

## Effects of Mothers' Knowledge and Coping Strategies on the Glycemic Control of Their Diabetic Children in Egypt

### Abstract

**Background:** This study aimed to examine the relationship between mothers' knowledge related to treatment management of type 1 diabetes (T1D), with perceptions of coping with diabetes-related stress and to examine the relationship between children's metabolic control and maternal coping. A cross-sectional study was done among ninety-two mothers of T1D children. **Methods:** Data were collected using a structured questionnaire, Ways of coping questionnaire (WCQ), and Diabetes Knowledge questionnaire-24 (DKQ-24). **Results:** The most important predictors of the total knowledge scores among mothers were father education ( $P < 0.0001$ ), followed by child age and sex ( $P < 0.0001$ ), while the most important coping scales affected by total knowledge scores was accepting responsibility ( $P = 0.01$ ). There were positive correlation between HBA1C and escape-avoidance and positive reappraisal coping scales ( $r = 0.24$ ,  $P = 0.02$  and  $r = 0.23$ ,  $P = 0.02$ , respectively). Blood glucose level was the most important clinical characteristics affecting the use of seeking social support coping scale among mothers. **Conclusions:** Parents with more knowledge of diabetes and with better education were able to cope more effective and maintain a better glycemic control of their diabetic children.

**Keywords:** Children, coping strategies, mothers, type 1 diabetes

### Introduction

Type 1 diabetes (T1D) is one of the most common chronic childhood illnesses.<sup>[1]</sup> Global rates have increased in the last decades, especially among children younger than 5 years of age,<sup>[2]</sup> and the overall increase in the incidence of T1D is around 3%, where, globally, about 78,000 children under age 15 years develop T1D.<sup>[3]</sup> There are few studies concerned with the epidemiology of childhood T1DM in Egypt due to lack of diabetes registries, dispersed medical facilities, and suboptimal identifying of new cases.<sup>[4]</sup>

A diagnosis of a child with T1D has a substantial impact and represents a challenge for the whole family. Mothers of diabetic children face challenges related to the diagnostic presentation which is often severe and a high proportion of children present as critically ill at the time of diagnosis.<sup>[5]</sup> Child parents' report elevated rates of stress and depressive symptoms.<sup>[6]</sup>

Management of T1D is complex and requiring frequent monitoring of blood glucose levels, monitoring and control of

food intake, frequent insulin administration, modifying insulin dose to match diet, and activity levels.<sup>[7]</sup> This mode of intensive therapy exerts a lot of efforts and puts big burden on caregivers of children with T1D, particularly mothers, who are responsible for the majority of treatment management.<sup>[8]</sup> Poor metabolic control may result in the acute hypoglycemia and ketoacidosis, poor growth and chronic microvascular and macrovascular complications.<sup>[9,10]</sup> Optimal metabolic control is associated with greater family cohesion and lower family conflicts.<sup>[11]</sup> Continuous parent involvement is associated with better quality of life and metabolic control in children.<sup>[12]</sup>

Diabetes management is also affected by developmental and physiological factors peculiar to this age group.<sup>[13]</sup> Thus, there is a need to identify coping and possible effects of the high demands required in management on mothers of children with T1D to support them and promote the best adjustment to deviation in health.<sup>[14]</sup>

Coping, a multidimensional process referring to how individuals deal with stress, involves conscious cognitive

Eman Mohamed Mahfouz,  
Nashwa Nabil Kamal,  
Eman Sameh Mohammed,  
Sara Ahmed Refaei

Department of Public Health and Preventive Medicine, Faculty of Medicine, Minia University, Minia, Egypt

**Address for correspondence:**  
Dr. Nashwa Nabil Kamal,  
Department of Public Health and Preventive Medicine, Faculty of Medicine, Minia University, Minya, Egypt.  
E-mail: [nashwakamal@yahoo.com](mailto:nashwakamal@yahoo.com)

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and/or behavioral efforts to deal with events appraised as stressful, or exceeding the resources of the individual.<sup>[15]</sup> The two types of coping are problem-focused coping and emotion-focused coping. An individual can apply either or both types of coping to a situation.<sup>[16]</sup>

The ways of maternal coping to face the stress of management, have important implications for illness adjustment. The extent to which mothers find coping with diabetes upsetting has been related to current maternal distress and level of distress after diagnosis.<sup>[17]</sup> Maternal positive coping have important implications for children's health outcomes, including both metabolic control and psychological adjustment.<sup>[18]</sup>

The purpose of this study was to examine the relationship between mothers' knowledge related to treatment management of T1D, with perceptions of coping with diabetes-related stress. Finally, we wanted to examine the relationship between children's metabolic control and maternal coping.

## Methods

### Study design and setting

This hospital-based study was conducted at children diabetes clinic of Minia Pediatric University Hospital, Minia, Egypt, between October 2016 and March 2017. This clinic was working only on Sunday, so in this day, over 6 months, a total of 99 mothers of children with T1D were recruited. From 99 mothers, ninety-two mothers agreed be interviewed and to participate in the study. The remaining 7 (7.1%) mothers declined to participate in the study. The response rate was 92.9%. The aim of the study was explained and the answers to the questionnaire were filled in by the researcher.

Inclusion criteria were mothers of children with T1DM, under 18 years of age and those whose diabetes was diagnosed at least 2 years before our study so that their mothers would have had the time to evolve and maintain her coping strategies.

### Data collection

Data were collected using a structured questionnaire, including the Ways of Coping Questionnaire (WCQ). The questionnaire included child demographic characteristics. Number of hospital administrations, its causes, and the last Hb1c were recorded. Personal information concerning research participants were kept confidential by removal of identifiers (names) and give it numbers.

The WCQ, designed by Folkman and Lazarus,<sup>[19]</sup> was used to assess the frequency and type of coping strategies used by mothers in response to their child's diabetes. The WCQ is a 66-item questionnaire. Each item or statement represents a specific coping strategy. Mothers indicate the frequency with which they use each coping strategy on a

scale ranging from 0 (not used at all/does not apply) to 3 (very often). A higher score indicates that the individual frequently uses the coping strategy that the item reflects. Of the 66 items, only 50 constitute the WCQ's 8 subscales. The remaining 16 items are not included in any of the subscales.

The subscales are confrontation, distancing, self-control, seeking social support, accepting responsibility, escape avoidance, planful problem-solving, and positive reappraisal. Each subscale yields a score. The subscales do not contain an equal number of items. We added the 16 additional items to the 50 items in the subscales to generate a total score that describes the frequency of use of all the WCQ coping strategies. The subscales offer a measure of the type and frequency of use of each particular category of coping strategy. The WCQ is reported to have good internal consistency with Cronbach's alphas for the subscales ranging between 0.61 and 0.79.<sup>[20]</sup>

Diabetes Knowledge Questionnaire-24 (DKQ-24) was used for assessment of patients' mother knowledge about DM<sup>[21]</sup> which was derived from the original 60-item questionnaire, which was established by Villagomez.<sup>[22]</sup> The DKQ-24 is a True/False self-report scale of knowledge related to diabetes with *Yes*, *No*, or *I Don't Know* options. Individuals are asked to report their knowledge of diabetes. The scores on the DKQ-24 were calculated. Content validity of the questionnaires was assessed by consulting experts in this field. The reliability of the WCQ and DKQ-24 questionnaires was done, and Cronbach's alpha coefficients for internal consistency of the whole tests were 0.91 and 0.82, respectively.

### Pilot study

The questionnaire was initially tested on 10 women to investigate its clinical application of the questionnaire. The pilot study also tested the reliability of test-retest and the time needed to conduct an interview. Proper corrections and adjustments were applied; the data for these 10 women were not included in the study results.

### Statistical analysis

SPSS 19 was used for data entry and analysis, and Microsoft Excel was used for graphics. Quantitative data were presented as mean and standard deviation, and qualitative data were presented as a frequency distribution. Chi-squared test and Student's *t*-test were used. A multiple regression analysis of the total knowledge scores was done with the most significant sociodemographic variables in univariate analysis; then, another regression analysis was done for predicting the total knowledge scores, it included the most significant (socio-demographic) variables, the most relevant coping scales and HbA1C.  $P < 0.05$  was considered to indicate significance.

## Ethical approval

The study protocol was approved by the scientific ethical committee of the Faculty of Medicine and Minia Maternity and Pediatric University Hospital. A written informed consent was obtained from each participant.

## Results

This study included 92 diabetic children, 48 (52.2%) females, and 44 (47.8%) males and 60.9% of them lived in urban areas. Regarding fathers' and mothers' educational level and occupation (60.9% had less than 6 years education, and 27.2% were non worker versus 67.4%, and 84.4% respectively). About 59.8% had no family history of diabetes but 40.2% had a history of hypertension. About 51.1% of their parents were relatives. Mean age of children was  $10 \pm 4.49$ , Number of siblings ( $3.6 \pm 1.26$ ), Birth order ( $2.8 \pm 1.28$ ), child age at diagnosis ( $6.1 \pm 4.35$ ) [Table 1].

Means and standard deviations of each coping scale were measured and it was found that social support strategies ( $1.38 \pm 0.48$ ) and positive reappraisal ( $1.33 \pm 0.50$ ) used more frequently than the use of distancing ( $1.32 \pm 0.41$ ), confrontation ( $1.31 \pm 0.51$ ), accepting responsibility ( $1.27 \pm 0.61$ ), planful problem-solving ( $1.23 \pm 0.43$ ), escape avoidance ( $1.21 \pm 0.35$ ), and self-control ( $1.20 \pm 0.45$ ) [Figure 1].

The mothers of female child had higher total knowledge score ( $11.5 \pm 3.4$ ) than male child ( $9.9 \pm 4.1$ ). The difference was significant ( $P = 0.04$ ). Table 2 showed that the most important sociodemographic factors affecting total knowledge scores among the mothers of the studied diabetic patients was father education ( $P = 0.0001$ ) followed by child age and sex ( $P = 0.0001$ ,  $0.001$ , respectively), while the least factors were mother education and father occupation ( $P = 0.6$ ,  $0.7$  respectively).

A multiple regression analysis was done [Table 3] and found that the most important predictors affecting total knowledge scores among mothers of the studied diabetic patients was father education ( $P = 0.0001$ ) followed by child age and sex ( $P = 0.0001$ ), while the most important coping scales affected by total knowledge scores was accepting responsibility ( $P = 0.01$ ). On the other hand, the least factors influenced by total knowledge scores were HBA1C and confrontive coping skill ( $P = 0.09$ ,  $0.6$ , respectively).

There were significant positive correlations between positive reappraisal scale, confrontation and self-controlling and total knowledge scores ( $r = 0.28$ ,  $P = 0.001$  and  $r = 0.25$ ,  $P = 0.01$  and  $r = 0.24$ ,  $P = 0.02$ , respectively) which suggested that the use of these coping scales increased with the increase of total knowledge scores. Furthermore, it shows that there was no correlation between

**Table 1: Sociodemographic characteristics of the studied diabetic patients**

Sociodemographic characteristics	n (%)	P
Sex		
Male	44 (47.8)	0.54
Female	48 (52.2)	
Residence		
Urban	56 (60.9)	0.003*
Rural	36 (39.1)	
Father educational level		
<6 years	56 (60.9)	<0.001*
More than 6 and <12	21 (22.8)	
More than 12	15 (16.3)	
Mother educational level		
<6 years	62 (67.4)	<0.001*
More than 6 and <12	24 (26.1)	
More than 12	4 (4.3)	
Father occupation		
Nonworker	25 (27.2)	0.14
Farmer	22 (23.9)	
Clerk	21 (22.8)	
Manual worker	12 (13)	
Free worker	4 (4.3)	
Professional	8 (8.7)	
Mother occupation		
Nonworker	78 (84.8)	<0.001*
Farmer	3 (3.3)	
Clerk	2 (2.2)	
Professional	9 (9.8)	
Family history for DM		
Yes	37 (40.2)	0.007*
No	55 (59.8)	
History of chronic diseases		
No	28 (30.4)	<0.001*
Hypertension	37 (40.2)	
Heart diseases	25 (27.2)	
Others	2 (2.2)	
Consanguinity		
Yes	47 (51.1)	0.7
No	45 (48.9)	
Age (mean±SD)	10.35±4.49	
Number of siblings (mean±SD)	3.6±1.26	
Birth order (mean±SD)	2.8±1.28	
Child age at diagnosis (mean±SD)	6.1±4.35	

\* $P < 0.05$  was considered to indicate significance. SD=Standard deviation, DM=Diabetes mellitus

HBA1C and all coping scales except for escape-avoidance and positive reappraisal scales ( $r = 0.24$ ,  $P = 0.02$  and  $r = 0.23$ ,  $P = 0.02$  respectively) [Table 4].

## Discussion

In this study, we investigate the effects of mother's knowledge and socioeconomic standard of the family on the coping with their children's diabetes.

**Table 2: Multiple regression analysis of sociodemographic factors and total knowledge scores**

Sociodemographic factors	$\beta$	P
Father education	0.571	0.0001
Child age	-0.395	0.0001
Child sex	0.286	0.001
History of chronic diseases in the family	0.135	0.1
Mother occupation	0.125	0.1
Family history of diabetes	0.075	0.4
Mother education	-0.046	0.6
Father occupation	-0.033	0.7

Dependent variable is total knowledge scores,  $R^2=0.5$ ,  $F=10.2$ ,  $P=0.0001$

**Table 3: Multiple regression analysis of sociodemographic factors, total coping scores, hemoglobin A1C, and the total knowledge scores**

Predictors	$\beta$	P
Father education	0.542	0.0001*
Child sex	0.335	0.0001*
Child age	-0.304	0.0001*
Accepting responsibility	0.184	0.01*
Positive reappraisal	0.182	0.04*
HBA1C	-0.134	0.09
Confrontation	-0.038	0.6

\* $P < 0.05$  was considered to indicate significance. Dependent variable is total knowledge scores,  $R^2=0.5$ ,  $F=12.8$ ,  $P=0.0001$ . HBA1c=Hemoglobin A1c

**Table 4: Correlation between coping scales with total knowledge scores and hemoglobin A1c levels**

Coping scales	Total knowledge scores		HBA1c	
	r	P	r	P
Positive reappraisal	0.28	0.007*	0.23	0.02*
Confrontation	0.25	0.01*	0.24	0.02*
Self-controlling	0.24	0.02*	0.05	0.06
Accepting responsibility	0.15	0.1	-0.04	0.06
Seeking social support	-0.01	0.9	0.16	0.1
Distancing	-0.04	0.6	0.03	0.7
Escape avoidance	0.02	0.1	0.09	0.3
Planful problem-solving	0.09	0.3	0.14	0.1

\* $P < 0.05$  was considered to indicate significance. Grades of r: 0 -0.24 (weak or no association), 0.25 to 0.49 (fair association), 0.50-0.74 (moderate association), 0.75+ (strong association). HBA1C=Hemoglobin A1c

Based on the relative scores of the WCQ, the most frequently used coping strategies were social support strategies and positive reappraisal in the whole studied sample which are more mixed in character and could be seen as either emotion-focused or problem-focused coping, depending on the situation.<sup>[23]</sup>

According to McDonnell *et al.*,<sup>[24]</sup> problem-focused coping was related to knowing more and emotional-focused coping

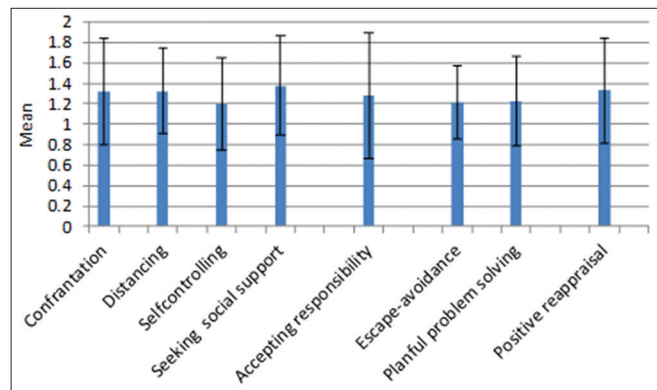


Figure 1: Means and standard deviations of each coping scale

was related to the acceptance and holding of oneself. A previous study reported that when depressive symptoms were high, more emotional-focused coping strategies in stressful situations were used; and when symptoms were moderate, problem-focused coping strategies were more widely used.<sup>[5]</sup>

The higher frequency of the coping strategy of “using social support” by the mothers was found also in a previous study<sup>[25]</sup> and this finding may reflect the cultural influence on the commonly used coping when faced with stress and reflects the Egyptian personality characteristic of interdependence and the family structure and family bonds of Egyptians. Furthermore, seeking social support from medical professionals may help mothers to obtain emotional support and manage any negative emotions during hard times.

In the present study, the mothers of female diabetic child had a significant higher total knowledge score than male diabetic child and this result was in agreement with a previous study which found that female gender was an independent determinant of low general knowledge about diabetes<sup>[26]</sup> and this difference may be due to mothers’ worries about nonmarriage of their daughters in the Egyptian community.

Education appeared to have an important effect on mothers’ total knowledge score. Our study illustrated that the most important sociodemographic factors affecting total knowledge scores among the mothers of the studied diabetic children was father education and this result was matched with another previous study.<sup>[27]</sup> This can be explained by the fact that well-educated fathers may lead to greater household income, more exposure to media, labor market participation, and higher health knowledge. Father’s education is positively associated with the healthy decision, while mother’s education is more critically associated with long-term health outcomes. Education establishes greater knowledge and the ability to respond to new knowledge more rapidly.<sup>[28]</sup> The flow effects from an educated father to a less educated mother are particularly crucial when the mother is the caretaker.

The most second important sociodemographic factors affecting total knowledge scores among the mothers of the studied diabetic children was child age, may be due increase the mother's experience in the care of diabetic children with time and increase their awareness of care and the factors that are involved in it.<sup>[29]</sup>

In the multiple regression analysis including all the significant variables predicting the total knowledge scores, the most important sociodemographic factors affecting total knowledge scores were father's education. Accepting responsibility was the most important coping scales affecting the total knowledge scores as it allows individuals to accept the problematic situation and attempting them to correct things by continuous learning and searching for appropriate support services that can help them adapt with their responsibilities and develop positive outcomes for their acceptance.<sup>[30]</sup>

Positive reappraisal is a coping strategy tries to control the emotions that are related to grief as a form of reinterpretation of the conflicting situation and growth, and it is often the first step toward a reengagement with the stressor event.<sup>[31,32]</sup> In this study, positive reappraisal scale was the second most important coping scale affected by total knowledge scores among mothers. This may be explained that positive reappraisal is done by the more knowledgeable mothers to increase the sense of control over their emotional states and to find some positive elements in DM.<sup>[33]</sup>

The confrontive coping method which is a problem-focused coping scale corresponds to the offensive strategies for coping with the situation, in which the people present an active situation in relation to the stressor.<sup>[34]</sup> In the present study, confrontive coping scale was the least factor affected by the total knowledge scores and this is possibly a form of the adaptive problem-focused coping strategies that decrease distress.

There is insignificant correlation between HbA1C or glycemic control and maternal coping strategies expect for the escape-avoidance coping scale (which is an emotion-focused coping scale); as there is a significant positive correlation between HbA1C and escape-avoidance scale. This result is similar to a study of mothers of young children with diabetes, in which mothers' coping was not related to glycemic control.<sup>[8]</sup> The significant positive correlation between HbA1C and escape-avoidance scale means that the more mothers use escape-avoidance strategies, the more uncontrolled diabetes. In this sense, escape avoidance is ineffective strategy for managing stressful events. This may be because mothers try to escape from their problems using a delusionary or imaginary strategy, using escapist fantasies to minimize the severity of the situation.

In the present study, the most clinical characteristics affecting the use of seeking social support coping scale

among the mothers of the studied diabetic patients was the blood sugar level of the diabetic child and HbA1C level, and this is in agreement with a previous study which revealed correlations between the treatment method and HbA1c level as well as the desire for social support in coping with stress.<sup>[35]</sup> It can be explained that the high blood sugar levels were one reason for parents' worries and seeking social support.

## Conclusions

DM is a big challenge, not only for the child, but also for his mother facing this new physical and emotional state. Parents with more knowledge of diabetes and with better education were able to maintain a better glycemic control of their children, and mothers of female diabetic children has more knowledge score than those of male diabetic children. Accepting responsibility and positive reappraisal were the most coping scale increased by increasing the mothers' knowledge regarding diabetes. Increasing HbA1C levels in the children lead to increasing in both escape-avoidance and positive reappraisal coping scales.

There are some limitations of this study. First, the small size of the sample makes the ability to generalize from our results is limited by. Second, additional data about children's psychosocial and diabetes characteristics were lacking, which could show a potential pathway to the parental coping with the diabetic child, and thereby limiting the analysis of the results. Despite these limitations, the strength of this study is that it helped bring some insight into coping processes in parents. Future research should also address the question of which strategies lead to more successful parental coping. It would also be of interest to assess possible strains in marital relationships caused by children's chronic illnesses and how are girls affected by their mothers' greater involvement?

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## Conflicts of interest

There are no conflicts of interest.

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