The Effect of HbA1c Levels of Children with Type 1 Diabetes and Their Parents' Anxiety on Family Functioning During the COVID-19 Pandemic

Tip 1 Diyabetli Çocukların HbA1c Düzeylerinin ve Ebeveynlerinin Kaygısının COVID-19 Pandemi Sürecinde Aile İşlevleri Üzerine Etkisi

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Abstract

Introduction This study was conducted to examine the effects of trait and state anxiety of parents who had children with type 1 diabetes on family functioning during the COVID-19 pandemic.

Materials and Methods This descriptive, cross-sectional, and correlational study was conducted during the quarantine period by using the random sampling method. The study was completed with the parents of 134 children with type 1 diabetes registered in the pediatric endocrinology outpatient clinic of a hospital in western Turkey.

Results It was determined that the family functions of parents with children with type 1 diabetes were mostly affected by state anxiety level and trait anxiety level and HbA1c level, respectively. It was found that 45% (F= 36.764, p<.001) of the factors affecting family functioning in the model were explained by state and trait anxiety levels and HbA1c level.

Conclusion The anxiety levels of parents during the quarantine period negatively affected family functioning. In public health emergencies such as pandemics, parents of children with chronic diseases should be followed carefully, mental assessments should be made, and necessary measures should be taken in the early period.

Keywords Type 1 Diabetes; Parent; Anxiety; Family Function.

Öz

Amaç Bu çalışmada, COVID-19 pandemi sürecinde tip 1 diyabetli çocuğu olan ebeveynlerin sürekli ve durumluk kaygısının aile işlevleri üzerine etkisinin incelenmesi amaçlanmıştır.

Yöntem ve Gereçler Tanımlayıcı, kesitsel ve ilişkisel tipteki bu çalışma rastgele örnekleme yöntemi ile karantina döneminde yapılmıştır. Çalışma, Türkiye'nin batısındaki bir hastanenin pediatrik endokrinoloji polikliniğine kayıtlı 134 tip 1 diyabetli çocuğun ebeveynleri ile tamamlanmıştır.

Bulgular Tip 1 diyabetli çocuğu olan ebeveynlerin aile işlevlerini sırasıyla en çok durumluk kaygı düzeyi ve sürekli kaygı düzeyi etkilediği saptanmıştır. Modelin genelinde aile işlevselliğini etkileyen faktörlerin %43'ünün ((F= 51.356, p<.001) durumluk ve sürekli kaygı düzeyi ile açıklandığı bulunmuştur.

Sonuç Karantina döneminde ebeveynlerin artan kaygı düzeyleri aile işlevlerini olumsuz yönde etkilemiştir. Pandemi gibi halk sağlığı acil durumlarında kronik hastalığı olan çocukların ebeveynler dikkatle takip edilmeli, mental yönden değerlendirmeleri yapılarak erken dönemde gerekli önlemler alınmalıdır.

Anahtar Kelimeler Type 1 Diyabet; Ebeveyn; Kaygı; Aile İşlevi.

INTRODUCTION

The World Health Organization (WHO) reported the COVID-19 outbreak caused by SARS-CoV-2 on 30 January, 2020 and declared it as a "public health emergency of international concern".[1] The WHO declared the COVID-19 outbreak as a pandemic due to its alarming spread across the world.[2] Due to the highly infectious nature of COVID-19 and its spread through droplets, countries have taken many restrictive measures such as lockdowns, working from home, restriction of unnecessary movements in the public space, and closure of schools.[3]

It has been stated that COVID-19 is a risk factor for adults with diabetes.[3] Although Type 1 Diabetes Mellitus (T1DM) is not considered high risk for children, serious symptoms, including mortality, have been reported in children, and the spread of infection has been found to pose a major health threat to all age groups.[4,5,6] The International Society for Pediatric and Adolescent Diabetes (ISPAD) emphasizes that attention should be paid to diabetes management at home, too, to reduce the need for emergency care and the frequency of hospitalization during the pandemic period.[5]

Parental support is very important in the management of T1DM. In addition, family processes are also affected by the disease[6]. Some family members experience strong feelings of despair and stress. Some studies show that chronic diseases cause psychological and emotional distress, physical illness, and family breakdown, disrupt social and sexual relationships, reduce social activities, and cause economic difficulties (Erdem et al., 2013).

Glycemic control in patients with T1DM can prevent complications. Glycated hemoglobin (HbA1c) is the standard parameter to assess glycemic control in patients with DM. Some studies have found a high level of correlation between poor glycemic control and family conflict.[7,8] The time spent in hospitals, the complexity of medication management, and intensive medical treatments greatly affect family members emotionally, physically, and financially. The impact of the disease on family functioning also affects the child's adaptation to the disease.[9] Parents of children with T1DM take on most of the responsibility for medical care (such as nutrition management, blood glucose monitoring, management of days when the child is sick, and insulin production).[10,11] Although the psychosocial impact of living with diabetes is complex, it affects both the person with T1DM and their family.[12] For example, experiencing hypoglycemia can be challenging for both individuals with diabetes and their family members.[13] The care of children with T1DM (such as blood glucose monitoring, insulin production, and compliance with the nutrition regime) includes daily challenges, and this responsibility can strain parents psychologically. The emotional burden experienced by parents of children with T1DM may be exacerbated by the current COVID-19 pandemic. The change in family dynamics since the onset of COVID-19 is reflected in different aspects of the care of children with T1DM. First, the anxiety about and fear of potentially serious infection of the child creates a stressful situation for parents.[14] Second, the suspension of school and extracurricular activities causes children and adolescents to spend more time at home and requires more attention from parents. Third, the closure of parks and recreational areas may cause a decrease in physical activity.[15] All these changes can significantly affect the child's glycemic control and increase their anxiety by placing more responsibility on parents.[16]

Anxiety is an adaptive mechanism for coping with perceived danger. It is defined as a very basic human emotion and a multifaceted affect. Because of the acute and chronic expression of anxiety, Spielberger et al. (1970) used the concepts of trait anxiety and state anxiety while developing their scale.[17] Accordingly, they defined state anxiety as the emotional response that occurs as a result of individuals' interpretation of negative situations as threatening in a specific moment and trait anxiety as the response of individuals to being generally anxious and stressed about the

situations they are in.[17] When we consider these anxiety types for the parents of children with T1DM, trait anxiety is the anxiety parents feel because their child has a diagnosis of T1DM. State anxiety, on the other hand, is the anxiety they feel because they interpret the pandemic as potentially threatening to their child. The anxiety and stress experienced by parents of children with T1DM can affect family dynamics and functions. Many studies have been conducted in the literature on the anxiety levels of children with T1DM and the effects of the pandemic.[3,18] However, no study has been found on the anxiety levels of parents in this period and its effect on family functioning.

Research Hypothesis

We hypothesized that during the COVID-19 pandemic, the trait and state anxiety levels of parents with a child with Type 1 Diabetes would increase and this would affect family functions. This study was conducted to investigate the effect of HbA1c levels of children with type 1 diabetes and their parents' state and trait anxiety on family functioning during the covid-19 pandemic.

MATERIALS and METHODS
Participants and study design

A descriptive, cross-sectional, and correlational research design was used in this study. The sample size was calculated as 110 individuals on the G-Power software package, based on medium effect size, Type 1 error of 0.05, and Type 2 error of 0.05 (95% power).[19] Parents who met the inclusion criteria, agreed to participate in the study, and submitted a written consent form were included in the study to clearly understand the relationship between the variables. The sample of the study consisted of the parents of 134 children with T1DM who were aged between 9 and 18 and registered with the Pediatric Endocrinology Clinic of a hospital in western XXX between April 2021 and July 2021.

Since face-to-face communication was not possible due to the COVID-19 quarantine, data were collected from the participants through an online self-report questionnaire using Google Forms®. Inclusion criteria for parents: a) having a child with T1DM between the ages of 9-18; b) diagnosis of the child with T1DM at least a year ago; c) volunteering to participate in the study. Criteria for participation in the present study were the absence of disabilities hampering comprehension, and voluntary participation. The exclusion criteria for parents with a diagnosis of psychiatric illness and/or using psychiatric medication were not included in the study. Independent variables: The State-Trait Anxiety Inventory, socio-demographic characteristics and HbA1c level. Dependent variables: The PedsQL Family Impact Module scale scores are dependent variables.

Survey instruments

In this study, a Descriptive Information Form, the State-Trait Anxiety Inventory, and the PedsQL Family Impact Module were applied to parents.

The Descriptive Information Form

This form, which was created by the researchers, consists of questions about the socio-demographic characteristics of parents with a child with T1DM, including age, gender, educational status, HbA1c level of the child with diabetes, and duration of diabetes.

The State-Trait Anxiety Inventory (STAI)

The State-Trait Anxiety Inventory (STAI) developed by Spielberger et al. (1970) was used in the study.[17] It's Turkish translation, reliability and validity studies were carried out by Öner and Le Compte in 1983. It is a self-evaluation scale with a 4-point Likert-type rating structure and includes a total of 40 items consisting of short statements.[20] It involves two parts, including a 20-item "state anxiety form" and a 20-item "trait anxiety form". Cronbach's alpha coefficient of the scale ranges between .83 and .87, test-retest reliability between .71 and .86, and item reliability between .34 and .72. In this study, the reliability coefficient was found to vary between 0.85 and 0.92.

The PedsQL Family Impact Module: This scale was developed by James Varni in 2004 to measure the effects of having a child with a disease on family functioning. It consists of a total of 6 sub-factors and 36 statements.[21] The entire scale consists of positive items and it is graded on a five-point Likert-type scale (Never (0), Rarely (1), Sometimes (2), Often (3), and Always (4)). The items are reverse scored during the calculation of the score (0 = 100, 1 = 75, 2 = 50, 3 = 25, and 4 = 0). Higher scores indicate good family functioning and a low negative impact on the family. Cronbach's alpha coefficient is 0.97 for the overall scale and ranges between 0.82 and 0.97 for the subscales (physical functioning, 0.91; emotional functioning, 0.90; social functioning, 0.88; cognitive functioning, 0.93; communication, 0.88; anxiety, 0.82; daily activities, 0.91; family relations, 0.97). It was adapted in 2020.[22] Cronbach's Alpha for the Turkish version of the PedsQL Family Impact Module was found as 0.917, and the alpha coefficients of the subscales ranged between 0.653 and 0.944. In this study, Cronbach's alpha for the total scale was found to be 0.94.

Statistical analysis

The study data were analyzed on the IBM SPSS 22 statistical software package. Frequencies, percentages, and mean scores were used to evaluate the descriptive data of the participants, and the Shapiro-Wilk test was used to evaluate the normality of the data. The relationship between PedsQL Family Impact Module and Trait Anxiety Inventory and between the State Anxiety Inventory and PedsQL Family Impact Module was evaluated by using Pearson correlation analysis. Regression analysis was conducted to determine to what extent parents' trait and state anxiety and children's' HbA1c levels predicted family functions. The independent variables (trait and state anxiety scale scores) that we think may have an effect on family functions, which is our dependent variable in the study, were included in the regression model. In addition, HbA1c level, which is the most important parameter of metabolic control in diabetes, was chosen as an independent variable. Ethics committee approval

This study was approved by the Institutional Review Board of the University (IRB approval no: 2021/10–33, dated 29.03.2021). In addition, parents were informed about the research, and their written consent was obtained.

RESULTS

The mean age of the parents of the adolescents with T1DM included in the study was 41.8 ± 5.89 years, 76.90% of them were female, 91.80% were married, and 54.50% had an undergraduate degree. Also, 94.80% of the parents stated that they were afraid that their children might contract COVID-19. It was found that the children of the parents participating in the study had diabetes for 6±3.25 years on average and that the HbA1c level of 61.90% of them was above 7.50% (Table 1).

Table 1. Demographic characteristics of participants

Descriptive Features			
		n	%
Gender	Kadın	103	76.9
	Erkek	31	23.1
Marital status	Married	123	91.8
	Not married	11	8.2
Education level	Primary School	20	14.9
	High School	41	30.6
	University	73	54.5
Fear of having Covid-19	Yes	127	94.8
	No	7	5.2
HbA1c (%)	<7.5	51	38.1
	>7.5	83	61.9
Age (year)		41.18±5.89 (min:27- max:54)	
Duration of diabetes (year)		6±3.25 (min:2- max:14)	

When the correlation between the trait and state anxiety levels and family functions of the parents with children with T1DM was examined, there was a moderate negative correlation between parents' state anxiety levels and their family functioning (r= -0.550, p<.001) and a low-level, negative, and significant correlation between family functioning and trait anxiety levels (r= - 0.308, p<.001) (Table 2).

Table 2. The relationship between family functioning and HbA1c Levels of Children with Type 1 Diabetes and Their Parents' Anxiety

	1	**2**	**3**
	r	r	r
1. PedsQl Family Impact Module	1.0		
2. State Anxiety	.550*	1.0	
3. Trait Anxiety	-.308*		1.0

*: p<.001

Three models were created to determine the level of trait and state anxiety levels of the parents with children with T1DM to predict family functioning. According to the multiple regression analysis, the relationship between the parents' family functioning and other variables was examined, and it was found that there was a moderate, significant negative correlation with the state anxiety levels (β= -0.598, p<.001), a weak, significant negative correlation with the trait anxiety levels (β=-0.356, p<.001), and a significant positive correlation with HbA1c levels (β=-0.141, p<..001). It was determined that the family functioning of parents with children with T1DM was mostly affected by the level of state anxiety, the level of trait anxiety, and HbA1c levels, respectively. It was found that 45% (F= 36.764, p<.001) of the factors affecting family functioning in the model were explained by state-trait anxiety levels and HbA1c levels (Table 3).

Table 3. The level by which state and trait anxiety of parents and HbA1c levels of a child with T1DM predicted family functioning

Variables	B	β	Standard Error	t	p	95% CI for B Lower - Upper
Constant	119.547		4.90	24.370	p < .001	109.843 129.252
Trait Anxiety	-.897	-.356	.17	5.252	p < .001	-1.234 -.559
State Anxiety	-.280	-.598	.16	7.951	p < .001	-1.598 -.961
HbA1c	.700	-.141	1.81		p < .001	2.894 4.295
R2		0.447				
F		36.764				
DW		2.062				
β: Beta , R2: Adjusted R2						

DISCUSSION

The mental health effects of COVID-19, which is a public health emergency, have been identified as a high-priority topic for research.[23] Understanding the psychological effects in different populations can provide a theoretical basis for identifying people at risk and developing solutions.[24] Strengthening families is of great significance in diseases such as T1DM, where family-centered care is important. The results of this study show the relationship between the state and trait anxiety levels of parents with children with T1DM and their family functioning.

It was determined that there was a low-level, negative, and significant relationship between the parents' trait anxiety level and family functioning. Trait anxiety shows how people feel about themselves in general. In studies conducted with parents of children with chronic diseases, parents' anxiety levels were found to be high. Whittemore et al.[25] stated in their study conducted before the pandemic that parents of children with T1DM were more stressed and anxious, given that diabetes management requires a lot of responsibility and time. Some studies have shown that depressive symptoms in parents with children with T1DM are associated with lower parent involvement, lower family adjustment, and higher family conflict.[26,27] The family functioning of children with T1DM is negatively affected by their parents' anxiety levels, and this finding is consistent with the literature.

It was determined that there was a low-level, negative, and significant relationship between parents' state anxiety levels and their family functioning. State anxiety level is defined as the type of anxiety that occurs when an individual experiences a stressful situation/event. The COVID-19 pandemic has caused panic and fear all over the world. Uncertainties, people's lack of knowledge of the disease, and the rapid increase in the number of deaths have increased anxiety. The severe course of infection in those with chronic diseases has also worried the parents.

Due to fear of COVID-19 infection and uncertainty about its severity in patients with diabetes, parents have become even more concerned during the pandemic.[28] It has been determined that parents of children with T1DM are twice as likely to be concerned about developing the disease, social distance, and emotional burden than parents of children with no diabetes.[29,30,18] BD found that during the COVID-19 period, families experienced intense anxiety because they were afraid that their children might contract the disease and because they had difficulties in managing diabetes. However, it was stated that family resilience was at a good level in this period.[31] Similar to our findings, the study showed that families with children with T1DM were negatively affected during the COVID-19 period.[32] Although the infection had a mild course in the pediatric age group, the existing anxiety of the parents increased with the pandemic due to the chronic disease in their children. It is thought that parents' anxiety also affected family functioning negatively.

It was determined that the family functioning of parents with children with T1DM was mostly affected by the level of state anxiety, trait anxiety and HbA1c levels, respectively. A low-level correlation was found between HbA1c, which is the most important indicator of metabolic control in diabetes, and family functioning. There were no studies in the literature on the effect of family functioning on metabolic control during the pandemic. Previous research found that families with a child with type 1 diabetes reported lower family functioning than families with no children with type 1 diabetes, which indicates the negative impact that type 1 diabetes can have on a family.[33] Differences in family functioning experience among family members were associated with poor metabolic control.[34,35] Pandemic process affects parent's ability to manage diabetes and to support children's autonomy[18]. In this context, it was observed that the anxiety of parents with children with T1DM affected their family functioning in their daily routine, but that the pandemic led to anxiety that affected family functioning at a higher level. In the literature,

there are studies on how children and adolescents with T1DM are affected in terms of glycemic control, diabetes management, and psychosocial aspects during the COVID-19 period. However, there are no studies on the effects of this pandemic period on families. During this period, it is thought that families have been neglected as studies have focused only on children with T1DM. Therefore, it is thought that this finding will contribute to the literature.

Limitations

This study has several limitations, the most important of which is that the responses of parents consist of data based on self-reports. Another limitation is the collection of data from only one hospital. Therefore, the results of this study cannot be generalized to all regions in Turkey.

CONCLUSION

In conclusion, it was found that the anxiety levels of parents who had children with T1DM negatively affected their family functioning. However, it was determined that the increased anxiety levels of parents during the COVID-19 pandemic process negatively affected family functioning more. Since there are no studies addressing parents regarding this topic, our study will contribute to the field. In future studies, it is recommended to conduct in-depth interviews to better examine the factors that increase parents' anxiety.

It is extremely important to provide and appropriately manage medical consultancy services to facilitate the access of children and their families to health services, make timely controls, and enable them to access accurate information promptly. It is necessary to create social platforms where parents can easily share and reach similar experiences about similar problems and manage them appropriately. Sharing the economic, psychological, and medical knowledge and experiences on such platforms timely and carefully, which have recently become widespread as "know-how", is important not only in the management of the disease but also in terms of its contribution to raising

the thresholds of psychological resistance.

It is suggested that mental health specialists should take an active part in the general intervention process of the disease to activate the mental health and psychosocial response promptly during the pandemic. Pediatric/Family nurses should define the psychological and behavioral responses and problems of parents with children with T1DM, and provide psychosocial care that facilitates their adaptation to new situations. Frequent meetings of public health nurses with parents who have children with T1DM in their region through telemedicine will facilitate early detection of possible problems.

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