.

Perception of community treatment. The "racism" section of the Survey Interview Schedule by Dressler (20) was modified to include six items that measured perceptions of unfair treatment because of race by various providers: city officials, restaurant workers, health providers, and schoolteachers. With use of a four-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree), the results indicated that Cronbach's α was 0.78 for this scale.

Table 2—*Single-order correlations between individual, family, and community contexts and HbA_{1c} of diabetic children in one- and two-parent families*

Independent variables	Metabolic control			
	In one-parent family		In two-parent family	
	r	*P*	*r*	*P*
Demographics				
Child's age	0.30	≤0.01	0.17	≤0.09
Child's race	0.16	≤0.24	0.34	≤0.0004
Child's sex	0.19	≤0.18	0.07	≤0.50
Mother's education	−0.11	≤0.40	−0.07	≤0.43
Mother's age	0.24	≤0.10	0.16	≤0.10
Health-related behaviors				
Adherence to treatment	−0.13	≤0.35	−0.30	≤0.002
Number of clinic visits attended	−0.15	≤0.29	−0.08	≤0.43
Number of clinic visits missed	0.28	≤0.05	0.13	≤0.20
Family characteristics				
Receives Medicaid	0.05	≤0.70	0.04	≤0.68
Family income	0.09	≤0.51	−0.09	≤0.37
Socioeconomic status	−0.07	≤0.60	−0.10	≤0.31
Total family stress	−0.12	≤0.47	−0.16	≤0.11
Total family resources	0.00	≤0.97	−0.07	≤0.46
Esteem and communication	0.02	≤0.89	−0.07	≤0.46
Mastery and health	−0.07	≤0.58	−0.00	≤0.98
Financial well-being	0.07	≤0.60	−0.04	≤0.67
Social support	0.12	≤0.41	−0.22	≤0.03
Family cohesion	0.04	≤0.76	−0.21	≤0.03
Family conflict	−0.06	≤0.67	−0.08	≤0.37
Community factors				
Neighborhood stressors	−0.08	≤0.58	0.17	≤0.10
Mother's perception of unfair community treatment	0.13	≤0.33	0.25	≤0.01

Data analysis

The χ^2 and *t* tests were conducted to determine differences in sociodemographic, family, and community factors within single-mother and two-parent families. Single-order correlations were conducted to determine relationships between HbA_{1c} levels and sociodemographic, family, and community variables for single-mother and two-parent families separately. To determine the variables that might statistically account for the disparity in children's HbA_{1c} levels between single-mother and two-parent families, we conducted multiple regression analysis for each group, including variables significantly associated ($P < 0.05$) with HbA_{1c} on a bivariate level.

RESULTS

Differences between single-mother and two-parent families

As shown in Table 1, children from single-mother families had significantly poorer metabolic control (mean HbA_{1c} 9.96%, SD 2.07) than children from two-parent families (mean HbA_{1c} 8.71%, SD 1.4). The majority of children from single-mother families were African-American (67.3%), whereas the majority of the children from two-parent families were Caucasian (83.5%). Single mothers had significantly less education than married mothers; 48.1 vs. 73.8% completed some education after high school. As expected, single-mother families had a significantly lower socioeconomic status and were more likely than two-parent families to receive Medicaid benefits and to report lower family income. Single-mothers also reported lower levels of adherence for their children than mothers of children living in two-parent families.

Family factors also differed between single-mother and two-parent families. Family stress was significantly higher and resources were lower among single-mother families than among two-parent families,

Table 3—*Multiple regression model to predict HbA_{1c} in single-mother families*

	β	*P*
Youth's age	0.32	0.02
Number of clinic visits missed	0.27	0.05

R^2 = 0.18; model: f = 4.98.

including lower levels of esteem and communication, financial well-being, and cohesion. Single mothers perceived significantly greater neighborhood stressors and more unfair treatment in their communities than mothers in two-parent families.

Predictors of children's HbA_{1c} in single-mother families

To determine predictors of HbA_{1c} among the single-mother family subsample (n = 52), we computed first-order correlations to assess the significant associations on a bivariate level between the independent variables (individual, family, and community) and youths' metabolic control. As shown in Table 2, only children's age and the number of diabetes clinic visits missed were significantly associated with metabolic control among children from single-mother families. When these two independent variables were combined in a regression model with the children's metabolic control (Table 3), both variables remained significant predictors of metabolic control of youth within the single-mother families (F[2,46] = 4.98, $P < 0.01$) and accounted for 18% of the variance. Thus, older children and those who miss clinic appointments with greater frequency have poorer metabolic control than younger children or those who don't miss appointments repeatedly.

Predictors of children's HbA_{1c} in two-parent families

The same analytic strategy used previously for the single-mother subsample was conducted for the subsample of two-parent families (n = 103). Significant first-order correlations between the independent variables and metabolic control indicated that children with poorer control were more likely to be African-American and report the following characteristics: lower levels of cohesion, less extended family social support, and lower levels of adherence to the diabetes treatment regimen. Poor metabolic control was also related to mothers' perception of unfair treatment in the community. As shown in Table 4, significant predictors in the multivariate model were the youth's race and adherence; family cohesion was marginally significant (P = 0.08). These variables accounted for 19% of the variance in HbA_{1c} among diabetic children from two-parent families (F[4,93] = 6.5, $P < 0.0001$).

CONCLUSIONS — Findings from this study point to important differences between single-parent and two-parent families. Metabolic control is poorer among diabetic children from single-mother families than from two-parent families. In addition, there exist very different patterns and models of prediction when influences of metabolic control are examined. Among single-mother families, older children have poorer control. This finding is consistent with an earlier study (21), and it is widely accepted that adolescence is associated with poorer diabetes management. Poorer control may also be related to decreasing parental supervision as the child matures. Because time constraints of single mothers limit their supervision of their children's diabetes management, age predicts poorer control in single-mother families. Closer supervision of children in two-parent families, however, appears to counteract the effect of age on metabolic control.

In addition, a greater number of diabetes clinic visits missed by the child also predicted poorer metabolic control among children in single-mother families. Although limited research has assessed children's clinic attendance, one study found that African-American youths with diabetes missed more clinic visits than their Caucasian counterparts (12). These findings are consistent with a previous study that reports that mothers of African-American children are less likely than mothers of Caucasian children to consult a physician or take them to the doctor during the course of a year for treatment or prevention services (22). Auslander et al. (8) suggest that the patient-practitioner relationship and communication may be adversely affected when the patient and providers are of different ethnic and/or socioeconomic backgrounds, thus possibly contributing to greater numbers of missed clinic visits.

Analyses of the two-parent family subsample revealed a substantially different picture than that found among single-mother families. Findings indicate that being African-American or having poor adherence are risk factors for poor metabolic control among children in two-parent families. Studies conducted largely with diabetic youths and their intact or two-parent families also report that African-American youths are in poorer metabolic control, hospitalized more frequently, and miss more diabetes clinic appointments than their Caucasian counterparts (8,9,12).

In this study, adherence to the diabetes treatment regimen predicted poorer metabolic control. It appears that adherence behaviors are a stronger influence on children's HbA_{1c} levels in families with two parents versus those with single parents. In single-parent families, other stressors overwhelm the parent's ability to provide the needed support for diabetes management, so the child's metabolic control may suffer. It is also possible that in two-parent families, the parents may be more available to supervise the child and may have a more realistic assessment of their child's adherence. This possible scenario may explain the stronger relationship found between adherence and metabolic control in two-parent families.

Limitations

The findings of this study should be interpreted with caution because of some limitations. One limitation of the study is that the results are generalizable only to children who attend diabetes clinics or to those who actually receive some level of professional health care in controlling their diabetes; implications for youth not receiving medical services are not addressed. In addi-

Table 4—*Multiple regression model to predict HbA_{1c} in two-parent families*

	β	*P*
Child's race	0.29	0.006
Child's adherence	0.19	0.04
Extended social support	−0.14	0.12
Family cohesion	−0.16	0.08
Perception of unfair community treatment	0.09	0.39

R^2 = 0.21; model: f = 6.2.

tion, family structure was measured by a dichotomous-level variable (single-mother and two-parent) when, in fact, family structures can also include stepfamilies as well as divorced and widowed people and individuals never married. To evaluate different patterns of influence on metabolic control, future studies must reflect the complexity and subtleties of family structures. A third limitation is that several variables—such as parental time constraints, level of child supervision, and assistance from significant others, including close family and friends—were not included in the present study. Last, many associations were tested statistically, and it is possible that some of the significant correlations were due to factors of chance unique to this sample. However, all of the significant predictors have been identified in previous studies of this population. Future studies examining these factors in larger samples would be beneficial from clinical and research perspectives. Although attention has been focused on the importance of ethnic diversity and age in diabetes management, family structure has received little attention. This study points to the need for developing strategies sensitive to the challenges of single mothers.

Acknowledgments — This research was supported in part by grant DK-20579 from the National Institute of Diabetes and Digestive and Kidney Diseases to the Diabetes Research and Training Center of Washington University and by United States Public Health Service Grants MO1 RR06021 and MO1 RR00036 awarded to the Pediatric and General Clinical Research Center at Washington University.

Portions of this work were presented at the Annual Meeting of the American Diabetes Association, Boston, Massachusetts, June 1997, and the Council on Social Work Education, Orlando, Florida, March 1998.

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