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Family stress and metabolic control in diabetes

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Abstract

The common clinical assumption that stress has a deleterious effect on metabolic control in insulin dependent diabetes mellitus (IDDM) has not been confirmed in children and adolescents. This cross sectional study of 43 children and adolescents with IDDM and their families examined the relations between family life stress, family social support, and metabolic control. High family life stress was found to be strongly correlated with HbA_{1c} in the whole group (n=43) and in children under 12 years (n=27) when considered separately. Family social support was not found to be directly related to HbA_{1c}, but was found to buffer the effects of family life stress. These findings support the hypotheses that family stress affects metabolic control in IDDM and that good social support buffers these deleterious effects.

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Childhood insulin dependent diabetes mellitus (IDDM) is associated with long term vascular complications and increased levels of child and family psychological or behavioural disturbance.[1–4] However, the relations between metabolic control and child and family psychological factors are poorly understood. Family issues are central to the management of chronic disease and this has led to increased attention to the relations of family characteristics to metabolic control in childhood diabetes. Much of the supportive work of children's diabetic services is based on the assumption that family stress produces poor diabetic control in children; however, there is little direct evidence to support this conclusion. Our study was designed to test the hypothesis that family stress is associated with poor glycaemic control in children and adolescents with diabetes, and to test whether this relation is buffered by high social support in the family.

It has been postulated that life stress is associated with poor diabetic outcomes.[5] A relation between the life stress of an individual with diabetes and poor diabetic control is well established in adults,[6–8] although there are dissenting opinions.[9 10] Similar studies of personal life stress in adolescents and children have found no relation between stress and diabetic control; in the only study to address the issue in prepubertal children, Chase and Jackson found no relation between Coddington life event scores and glycated haemoglobin (HbA_{1c}) in children, although a small positive relation was noted in the 15–18 year adolescent group.[11] Similar negative findings are reported in studies of personal life stress and diabetic control in adolescents.[12 13] The only study to find an association between stress and control in adolescents assessed family stress rather than personal life stress, using the adolescent family inventory of life events (AFILE).[14 15]

The disparity between adult studies and those in children and adolescents with diabetes concerning the stress-control relation emphasises that conclusions drawn from adult studies cannot be generalised.[16] The use of self report life event scales in children is controversial; firstly, little is known about how children appraise stress and life events[17 18]; secondly, children are vulnerable to the stress of other family members[18 19]; and thirdly, children are often unable to report significant events such as marital and financial discord.[20] Such problems have led researchers to suggest that measures of the stress in a child's family are more useful than children's own stress measures.[14 15] This is supported by the relation noted above between diabetic control and family stress, but not personal stress, in adolescents.

Reports on the family in diabetes are incomplete and contradictory. While little difference has been found between families of children with diabetes and control families,[21] it has been reported that good metabolic control can be predicted by expressive and adaptive family environments[22–24] and by rigid, controlling, and achievement oriented families.[25 26] In the only longitudinal study of diabetic families, Kovacs *et al* reported that family environment was not associated with metabolic control, and that the diagnosis of diabetes did not change family environment with time.[27] While the use of differing family scales and selected populations may explain these seemingly contradictory findings, it is more probable that the relation between family environment and diabetic management and control is more complex than hitherto realised. Further elucidation of the interrelation between family environment, function, and diabetic control is necessary, involving an understanding of the relations between family stress and diabetic control.

Factors that may modify or buffer the relation between life stress and diabetic control have received much attention in the reports concerning adults. Understanding these factors may assist in the construction of interventions designed to improve diabetic control. Social support has been hypothesised to improve diabetic control, either through physiological factors or by an increase in regime adherence. If this is so it would introduce further possibilities for interventions in

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this area. Adult research provides contradictory results – social support was found to buffer the association between high life event score and HbA_{1c} in 80 adults with diabetes,[6] whereas no relation was found in other studies.[7 28] Little information is available regarding the construct of social support in adolescents and children with diabetes, and the importance of parental support for the child, peer support of the children, and social support for the parents is unknown for the management of chronic disease.[15] Hauenstein *et al*[29] reported that mothers of children with diabetes see themselves as more stressed than mothers of other children, and perceive less support from their spouses than control mothers. Hanson *et al*[30] stated that the level of parental support available to adolescents did not buffer the effects of stress on diabetic control. No studies have examined social support and diabetic control in children.

Methods

SUBJECTS AND PROCEDURES

The study involved a cross sectional analysis of metabolic and family variables from 43 children and adolescents with IDDM and their mothers. Subjects were sequential outpatient families attending a public metropolitan regional paediatric diabetic clinic in Brisbane, Australia, over a three month period. The mean age of the children and adolescents was 10·2 (SD 3·16) years (n=43), with range from 2 to 16 years. Eighteen (42%) were male, 25 (58%) female. Thirty (70%) were prepubertal, with 13 (30%) being in Tanner stage 2 or above pubertal development. Twenty seven were children under 12 years of age (63%, of whom 13 were male (48%) and 14 female (52%)), and 16 were 12 to 16 years (37%, five being male (31%) and 11 female (69%)). At a routine clinic visit, the diabetes nurse obtained consent from the mother for participation in the study, and consent from the child if over 12 years. Mothers completed a questionnaire containing psychological instruments and questions on diabetic routines and demographic data. Measurements of blood glucose, urinary ketones, and HbA_{1c} were obtained by the nursing staff. Families were assured of the confidentiality of information gathered and their right to discontinue involvement at any time. The study and all procedures were approved by the hospital ethics committee. Only four families (8%) refused to participate. Fathers were not recruited into the study, as mothers are generally the primary care givers and usual regime managers for children with diabetes.[31 32] Mothers were the prime or equal care giver in all families participating in this study.

Patients were asymptomatic at time of study, with a blood sugar level range of 3 to 21 mmol/l. Four subjects were excluded as they were less than 12 months from diagnosis of IDDM (to avoid confounding of stress-control linkages by the 'honeymoon period'), as was a child with cystic fibrosis, and one had maturity onset diabetes of the young.

MEASURES OF CONTROL

Routine clinic HbA_{1c} assays were used as the prime measure of metabolic control. HbA_{1c} is well accepted as the best method of assessing long term diabetic control, reflecting control over the past 8 to 10 weeks. Assays were performed at the Royal Alexandra Hospital for Children, Sydney (reference range: good control <1400 pmol/mg; fair 1400–1600; poor 1600–2000; very poor >2000). A review of patients' medical notes was used to ascertain HbA_{1c} data for the previous 12 months, and whether the child had been admitted to hospital for a diabetes related reason during the preceding 12 months. Measures of diabetic control generated were HbA_{1c} at time of questionnaire (Hb_{1c}-Q), and the number of hospital admissions for diabetes in the previous 12 months (diabetic admissions for any reason were taken to be indicative of poor control). The mean HbA_{1c} (mean Hb_{1c}) over the previous 12 months was also calculated as an indicator of metabolic control during the period from which life events were assessed by questionnaire. Demographic data on patients' age, sex, and duration of diabetes were gathered by questionnaire, and height, weight, and pubertal status were gathered from hospital records.

FAMILY LIFE STRESS

Stress in the family of a child with diabetes was measured by maternal report using the McCubbin *et al* FILE (family inventory of life events).[14] FILE was developed through factor analytic techniques with a large national sample of American families, and has excellent reliability and validity (Cronbach's α=0·81 and test-retest reliability correlation=0·8). FILE covers financial, marital, illness, school, and interpersonal stressors and is designed to elicit the stressful events that occur to all immediate family members. The questionnaire was filled out by the mother, who as the usual central family figure would be most aware of the life events of all family members. Obtaining life event reports from all family members would be a more optimum method of determining life stress, but this is impracticable in a clinical setting. The life event scale contains no symptoms of diabetes that would falsely increase stress scores. A total unweighted life event score was calculated, as a simple unweighted count of events over time has been shown to provide similar results to the weighting of scores by various strategies.[33 34]

SOCIAL SUPPORT

Maternal perceived social support by family and friends or acquaintances was measured by a self report instrument validated for Australian women with partners (α reliability coefficient=0·62).[35] Both perceived spousal support and wider social networks were measured separately. A total social support score was calculated by simple addition of the two subscale scores, as much evidence suggests that social support can be adequately

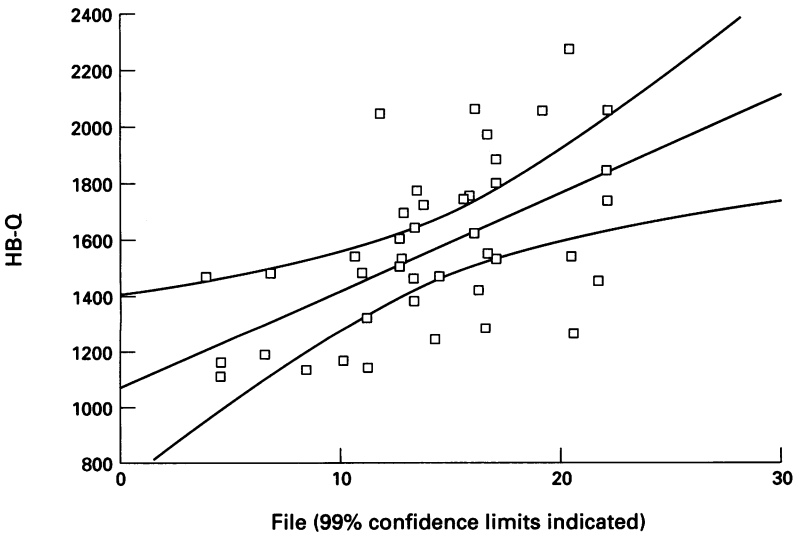
conceptualised as a more global single construct.[36] As with the life event instrument, we took the maternal perception of family support as a measure of family social support.

STATISTICAL ANALYSIS

Statistical analysis was performed using Spearman rank correlations with SPSS-PC. Because of the risk of chance associations arising from multiple correlations, associations were reported as significant only at the $p<0{\cdot}01$ level. All analyses were performed upon the whole group (n=43); however, the relation between FILE and control variables was also considered separately in children under 12 years of age (n=27).

Results

Hb_{1c}-Q was found to be significantly associated with FILE (n=43, $r_s=0{\cdot}554$, $p<0{\cdot}001$) (see the figure). A similarly strong association between FILE and Hb_{1c}-Q was found in the children when considered as a separate group (n=27, $r_s=0{\cdot}493$, $p<0{\cdot}01$). Mean Hb_{1c} was also significantly associated with FILE (n=43, $r_s=0{\cdot}563$, $p<0{\cdot}001$) and with FILE in the children's group considered separately (n=27, $r_s=0{\cdot}516$, $p<0{\cdot}01$). No associations were found between spouse support and network support subscales, or total support, with the control variables Hb_{1c}-Q or mean Hb_{1c}. In the group with high total social support (n=19), we dichotomised FILE at the mean into low and high FILE categories, and analysed the resulting means of mean Hb_{1c} to test whether high social support buffered the stress-control relation. The means of the two mean Hb_{1c} groups (high FILE group mean=1568·9, SD 227·7; low FILE group mean=1439·1, SD 179·5) are not significantly different at the 1% level (t test for μ low=μ high: $t=1{\cdot}29$, $r=0{\cdot}23$, DF=10, 99% confidence intervals −189, 448), suggesting that high total social support buffers the association between life stress (FILE) and poor control (mean Hb_{1c}). The number of admissions had no significant associations with FILE, social support, or other measures of control. No significant relation between sex and diabetic control was found, with the means of Hb_{1c}-Q and mean Hb_{1c} values not significantly different at the 1% level (Hb_{1c}-Q: t test for μ male=μ female: $t=-0{\cdot}54$, $r=0{\cdot}59$, DF=40, 99% confidence intervals −191, 287; mean Hb_{1c}: t test for μ male=μ female: $t=-0{\cdot}031$, $r=0{\cdot}76$, DF=40, 99% confidence intervals −167, 216). Pubertal status was also not significantly associated with control. Blood sugar level at time of questionnaire was significantly associated with Hb_{1c}-Q (n=43, $r_s=0{\cdot}417$, $p<0{\cdot}001$).



Relation between HbA_{1c} at time of questionnaire (Hb-Q) and family inventory of life events (FILE) score.

Discussion

Family stress has been shown to be significantly associated with worse metabolic control in children and adolescents with IDDM. Although clinicians have assumed that such a relation was operative, this is the first time it has been documented in preadolescent children. In evidence based medical practice, the identification of such relations would be the first step in planning interventions aimed at improving diabetic control in order to minimise hospital admissions and long term complications. The next step would be to identify factors that modify the stress-control relation. Our finding that high social support buffered the effects of life stress on diabetic control is the first evidence of such a relation in children. The identification of a buffering role for family social support offers the opportunity for health professionals to intervene to boost social support in families suffering from high life stress or children with poor metabolic control. Our finding conflicts with that of Hanson *et al*,[30] who, in the only other study of social support in juvenile diabetes, found that parental support did not buffer the stress-control relationship in adolescents. This difference may be explained by our use of maternal measures of family social support whereas they assessed adolescents' perceptions of parental support.

We did not find an association between admission rate and family stress, nor with glycated haemoglobin measures of control. This is surprising given the widespread assumption that admissions in diabetes, especially adolescents, commonly reflect family stress – a view for which there is some theoretical support.[8 23] However, we must be cautious in interpreting this finding because of the small number of total admissions in the study. It is also important to note that a cross sectional study such as this does not allow conclusions to be drawn regarding the direction of causality in the relation between stress and control. Indeed, it is likely that the relation between family stress and diabetic control is bidirectional, with poor diabetic control producing family stress as well as family stress inducing poor control in the child.

The psychological construct of family stress is supported by the findings of our study, namely that metabolic control in childhood diabetes is vulnerable to the stress of other

family members. Our finding of a link between family stress and control is contrary to that of Chase and Jackson,[11] who found no association using a personal event inventory for children. This may indicate that family stress scales tap into family stressors that act on parental adherence to the demanding diabetic regimen. Our study conceived family stress as a global measure and was not designed to examine the contribution of particular family stressors such as marital or financial stress. In order to better plan supportive interventions in this area, further work is necessary to understand the operation of particular stressors in families with diabetes, and to differentiate the operation of family support in ameliorating the effects of stress.

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