



# Frequency of Eating Disorders and Associated Factors in Type 1 Diabetic Adolescents

## Tip 1 Diyabetik Ergenlerde Yeme Bozukluklarının Sıklığı ve İlişkili Faktörler

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### ABSTRACT

**Objective:** Examine the relationship between eating problems, emotional problems, behavioral attitudes about treatment, and adherence to diet in adolescents.

**Methods:** The study was conducted with 132 participants, 60 of whom were in the healthy control group and 72 in the type 1 diabetes mellitus (T1DM) group. Participants were assessed using Children's Depression inventory (CDI), Screen for Child Anxiety Related Disorders (SCARED), and the Eating Attitude test (EAT) self-report scales and a data form.

**Results:** Significant scores for CDI, SCARED, and EAT were higher in the T1DM group than in the control group ( $p<0.01$ ). Patients with lower parent education, separated parents, irregular outpatient follow-up, history of diabetes complications and refusal of insulin injections, and hospitalization in the last 3 months had higher rates of have significant outcomes for CDI and SCARED ( $p<0.05$ ). A significant correlation was found between the person who injected insulin ( $p<0.05$ ) and the child's adherence to diet ( $p<0.01$ ) and the EAT scores being significant. There was a positive correlation between CDI and EAT scores ( $p<0.01$ ).

**Conclusion:** Low parent education, increasing age, strict adherence to a diabetic diet, lack of responsibility for insulin therapy, and depressive symptoms have been associated with an increased risk of eating problems in adolescents. The clinical outcome will improve with identifying risky cases.

**Keywords:** Type 1 diabetes mellitus, adolescent, eating problems, emotional problems

### ÖZ

**Amaç:** Ergenlerde yeme sorunları, duygusal sorunlar, tedaviye yönelik davranışsal tutumlar ve diyetle bağlılık arasındaki ilişkiyi incelemeyi amaçladık.

**Gereç ve Yöntem:** Çalışma sağlıklı kontrol grubunda 60, tip 1 diabetes mellitus (T1DM) grubunda 72 olmak üzere toplam 132 katılımcı ile gerçekleştirilmiştir. Katılımcılar Çocuk Depresyon ölçeği (CDI), Çocuk Anksiyete İlişkili Bozukluklar için Tarama (SCARED) ve Yeme Tutum testi (EAT) kişisel bildirim ölçekleri ve veri formu kullanılarak değerlendirildi.

**Bulgular:** CDI, SCARED ve EAT için anlamlı puanlar T1DM grubunda kontrol grubuna göre daha yüksekti ( $p<0,01$ ). Düşük ebeveyn eğitimi, ayrı ebeveynler, düzensiz ayakta tedavi takibi, diyabet komplikasyonları öyküsü ve insülin enjeksiyonlarını reddetme ve son 3 ayda hastaneye yatış olan hastalarda CDI ve SCARED için anlamlı sonuçlara sahip olma oranları daha yüksekti ( $p<0,05$ ). İnsülin enjekte eden kişi ( $p<0,05$ ) ile çocuğun diyetle uyumu ( $p<0,01$ ) ve EAT puanlarının anlamlı olması arasında anlamlı bir ilişki bulundu. CDI ve EAT puanları arasında pozitif korelasyon vardı ( $p<0,01$ ).

**Sonuç:** Düşük ebeveyn eğitimi, artan yaş, diyabetik diyetle sıkı bağlılık, insülin tedavisi için sorumluluk eksikliği ve depresif semptomatoloji, ergenlerde artan yeme sorunları riski ile ilişkilendirilmiştir. Riskli olguların belirlenmesi ile klinik sonuç iyileşecektir.

**Anahtar Kelimeler:** Tip 1 diabetes mellitus, adölesan, yeme problemleri, duygusal problemler

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## INTRODUCTION

Type 1 diabetes mellitus (T1DM) is characterized by insufficient endogenous insulin production. Today, with its increasing prevalence, T1DM is defined as a public health problem in children and adolescents (1). According to the 9th edition of the International Diabetes Federation's Diabetes Atlas, 1.1 million children and adolescents worldwide have a diagnosis of T1DM (2). Because it causes serious complications and leads to a serious reduction in life quality, effective treatment is essential. Treatment of T1DM includes exogenous insulin usage, physical exercise, and a restrictive diabetic diet (3,4). Today, despite advances in T1DM treatment, at least two-thirds of adolescents and young adults have insufficient treatment adherence (3). Besides biological determinants, psychosocial factors have important roles in adherence to the nutritional regimen during adolescence, and stress and psychophysiological processes may result in impaired disease control (5).

Studies on adolescents with T1DM demonstrate that these patients have poorer psychosocial adjustment and higher rates of psychiatric disorders such as anxiety, depression, and eating disorders (ED) compared to healthy peers (6,7). The disease's psychological burden is associated with its chronic course and its treatment requiring frequent invasive procedures and restrictive diet. A restrictive diet in terms of content and timing is a challenging stressor, especially in adolescence, which is characterized by increased autonomy, withdrawal from parental authority, suboptimal impulse control, and increased self-focus in body appearance (8,9).

ED are behavioral conditions characterized by severe and persistent ailments in eating behaviors and associated distressing thoughts and emotions about eating, weight, and shape or their control. The major risk factors associated with ED are; shape and weight related concerns, family history of ED, dietary restraint, adolescence period, female gender, low self-esteem, and concerns about being underweight (10,11). In T1DM, the standard treatment regimen requires focusing on eating habits that can cause eating concerns.

It has been reported that these factors along with the psychological burden of chronic disease management and depression may lead to ED in adolescents with T1DM (12,13). Commissariat et al. (14) reported that problems in psychosocial adjustment are important causes of eating problems in adolescents with T1DM. However, studies on ED frequency specifically in the adolescence period are limited in number and existing studies show inconsistent results in terms of the association of ED with emotional problems and treatment attitudes in T1DM. Our study

examined the frequency of emotional and eating problems in adolescents diagnosed with T1DM.

## METHODS

Our study is a cross-sectional descriptive study conducted with adolescents diagnosed with T1DM in the Pediatric Endocrinology Outpatient Clinic. Inclusion criteria were; being at 13-18 years of age, using insulin treatment for at least 6 months, and being volunteered to participate in the study (both participants and their parents). Patients with another chronic disease, genetic/syndromic disease, or severe psychiatric disease (such as autism spectrum disorders, magnetic resonance imaging, psychotic disorder, bipolar affective disorder, substance use disorder) leading to cognitive impairment were not included in the study. Adolescents the ages of 13-18 who applied to the general pediatric outpatient clinics of the same hospital, did not have any chronic diseases and agreed to participate in the study were included as the control group. The study was conducted with 132 participants, 72 in the T1DM group and 60 in the control group. Participants were assessed using a data form and self-report scales which were Children's Depression inventory (CDI), Screen for Child Anxiety Related Disorders (SCARED), and the Eating Attitude test (EAT).

### Data Collection Tools

1. Data form: It contains questions related to sociodemographic information including the age, gender, education level of the parents, socioeconomic level of the adolescent, as well as questions about the disease and its treatment. The duration of the disease diagnosis, the presence of complications, hospitalization, who administered the insulin, adherence to the diet, insulin rejection, and inability to make insulin were asked. During the patient's clinical interview, information was recorded on the data form.

2. CDI: It is a self-assessment scale with 27 items developed by Kovacs (15). Each item is scored between 0 and 2. Higher scores indicate high levels of depression. Its Turkish validity and the reliability study was done by Oy (16). Scores of at least 19 indicate significant scores for depression.

3. SCARED-Child form: This self-report scale consisting of 41 items was developed by Birmaher et al. (17) to screen childhood anxiety disorders. Its Turkish validity and the reliability study was conducted by Cakmakci (18). The total anxiety score is also obtained from the scale, which has different subscales such as phobic anxiety, social anxiety, separation anxiety, pervasive anxiety, and school-related anxiety. Higher scores on the scale indicate higher anxiety

symptom levels. Scores of at least 25 indicate significant scores for anxiety.

4. EAT: It is a six-point likert-type self-report scale developed to evaluate possible eating behavior in individuals with and without EDs. It was developed by Garner and Garfinkel (19). It includes 40 items. It is thought to be a good screening tool for eating behavior disorders. The total score is directly related to the level of psychopathology. In other words, EAT can determine individuals who can be considered “patients” at the clinical level, as well as an indicator of how susceptible they are to this disorder. Significant scores for EDs are those above 30. A Turkish validity and reliability study of the scale was conducted by Savasir and Erol (20).

Ethics Statement: The questionnaire and methodology for this study the decision number 2020-22-32 (date: 02.11.2020) were obtained from the Ethics Committee of University of Health Sciences Türkiye, Bakırköy Dr. Sadi Konuk Training and Research Hospital. Written and verbal consent was obtained from all participants and their parents. The authors assert that all procedures contributing to this work comply with the ethical standards in University of Health Sciences Türkiye, Bakırköy Dr. Sadi Konuk Training and Research Hospital and the Helsinki Declaration of 1975, as revised in 2008. The participants’ consent to participate in the study was requested personally from each individual.

### Statistical Analysis

The Number Cruncher Statistical System 2007 (Kaysville, Utah, USA) program was used for statistical analysis. Descriptive statistical methods (mean, standard deviation, median, frequency, ratio, minimum, maximum) were used while evaluating the study data. The suitability of quantitative data to a normal distribution was tested by Kolmogorov-Smirnov, Shapiro-Wilk test and graphical evaluations. Student's t-test was used for two-group comparisons of quantitative data with normal distribution, and Mann-Whitney U test was used for two-group comparisons of data that did not show normal distribution. In comparison of qualitative data, Pearson chi-square test, Fisher’s Exact test, Fisher-Freeman-Halton Exact test were used. Spearman’s correlation analysis was used to evaluate the relationships between variables. Significance was assessed at least at  $p < 0.05$  level.

## RESULTS

The study was completed with 132 participants with 13-18 years of age, of whom 60 were healthy controls and 72 were with T1DM. In the T1DM group, the average age was 14.72 years and 61.1% were girls. Groups were similar in terms of

age, gender, and familial characteristics of the participants. The demographic characteristics of the groups about themselves and their families are presented in Table 1.

Findings related to clinical characteristics of the participants in the T1DM group showed that; 36.1% (n=26) had irregular outpatient clinic follow-up, 16.7% (n=12) had no diet adherence at all, and 30.5% refused insulin injections at least rarely. In 27.8% (n=20) of participant, insulin injections were being done by only parents. The distribution of characteristics of the participants in the DM group regarding the disease and its treatment is presented in Table 2.

In the DM-group; examination of the relationship between sociodemographic data and the obtaining significant scores from scales showed that there were statistically significant relationships between SCARED and family type ( $p=0.003$ ); between CDI and family type ( $p=0.001$ ) and paternal education ( $p=0.036$ ); between EAT and age ( $p=0.037$ ), maternal education ( $p=0.011$ ) and paternal education ( $p=0.025$ ) (Table 3).

In the DM group participants, the ratios of getting significant scores from SCARED and CDI were higher in patients who rejected insulin injections, who had irregular outpatient follow-ups, and who were hospitalized for diabetes in the previous 3 months ( $p < 0.05$ ). In addition, the ratio of getting significant scores from CDI was higher in those with diabetes complications compared to others ( $p=0.023$ ;  $p < 0.05$ ). In the DM group, getting significant scores from EAT was related to the person who made the insulin injections ( $p=0.017$ ;  $p < 0.05$ ) and the child’s diet adherence ( $p=0.001$ ;  $p < 0.01$ ). The ratio of getting significant scores from EAT was lower among the participants who made their own insulin injections and higher among those who always adhered to a diabetic diet (Table 4).

The groups were compared according to the scores of the scales. In the T1DM group, scores of all scales (except for SCARED-PA and SCARED-SA) and rates of getting significant scores from all scales were significantly higher compared to the control group ( $p < 0.05$ ). In the DM group, EAT scores showed a weak statistically significant positive correlation with CDI scores ( $r=0.309$ ;  $p=0.008$ ;  $p < 0.01$ ) but not with SCARED scores ( $p > 0.05$ ).

## DISCUSSION

We examined emotional and eating problems in adolescents with T1DM diagnosis and found that compared to their healthy peers, these adolescents had more emotional and eating problems. Refusing insulin injections and having irregular outpatient follow-up, recent hospitalization, and

**Table 1.** Evaluation of demographic characteristics according to groups

		T1DM-group (n=72)	Control group (n=60)	p
		n (%)	n (%)	
Age (year)	Min-max (median)	13-17 (14.5)	13-18 (14)	<sup>a</sup> 0.808
	Mean $\pm$ SD	14.72 $\pm$ 1.25	14.78 $\pm$ 1.57	
Gender	Girl	44 (61.1)	30 (50.0)	<sup>b</sup> 0.200
	Boy	28 (38.9)	30 (50.0)	
Family type	Nuclear	62 (86.1)	44 (73.3)	<sup>b</sup> 0.102
	Extended	4 (5.6)	10 (16.7)	
	Parental separation	6 (8.3)	6 (10.0)	
Monthly family income	At minimum wage	16 (22.2)	16 (26.7)	<sup>b</sup> 0.876
	Minimum wage-4000 TL	26 (36.1)	21 (35.0)	
	4000-5000 TL	18 (25.0)	12 (20.0)	
	$\geq$ 5000 TL	12 (16.7)	11 (18.3)	
Maternal educational level	At or below primary school	36 (50.0)	25 (41.7)	<sup>b</sup> 0.369
	Secondary education	32 (44.4)	28 (46.7)	
	University	4 (5.6)	7 (11.7)	
Paternal educational level	At or below primary school	38 (52.8)	29 (48.3)	<sup>b</sup> 0.867
	Secondary education	28 (38.9)	26 (43.3)	
	University	6 (8.3)	5 (8.3)	

<sup>a</sup>Student's t-test, <sup>b</sup>Pearson chi-square test, Min-max: Minimum-maximum, SD: Standard deviation, TL: Turkish liras, T1DM: Type 1 diabetes mellitus

diabetes complications, which indicated lower disease management, were associated with increased emotional problems. Besides increasing age, lower parent education, lack of responsibility for insulin therapy, strict adherence to diabetic diet and depressive symptoms were associated with increased risk for eating problems in these adolescent patients.

Khandelwal et al. (5), in their case-control study showed that the prevalence of psychosocial problems in children and adolescents (6-14 years) with T1DM was 55.95%, and this rate was almost three times higher than their healthy peers. The authors report that among patients 36.9% had a depression; 32.1% had anxiety. Another cross-sectional study involving adolescents and young adults (11-25 years) similarly showed higher ratios of depression (11.3%) and anxiety (21.3%) compared with healthy controls (21). In a recent review, 14 studies on children and adolescents were examined and confirmed that T1DM is associated with high depression and anxiety symptoms (22). It is estimated that T1DM in adolescents is associated with a twice risk of depression (7). Similar to these studies, we showed higher anxiety (52.8%) and depression (36.1%) ratios in T1DM adolescents compared to healthy controls (21.7%, 8.3%, respectively).

**Table 2.** Distribution of disease characteristics in the diabetes mellitus-group

Disease characteristics (n=72)		n (%)
Complications	Absent	64 (88.9)
	Present	8 (11.1)
Hospitalization due to diabetes in the previous 3 months	Absent	60 (83.3)
	Present	12 (16.7)
Regular follow-up	Absent	26 (36.1)
	Present	46 (63.9)
Person who makes he insulin injections	Patient himself/herself	44 (61.1)
	Parents	20 (27.8)
	Mixed	8 (11.1)
Child's diet adherence (depending on parental report)	Never	12 (16.7)
	Sometimes	34 (47.2)
	Generally	18 (25.0)
Adolescents' rejection of the insulin injections (depending on parental report)	Always	8 (11.1)
	Never happens	50 (69.4)
	Rarely	8 (11.1)
	Sometimes	14 (19.4)

**Table 3.** In DM-group: Examination of the relationship between demographic characteristics and the status of having significant scores of SCARED, CDI and EAT

		T1DM-group (n=72)					
		Significant score for SCARED		Significant score for CDI		Significant score for EAT	
		Present	Absent	Present	Absent	Present	Absent
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Age (year)	Mean ± SD	14.89±1.31	14.53±1.16	15.00±1.13	14.57±1.29	15.18±1.14	14.52±1.25
	p	<sup>a</sup> 0.217		<sup>a</sup> 0.157		<sup>a</sup> 0.037*	
Gender	Girl	26 (59.1)	18 (40.9)	18 (40.9)	26 (59.1)	14 (31.8)	30 (68.2)
	Boy	12 (42.9)	16 (57.1)	8 (28.6)	20 (71.4)	8 (28.6)	20 (71.4)
	<b>p</b>	<b><sup>b</sup>0.228</b>		<b><sup>b</sup>0.288</b>		<b><sup>b</sup>0.774</b>	
Family type	Nuclear	32 (51.6)	30 (48.4)	20 (32.3)	42 (67.7)	22 (35.5)	40 (64.5)
	Extended	0 (0)	4 (100)	0 (0)	4 (100)	0 (0)	4 (100)
	Parental seperation	6 (100)	0 (0)	6 (100)	0 (0)	0 (0)	6 (100)
	<b>p</b>	<b><sup>d</sup>0.003**</b>		<b><sup>d</sup>0.001**</b>		<b><sup>d</sup>0.087</b>	
Family income	At minimum wage	6 (37.5)	10 (62.5)	2 (12.5)	14 (87.5)	6 (37.5)	10 (62.5)
	Minimum wage-4000 TL	16 (61.5)	10 (38.5)	10 (38.5)	16 (61.5)	4 (15.4)	22 (84.6)
	4000-5000 TL	10 (55.6)	8 (44.4)	8 (44.4)	10 (55.6)	6 (33.3)	12 (66.7)
	≥5000 TL	6 (50.0)	6 (50.0)	6 (50.0)	6 (50.0)	6 (50.0)	6 (50.0)
	<b>p</b>	<b><sup>b</sup>0.495</b>		<b><sup>b</sup>0.140</b>		<b><sup>d</sup>0.128</b>	
Maternal education	At or below primary education	18 (50)	18 (50.0)	12 (33.3)	24 (66.7)	16 (44.4)	20 (55.6)
	At or above secondary education	20 (55.6)	16 (44.4)	14 (38.9)	22 (61.1)	6 (16.7)	30 (83.3)
	<b>p</b>	<b><sup>b</sup>0.637</b>		<b><sup>b</sup>0.624</b>		<b><sup>b</sup>0.011*</b>	
Maternal education	At or below primary education	22 (57.9)	16 (42.1)	18 (47.4)	20 (52.6)	16 (42.1)	22 (57.9)
	At or above secondary education	16 (47.1)	18 (52.9)	8 (23.5)	26 (76.5)	6 (17.6)	28 (82.4)
	<b>p</b>	<b><sup>b</sup>0.358</b>		<b><sup>b</sup>0.036*</b>		<b><sup>b</sup>0.025*</b>	

<sup>a</sup>Student's t-test, <sup>b</sup>Pearson chi-square test, <sup>d</sup>Fisher-Freeman-Halton Exact test, \*p<0.05, \*\*p<0.01, SD: Standard deviation, TL: Turkish liras, T1DM: Type 1 diabetes mellitus, CDI: Children's Depression inventory, SCARED: Screen for Child Anxiety Related Disorders, EAT: Eating Attitude test

These ratios are even higher than those reported in previous studies. We think that the most important reason for these higher rates are because our study included only adolescents, not the children. Adolescence is the last period of childhood; in which the child has weaker impulse control, more oppositional behavior, and refuses external parental control. Therefore, diabetes management becomes more difficult and deterioration in treatment adherence is more evident in the adolescence period. As a matter of fact, we found that a significant portion of the patients participating in our study had no regular clinic follow-ups and in a significant portion diet adherence was poor, which indicates their poor

disease management. Disease management is important for the prognosis of the disease. Any difficulty in adaptation to disease and its treatment leads to deterioration in this process. In T1DM, disease management itself is reported to cause additional problems in the form of emotional and psychological difficulties (3). Managing T1DM in the presence of anxiety is challenging. In our study, we found that emotional problems were more common in adolescents with T1DM. Moreover, those who refused insulin injections, had irregular follow-ups, diabetes complications, and were recently hospitalized had higher emotional problems. In other words, we showed that those with poor diabetes

**Table 4.** In the patient group; examination of the relationship between disease characteristics and the status of having significant scores of SCARED, CDI and EAT

		DM-group (n=72)					
		Significant score for SCARED		Significant score for CDI		Significant score for EAT	
		Present	Absent	Present	Absent	Present	Absent
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Person who makes he insulin injections	Patient himself/herself	22 (50.0)	22 (50.0)	16 (36.4)	28 (63.6)	8 (18.2)	36 (81.8)
	Parents	12 (60.0)	8 (40.0)	4 (20.0)	16 (80.0)	10 (50.0)	10 (50.0)
	Mixed	4 (50.0)	4 (50.0)	6 (75.0)	2 (25.0)	4 (50.0)	4 (50.0)
	<b>p</b>	<sup>a</sup> <b>0.781</b>		<sup>b</sup> <b>0.024*</b>		<sup>b</sup> <b>0.017*</b>	
Child's diet adherence (depending on parental report)	Never	8 (66.7)	4 (33.3)	8 (66.7)	4 (33.3)	2 (16.7)	10 (83.3)
	Sometimes	16 (47.1)	18 (52.9)	10 (29.4)	24 (70.6)	6 (17.6)	28 (82.4)
	Generally	12 (66.7)	6 (33.3)	6 (33.3)	12 (66.7)	6 (33.3)	12 (66.7)
	Always	2 (25.0)	6 (75.0)	2 (25.0)	6 (75.0)	8 (100)	0 (0)
	<b>p</b>	<sup>a</sup> <b>0.162</b>		<sup>d</sup> <b>0.134</b>		<sup>e</sup> <b>0.001**</b>	
Adolescents' rejection of the insulin injections (depending on parental report)	Never happens	18 (36.0)	32 (64.0)	12 (24.0)	38 (76.0)	18 (36.0)	32 (64.0)
	Rarely	8 (100)	0 (0)	6 (75.0)	2 (25.0)	0 (0)	8 (100)
	Sometimes	12 (85.7)	2 (14.3)	8 (57.1)	6 (42.9)	4 (28.6)	10 (71.4)
	<b>p</b>	<sup>b</sup> <b>0.001**</b>		<sup>d</sup> <b>0.004**</b>		<sup>e</sup> <b>0.113</b>	
Regular follow-up	Absent	18 (69.2)	8 (30.8)	16 (61.5)	10 (38.5)	6 (23.1)	20 (76.9)
	Present	20 (43.5)	26 (56.5)	10 (21.7)	36 (78.3)	16 (34.8)	30 (65.2)
	<b>p</b>	<sup>b</sup> <b>0.036*</b>		<sup>b</sup> <b>0.001**</b>		<sup>b</sup> <b>0.300</b>	
Copications	Absent	32 (50.0)	32 (50.0)	20 (31.3)	44 (68.8)	18 (28.1)	46 (71.9)
	Present	6 (75.0)	2 (25.0)	6 (75.0)	2 (25.0)	4 (50.0)	4 (50.0)
	<b>p</b>	<sup>a</sup> <b>0.267</b>		<sup>a</sup> <b>0.023*</b>		<sup>a</sup> <b>0.237</b>	
Hospitalization due to diabetes in the previous 3 months	Absent	28 (46.7)	32 (53.3)	14 (23.3)	46 (76.7)	20 (33.3)	40 (66.7)
	Present	10 (83.3)	2 (16.7)	12 (100)	0 (0)	2 (16.7)	10 (83.3)
	<b>p</b>	<sup>b</sup> <b>0.020*</b>		<sup>e</sup> <b>0.001**</b>		<sup>e</sup> <b>0.322</b>	

<sup>a</sup>Student's t-test, <sup>b</sup>Pearson chi-square test, <sup>c</sup>Fisher-Freeman-Halton Exact test, <sup>d</sup>Fisher's Exact test, \*p<0.05, \*\*p<0.01  
 CDI: Children's Depression inventory, SCARED: Screen for Child Anxiety Related Disorders, EAT: Eating Attitude test

management had a higher risk of emotional problems. This finding, which shows the relationship between emotional problems and poor disease management, supports the literature knowledge. Another important finding on the emotional state of these adolescents was that those with separate parents and low parental education had more emotional problems. Childhood adversities are important risk factors for psychopathology. Our findings related to family characteristics drew attention to the importance of the evaluation of adolescents with their families, not alone, in their clinical follow-ups. If negative familial factors are identified, early interventions will be valuable

for the psychosocial and so for the physical health of the adolescent.

Eating problems are increased in T1DM patients (12,13). Bernstein et al. (21) reported that among T1DM patients 20.7% had irregular eating attitudes. Scheuing et al. (23) demonstrated that among 52,215 patients with diabetes 467 had clinical ED diagnosis. In our study, the eating problem was significantly higher in adolescents diagnosed with T1DM compared with their healthy peers. Almost one-third of the cases had eaten problems. Our finding related to the association of eating problems with some sociodemographic factors was striking. Eating problems



were similar to ratio in both genders but were increasing in frequency with age and were associated with low parental education level. In general, disordered eating symptoms are more common in girls, especially between the ages of 13 and 14 for girls and over 16 for boys (13,24). In T1DM, female gender and increasing age have been reported to be associated with increased risk of irregular eating behavior (25). In the presence of T1DM, there is an excessive family focus on food and weight (12). This excessive mental focus on food and feeding and weight is among the major risk factors for EDs. Our finding related to parental education level is contrary to the literature. In the general population, ED is more common in patients with higher educational levels. In particular, poorer communication with parents and poorer trust relationships were reported among girls with T1DM than those with EDs (26). We thought that the relationship between low parental education and eating problems may be due to an indirect link; low parental educational level may cause negative consequences such as problems in parent-adolescent communication, conflict, and low parental involvement in the care of adolescents, which further lead to eating problems in our participants.

The last important finding of this study showed that adolescents with T1DM had a higher risk for eating problems compared with their healthy peers. Besides, depressive mood, strict adherence to diet, and not taking the primary responsibility for insulin injections were the associated factors for this increased risk. We think that there may be various reasons why T1DM carries an extra risk in terms of EDs in adolescence. T1DM management requires focusing on timing and content of meals and calori monitoring. Inappropriate approaches in this, by health services or parents, may predispose the patient to malfunctioning eating patterns. Because in the etiopathogenesis of ED there is over focusing on body image and appearance and preoccupations with content and calori of meals are the main symptoms. It has been shown that higher levels of health and food-related anxiety may lead to ED. Similarly, psychiatric disorders such as depression and anxiety are risk factors for ED in T1DM-diagnosed adolescents (13,24). In particular, early recognition and treatment of emotional problems will enable early handling of EDs, which makes diabetes management more difficult. The fact that eating problems are higher in those with strict diet compliance draws attention to the presence of food and diet-related concerns that these patients and their parents frequently experience.

There are certain limitations to our study. Not evaluating the height, weight, and body mass indexes of the adolescents

included in the study and the eating behaviors of their families can be stated as a limitation.

## CONCLUSION

Treatment of T1DM requires adherence to medication and diet. However, the chronic course of T1DM, including a restricted diet and frequent interventional procedures, may cause difficulties for the patient in a psychosocial context. This study demonstrated that T1DM adolescents are at high risk for EDs and emotional problems. Further analysis showed that increasing age, lower parent education, lack of responsibility for insulin therapy, strict adherence to diabetic diet and depressive symptoms were the associated risks for ED in T1DM. EDs should be given extra attention for T1DM because its treatment is diet dependent and any difficulty in the diet will worsen the patients clinic. Therefore, the awareness of these factors in clinical settings is important. In the clinical follow-up of adolescents with T1DM, it is important to assess their emotional state, eating habits, and attitudes apart from physical well-being and laboratory findings. Besides pediatric professionals, primary healthcare providers can provide close monitoring and support to adolescents with diabetes. Early screening for psychiatric comorbidity in chronic diseases and regular follow-up from diagnosis is necessary for the clinical outcome of the disease. In T1DM adolescents, it is important to direct the cases at risk in terms of emotional and eating problems to mental health specialists as soon as possible.

## ETHICS

**Ethics Committee Approval:** The questionnaire and methodology for this study the decision number 2020-22-32 (date: 02.11.2020) were obtained from the Ethics Committee of University of Health Sciences Türkiye, Bakırköy Dr. Sadi Konuk Training and Research Hospital.

**Informed Consent:** Written and verbal consent was obtained from all participants and their parents.

## Authorship Contributions

Surgical and Medical Practices: Ö.P., S.Y., E.P.Ç., Concept: Ö.P., S.Y., E.P.Ç., Design: Ö.P., S.Y., E.P.Ç., Data Collection or Processing: Ö.P., S.Y., E.P.Ç., Analysis or Interpretation: Ö.P., S.Y., E.P.Ç., Literature Search: Ö.P., S.Y., E.P.Ç., Writing: Ö.P., S.Y., E.P.Ç.

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