Factors Associated with Self-Management in Adolescents with Type 1 Diabetes

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Abstract

Introduction: Diabetes is one of the most common chronic diseases that is also highly prevalent among adolescents. The present study was conducted to determine the relationship between demographic characteristics and self-management in adolescents with type 1 diabetes.

Methods: This descriptive-analytical study was conducted on 426 adolescents with type 1 diabetes aged 13 to 18, and diagnosed for at least one year. The research tools included a demographic information form covering the patients' personal, family, and health details, and the Self-Management of type 1 Diabetes in Adolescence (SMOD-A) with five subscales of collaboration with parents, diabetes care activities, diabetes problem-solving, diabetes communication, and diabetes goals. The content validity of the measure was then evaluated by a group of experts and found to be acceptable (SCVI = 98%). In the assessment of the measure›s reliability, the intra-class correlation showed an overall Cronbach's alpha of 0.88. The test-retest showed a consistency of 0.73 for the measure.

Results: The results obtained showed that the presence of another diabetic member in the family leads to higher levels of self-management in some dimensions, including problem-solving, communication, and goals, yet to lower levels in some others, including collaboration with parents and diabetes care activities. A direct relationship was observed between the duration of time since the diagnosis and the scores obtained by the adolescents. An inverse relationship was observed between the type of physician in charge and the scores obtained in the subscales of collaboration with parents, problem-solving, communication, and goals. The scores obtained were directly related to having a school health record and having access to diabetic care tools at school. Family income was found to be directly related to diabetes care activities and inversely to problem-solving, communication and goals. P of ≤ 0.05 was considered significant for all relationships.

Conclusions: Self-management was found to be moderate to good among Iranian adolescents with type 1 diabetes; however, it could be further improved with the support of both families and medical teams involved.

INTRODUCTION

Diabetes currently affects 382 million people worldwide and is anticipated to reach 592 million cases by 2035 [1]. In Iran, 3% to 5% of the population (about 3 million) is affected by diabetes, and this figure is expected to reach 9 million

by 2020 [2]. In Sweden, diabetes accounts for 4% to 6% of chronic diseases. Very few studies have examined diabetes in adolescents and young adults. In the past, most studies used to focus on the treatment of patients; however, a greater attention is now being paid to patient-oriented health services. Careful examination of the problems faced by diabetic patients helps find solutions to the challenges of diabetes [3]. Adolescence is a unique period in life that is intrinsically challenging and critical for the individual. To control their disease, adolescents with diabetes should perform certain medical procedures every day, which requires problem-solving and decision-making skills. In addition to being able to perform practical measures, adolescents with type 1 diabetes require cognitive and emotional abilities [4]. Previous studies have shown that self-management helps adolescents improve their knowledge and skills and thus make appropriate behavior changes [1]. Various studies conducted on this subject have often addressed self-regulation, self-care, family features, lifestyle and similar topics. Self-management has various dimensions, including collaboration with parents, decision-making and problem-solving abilities, care activities, communication, and goals. Self-management empowers the adolescent to resolve problems independently of others and to make plans for the future [5]. Self-management is a multi-dimensional concept, through which the adolescent can successfully overcome his problems and make good decisions through measures that change on a daily basis, according to prevailing circumstances [6]. The diagnosis and management of type 1 diabetes in adolescents presents a special challenges related to the unique hormonal and emotional milieu in the teenage years. Management of type 1 diabetes requires a multitude of life-long daily tasks that the child and/or their family must perform to maintain a relatively healthy metabolism and glycemic control [7]. The focus of diabetes research and practices is mainly on the medical procedures that need to be taken; however, the problems with which an adolescent with type 1 diabetes is faced are not limited to treatment and care [6, 8]. The present study describes the demographic features of adolescents with type 1diabetes and then proceeds to examining the relationship between self-management and different personal, family, and social factors at play.

METHODS

The present descriptive-analytical cross sectional study was conducted over a period of eight months at five teaching hospitals and medical centers affiliated to Shahid Beheshti University of Medical Sciences (3 cases), Iran University of Medical Sciences (1 cases), and Tehran University of Medical Sciences (1 casas) that counted as referral centers for adolescents with diabetes. The study participants consisted of 426 adolescents aged 13 to 18, diagnosed with type 1 diabetes for at least one year. All adolescent patients that had referred to

these health centers were selected during years 2010 to 2015. The research tools consisted of a demographic information form covering the patients' personal and family details and the Self-Management of type 1 Diabetes in Adolescence (SMOD-A). The SMOD-A contains 5 subscales, including collaboration with parents (13 items), diabetes care activities (15 items), diabetes problem-solving (7 items), diabetes communication (10 items), and diabetes goals (7 items) [8]. The SMOD-A items were given a score of 3 for a response of "always", 2 for "often", 1 for "occasionally", and 0 for "never". A total of 8 items were reverse-scored, including items 8, 13, 15, 22, 24, 25, 27, and 28. The analysis and statistical tests were calculated and ratings were reversed. The questionnaire took 20 minutes to be completed by the adolescents after they referred to the Endocrine Clinic or were hospitalized at the ward, or once the researcher visited them in their home. The researcher answered any questions they had after they filled out the questionnaire. The content validity of the questionnaire was assessed using the views of 14 experts in tool design, pediatric nursing, and endocrinology. The overall validity of the scale, according to the Waltz and Basel content validity index, was measured in terms of relevance, giving a score of 98%. The reliability of the questionnaire was assessed using internal consistency and test-retest methods. The internal consistency was confirmed with a Cronbach's alpha of 86%. To examine the stability of the questionnaire, the test-retest method was used with an interval of 2 weeks and for 20 of the participating adolescents the result was 0.83. The intra-class consistency of the questionnaire was 73%.

RESULTS

According to the demographic details obtained, the mean age was 14.67 ± 1.59 years in females and 14.53 ± 1.54 years in males (Table 1).

Table 2 also presents the duration of time since the diagnosis of the disease. The demographic details also showed that 26.5% of the adolescents had complications such as hypoglycemia as the most common (6%), followed by diabetic coma (3%). A total of 74.6% of the participants lived in Tehran and 25.4% lived in other provinces, suggesting that, compared to the past, the patients are less required to travel to Tehran for receiving treatments these days. Only 33.1% of the adolescents had received diabetes training while 66.9% had received no training at all. No significant relationships were

Table 1: Mean and Standard Deviation of the Study Subjects by Age

	Age	
	Female	**Male**
Mean	14.67	14.53
Standard deviation	1.59	1.54

Overall, 51.1% were female and 48.9% were male (Table 2).

Table 2: Absolute and Relative Frequency of the Study Subjects by Gender and duration of Diagnosis with Diabetes

	Gender		Duration of diagnosis with diabetes		
	Female	**Male**	**1-2 years**	**1-2 years**	**1-2 years**
Absolute Frequency	126	122	168	130	128
Relative Frequency (%)	51.1	48.9	39.1	30.2	29.8

observed between the self-management scores obtained and age (Analysis of Variance (ANOVA)), gender (the *t*-test), number of siblings (ANOVA), parents' degree of education (non-parametric Kruskal-Wallis test), and the place of residence (Mann-Whitney U test). According to the results of the *t*-test, the presence of another diabetic member in the family was directly and significantly related to some of the self-management dimensions, including problem-solving, communication and goals, and inversely and significantly to dimensions, including collaboration with parents and diabetes care activities (Table 4).

The Presence of another Diabetic Member in the Family Leads to a Better Self-Management in Relation to the Di- mensions of Problem-Solving, Communication and Goals, Yet a Poorer Self-Management in Relation to the Dimensions of Collaboration with Parents and Diabetes Care Activities

The Kruskal-Wallis test showed a direct and significant relationship between the duration of time since the diagnosis and the scores obtained by the adolescents (Table 5).

The majority of the adolescents visited an endocrinologist. The Kruskal-Wallis test found a significant and inverse relationship between the type of physician in charge and the scores obtained by the adolescents in the dimensions of collaboration with parents, problem-solving, communication, and goals (Table 6).

Table 3: The Mean and Standard Deviation of the Scores Obtained in the Five Subscales of the Self-Management of Type 1 Diabetes in Adolescence (SMOD-A)

	Number	Mean	Standard Deviation	Minimum	Maximum
Collaboration with Parents	426	2.09	± 0.31	0	3
Diabetes Care Activities	426	1.84	± 0.27	1	2.62
Problem-Solving	426	1.81	± 0.63	0	3
Diabetes Communication	426	1.69	± 0.36	0	2.8
Diabetes Goals	426	2.05	± 0.44	0	3

According to the Mean Scores obtained, the Adolescents Possess a Good Level of Self-Management in the First and Fifth Dimensions and a Moderate Level in the Remaining three Dimensions

Table 4: The Relationship between the Presence of another Diabetic Member in the Family and the Scores Obtained in the Five Subscales of the Self-Management of Type 1 Diabetes in Adolescence (SMOD-A)

Mean SMOD-A Score / Presence of another diabetic member in the family	Collaboration with Parents	Diabetes Care Activities	Problem-Solving	Communication	Goals
Yes	2.03	2.06	2.13	2.13	2.13
No	2.10	2.09	2.04	2.04	2.03

Table 5: The Relationship between the duration of Time since the Diagnosis and the Mean Scores Obtained in the Five Subscales of the Self-Management Of Type 1 Diabetes in Adolescence (SMOD-A)

Mean SMOD-A Score / Duration of time since the diagnosis	Collaboration with Parents	Diabetes Care Activities	Problem-Solving	Communication	Goals
1-2	2.15	2.16	1.90	1.90	1.89
3-4	2.03	2.03	1.82	2.05	2.05
> 5	2.09	2.08	2.45	2.27	2.26

Longer Durations of Time since the Diagnosis of the Disease are associated with a Better Level of self-Management

Table 6: The Relationship between the Type of Physician in Charge and the Mean Scores obtained in the Five Subscales of the Self-Management of Type 1 Diabetes in Adolescence (SMOD-A)

Mean SMOD-A Score / Type of physician in charge	Collaboration with Parents	Diabetes Care Activities	Problem-Solving	Communication	Goals
Pediatrician	2.10	2.27	2.07	2.07	2.08
Endocrinologist	2.10	1.86	2.13	2.06	2.08
Pediatric Endocrinologist	1.85	1.99	1.85	1.93	1.87

The Type of Physician in Charge Affects the Level of Self-Management, as the Adolescents, who were Supervised by an Endocrinologist had a Poorer Level of Self-Management with Respect to the Dimensions of Collaboration with Parents, Problem-Solving, Communication and Goals

Table 7: The Relationship between having a School Medical Record and the Scores Obtained in the Five Subscales of the Self-Management of Type 1 Diabetes in Adolescence (SMOD-A)

Mean SMOD-A Score / Having a school medical record	Collaboration with Parents	Diabetes Care Activities	Problem-Solving	Communication	Goals
Yes	2.16	2.18	2.17	2.18	2.16
No	2.10	2.05	2.09	2.05	2.09

Adolescents with a School Medical Record Showed a Better Level of Self-Management

Table 8: The Relationship between having Access to Diabetic Care Tool at School and the Scores obtained in the Five Subscales of the Self-Management of Type 1 Diabetes in Adolescence (SMOD-A)

Mean SMOD-A Score / Having access to diabetic care tools at school	Collaboration with Parents	Diabetes Care Activities	Problem-Solving	Communication	Goals
Yes	2.16	2.16	2.19	2.20	2.17
No	1.67	1.68	1.46	1.39	1.51

Having Access to Diabetes Care Tools at School led to a Better Level of Self-Management in the Adolescents

Table 9: The Relationship between Family Income and the Scores Obtained in the Five Subscales of the Self-Management of Type 1 Diabetes in Adolescence (SMOD-A)

Mean SMOD-A Score / Family income	Collaboration with Parents	Diabetes Care Activities	Problem-Solving	Communication	Goals
≤1000000	2.06	2.00	2.36	2.22	2.15
1000000-2000000	2.15	2.04	2.17	2.16	2.14
≥2000000	2.05	2.22	1.85	1.94	1.99

A Higher Family Income Improves Diabetes Care Activities and Worsens Problem-Solving, Communication and Goals

According to the Mann-Whitney U test, the scores obtained by the adolescents were directly related to having a school health record and access to diabetic care tools at school (Tables 7 and 8).

The results of the non-parametric Kruskal-Wallis test showed that family income was directly and significantly related to the subscale of diabetes care activities, yet inversely and significantly to the subscales of problem-solving, communication, and goals. P values of ≤ 0.05 were considered significant for all the relationships.

DISCUSSION

The present study was conducted to determine the relationship between demographic characteristics and self-management in adolescents with type 1 diabetes. The obtained results showed no significant relationships between the five self-management subscales and age, gender, number of siblings, place of residence, parents' degree of education, and family income. The sample of this study included the same number of males and females. The relationship between age and prevalence of diabetes and prediabetes was not significant, for both genders. The presence of another diabetic member in the family was found to be directly related to the adolescents' self-management in the dimensions of problem-solving, communication, and goals, yet inversely related to collaboration with parents and diabetes care activities. In a study conducted by Heidari et al. (2012), the presence of another diabetic member in the family was found to be associated with empowerment of the adolescents [9]. The results of a study conducted by Kalayou et al. (2013) in Ethiopia were also consistent with the findings of the present study [10], as they showed that the presence of another diabetic mem-

ber in the family was a source of mental and physical support and enabled the adolescent to achieve self-management more easily. A direct relationship was observed between the duration of time since the diagnosis of the disease and the scores obtained by the adolescents. Heidari et al. (2012) showed a positive relationship between this variable and the scores obtained in the dimensions of empowerment and compliance with instructions [9], which may suggest that, over time, the adolescent learns more about the problems associated with his condition and takes better control of the disease and his life and can thus achieve a better level of self-management. According to the results, the majority of the adolescents were under the supervision of an endocrinologist. There was an inverse relationship between the type of physician in charge and scores in the subscales of collaboration with parents, problem-solving, communication, and goals. A study conducted by Hevida and Basma (2014) showed that the healthcare team's better interaction with the adolescent enables him to achieve a better level of self-management [11]. It may also be concluded that due to heavy workloads in clinics, healthcare teams and the endocrinologists in charge cannot properly interact with their adolescent patients, and different results could be expected if the study is repeated at doctor's offices. Furthermore, it is essential for the healthcare team to realize that communication with adolescents and their participation in treatment and care of diabetes can increase their self-management.

In the present study, having a school medical record and access to diabetic care tools were directly related to the scores obtained. Wilt (2015) conducted a study at the University of Stone Hall and found that self-management was improved in adolescents with type 1 diabetes if a school nurse was always available and the school authorities knew about the student's

conditions and provided him with access to diabetic care tools [12]. The school authorities' support, especially in the emergence of symptoms, such as a drop or sudden rise in blood sugar, may help the adolescent overcome his problems better and more quickly. Therefore, school authorities should be aware of the importance of continuous care of diabetic adolescents and presence of emergency treatment kit for adolescent's blood glucose fluctuations, which ultimately promotes the adolescent's self-management. The obtained results showed a direct relationship between family income and the subscale of diabetes care activities and an inverse relationship between family income and problem-solving, communication, and goals. In another study, Dabelea et al. (2014) concluded that a higher family income leads to a better quality of life in diabetic adolescents [13]. The results of the present study showed that the relationship between income and self-management is not always positive, especially with respect to the dimensions of problem-solving, communication and goals, and that the adolescent's level of self-management may not always improve with an increased family income; rather, it is the family's support and facilitating of the adolescent's independence that truly helps. Accordingly, family's support of diabetic adolescents, helps them with self-management, solving problems related to diabetes, and reaching their long-term goals for coping with the disease. Improvements in demographic characteristics led to better self-management scores. Hevida and Basma (2014) also showed that diabetic adolescents could develop a better understanding of their condition and improve their self-management abilities with better demographic characteristics [11].

Limitations

Data collection was carried out mostly when the adolescent patients visited the selected hospitals and medical centers; the crowded conditions in these settings may have affected the results.
Understanding and examining the demographic characteristics associated with the concept of self-management could help improve self-management among adolescents with type 1 diabetes.

CONCLUSIONS

The relationship between demographic characteristics of adolescents with type 1 diabetes mellitus in some cases was statistically significant and in some cases not significant.

ETHICAL CONSIDERATION

code of Ethics This article was published on uswr. rec.1393.237 by the Ethics Committee of the University of Social Welfare and Rehabilitation.

ACKNOWLEDGEMENTS

CONFLICTS OF INTEREST

The participation of adolescences has not led to their own losses

FUNDING

AUTHOR CONTRIBUTIONS

Introduction and data collection and methodology and Discussion by was written by Fatemeh Alaee karahroudy

REFERENCES

1. Lee EH, van der Bijl J, Shortridge-Baggett LM, Han SJ, Moon SH. Psychometric Properties of the Diabetes Management Self-Efficacy Scale in Korean Patients with Type 2 Diabetes. Int J Endocrinol. 2015;2015:780701. DOI: 10.1155/2015/780701 PMID: 26089892

2. Rohani H, Eslami AA, Raei M, Tavakoli Ghouchani H, Afshari A. Psychometric properties of the healthful eating belief scales for type 2 diabetics. J North Khorasan Univ Med Sci. 2014;6(2):319-27. DOI: 10.29252/jnkums.6.2.319

3. Johansson K, Osterberg SA, Leksell J, Berglund M. Manoeuvring between anxiety and control: patients' experience of learning to live with diabetes: a lifeworld phenomenological study. Int J Qual Stud Health Well-being. 2015;10:27147. DOI: 10.3402/qhw.v10.27147 PMID: 25861973

4. Hockenbury MJ, Wilson D. Wong's infant and children nursing care. 9th ed. St Louis: Mosby; 2011.

5. Guo J, Dixon JK, Whittemore R, He GP. Instrument translation and initial psychometric evaluation of the Chinese version of the Self-Management of Type 1 Diabetes for Adolescents scale. J Adv Nurs. 2013;69(4):960-9. DOI: 10.1111/j.1365-2648.2012.06129.x PMID: 22931463

6. Schilling LS, Grey M, Knafl KA. The concept of self-management of type 1 diabetes in children and adolescents: an evolutionary concept analysis. J Adv Nurs. 2002;37(1):87-99. PMID: 11784402

7. Adi S. Type 1 diabetes mellitus in adolescents. Adolesc Med State Art Rev. 2010;21(1):86-102, ix. PMID: 20568557

8. Schilling LS, Dixon JK, Knafl KA, Lynn MR, Murphy K, Dumser S, et al. A new self-report measure of self-management of type 1 diabetes for adolescents. Nurs Res. 2009;58(4):228-36. DOI: 10.1097/NNR.0b013e3181ac142a PMID: 19561555

9. Heidari M, Alhani F, Kazemnejad A, Tol A, Moezi F. [Assessing the Effect of Educational Program Based on Empowerment Model on HbA1C among Adolescents with Type 1 Diabetes]. J Health Syst Res. 2013;8(7):1377-85.

10. Kalayou KB, Alemayehu BK, Haftu BG. Adherence to Diabetes Self-Management Practices among Type Ii Diabetic Patients in Ethiopia; A Cross Sectional Study. Greener J Med Sci. 2013;3(6):211-21.

11. Hewida A, Basma RAS. Hindering Factors of Self-Management in Diabetes Mellitus as Perceived by Adolescents Versus Mothers. World Appl Sci J. 2014;29(1):9-19.

12. Wilt L. The Relationships Among School Nurse to Student Ratios, Self-efficacy for Type 1 Diabetes Management, and Glycemic Control in Adolescents: Seton Hall University; 2015.

13. Dabelea D, Mayer-Davis EJ, Saydah S, Imperatore G, Linder B, Divers J, et al. Prevalence of type 1 and type 2 diabetes among children and adolescents from 2001 to 2009. JAMA. 2014;311(17):1778-86. DOI: 10.1001/jama.2014.3201 PMID: 24794371