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Challenges During the Coronavirus Disease 2019 Pandemic: Diabetes Control and Psychosocial Issues in Children with Type 1 Diabetes Mellitus and Their Mothers

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What is already known on this topic?

- *The generalization that diabetes worsens coronavirus disease 2019 infection falsely suggests that this is also the case in children.*
- *The psychosocial well-being of diabetic children and families is very important in disease control.*

What this study adds on this topic?

- *The mistaken belief that the risk of coronavirus disease 2019 increases in children with type 1 diabetes badly affects mothers psychosocially.*
- *Any deterioration of the mother's psychosocial well-being is reflected in the family during these relatively new and dynamic periods.*

ABSTRACT

Objective: Governments have enforced restrictions to prevent the spread of coronavirus disease 2019, which has affected lifestyle and psychosocial well-being. The aim of this study is to examine the psychosocial dimensions of children with type 1 diabetes mellitus and lifestyle changes in the face of the pandemic.

Materials and Methods: Sixty school-aged children with type 1 diabetes mellitus were included to evaluate socioeconomic status, lifestyle changes, and psychological state after a 3-month school closure, using a questionnaire as well as scales in children and mothers [Depression-Anxiety-Stress Scale (short-form), Revised Child Anxiety-Depression Scale (parent-version), The Perceived Stress Scale in Children] via a Google® Form. The effect of pre-pandemic glycemic control on lifestyle and factors affecting HbA1c change were also investigated.

Results: The percentage of mothers having scale scores above the cutoff in terms of stress, anxiety, and depression were 18.3%, 23.3%, and 33.3%, respectively. Mother's and children's anxiety, depression, and stress scores were positively correlated. Employed mothers had higher depression scores. Paternal unemployment increased the anxiety of the mothers. Seventy-eight percent (n = 46) of the mothers thought that diabetes in their children increased the risk of coronavirus disease 2019 infection, and children of these mothers had higher depression, anxiety, and stress scores($P = .01$, $P < .01$, $P < .01$). The majority of participants were adversely affected by coronavirus disease 2019 in terms of daily routines and dietary compliance. Patients with poor-controlled type 1 diabetes mellitus deteriorated more in terms of diet compliance ($P = .01$).

Conclusion: Coronavirus disease 2019 affects the psychosocial dimensions in the family of children with type 1 diabetes mellitus. The psychosocial impact is reflected within the family and may affect diabetic control. Thus, it should be handled within the context of family. The provision of proper information and guidance to parents may be crucial to alleviate the psychosocial burden on the family during the pandemic.

Keywords: COVID-19, type 1, diabetes mellitus, psychologic

INTRODUCTION

In January 2020, coronavirus disease 2019 (COVID-19) outbreak was declared a global health emergency of international concern by the World Health Organization.[1] It has become one of the vastest disasters of the last century with rising numbers of cases and increased mortality. In order to prevent the rapid spread of the novel virus, severe restrictions enforced by governments have caused disruption in daily routines, physical activity, and mental health of

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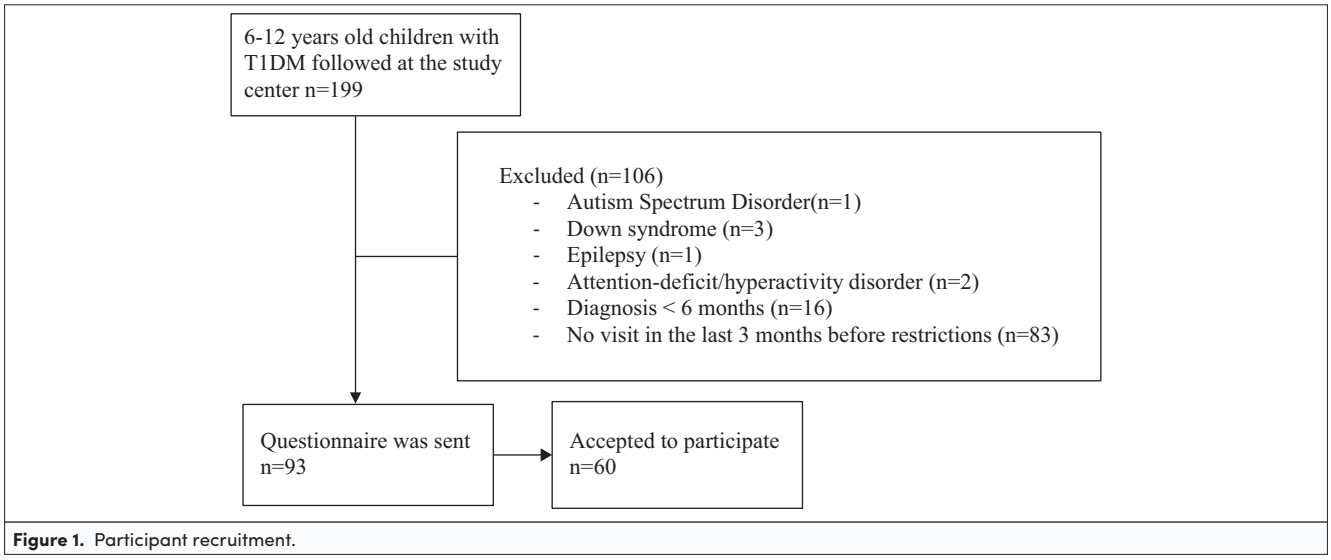

Figure 1. Participant recruitment.

children and their families.[2] People with chronic diseases and their families have been more vulnerable during this period both psychologically and biologically.[2,3] Type 1 diabetes mellitus (T1DM) is one of the most frequent chronic diseases in the pediatric population.[4] Glycemic control, an important component of the disease, is directly related to daily routines and physical activity.[5] Moreover, it is known that psychological and behavioral problems are common in children with T1DM which have a negative impact on glycemic control.[6-8]

During the COVID-19 outbreak, one of the most important restrictions has been school closures which may have a dramatic impact on school-age children and their families. It can be predicted that repeated and ongoing restrictions will be part of our lives in the future. It is imperative to determine whether children with T1DM and their families have emotional burden or change in lifestyle and if any, which factors play key roles in such alterations. The definition of susceptible groups and their needs may help guide future healthcare strategies.

The first aim of our study is to evaluate factors that might impact the psychosocial dimensions of school-age children with T1DM and their mothers. The second aim is to describe changes in daily and dietary routine after the restrictions, comparing the well and poor glycemic control groups, to see if there are any differences in the effects of restrictions. Additionally, we aim to analyze the influence of all these factors on eventual glycemic control.

MATERIALS AND METHODS

Participants

The study protocol was approved by the Clinical Research Ethics Committee of Hacettepe University Faculty of Medicine (GO20/625 2020/12-70), and the study was performed between April 2020 and June 2020. The target population of the study is children with T1DM (n = 199) between the ages of 6 and 12 years followed at our outpatient clinic. The diagnosis of type 1 diabetes was based on ISPAD 2018 guidelines[9] and the presence of at least 1 diabetes-associated autoantibody was required. Children with T1DM, who (i) had a diagnosis of less than 6 months, (ii) did not have an outpatient control at the clinic in the last 3 months before restrictions, or (iii) had any chronic disease other than celiac disease or Hashimoto's thyroiditis were excluded. Initially, the families were provided with information pertaining to the study. Subsequently, a questionnaire was dispatched to 93 families via Google® Forms, out of which 60 families agreed to partake in the study (Figure 1). Additionally, consent was acquired via e-mail.

Medical records of all participants were reviewed, and the date of diagnosis and age of the children were recorded. Ninety percent (n = 54) of the children were on a basal-bolus insulin regimen and 6 (10%) were on a continuous subcutaneous insulin infusion.

Evaluation of Glycemic Control

Glycated hemoglobin (HbA1c) values from the last 3 months outpatient visits before restrictions were extracted retrospectively from the medical files of all participants. The children were grouped into 2 based on their glycemic control: good glycemic control comprising those with HbA1c ≤7.5% (58 mmol/mol) and poor glycemic control those with HbA1c >7.5% (58 mmol/mol).[10]

From March 2020 to March 2021 during the strict restrictions in Turkey, children with T1DM were evaluated through telemedicine as a routine outpatient control. Information about each child's condition and complaints was obtained from the mother, and necessary information and guidance were provided online. After 3 months of restriction, we asked all children to have their HbA1c measurements taken by their family physicians. They sent their HbA1c results to us via e-mail. A significant change in HbA1c was defined as a difference of ≥0.5% before and 3 months after COVID-19 pandemic restrictions.[11] Patients deemed necessary by telemedicine interview or laboratory results were called to the outpatient clinic.

Google® Form

The web-based survey consisted of 2 main sections. The first section was a questionnaire prepared by the researchers, which consisted of 3 parts: the first part included questions concerning socioeconomic status, the second part was related to perceptions and feelings about the COVID-19 pandemic (e.g.

how it affected their life; whether they think DM increases the COVID-19 risk, mood of the children, etc.), and the third part consisted of changes in the daily and dietary routines.

The second section of the survey included Depression Anxiety Stress Scale short form (DASS-21) and Revised Child Anxiety and Depression Scale-Parent Version (RCADS-P) to be completed by the mothers, as well as The Perceived Stress Scale in Children (8-11 Years) to be completed by the children.

Socioeconomical data obtained from the first section of the survey was scored using the Hollingshead–Redlich scale. This scale determines the socioeconomic-sociocultural level of the family, and it is based on the educational and occupational status of the parents.[12]

Data from the questionnaire were collected using a 5-point or 4-point Likert scale self-report in the first section. The scale was scored as increased a lot/increased a little/no change/decreased a little/decreased a lot and worsened much/worsened/no change/improved. During the statistical analysis, the scale was reduced to increased/no change/improved and worsened/no change/improved respectively, since, the number of cases was limited. The choices for the mood of the children during restriction were bored, sad, restless, anxious, happy, exhausted, excited, and frightened, with an option to choose more than one (Supplementary Material 1).

The Perceived Stress Scale in Children consists of 9 items rating the frequency reactions to recent stressors they were exposed recently on a 4-point Likert scale (1 = never, 2 = sometimes, 3 = often, 4 = very often). A higher score on the questionnaire corresponds to high-intensity stress symptoms. It has been adapted to Turkish children, and the Cronbach's alpha internal consistency coefficient of the scale indicating reliability was 0.76, and test–retest correlation was 0.71.[13] Although the scale is for children aged 8-11, this scale was applied to children aged 7-12 years in the current study based on previous applications in the literature. The scale had been used in children between 7 and 17 years, previously with a Cronbach's alpha (α) internal consistency coefficient of 0.76, and also another study from our country with a Cronbach's alpha (α) internal consistency coefficient of 0.71 in children aged 8-12 years.[14,15]

The DASS-21 is a short form of Lovibond and Lovibond's (1995) 42-item self-report measure of depression, anxiety, and stress. The scale has a 4-point Likert-type rating, ranging from 0 "not at all convenient to me" to 3 "completely suitable to me." It consists of 3 subdimensions: Anxiety (DASS-21A), Depression (DASS-21D), and Stress (DASS-21S). The Turkish adaptation of the short form of the scale was made by Yılmaz et al[16] and the internal consistency coefficient of the scale is between 0.76 and 0.80. High scores show high-intensity symptoms, and subscale scores have cutoff points of 3.5 for DASS-21A, 4.5 for DASS-21D, and 7 for DASS-21S.

The RCADS-P is a widely used, 47-item, parent-report questionnaire designed to assess DSM-IV depression and anxiety disorders in children and adolescents. Response options are based on a 4-point Likert-type scale (0 = never, 1 = sometimes, 2 = often, and 3 = always). In addition to total anxiety (the sum of 5 anxiety subscales) and total anxiety-depression (total sum of all subscales) value, it includes 6 subscales: separation anxiety, general anxiety, panic, social phobia, obsession/compulsion, and depression. Its Turkish adaptation, validity and reliability study was carried out by Gormez et al.[17] Total anxiety and depression subscales of the RCADS-P were used in this study. All scales were included in the study with permission.

Statistical Analysis

Statistical Package for the Social Sciences version 19.0 software package (IBM corp., Armonk, NY, USA) was used for the statistical analyses. Data were tested for normality using the skewness and kurtosis test, Kolmogorov–Smirnov or Shapiro–Wilk tests, histogram, q–q plot, and coefficient of variation. The median value (minimum–maximum) was shown for data that did not show the normal distribution. Mann–Whitney *U*-test and Kruskal–Wallis test were used to compare independent groups for nonparametric variables. Continuous variables are presented as mean ± SD for normally distributed variables. A comparison of 2 independent groups for continuous variables was made using the independent samples *t*-test. Comparison of 2 dependent groups (before and after COVID-19) was determined using the dependent *t*-test for paired and Wilcoxon test. Categorical variables are summarized as numbers and percentages. Chi-square tests and Fisher's exact tests were used to compare between-group differences of categorical variables. Spearman correlations were used to determine the relationship between nonparametric variables. The coefficient strength of the correlation and the level of relationship were as follows: 0.00-0.25 as very weak, 0.26-0.49 as weak, 0.50-0.69 as moderate, 0.70-0.89 as high, and 0.90-1.0 as very high. The significance level was set at $P < .05$. Significance has been tested for 2-tailed test.

RESULTS

The mean age of the participants (27 boys/33 girls) was 10.0 ± 1.9 years. The age of 31 (52%) children was between 6 and 9 years and the age of 29 children (48%) was between 10 and 12 years. The mean duration of T1DM was 5.9 ± 2.8 years. Twenty-three out of 60 children (%38) had well-glycemic control [HbA1c ≤7.5% (58 mmol/mol)], whereas 37 (%62) had poor-glycemic control [HbA1c >7.5% (58 mmol/mol)] before restrictions.

Among all participants, 46 mothers (78%) thought diabetes increases the risk of COVID-19 infection. Almost all mothers (53/60, 88.3%) declared that COVID-19 had a negative impact on their children. The mood of the children during the restriction period was reported by mothers as bored in 70% (n = 42), sad in 33.3% (n = 20), restless in 31.7% (n = 19), anxious in 31.7% (n = 19), happy in 26.7% (n = 16), exhausted in 18.3% (n = 11), excited in 6.7% (n = 4), and frightened in 6.7% (n = 4). Median scores of RCADS-P Depression and Anxiety Subscale as well as The Perceived Stress Scale in Children were 2 (0-11), 18 (0-66), and 14 (9-28), respectively.

Median scores of DASS-21D, DASS-21A, and DASS-21S in the mothers were 2 (0-18.28), 1 (0-15), and 3 (0-16) respectively. The percentage of mothers who had DASS-21-D, DASS-21-A, and DASS-21S scores above the cutoff was 23.3% (n = 14), 18.3% (n = 11), and 33.3% (n = 20), respectively. Risk factors (sociodemographic characteristics, dietary-lifestyle changes, pre-pandemic glycemic control, and risk perception) that may have an impact on the scale scores are displayed in Table 1.

Table 1. The Analysis of RCADS-P, DASS-21, and The Perceived Stress Scale Scores According to Sociodemographic Characteristics, Pre-Pandemic Glycemic Control, and Risk Perception

	RCADS-P (Depression) Median (Minimum–Maximum)	*P*	RCADS-P (Anxiety) Median (Minimum–Maximum)	*P*	PSSC Median (Minimum–Maximum)	*P*	DASS-21 (Anxiety) Median (Minimum–Maximum)	*P*	DASS-21 (Depression) Median (Minimum-maximum)	*P*	DASS-21 (Stress) Median (Minimum–Maximum)	*P*
Age												
6-9 years (n = 31)	2 (0-11)	.19[b]	17 (0-46)	.25[b]	15 (9-25)	.12[b]	1 (0-15)	.80[b]	1.5 (0-18)	.86[b]	3 (0-16)	.07[b]
10-12 years (n = 29)	2.5 (0-11)		19 (4-66)		12 (9-28)		1 (0-11)		2 (0-11)		4 (0-14)	
Mother's employment status												
Employed (n = 17)	3 (0-8)	.40[b]	18 (2-66)	.80[b]	16 (10-28)	.08[b]	1.3 (0-11)	.31[b]	5 (0-9)	**<.01**[b]	4 (0-14)	.07[b]
Unemployed (n = 43)	2 (0-11)		18 (0-46)		13 (9-23)		1 (0-15)		1 (0-18)		3 (0-16)	
Father's employment status												
Employed (n = 48)	2 (0-10)	.07[b]	18 (0-66)	.34[b]	14 (9-28)	.45[b]	1 (0-11)	**.04**[b]	1 (0-9)	.10[b]	3 (0-14)	.28[b]
Unemployed (n = 11)	6 (0-11)		21 (8-46)		15 (10-23)		2 (0-15)		3 (0-18)		4 (0-16)	
Father's education												
Elementary school (n = 18)	2 (0-11)	.88[c]	14 (2-46)	.85[c]	15 (10-23)	.97[c]	2 (0-15)	.27[c]	2 (0-18)	.85[c]	3 (0-16)	.90[c]
High school (n = 15)	2 (0-8)		20 (0-37)		14 (11-22)		1 (0-8)		2 (0-5)		3 (0-8)	
University (n = 27)	3 (0-11)		18 (2-66)		13 (9-28)		1 (0-10)		2 (0-11)		3 (0-14)	
Mother's education												
Elementary school (n = 20)	2 (0-11)	.84[c]	16 (4-46)	.86[c]	15 (10-23)	.13[c]	2 (0-15)	**.03**[c]	2 (0-18)	.67[c]	3 (0-16)	.25[c]
High school (n = 19)	2.5 (0-10)		20 (0-37)		12 (9-25)		0 (0-6)		2 (0-7)		3 (0-11)	
University (n = 20)	2.5 (0-10)		17 (2-66)		14 (9-28)		1 (0-10)		3 (0-9)		4 (0-14)	
Hollingshead–Redlich Scale[a]												
II-III (n = 43)	2 (0-10)	.25[b]	19 (0-66)	.98[b]	14 (9-28)	.54[b]	1 (0-10)	.33[b]	2 (0-9)	.96[b]	3 (0-14)	.67[b]
IV-V (n = 17)	3 (0-11)		14 (4-46)		15 (10-23)		2 (0-15)		2 (0-18)		4 (0-16)	
HbA1c												
<7.5% (58 mmol/mol) (n = 23)	2 (0-11)	.49[b]	20 (0-46)	.61[b]	13 (9-28)	.51[b]	1 (0-15)	.75[b]	2 (0-18.2)	.63[b]	3 (0-16)	.74[b]
≥7.5% (58 mmol/mol) (n = 37)	2.5 (0-11)		17 (2-66)		15 (9-25)		2 (0-8)		2 (0-11)		3 (0-14)	
Perception of diabetes as a risk for COVID-19 infection												
Yes (n = 46)	3 (0-11)	**.01**[b]	20 (4-66)	**<.01**[b]	15 (9-28)	**<.01**[b]	1 (0-15)	.39[b]	2 (0-18.2)	.95[b]	3 (0-16)	.06[b]
No (n = 13)	0.5 (0-7)		8.5 (0-31)		11 (9-19)		1 (0-8)		3 (0-8)		1 (0-8)	

DASS-21, The Depression Anxiety Stress Scales 21; RCADS-P, The Revised Child Anxiety and Depression Scale-Parent Version. Bold P values were statistically significant.

[a]II, university-educated, professional or parent in a high administrative position; III, small businessman, white collar or skilled worker, high school graduate parents; IV, semi-skilled worker, educated parents below high school level; and V, semi-skilled worker, uneducated, educated parents at primary school level.

[b]Mann–Whitney *U*-test.

[c]Kruskal–Wallis.

Table 2. The Correlation of Scale Scores for Anxiety, Depression, and Stress in Children and Their Mothers

Correlation Coefficient	RCADS-P (Depression Subscale)	RCADS-P (Anxiety Subscale)	The Perceived Stress Scale in Children
DASS-21 (D)	**0.392***	0.255	**0.491***
DASS-21 (A)	**0.413***	0.233	**0.427***
DASS-21 (S)	**0.516***	**0.426***	**0.504***

A, anxiety; D: depression; DASS-21: The Depression Anxiety Stress Scales 21; RCADS-P: The Revised Child Anxiety and Depression Scale-Parent Version; S, stress.Bold *P* values were statistically significant.
Spearman correlation results: <0.25 very weak correlation; 0.26-0.49 weak correlation; 0.50-0.69 moderate correlation; 0.70-0.89 high correlation; 0.90-1.0 very high correlation.
*$P < .01$.

There was no statistically important correlation between dietary-lifestyle changes and RCADS-P, DASS-21, and The Perceived Stress Scale scores (Supplementary Table 1).

The Perceived Stress Scale and depression scores of children were significantly correlated with maternal depression, anxiety, and stress scores. Furthermore, there was a statistically significant correlation between the anxiety scores of children and maternal stress scores (Table 2).

Duration of screen time increased in 51.7% (n = 30/58) of the children. Mothers reported that the mean duration of daily total screen time was 1.8 ± 1.2 hours before the pandemic, and it significantly increased to 5.6 ± 2.8 hours ($P < .01$). The screen time was still longer after the exclusion of the online education period (3.3 ± 2.3 hours in a day, $P < .01$). The median time spent on physical activity was 7.8 (0-35) hours per week before the COVID-19 pandemic, while it decreased to 4 (0-20) hours per week during the pandemic ($P < .01$). The median duration of daily sedentary time increased from 2 (1-10) to 4 (0.5-8) hours before and after the pandemic ($P < .01$). There was no statistically significant difference in terms of duration of screen time, sedentary time, and physical activity time between DM^{well} and DM^{poor} groups ($P < .05$). Change in daily routines did not differ between well- and poor-control groups ($P > .05$) (Table 3).

However, deterioration in diet compliance and increase in carbohydrate consumption were more pronounced in the poor-control group ($P = .01$ and $P = .01$, respectively) (Table 4).

The HbA1c was available in 46 out of 60 participants after the restriction period of 3 months, Mean HbA1c before and after restrictions were similar [8.1 ± 1.05% (65 ± 8.43mmol/mol) vs. 7.9 ± 1.05% (63 ± 8.37mmol/mol); $P = .17$]. The scale scores of neither the children nor the mothers varied among those with or without a significant change in HbA1c (≥0.5%) before and after restrictions (Supplementary Table 2).

DISCUSSION

Parenting plays a crucial "scaffolding" role in the mental health of children, and there is a close link between parents' and children's mental health problems in unpredictable, traumatic periods.[18,19] During the COVID-19 pandemic, Whittle et al[20] showed the importance of parenting behavior and parents' psychological status on the mental health of children without

Table 3. The Effect of COVID-19 on Daily Routines in Children with Type 1 Diabetes Mellitus According to Glycemic Control

	DM^{well} (n = 23)	DM^{poor} (n = 37)	All Participants (n = 60)	
	n (%)	n (%)	n (%)	*P*
The effect of COVID-19 pandemic on life of the child				
Worsened	20 (87)	33 (89.2)	53 (88.3)	.33[a]
No change	3 (13)	2 (5.4)	5 (8.3)	
Improved	0	2 (5.4)	2 (3.3)	
Change in daily routines				
Worsened	15 (65.2)	25 (69.4)	40 (67.8)	.69[a]
No change	7 (30.4)	8 (22.2)	15 (25.4)	
Improved	1 (4.3)	3 (8.3)	4 (6.8)	
Duration of daily screen time				
Increased	13 (56.5)	17 (48.6)	30 (51.7)	.83[a]
No change	8 (34.8)	14 (40)	22 (37.9)	
Decreased	2 (8.7)	4 (11.4)	6 (10.3)	
Duration of daily reading time				
Increased	5 (21.7)	14 (38.9)	19 (32.2)	.36[a]
No change	11 (47.8)	12 (33.3)	23 (39)	
Decreased	7 (30.4)	10 (27.8)	17 (28.8)	
Duration of weekly physical activity				
Increased	6 (28.6)	10 (28.6)	16 (28.6)	.80[a]
No change	10 (47.6)	14 (40)	24 (42.9)	
Decreased	5 (23.8)	11 (31.4)	16 (28.6)	

[a]Chi-square test.
COVID-19, coronavirus disease 2019; DM, diabetes mellitus.

Table 4. The Effect of COVID-19 on Dietary Routines in Children with Type 1 Diabetes Mellitus According to Glycemic Control

	DM^{well} (n = 23)	DM^{poor} (n = 37)	All Participants (n = 60)	
	n (%)	n (%)	n (%)	*P*
Diet compliance				
Worsened	6 (26.1)	24 (64.9)	30 (50)	**.01**[a]
No change	15 (65.2)	13 (35.1)	28 (46.7)	
Improved	2 (8.7)	0	2 (3.3)	
Main meal number				
Increased	2 (8.7)	6 (17.6)	8 (14)	.33[a]
No change	19 (82.6)	22 (64.7)	41 (71.9)	
Decreased	2 (8.7)	6 (17.6)	8 (14)	
Carbohydrate consumption				
Increased	8 (34.8)	24 (64.9)	32 (53.3)	**.01**[a]
No change	15 (65.2)	10 (27)	25 (41.7)	
Decreased	0	3 (8.1)	3 (5)	
Packaged food consumption				
Increased	6 (26.1)	6 (16.7)	11 (19.3)	.53[a]
No change	12 (52.2)	18 (50)	29 (50.9)	
Decreased	5 (21.7)	12 (33.3)	17 (29.8)	
Snack consumption				
Increased	9 (39.1)	12 (43.3)	21 (36.2)	.24[a]
No change	14 (60.9)	19 (54.3)	33 (56.9)	
Decreased	0	4 (11.4)	4 (6.9)	

[a]Chi-square test.Bold *P* values were statistically significant.
COVID-19, coronavirus disease 2019; DM, diabetes mellitus.

any chronic condition. Consistent with the family systems theory, caring for a child with diabetes has implications for the mental health of both parents and the child as well as for the physical well-being of the child.[21] The COVID-19 outbreak and restrictions are presumed to present a challenge to both adults and children with diabetes as well as their families. In the current study, we analyzed the link between the psychosocial state of the child with T1DM and the mother under real stress like the COVID-19 pandemic, investigating stress, anxiety, and depression scores of diabetic children, and their mothers cross-sectionally. Interestingly, anxiety was found to be the psychological symptom with the highest scores among children, whereas depression was the most prevalent symptom among mothers. It seems the same stress leads to depression in the mother and anxiety in children in the short term. The correlation of anxiety, depression, and stress scores between the diabetic child and the mother reflects the scaffolding role of parenting. The high scores of stress, anxiety, and depression above the thresholds in the mothers of children with diabetes suggest that they need psychological support during the pandemic. Psychosocial well-being affects compliance to treatment in children with T1DM,[22] Thus, it is important to define the factors that have an impact on the psychosocial status of the family. In our study, we found that the depression and anxiety scores of mothers differed significantly according to the employment status of the mother and father, respectively. Employed mothers had higher depression scores than unemployed ones. Contrary to our findings, a study with healthy children and parents from Jordan showed that mothers who were still employed during the COVID-19 pandemic had less depression and stress compared to mothers who are not employed.[23] It may be due to the fact that our study was conducted with children with a chronic disease that was counted to be a risk factor for COVID-19 morbidity and mortality. We do not have data about where the mothers are working (home, outside home). It may be speculated that employed mothers who have to go outside to work may have worries about getting contacted with the virus and cause disease in their child or otherwise mothers working at home may worry about not being able to care for their diabetic child. Father's employment status was another factor affecting the anxiety of mothers. Economic problems may be the underlying reason for the observed symptoms as fathers' unemployment causes higher scores on the mothers' anxiety. Financial loss has already been known as a risk factor for psychological disorders,[2] also poverty complicates backing a child with a chronic disorder.[24]

In our study, it was shown that 78% (n = 46) of the mothers thought diabetes increases the risk of COVID-19 infection. The children of mothers who thought diabetes increases the risk of COVID-19 infection had higher depression, anxiety, and stress scores. However, current evidence shows that T1DM in children and youth does not increase the severity of COVID-19 infection.[25] It is obvious that children with T1DM, as well as their caregivers are exposed to unnecessary psychosocial burden since health authorities generalize the increased risk without addressing the age groups in their statements.[26] Physicians dealing with childhood diabetes should inform families accordingly.

A flexible but consistent daily routine is advised for psychosocial well-being.[27] In the current study, 67.8% of participants reported that their children's daily routines got worse. Duration of total screen and sedentary times increased whereas that of physical activity decreased significantly during this period. Another study conducted in healthy children aged 3-18 years in Italy and Spain reported similar results.[28] Children are deprived of group activities and team sports, and the time spent at home increases because of restrictions. Stress scores of those with a decreased reading time and increased screen time were higher, although they did not reach statistical significance, Hence, it is of great importance to plan the day efficiently and productively and spend quality time at home. Family-centered practical solutions may be more effective than the generalized guidelines published recently for families.[27,29]

Psychosocial problems affect the treatment and dietary compliance of children with T1DM.[22] Interestingly, studies reported so far revealed a recovery in glycemic control during COVID-19 restrictions in patients with T1DM.[30,31] Analysis of dietary routines demonstrated that the diet was disrupted in 50% of our participants. This was mainly due to an increase in carbohydrate consumption. The deterioration in dietary compliance and the increase in carbohydrate consumption were more pronounced, especially in the poor control group, However, there was no significant change in HbA1c levels in the study group. This may be because the study period may not be sufficient for a significant change in HbA1C. Studies with large numbers of patients and long-term follow-up are required.

This study has several limitations. The main limitation is the relatively small number of participants from a single center. The characteristics of the population refusing to participate in the study are unknown, which may be a bias. Another important limitation is that we do not know the psychosocial status of the study group before the pandemic. Pandemic conditions urged the diabetic children to continue follow-up examinations with their family physicians; therefore, HbA1c measurements were carried out at different laboratories with different assays which is another important limitation. In addition, data were collected through mothers' self-reports, which may impact the reporting. Therefore, it may not be appropriate to generalize the results to all children with T1DM. Since this process is still ongoing, the first 3-month effect may not be generalizable to the whole process.

In summary, we found that parents' employment status and providing correct information to the parents are the most important factors affecting the psychosocial dynamics in the families of children with diabetes. In addition, the deterioration in dietary compliance was striking in those who were previously poor controlled. This study is a pathfinder especially emphasizing psychosocial dimensions of COVID-19 and restrictions in diabetic children and their families. Future studies are warranted to explore the long-term psychosocial effects of COVID-19.

Ethics Committee Approval: This study is approved by the Hacettepe University Medical Faculty Clinical Research Ethics Committee (GO20/625 2020/12-70).

Informed Consent: Written informed consent was obtained from the patients who agreed to take part in the study.

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REFERENCES

1. Available at: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200420-sitrep-91-covid-19.pdf?sfvrsn=4fcf0670b_4. 2019.
2. Brooks SK, Webster RK, Smith LE, et al. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *Lancet*. 2020;395(10227):912-920. [CrossRef]
3. Evliyaoğlu O. Children with chronic disease and COVID-19. *Turk Pediatr Ars*. 2020;55(2):93-94. [CrossRef]
4. Mobasseri M, Shirmohammadi M, Amiri T, Vahed N, Hosseini Fard H, Ghojazadeh M. Prevalence and incidence of type 1 diabetes in the world: a systematic review and meta-analysis. *Health Promot Perspect*. 2020;10(2):98-115. [CrossRef]
5. Fonseca VA, Smith H, Kuhadiya N, et al. Impact of a natural disaster on diabetes: exacerbation of disparities and long-term consequences. *Diabetes Care*. 2009;32(9):1632-1638. [CrossRef]
6. Reynolds KA, Helgeson VS. Children with diabetes compared to peers: depressed? Distressed? A meta-analytic review. *Ann Behav Med*. 2011;42(1):29-41. [CrossRef]
7. Khandelwal S, Sengar GS, Sharma M, Choudhary S, Nagaraj N. Psychosocial illness in children with type 1 diabetes mellitus: prevalence, pattern and risk factors. *J Clin Diagn Res*. 2016;10(9):SC05-SC08. [CrossRef]
8. Liu S, Leone M, Ludvigsson JF, et al. Association and familial coaggregation of childhood-onset type 1 diabetes with depression, anxiety, and stress-related disorders: a population-based cohort study. *Diabetes Care*. 2022;45(9):1987-1993. [CrossRef]
9. Mayer-Davis EJ, Kahkoska AR, Jefferies C, et al. ISPAD clinical practice consensus guidelines 2018: definition, epidemiology, and classification of diabetes in children and adolescents. *Pediatr Diabetes*. 2018;19(suppl 27):7-19. [CrossRef]
10. American Diabetes Association. 12. Children and adolescents: standards of medical care in Diabetes-2018. *Diabetes Care*. 2018;41(suppl 1):S126-S136. [CrossRef]
11. Little RR, Rohlfing CL. The long and winding road to optimal HbA1c measurement. *Clin Chim Acta*. 2013;418:63-71. [CrossRef]
12. Ginsburg SW. Social class and mental illness: a community study. *Am J Orthopsychiatry*. 1959;29(1):192-201. [CrossRef]
13. Tuncay O, Çocuklarda EC. Algilanan Stres Ölçeği'nin Türkçeye Uyarlama Çalişmasi/Adaptation of the perceived stress scale in children (8-11 years) [into Turkish]. *Selçuk Univ Edebiyat Fak Derg*. 2017;37:419-428.
14. Razani N, Niknam K, Wells NM, et al. Clinic and park partnerships for childhood resilience: a prospective study of park prescriptions. *Health Place*. 2019;57:179-185. [CrossRef]
15. Ayhan AS. *Pediatrik Astımda Algılanan Stres Düzeyi ile Yaşam Kalitesi Arasındaki Ilişkide Bilinçli Farkındalığın Aracı Rolünün Incelenmesi*. Işık Univ; 2020.
16. Yılmaz Ö, Boz H, Arslan A. Depresyon Anksiyete Stres Ölçeğinin (Dass 21) Türkçe Kisa Formunun Geçerlilik-Güvenilirlik Çalişmasi. *Finans Ekonomi ve Sosyal Araştırmalar Dergisi (FESA)*. 2017;2(2):78-91.
17. Gormez V, Kilincaslan A, Ebesutani C, et al. Psychometric properties of the parent version of the revised Child Anxiety and Depression Scale in a clinical sample of Turkish children and adolescents. *Child Psychiatry Hum Dev*. 2017;48(6):922-933. [CrossRef]
18. Cobham VE, McDermott B, Haslam D, Sanders MR. The role of parents, parenting and the family environment in children's post-disaster mental health. *Curr Psychiatry Rep*. 2016;18(6):53. [CrossRef]
19. Yap MB, Allen NB, Sheeber L. Using an emotion regulation framework to understand the role of temperament and family processes in risk for adolescent depressive disorders. *Clin Child Fam Psychol Rev*. 2007;10(2):180-196. [CrossRef]
20. Whittle S, Bray K O, Lin S, Schwartz O. *Parenting, child and adolescent mental health during the COVID-19 pandemic*; PsyArXiv 2020. [CrossRef]
21. Helgeson VS, Becker D, Escobar O, Siminerio L. Families with children with diabetes: implications of parent stress for parent and child health. *J Pediatr Psychol*. 2012;37(4):467-478. [CrossRef]
22. Delamater AM, de Wit M, McDarby V, et al. ISPAD Clinical Practice Consensus Guidelines 2018: psychological care of children and adolescents with type 1 diabetes. *Pediatr Diabetes*. 2018;19(suppl 27):237-249. [CrossRef]
23. Malkawi SH, Almhdawi K, Jaber AF, Alqatarneh NS. COVID-19 quarantine-related mental health symptoms and their correlates among mothers: a cross sectional study. *Matern Child Health J*. 2021;25(5):695-705. [CrossRef]
24. Paediatrics RCo, Health C. *Pover Child Health views Frontline*; 2017.
25. Cardona-Hernandez R, Cherubini V, Iafusco D, Schiaffini R, Luo X, Maahs DM. Children and youth with diabetes are not at increased risk for hospitalization due to COVID-19. *Pediatr Diabetes*. 2021;22(2). [CrossRef]
26. Tejera C, Moreno-Pérez Ó, Rios J, Reyes-García R. People living with type 1 diabetes point of view in COVID-19 times (COVIDT1 study): disease impact, health system pitfalls and lessons for the future. *Diabetes Res Clin Pract*. 2020:108547.
27. Cluver L, Lachman JM, Sherr L, et al. Parenting in a time of COVID-19. *Lancet*. 2020;395(10231):e64. [CrossRef]
28. Orgilés M, Morales A, Delvecchio E, Mazzeschi C, Espada JP. Immediate psychological effects of the COVID-19 quarantine in youth from Italy and Spain. *Front Psychol*. 2020;11:579038. [CrossRef]
29. Ercan E Ü, Arman-Rodopman A, İnal-Emiroğlu N, Öztop D B, Yalçın Ö. Türkiye çocuk ve genç psikiyatrisi derneği covid-19 (korona) virüs salgını sırasında aile, çocuk ve ergenlere yönelik psikososyal ve ruhsal destek rehberi. 2020. http://www.cogepder.org.tr/images/covid-19-rehber.pdf.
30. Bonora BM, Boscari F, Avogaro A, Bruttomesso D, Fadini GP. Glycaemic control among people with type 1 diabetes during lockdown for the SARS-CoV-2 outbreak in Italy. *Diabetes Ther*. 2020;11(6):1369-1379. [CrossRef]
31. Brener A, Mazor-Aronovitch K, Rachmiel M, et al. Lessons learned from the continuous glucose monitoring metrics in pediatric patients with type 1 diabetes under COVID-19 lockdown. *Acta Diabetol*. 2020;57(12):1511-1517. [CrossRef]

Supplementary Material 1. Second and Third Part of the Questionnaire

How did COVID-19 pandemic effect the life of your child overall?
- Worsened very much
- Worsened
- No change
- Improved

Do you think that having diabetes increases your child's risk related to COVID-19 infection?
- Yes
- No

How is your child's mood nowadays? (you can select more than one)
- Bored
- Sad
- Restless
- Anxious
- Happy
- Exhausted
- Excited
- Frightened

How has your child's daily routine changed?
- Worsened much
- Worsened
- No change
- Improved

How has your child's duration of daily screen time changed?
- Increased a lot
- Increased a little
- No change
- Decreased a little
- Decreased a lot

How has your child's duration of daily reading time changed?
- Increased a lot
- Increased a little
- No change
- Decreased a little

How has your child's duration of weekly physical activity time changed?
- Increased a lot
- Increased a little
- No change
- Decreased a little
- Decreased a lot

How much was your child's daily screen time per day before pandemic?

.....

How much is your child's daily screen time per day after pandemic?

.....

How many hours a week did your child exercise, dance or actively play on average before pandemic?

.....

How many hours a week does your child exercise, dance or actively play on average after pandemic?

.....

How many hours in total did your child spend in a day sitting and without getting up before pandemic?

.....

How many hours in total do your child spend in a day sitting and without getting up after pandemic?

.....

How has your child's diet compliance changed?
- Worsened much
- Worsened
- No change
- Improved

How has your child's main meal number changed?
- Increased a lot
- Increased a little
- No change
- Decreased a little
- Decreased a lot

How has your child's carbohydrate consumption changed?
- Increased a lot
- Increased a little
- No change
- Decreased a little
- Decreased a lot

How has your child's packaged food consumption changed?
- Increased a lot
- Increased a little
- No change
- Decreased a little
- Decreased a lot

How has your child's snack food consumption changed?
- Increased a lot
- Increased a little
- No change
- Decreased a little
- Decreased a lot

Supplementary Table 1. The Correlation of Scale Scores for Anxiety, Depression and Stress and Daily and Dietary Changes

Correlation Coefficient	RCADS-P (Depression Subscale)	RCADS-P (Anxiety Subscale)	The Perceived Stress Scale In Children	DASS-21 (Depression)	DASS-21 (Anxiety)	DASS-21 (Stress)
Daily routines	-0.08	-0.03	-0.08	-0.08	0.07	-0.08
Duration of daily screen time	0.09	0.18	0.18	0.16	-0.01	0.12
Duration of daily reading time	-0.14	-0.13	-0.24	-0.04	0.04	0.01
Compliance to diet	-0.16	-0.14	-0.23	-0.14	-0.21	-0.18
Main meal number	0.06	0.03	-0.04	-0.01	0.12	0.11
Carbohydrate consumption	0.01	-0.09	0.04	0.10	0.11	0.15
Packaged food consumption	-0.01	0.03	-0.01	0.12	-0.04	-0.01
Snack consumption	0.08	0.20	0.28*	0.27*	-0.03	0.21
Weekly physical activity	-0.08	-0.14	-0.10	0.03	0.04	-0.08

*P = .03; RCADS-P, The Revised Child Anxiety and Depression Scale - Parent Version; DASS-21: The Depression Anxiety Stress Scales 21.
Spearman correlation results, <0.25 very weak correlation; 0.26-0.49 weak correlation; 0.50-0.69 moderate correlation; 0.70-0.89 high correlation; 0.90-1.0 very high correlation.

Supplementary Table 2. The Results of Scales According to Clinically Important Hba1c Change

Scores Median (min-max)	Significant increase in HbA1c (n=12)	Significant decrease in HbA1c (n=17)	no significant change (n=17)	*P*
DASS-21D	2 (0-11)	1 (0-18)	2.5 (0-8)	0.50
DASS-21A	1 (0-11)	1 (0-15)	2 (0-6)	0.88
DASS-21S	3.5 (0-9)	3 (0-16)	3 (0-8)	0.90
RCADS-P (Depression Subscale)	2.5(0-11)	2 (0-11)	3 (0-10)	0.83
RCADS-P (Anxiety Subscale)	12 (7-40)	19 (2-46)	17.5 (2-66)	0.64
The Perceived Stress Scale In Children	11.5 (9-20)	16 (10-28)	13.5 (10-19)	0.09

RCADS-P, The Revised Child Anxiety and Depression Scale - Parent Version; DASS-21, The Depression Anxiety Stress Scales 21.
[a]Mann Whitney U test