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Evaluation of Factors Affecting Quality of Life in Children with Type 1 Diabetes Mellitus

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Abstract

Introduction: It has currently been understood that monitoring diabetic patients only with metabolic variables is insufficient, and thus, quality of life assessments have been initiated. The aim of the present study was to compare the quality of life scored between diabetic and healthy children and to investigate the factors affecting the quality of life in diabetic patients.

Material-Method: Sixty-one patients aged between 7-16 years who were followed-up with diagnosis of type 1 Diabetes Mellitus in the Department of Pediatric Endocrinology of Gazi University School of Medicine and 57 age-matched healthy volunteers were enrolled. Patient and control groups were evaluated in terms of quality of life, depressive mood, and accompanying behavioral problems. The assessment of children was performed using Conners' parent and teacher rating scales, Children Depression Inventory, State-Trait Anxiety Inventory for Children, and Short Form-36 for quality of life, Kid–KINDL questionnaire, Kiddo–KINDL questionnaire, and KINDL questionnaire. Clinical and laboratory characteristics of the diabetic patients were retrieved from their patient files.

Results: Short Form-36 general health, vitality, and mental health subdimension scores of type 1 diabetic children were lower than those in the controls ($p<0.05$). However, no significant difference was noted between the groups in terms of Kid-KINDL, Kiddo-KINDL and parent-reported KINDL scores. Moreover, there was also no significant difference between patients and controls in terms of anxiety, depressive mood, Conners' parent and teacher rating scale scores. Gender, HbA1c level, disease duration, and insulin treatment model did not affect the quality of life of diabetic patients.

Conclusion: Quality of life assessment provides valuable information regarding the effect of diabetes mellitus on quality of life. Thus, specific management programs aiming to develop functional abilities, and well-being and general health perception of the patients can be selected, patient compliance can be improved and negative effects of disease on quality of life can be reduced.

Keywords: Quality of life; Children; Type 1 Diabetes Mellitus

Introduction

There has been a progressive increase in the goal of management of type 1 diabetes mellitus (DM), one of the most common chronic disorders of childhood. While the purpose was merely maintaining survival in 1920s, achieving physiological insulin release has become the main objective in 1990s. Close cooperation with a health professional has become essential by the introduction of regular multiple-dose insulin injection therapy, frequent blood glucose measurement, and carefully planned exercise and nutritional programs. These treatment protocols provide a positive impact on the child's short- and long-term health status, quality of life and well-being [1].

The definition of the quality of life is made as 'the way of perceiving his/her own position in the system of culture and values' by the World Health Organization [2]. Health-related quality of life indicates the extent to which a disease or medical condition impacts upon the daily physical, emotional, mental and contextual well-being of an individual. In other words, it reflects the subjective perception of health [3]. This concept is therefore increasingly considered as a relevant 'patient-reported outcome' [4]. Health-related quality of life measures can offer to evaluate different aspects of well-being and functioning. In recent years, health-related quality of life has become a relevant treatment outcome from epidemiological and clinical perspectives. Moreover, it is broadly employed in health economic analyses [3].

It is widely assumed that DM can result in psychological, social and physical problems. The children with DM experience chronic psychosocial stress [5] and have higher rates of behavioral difficulties and lower social competency compared with healthy children [6,7], Therefore, it is important to improve the quality of life and well-being in order to prevent secondary morbidities and achieve good metabolic control during the management of diabetes [8]. Quality of life is considered to be a significant indicator of disease prognosis [9-11]. The aim of the present study was to compare the quality of life between type 1 diabetic and healthy children and to investigate the factors affecting the quality of life in diabetic patients.

Material and Methods

In the present cross-sectional study, 61 patients (28 boys, 33 girls) aged between 7-16 years and followed-up with diagnosis of type 1 diabetes in the Department of Pediatric Endocrinology of Gazi University School of Medicine and 57 age-matched healthy volunteers

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were enrolled. Patients who had been followed-up for at least 6 months, who did not have any other concomitant chronic disease, and who had normal intelligence were included. During the routine follow-up visits, a sociodemographic data form was administered to both parents and children by face-to-face interview technique after providing instructions in the diabetes education room. The parents were asked to hand the teacher assessment forms to the teachers of their children in a closed envelope. Metabolic status of the patients was assessed by $HbA1_c$ level measurement in the mean of the past year. Those with $HbA1_c$ level <7.5% were grouped as good metabolic control, those between 7.5-9% as moderate, and those >9% as poor metabolic control [12].

Fifty-seven healthy volunteers between 7-16 years of age with no active complaints or chronic diseases (27 boys, 30 girls) were included as the control group. Questionnaires were also administered to the control group by face-to-face interview technique.

The study was approved by the Ethical Committee of Gazi University School of Medicine. The forms and questionnaires used in the study are described below.

Short form-36

Short Form-36 (SF-36) is a generic quality of life assessment tool developed in 1992. It has increasingly been used in clinical studies to evaluate current health status during treatment and to determine the outcome of medical treatment [13]. The scale consists of 36 items, which provide assessment of 8 subdimensions including physical functioning (10 items), social functioning (2 items), role limitations due to physical problems (5 items), role limitations due to emotional problems (3 items), mental health (5 items), vitality (4 items), bodily pain (2 items), and general health perception (5 items) [13]. All but one of the 36 items (self-reported health transition) are used to score the eight SF-36 scales. The validity and reliability of SF-36 Turkish version was performed by Koçyiğit *et al* [14].

Kid-KINDL and Kiddo-KINDL questionnaires

KINDL was developed by Bullinger in order to assess the health related quality of life in children and adolescents. It was revised and reconstructed by Ravens-Sieberer and Bullinger in 1998 [15].

Kid-KINDL is a generic measure of health related quality of life in children and Kiddo-KINDL is a generic measure health related quality of life in adolescents. Quality of life assessment includes physical, mental, and social life without being associated with any specific disorders. Kid-KINDL and Kiddo-KINDL consist of seven domains including physical well-being, emotional well-being, self-esteem, family, friends, functioning in school and disease domains. Higher scores reflect better quality of life.

Conners' Teacher Rating Scale

Conners' Teacher Rating Scale (CTRS) was developed by Conners to assess the students' classroom behavior [16]. Its initial Turkish adaptation was a 39-item form. Then, normative data of CTRS Turkish translation consisting of 28 items were obtained and its construct validity and internal consistency were performed [17].

Conners' Parent Rating Scale

The Turkish adaptation of Conners' Parent Rating Scale (CPRS) consisting of 48 items each graded by a 4-point Likert type scale was performed by Sener *et al* [17] Attention deficit (5 items), hyperactivity (4 items), oppositional defiant disorder (5 items), and conduct disorder (11 items) were measured using this scale.

Children's Depression Inventory

Children's Depression Inventory (CDI), which was introduced by Kovacs in 1985, is the most commonly used self-assessment instruments in childhood depression, with psychometric characteristics that have been investigated the most [18]. It has been constructed considering that "there is an observable and measurable childhood depression similar to that observed in adults". Its Turkish validation study was performed by Öy *et al* in 1991 [19].

The State-Trait Anxiety Inventory for Children

State-Trait Anxiety Inventory (STAI) for Children was developed by Spielberger in 1983, in to measure individual differences in anxiety proneness [20]. It is a self-reported questionnaire with two subdimensions including 20 items of state anxiety and 20 items of trait anxiety [20]. It is often used in individuals between 7 and 18 years of age. Its Turkish version validity and reliability study was performed by Özusta *et al* [21].

Statistical Analysis

Data analysis was performed using Statistics Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) version 11.5. Normality of distribution of continuous variables was assessed by Shapiro Wilk test. Results of descriptive statistics were presented as mean±standard deviation or median (minimum-maximum) for parametric variables and as number and percentage for categorical variables.

Comparison of two independent groups was performed by Student's t test or Mann Whitney U test and comparison of more than two independent groups was performed by Kruskal Wallis one-way analysis of variance. When a significant difference was noted between the groups by Kruskal Wallis test, Kruskal Wallis multiple comparison test was used in order to determine the group or groups which caused the difference.

Comparison of categorical variables was performed using chi-square or Fisher's exact test. The linear regression analysis of the measured variables was assessed by Pearson or Spearman correlation analysis. Bonferroni correction was used for all potential intragroup comparisons.

The effects of variables on the change in the dependent variables (SF-36, kid-KINDL, kiddo-KINDL, and KINDL (parent) subdimensions) assessed by univariate analysis were evaluated by multiple linear regression analysis. P value of <0.05 was considered significant.

Results

Sociodemographic and clinical characteristics of the study population are presented in [Table 1 and Table 2]. Among 61 diabetic patients, 87% (n=53) were using multiple dose insulin injection therapy and 13% (n=8) were using insulin pump. $HbA1_c$ level in diabetic patients was less than 7.5% in 35 patients, between 7.5–9% in 16 patients, and over 9% in the remaining 10 patients. There was a significant correlation between $HbA1_c$ level and age and disease duration ($p<0.05$). $HbA1_c$ level was significantly higher in girls compared to boys ($p<0.05$). However, there was no significant correlation between the treatment model and $HbA1_c$ level ($p>0.05$).

Among the SF-36 subdimensions, general health, vitality and mental health scores of the patient group was found to be significantly lower compared to those in the control group [$p<0.05$; [Table 3]. There was no significant difference between the study groups in terms of KINDL and KINDL (parent) quality of life scores ($p>0.05$). There was

also no gender-related difference in the quality of life scores between the study groups (p>0.05). Moreover, no significant correlation between disease duration and quality of life scores was obtained (p>0.05).

There was no significant difference between treatment models (multiple dose or insulin pump) in terms of SF-36 and KINDL (child and parent) subscores (p>0.05). In multiple dose insulin injection therapy group, a significant negative correlation was found between the number of insulin injections and KINDL school functioning subscore (p<0.05). Moreover, no significant difference was found between the diabetic patients with good, moderate and poor metabolic control in terms of quality of life.

When the patients and controls were compared in terms of depression scores, state anxiety scores, trait anxiety scores, teacher assessment scores (hyperactivity, attention deficit, conduct disorder), family assessment scores (attention deficit, hyperactivity, oppositional defiant disorder, conduct disorder), no significant differences were noted (p>0.05). Increases in HbA1c level and disease duration did not affect the scores of depression, state anxiety, trait anxiety, teacher and parent assessments. When the relationships of multiple dose injection or insulin pump therapy with depression, state anxiety, trait anxiety, teacher and parent assessment scores were evaluated, it was found that family (oppositional defiant disorder and conduct disorder) scores of patients receiving multiple dose insulin injection therapy were significantly higher than those using insulin pump (p<0.05).

Discussion

In the present study, the quality of life scores were compared between type 1 diabetic and healthy children and the factors affecting the quality of life in diabetic children were investigated. Accordingly, the SF-36 general health, vitality and mental health subdimension scores were found to be significantly lower in diabetic children compared to those in the controls and metabolic control and duration of diabetes were found to be not effective on quality of life scores.

	Patient Group (n=57)	Control Group (n=61)	p
Age	12.9±2.70	11.3±2.49	>0.05
Sex [n (%)]			
Girls	33 (54)	30 (53)	>0.05
Boys	28 (46)	27 (47)	
Preterm infant (%)	11.5	1.8	>0.05
Average duration of breast milk feeding (months)	13	8	
Mother's age (years, [mean±SD])	38.2±6.07	37.2±5.25	>0.05
Father's age (years, [mean±SD])	42.6±6.52	39.6±10.67	>0.05
Educational status of the mother			
Literate (%)	3.3	-	<0.001
Primary school (%)	41.0	8.8	
Secondary school (%)	9.8	14.0	
High School (%)	21.3	38.6	
College/university (%)	24.6	38.6	
Educational status of the father			
Primary school (%)	9.8	7.0	>0.05
Secondary school (%)	11.5	7.0	
High School (%)	39.3	38.6	
College/University (%)	39.3	47.4	
Puberty (%)	68	56	>0.05

SD: Standard deviation

Table 1: Sociodemographic characteristics of the study groups.

Disease duration (years)	3 (1-12)
Number of hospitalizations after diagnosis	2 (0-12)
Treatment Models (%)	
Multiple dose	%87
Insulin pump	%13
HbA1c (%)	7.3 (5.2 – 12.3)

Table 2. Clinical characteristics in the study groups.

SF-36 Subdimensions	Patient Group (Mean±SD)	Control Group (Mean±SD)	p
Physical functioning	85.6±15.31	88.0±15.23	0.211
Physical role limitation	81.6±23.67	77.2±28.06	0.560
Bodily pain	72.7±17.06	76.0±14.91	0.344
General health perception	64.8±22.34	78.7±17.59	<0.001
Vitality	68.6±20.98	77.4±19.89	0.012
Social functioning	81.8±19.71	84.6±19.48	0.214
Emotional role limitation	71.6±32.11	77.8±26.97	0.360
Mental health	66.2±20.22	74.6±17.06	0.021

SF-36: Short form-36; SD: standard deviation

Table 3: Results of SF-36 subdimensions in the study groups.

Treatment goals in diabetes include achieving normal blood glucose and HbA1c level, reducing the risk of severe hypoglycemia, improving quality of life, and preventing complications [22,23]. In the present study, the diabetic patients had lower SF-36 quality of life scores compared to controls; particularly, SF-36 general health, vitality, and mental health subdimension scores were found to be lower. Wee *et al* [24] reported that KINDL scores of diabetic patients were significantly higher than those without diabetes and they concluded that providing good medical care might have reduced the effects of disease on health-related quality of life. In the present study, no significant difference was noted between diabetics and controls in terms of KINDL child and KINDL parent scores. Moreover, Laffel *et al* [25] also established no significant difference between quality of life scores of diabetic and healthy children. On the other hand, in another study, quality of life scores of 128 diabetic children between 5-18 years of age were found to be worse in all subdimensions compared to those in healthy children and as well as diabetic children were noted to exhibit poor psychosocial functioning and have poor family relationship [26]. However, we observed that physical health, mental health, family and friends assessment subscores were significantly higher in diabetic children than those in the healthy children. Moreover, no significant difference was noted between the diabetic and control groups in terms of anxiety proneness, depressive mood, and teacher and parent assessment scores.

Kylie *et al* (227) investigated the effects of metabolic control in diabetic patients and found that reduction in HbA1c level increased quality of life [27]. In that particular study, an association between poor metabolic control and poor psychosocial functioning was demonstrated. Lawson *et al* [28] reported that psychosocial well-being was significantly worse in diabetic children with HbA1c levels >8.8% compared to those with HbA1c level <8.8%, but they noted no significant difference in terms of physical well-being. In the present study, no significant difference was present in the quality of life scores of diabetic children according to metabolic control levels. This might be due to the low number of patients with poor metabolic control. For the diabetic children, 83.6% had good or moderate metabolic control.

The effects of increasing HbA1c level on depression, state anxiety, trait anxiety, teacher and parent assessment scores revealed similar results with the above-mentioned quality of life results. Increase in HbA1c level did not lead to a significant change in these scores. The

changes in the HbA1c levels, which is the most reliable and appropriate tool to assess metabolic control, did not cause any differences in quality of life, depressive mood, anxiety, and family and teacher assessment scores of diabetic children. However, it might be expected that quality of life may be affected in the long term as a result of chronic complications associated with high HbA1c levels. Vanelli *et al* (229) reported that depressive mood led to poor glycemic control and recommended that children with type 1 DM, especially those with poor glycemic control, should have been routinely monitored in terms of depressive mood. In another study, where they used the same anxiety and depression scale in our study with Vanelli et al. [29], no significant relationship was observed between glycemic control, and anxiety and social support [30]. Similarly, in the present study, no significant difference was found between diabetic patients and controls in terms of anxiety and social support. Hanestad *et al* [31] demonstrated that there was no correlation between HbA1c level and quality of life; however, patients with poor metabolic control were less satisfied with physical and behavioral moments of life [31].

In a study investigating the effects of insulin therapy models on quality of life, adolescents treated by insulin pump were noted to cope better with diabetes compared to those using multiple dose insulin injection therapy [32]. However, Weintrob *et al* [33] reported no significant difference between the two treatment models in terms of HbA1c level, frequency of hypoglycemia or hyperglycemia, and quality of life, but noted that treatment satisfaction was greater in the group receiving insulin pump compared to those receiving multiple dose insulin injection [33]. In the present study, we did not find such a difference. This might be due to the fact that number of patients using pump was small in our study. Thus, further studies to be conducted in larger samples are needed.

In conclusion, quality of life assessment provides valuable information about the effect of diabetes on quality of life. Thus, specific management programs aiming to develop functional abilities, and well-being and general health perception of the patients can be selected, patient compliance can be improved and the negative effects of disease on quality of life can be reduced. Therefore, it is extremely important that management teams treating diabetic patients should integrate quality of life assessment in their practice as the main goals of diabetes management include learning to live with diabetes, interventions that teach families strategies for decreasing conflict, decreasing psychologically controlling interactions, embracing it as a life style and improving quality of life.

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