Journal of Clinical and Basic Research (JCBR). 2020; 4(1): 14-20.

Original Article

Relationship between Psychosocial Factors and Glycemic Control in 7-16 Years Old Children with Type 1 Diabetes

Firoozeh Derakhshanpour[1], Sakineh Mohammadian[2], Hosein Zaeri[2], Yalda Sanei[3], Leila Kashani*[1]

1. Department of Psychology, 5 Azar Hospital, Golestan University of Medical Sciences, Gorgan, Iran; orcid id:0000-0003-4266-0202
2. Department of Pediatrics, Taleghani Hospital, Golestan University of Medical Sciences, Gorgan, Iran
3. Department of Pediatrics, School of Medicine, Golestan University of Medical Sciences, Gorgan, Iran

ABSTRACT

Background and objectives: Diabetes mellitus is a metabolic disease characterized by hyperglycemia due to defects in insulin secretion or action. One of the consequences of diabetes is depression, which itself is related to complication of diabetes. Given the lack of enough studies on the relationship between psychological variables of parents and level of HbA1C in children with type 1 diabetes in Iran, we examined the relationship between psychosocial factors and glycemic control in children aged 7-16 years with type 1 diabetes.

Methods: This is a cross-sectional study conducted on all children with type 1 diabetes who were referred to Taleghani children's hospital in Gorgan, Iran. Data were collected using the General Health Questionnaire, the Strengths and Difficulties Questionnaire and a parenting style questionnaire. The collected data were analyzed in SPSS software (version 17).

Results: Overall, 64 diabetic children aged 7 -16 years who had a record file at the hospital were enrolled in the study. Children of homemakers and highly educated mothers had better glycemic control. In addition, the General Health Questionnaire test score of mothers had an inverse relationship with glycemic control in children with type 1 diabetes. Moreover, daring parenting style seemed to have a more positive impact on glycemic control of diabetic children compared to permissive and authoritarian parenting styles.

Conclusion: Our findings demonstrate that various parental variables may affect glycemic control in children with type 1 diabetes. Children with poor glycemic control have more personality and psychosocial problems. We suggest endocrinologists to refer children with type 1 diabetes and their parents to psychiatrists for psychological assessment and psychoeducation.

Keywords: Psychosocial factors; Glycemic control; Type 1 diabetes mellitus

Received: 30 Feb 2019 **Revised:** 7 Mar 2019 **Published:** 4 Apr 2020

***Correspondence:** Leila Kashani, Department of Psychology, 5 Azar Hospital, Gorgan, Iran

Tel: +981731153374

Email: Leilakashani649@gmail.com

[DOI: 10.29252/jcbr.4.1.14]

INTRODUCTION

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia due to defects in insulin secretion, activity or both. Type 1 diabetes mellitus results from idiopathic or autoimmune insulin deficiency and accounts for 5 to 10 percent of all diabetes cases (1-4). Depression is an important consequence of diabetes, which deteriorates physical symptoms of the disease (5). Moreover, there is a significant correlation between depression and complications of diabetes such as retinopathy, nephropathy, cardiovascular disease and sexual dysfunction (6). In recent years, various studies have examined the relationship between psychosocial factors and HbA1c levels in people with diabetes (7-10). Meanwhile, few studies have examined the relationship between psychosocial problems of parents and metabolic control in children with diabetes. In this regard, a study reported that mothers of diabetic children with good glycemic control had less dysthymic disorders (11). Anxiety in mothers of diabetic children was associated with higher levels of HbA1c in the children (12). In addition, presence of coping resources in the environment helps mothers become more self-efficient in management of diabetic children. Given the limited number of studies on the relationship between psychological variables of parents and HbA1c level in children with type 1 diabetes and the importance of glycemic control in diabetic children for prevention of diabetic complications, we aimed to examine the relationship between psychosocial factors and glycemic control in children with type 1 diabetes.

MATERIALS AND METHODS

This was a cross-sectional descriptive study conducted on children (aged 6-17 years) with type 1 diabetes who were referred to Taleghani Children's Hospital in Gorgan (Iran) between 2013 and 2014Inclusion criteria were age of 7-16 years, having confirmed type 1 diabetes mellitus and parental consent to participate in the study. Exclusion criteria were arbitrary cutting of anti-diabetic drugs, lack of follow-up and any

disease not related to diabetes. Of 105 eligible children with type 1 diabetes, 64 children aged 7 to 16 years who had a file at the hospital were enrolled in study by census. Demographic characteristics were collected using a questionnaire. The General Health Questionnaire (GHQ) consisting of 28 items on four subscales (somatic symptom, social dysfunction, depressive symptom, anxiety and sleep disturbance) was used to assess current health status. Total scores of less than 24 indicated better mental health. The validity of this questionnaire was verified by Palahang et al. (1996) (13). Emotional and behavioral status of the children was assessed using the Strengths and Difficulties Questionnaire (SDQ) consisting of 25 items on five subscales of emotional symptoms, conduct problems, hyperactivity, peer relationship problem and prosocial behavior with a cut-off point of 12. The validity of this questionnaire was verified by Goodman .(14). A parenting style questionnaire consisting of 30 questions on three parenting styles (authoritarian, permissive and daring) was also completed based on a 4-point scale (15). Parents of children with diabetes completed all questionnaires. Then, blood samples were taken to measure serum levels of HbA1c in diabetic children using NycoCard kit according the manufacturer's instructions

The collected data were analyzed using SPSS software (version 17). Descriptive statistics including mean, median, standard deviation and percentage were used to describe data. Quantitative dependent variable (glycemic control) and variables related to psychosocial factors were analyzed using multiple linear regression and correlation coefficient. A P-value of less than 0.05 was considered statistically significant.

RESULTS

This study was performed on 64 children aged 7 - 16 years old suffering from type 1 diabetes. The demographic characteristics of the subjects are presented in tables 1.

[DOI: 10.29252/jcbr.4.1.14]

Table 1. Demographic characteristics of the study population

Characteristics	Value
Mean age (year±standard error)	10.81± 3.02
Male (%)	46.9
Mean age of mothers (year)	36.08 ± 4.9
Mean age of fathers (year)	40.03± 5.98
Mean number of hospital admissions	2.2
Mean HbA_1C level (mg/dl)	9.26 ± 1.87
Frequency of subjects under glycemic control	12.5%

Table 2. Frequency distribution of parents' education level

Education level	Number		Percent		Cumulative frequency	
	Father	Mother	Father	Mother	Father	Mother
Illiterate	2	1	3.1	1.6	3.1	1.6
Under diploma	26	26	40.6	40.6	43.8	42.2
Diploma	26	32	40.6	50	84.4	92.2
Bachelor degree	10	5	15.6	7.8	100	100

Table 3. Correlation between family income and HbA1c levels

Family income		Mean of HbA1c difference	Standard deviation	P-value
Less than 500,000 Tomans	500,000-1,000,000	1.32	0.48	0.008
	1,000,000-2,000,000	2.24	0.55	<0.001
500,000-1,000,000 Tomans	< 500000	-1.32	0.48	0.008
	1,000,000-2,000,000	0.91	0.53	0.09
1,000,000-2,000,000 Tomans	<500,000	-2.24	0.55	<0.001
	500,000-1,000,000	-0.91	0.53	0.09

Findings indicated that families with a higher economic status had better glycemic control compared to those with a lower economic status. When assessing the general health of parents, the mean score of 22.98 ±10.6 was obtained in the GHQ-28 questionnaire. The mean score of somatic symptoms, anxiety and sleep disturbance, social dysfunction and depressive symptom was 6.58±3.39, 6.27±3.5, 7.27 ± 2.5 and 3.34±2.88, respectively.

The mean score obtained in the parenting style questionnaire was 70.64 ±12.38. The mean scores in the subscales of permissive, authoritarian and daring parenting styles were

[DOI: 10.29252/jcbr.4.1.14]

16.16±0.7, 18 .06 ±0.7 and 29.58±0.6, respectively.

The results showed that HbA1c levels differed significantly between children whose mothers had a university degree (8.75 ±0.23 mg/dl) and those whose mothers had high school diploma or less education (10.02±0.42 mg/dl) (P=0.006). In addition, HbA1c levels were significantly higher in children whose mothers were employed (10.28± 0.47 mg/dl) compared to those whose mothers were homemakers (8.84±0.23 mg/dl) (P=0.01). There was also a significant correlation between scores of mothers in the GHQ test score and HbA1c levels in diabetic children (Table 4).

Table 4. Correlation between the GHQ score of mothers and HbA1c levels in diabetic children

		Total score	Depression symptoms	Incompatibility symptoms	Anxiety symptoms	Somatic symptoms
HbA1C	Pearson Correlation	0.387 **	0.289 *	0.360 **	0.264 *	0.395 **
	Sig	0.002	0.021	0.003	0.035	0.001
	N	64	64	64	64	64

*: Correlation is significant at the 0.05 level
**: Correlation is significant at the 0.01 level

According to the results of the SDQ, there was a significant positive correlation between the SDQ score and HbA1c level (Table 5)

table 5. Correlation between strengths and difficulties questionnaire score and HbA1c levels in children with diabetes

		Total score	Social problems	Peer problems	ADHD	Conductive disorders	Emotional problems
HbA1C	Pearson Correlation	0.302 *	0.211	0.455 **	0.313 *	0.327 **	0.425 **
	Sig	0.015	0.095	<0.001	0.012	0.008	<0.001
	N	64	64	64	64	64	64

*: Correlation is significant at the 0.05 level
**: Correlation is significant at the 0.01 level
ADHD: Attention deficit hyperactivity disorder

Moreover, HbA1c levels of children were higher in families with the permissive parenting style than in families with the daring parenting style (Table 6).

Table 6. Correlation between parenting style questionnaire score and HbA1c levels

		Total score	Daring style	Authoritarian style	Permissive style
HbA1C	Pearson Correlation	0.234	-0.465 **	0.091	0.271 *

[DOI: 10.29252/jcbr.4.1.14]

	Sig	0.063	<0.001	0.475	0.03
	N	64	64	64	64

*: Correlation is significant at the 0.05 level

**: Correlation is significant at the 0.01 level

There were also significant correlations between the overall SDQ score and the permissive and authoritarian parenting styles (Table 7).

Table 7. Correlation of strengths and difficulties questionnaire score with parenting styles

		Total score	Daring style	Authoritarian style	Permissive style
SDQ Score	Pearson Correlation	0.526 **	0.161	-0.361 **	0.371 **
	Sig	<0.001	0.204	<0.001	0.003
	N	64	64	64	64

*: Correlation is significant at the 0.05 level

**: Correlation is significant at the 0.01 level

DISUCSSION

In this study, we examined the relationship between psychosocial factors and glycemic control in children with type 1 diabetes. The results showed that glycemic control was associated with employment status and education level of mothers as children of homemakers and highly educated mothers had better glycemic control. This is in line with findings of a study by Haugstvedt et al. (16). Vesco and colleagues also stated that greater accountability of parents and their presence at home are associated with better glycemic control in diabetic children (17).

We also found that glycemic control was significantly associated with economic status of families. In this regard, a study reported that patients with a higher socioeconomic status had significantly improved glycemic control (18).

Our findings also showed that glycemic control was better in children whose mothers had a lower GHQ-28 test score. Similar to this finding, Whittemore et al. stated that parental distress is associated with depression, distress, lower quality of life and higher glucose level in children with diabetes (19). According to Eckshtain et al., depression of parents has an indirect impact on their teenager's mental and metabolic status (20). In addition, family conflict is associated with poor psychosocial condition and depressive symptoms in patients with insulin-dependent diabetes. Living with a single parent, being an ethnic minority and poor general health are associated with a higher HbA1c level (21). These studies emphasize on the direct impact of maternal mental health on children's glycemic control and psychological status. In the present study, children with poor glycemic control had more problems in all SDQ subscales. According to Vollrath et al. children who have better glycemic control, generally have greater compliance, more responsibility and less neurotic disorders.

The results of the present study indicate that parenting style is closely related to glycemic status of diabetic children, the glycemic control in permissive style of parenting is poor and it is more suitable in daring style. On the other hand, the study of Heidari and colleagues revealed an inverse relationship between family support and HbA1c. A significant correlation also was seen between family support, age, sex, marital status and household size (22). all of which are in line with the findings of this study.

CONCLUSION

The results showed that glycemic control in children with type 1 diabetes is influenced by many factors. Parents have a direct impact on children's nutrition and glycemic control. In

[DOI: 10.29252/jcbr.4.1.14]

addition to education and efforts to raise parental awareness about diabetes and proper nutrition models, mental health of mothers can improve glycemic status. Our findings showed that parenting style affects glycemic control in diabetic children in a way that daring parenting style has a positive impact on glycemic status of children.

The findings of this study once again emphasize on the necessity of glycemic control in children with type 1 diabetes. Children with poor glycemic control have more personality and psychosocial problems. We suggest endocrinologists to refer children with type 1 diabetes and their parents to psychiatrists for psychological assessment and psychoeducation. Finally, complementary studies and clinical trials about effects of psychosocial interventions on glycemic control are recommended

.

DECLARATIONS

The results of this study was extracted from a thesis supported by the Golestan University of Medical Sciences, Iran.

Funding

Not applicable.

Ethics approvals and consent to participate

This study was approved by the ethics committee of the Golestan University of Medical Sciences and written consent was taken from parents of all children enrolled in the study

REFERENCES

1. Sobhi A, Ahadi H, Rajab A, Nafisi Gh, Hejazi M. Copying style with stress in parents and metabolic control in children. Iranian Journal of Diabetes and Lipid Disorders. 2011;10(3): 327-38. [In Persian]

2. Chan JCN, Malik V, Jia W, Kadowaki T, Yajnik C, Yoon KH, et al. Diabetes in Asia. Epidemiology, Risk Factors, and Pathophysiology. JAMA. 2009;301(20): 2129-40. [DOI:10.1001/jama.2009.726]

3. Larejani B, Zahedi F. Epidemiology of diabetes mellitus in Iran. Iranian Journal of Diabetes and Metabolism. 2001 Jul 15;1(1):1-8.

4. Harris MI. Definition and classification of diabetes mellitus and the new criteria for diagnosis, In: LeRoith D, Taylor SI, Olefsky JM (eds). Diabetes Mellitus: a fundamental and Clinical Text. Philadelphia: Lippincott Williams & Wilkins. 2000:p 326-34.5

5. Pool G, Matheson DH, Cox DN. The psychology of health and health care: a Canadian perspective. Pearson Prentice Hall. 2005.

6. De Groot M, Anderson RJ, Freedland KE, Clouse RE, Lustman PJ. Association of depression and diabetes complications: a meta-analysis. Psychosomatic Medicine. 2001;63: 619-30. [DOI:10.1097/00006842-200107000-00015]

7. VanTilburg MA, McCaskill CC, Lane JD, Edwards Ch L, Bethel A, Feinglos MN, et al. Depressed Mood Is a Factor in Glycemic Control in Type 1 Diabetes. Psychosomatic Medicine. 2001;63: 551-5. [DOI:10.1097/00006842-200107000-00005]

8. Helgeson VS, Siminerio L, Escobar O, Becker D. Predictors of Metabolic Control among Adolescents with Diabetes: A 4-Year Longitudinal Study. Journal of Pediatric Psychology. 2009;34(3): 254-70. [DOI:10.1093/jpepsy/jsn079]

9. Gilbert BO. Insulin-dependent diabetes control, personality and life stress in adolescents. Personality and individual differences. 1992;13(3): 269-73. [DOI:10.1016/0191-8869(92)90101-T]

10. . Delamater AM, Kurtz SM, Bubb J, White NH, Santiago JV. Stress and coping in relation to metabolic control of adolescents with type 1 diabetes. Dev Behav Pediatr. 1987;8(3): 136-40. [DOI:10.1097/00004703-198706000-00002]

11. Vollrath ME, Landolt MA, Gnehm HE, Laimbacher J, and Sennhauser FH. Child and parental

[DOI: 10.29252/jcbr.4.1.14]

personality are associated with glycaemic control in Type 1 diabetes. Diabet Med. 2007;24(9): 1028-33. [DOI:10.1111/j.1464-5491.2007.02215.x]

12. Cameron LD, Young MJ, and Wiebe DJ. Maternal Trait Anxiety and Diabetes Control in Adolescents with Type 1Diabetes. Journal of Pediatric Psychology. 2007;32(7): 733-44. [DOI:10.1093/jpepsy/jsl053]

13. Palahang H, Nasr M, Baraheni MT, et al. Epidemiological study of mental disorders in Kashan city. Andisheh Raftar J. 1996;8:19-27. [In Persian]

14. Goodman R (1997) The Strengths and Difficulties Questionnaire: A Research Note. Journal of Child Psychology and Psychiatry, 38, 581-586. [DOI:10.1111/j.1469-7610.1997.tb01545.x]

15. Esfandiari H. Reliability and validation of scale for the measurement parent's child rearing practices and relationship its life skills in high schools' students Minab. Hormozgan State Researches Education 1995; 4(2): 71-2. [In Persian]

16. Haugstvedt A, Wentzel-Larsen T, Rokne B, Graue M. Psychosocial family factors and glycemic control among children aged 1-15 years with type 1 diabetes: a population-based survey. BMC pediatrics. 2011;11(1): 118. [DOI:10.1186/1471-2431-11-118]

17. Vesco AT, Anderson BJ, Laffel LM, Dolan LM, Ingerski LM, Hood KK. Responsibility sharing between adolescents with type 1 diabetes and their caregivers: importance of adolescent perceptions on diabetes management and control. Journal of pediatric psychology. 2010;35(10): 1168-77. [DOI:10.1093/jpepsy/jsq038]

18. Walker RJ, Gebregziabher M, Martin-Harris B, Egede LE.Understanding the influence of psychological and socioeconomic factors on diabetes self-care using structured equation modeling.Patient Educ Couns. 2015 Jan;98(1):34-40. [DOI:10.1016/j.pec.2014.10.002]

19. Whittemore R, Jaser S, Chao A, Jang M, Grey M. Psychological Experience of Parents of Children With Type 1 Diabetes A Systematic Mixed-Studies Review. The Diabetes Educator. 2012;38(4): 562-79. [DOI:10.1177/0145721712445216]

20. Eckshtain D, Ellis DA, Kolmodin K, Naar-King S. The effects of parental depression and parenting practices on depressive symptoms and metabolic control in urban youth with insulin dependent diabetes. Journal of pediatric psychology. 2010;35(4): 426-35. [DOI:10.1093/jpepsy/jsp068]

21. De Wit M, Delemarre-van de Waal HA, Bokma JA, Haasnoot K, Houdijk MC, Gemke RJ, et al. Self-report and parent-report of physical and psychosocial well-being in Dutch adolescents with type 1 diabetes in relation to glycemic control. Health and Quality of life outcomes. 2007;5(10): 1-8. [DOI:10.1186/1477-7525-5-10]

22. Heidari S,Noori Tajer M,Shirazi F,Sanjari M,Shoghi M,Salemi S.The association between family support and glycemic controlin diabetes type 2 patients.Iranian Journal of Diabetes and Lipid.2008;8(2):93-102

[DOI: 10.29252/jcbr.4.1.14]