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The Prevalence of Anxiety and Depression in Children with Type 1 Diabetes Mellitus and Their Effects on Metabolic Control

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ABSTRACT

Objective: Chronic diseases affect the quality of life negatively. Parents' mental problems and their coping methods, may play a role on the behavior of children and adolescents.

The aim of the study is to determine the anxiety and depression status of children and adolescents with type 1 DM, and to investigate their relationship with metabolic control.

Methods: Forty-three patients between 6 and 17 years old with type 1 DM were included in this prospective study. Metabolic and clinical data of cases were retrospectively collected. Questionnaire forms were used for demographic data. Individual and family interviews were made by pediatric and adult psychiatrist. State-Trait Anxiety Inventory (STAI), Child Depression Inventory (CDI) and Beck Depression Scale (BDS) were used to determine depression and anxiety rates.

Results: Depression was detected in 2.3 %, state anxiety in 23.2 % and trait anxiety in 25.5 % of the children with type 1 DM. Mild depression was detected in 24.4 %, moderate depression was detected in 6.9 % of mothers. There was a state anxiety in 7.3 %, trait anxiety in 11.6 % of the mothers. There was a significant correlation between the depression, STAI scores of mothers and children. It was found that an increase in depression scale point of child, affected trait anxiety score of mother (OR: 1.2, CI: 1.01-1.49), (p=0.02).

Conclusion: Mental health condition is usually unnoticed in daily practice while monitoring T1 DM. Validated and efficient strategies are needed to screen and treat anxiety and depression symptoms in children and adolescents with T1 DM.

Keywords: Anxiety, depression, type 1 diabetes

ÖZ

Tip 1 Diabetes Mellituslu Çocuklarda Kaygı ve Depresyon Sıklığı ve Bunların Metabolik Kontrole Etkisi

Amaç: Kronik hastalıklar yaşam kalitesini olumsuz yönde etkilemektedir. Ailelerin kronik hastalık ile baş etme yöntemleri ve ruhsal sorunları, çocuk ve ergenlerin davranışların özelliklerinde rol oynayabilir.

Yöntem: Prospektif olarak yapılan çalışmaya, 6-17 yaş arasında Tip 1 diabet tanılı 43 olgu alınmıştır. Olguların metabolik ve klinik verileri geriye dönük olarak toplanmıştır. Demografik veriler için anket formları doldurulmuştur. Bireysel görüşme ve aile görüşmeleri, çocuk ve yetişkin psikiyatristleri tarafından yapılmıştır. Depresyon ve kaygı değerlendirmeleri Durumluluk-Süreklilik Kaygı Ölçeği (DSKÖ), Çocuklar için Depresyon Ölçeği (ÇDÖ) ve Beck Depresyon Ölçeği (BDÖ) ile yapılmıştır.

Bulgular: Tip 1 diyabetli çocukların %2,3'ünde depresyon, %23,2'sinde durumluluk kaygı, %25,5'inde süreklilik kaygı düzeyi yüksek saptanmıştır. Annelerin %24,4'sinde ılımlı, %6,9'unda orta derecede depresyon tespit edilmiştir. Annelerin %7,3'ünde durumluluk kaygı, %11,6'sında süreklilik kaygı düzeyi yüksek bulunmuştur. Anne ve çocukların, depresyon, DSKÖ skorları arasında anlamlı ilişki bulunmuştur. Çocuğun depresyon skorundaki artışın, annenin süreklilik kaygı skorunu etkilediği saptanmıştır (OR: 1.2, CI: 1.01-1.49), (p=0.02).

Sonuç: Tip 1 diyabetli olguların izleminde ruhsal sağlık durumu genellikle gözardı edilmektedir. Tip 1 diyabetli çocuk ve ergenlerde, kaygı ve depresyonun taranması ve tedavi edilmesi için doğrulanmış ve etkin yöntemlere ihtiyaç vardır.

Anahtar Sözcükler: depresyon, kaygı, tip 1 diyabet

INTRODUCTION

Psychological problems are frequently seen in individuals with chronic conditions.[1-5] In many studies, it has been stated that the possibility of presence of more than one mental disorder in adolescents and young people with type 1 DM was high.[6,7] Difficulties such as monitoring blood glucose, insulin injection, diet which may not be easily tolerated by children affect quality of life.[8,9] With the impact of type 1 DM on the quality of life of the child and family problems are observed in intra-familial relations and the attitudes and coping skills of parents seem to be associated with psychopathologies in children.[10] Otherwise complications secondary to diabetes may also cause psychopathology.[11] Most studies are focused depression.[1-4] Depressive symptoms were reported in approximately 20 % of adolescents with type 1 DM, and this is 2-3 times more frequent compared to general adolescent population.[12] Depressive symptoms and anxiety have been associated with poor glycemic control and inadequate-irregular treatment.[4,13-16]

Anxiety affects the management of type 1 DM treatment and glycemic control. [15,16] Studies conducted on parents, found that the underlying causes for anxiety disorder in parents were problems in compliance with treatment by the children and poor glycemic control.[17] On the other hand it has been observed that fear of hypoglycemia increased anticipation anxiety.[18,19] When arranging treatment for children with type 1 DM, mental disorders may be unnoticed. This affects the prognosis of treatment. The aim of the study is to investigate the anxiety and depressive symptoms of children with type 1 DM and the relationship of these psychopathologies with metabolic control. We want to verify our clinic observation and compare our results with the existing literature. Additionally, we want to raise the awareness of mental health conditions which are usually neglected in daily practice and to expand the already existing data.

Table 1. Clinical Characteristics and Scores of Scales of the Cases and Mothers

	Mean	SD	Minimum	Maximum
Age (year)	12.51	2.98	6	17.9
Diabetes Duration (years)	4.4	2.4	0.9	12.9
Mean HbA1c (%)	8.4	1.4	5.5	13
Blood Glucose Monitoring Frequency Per Day	5.6	1.9	2	12
Mother's Age (years)	39.2	5.7	24	52
Father's Age (years)	43.4	6.9	25	60
STAI-I	36.1	12.3	20	71
STAI-II	40.6	11.3	22	72
BDS	8.41	8.3	0	41
STAIC-I	32.6	9.3	21	53
STAIC-II	35.7	9.01	21	62
CDI	7	5.53	0	24

STAI-I = State Anxiety Inventory; STAI-II = Trait Anxiety Inventory; BDS = Beck Depression Scale; STAIC-I = State Anxiety Inventory for Children; STAIC-II = Trait Anxiety Inventory for Children; CDI = Children Depression Inventory.

METHODS

The study was carried out with the written permission of the Ethics Committee of Pamukkale University (10.01.2017/01). Patient enrollment was started after the approval of the committee. Informed written consent was obtained from the parents.

Study was conducted in State hospital of Denizli. Participation in the study was entirely voluntary. Total 43 cases who were followed in Pediatric Endocrinology unit with the diagnosis of type 1 DM and their mothers have been enrolled in the study. Metabolic control and clinical parameters of cases have been completed retrospectively from their files. Questionnaire forms were used for demographic data. While central provinces and counties were accepted as urban, village and town settlements were accepted as rural settlements. Working group has been divided into subgroups with respect to;

i. Gender (female vs male)

ii. Puberty status (prepubertal vs pubertal)

iii. Metabolic control (good vs moderate/poor (mean HbA1c of the last one year ≤ 7.5% vs > 7.5%))

iv. Level of income (low vs normal, considering the poverty limit, reported by Turkey Statistics Institution for 2017)

v. Presence of family history of chronic diseases

vi. Parents' educational status (high and/or higher school vs secondary and/or lower school education)

Severe hypoglycemic attack was defined as a hypoglycemic attack, requiring assistance by another person. After Pediatric Endocrinology clinic assessment, patients were referred to Child and adolescent psychiatry clinic and patient and family interviews were made by child and adolescent psychiatrist. State-Trait Anxiety Inventory for Children (STAIC) and Child Depression Inventory (CDI) were applied. Concurrently, mothers were given State-Trait Anxiety (STAI I and II) and Beck Depression Scale (BDS).

Table 2. Clinical and Social Characteristics of the Cases and Parents

	Number (n)	Percent (%)
Clinical Diagnosis (n=31)		
Incidental Hyperglycemia	4	12.9
Ketosis	14	45.2
DKA	13	41.9
Pubertal Status at the Time of Diagnosis (n=43)		
Pre-pubertal	31	72.1
Pubertal	12	27.9
Chronic Disease in Children (n=43)		
Absent	36	87.3
Present	7	16.3
Hospitalization due to Diabetes after Diagnosis (n=42)		
Absent	13	31
Present	29	69
Symptomatic Severe Hypoglycemia Attack (n=42)		
Absent	34	19
Present	8	81
Place of Residence (n=42)		
Rural	10	23.8
Urban	32	76.2
Economical Situation (n=40)		
Low Income Level	34	85
Normal Income Level	6	15
Educational Levels of the Mother		
High School / University	16	
Secondary / Primary School	27	
Educational Levels of the Father		
High School / University	19	
Secondary / Primary School	24	

DKA = Diabetic Ketoasidosis.

Table 3. Comparison of the Children with High Anxiety Level and Low Anxiety Levels with Respect to Clinical and Sociodemographic Characteristics

	STAIC-I and STAIC-II Score High (n=8)	STAIC- I and STAIC-II Score Normal (n=35)	p
Age	45 (4.8-13.32)	7.0 (5.8-9.5)	0.95
Diabetes Duration	2.95 (2.1-6.8)	4.5 (3.3-6.0)	0.95
HbA1c mean (%)	7.8 (7.5-8.7)	8.3 (7.5-9.2)	0.69
Number of Daily BG Measurements	5 (4.2-6.5)	5 (4-6.5)	0.54
Age of Mother	41(40-41.7)	39 (36.2-42)	0.20
Age of Father	45 (38.7-45)	43.5 (40-47)	0.91
Clinical Diagnosis (n=31)			0.90
Ketosis (14)	3	11	
DKA (13)	4	9	
Coincidently (4)	1	3	
Pubertal Condition at the Time of Diagnosis (n=43)			0.19
Pre-pubertal (31)	4	27	
Pubertal (12)	4	8	
Metabolic Control (n=38)			
Fine (6)	1	5	0.77
Mid-bad (32)	7	25	
Additional Chronic Disease (n=43)			0.26
Present (7)	2	5	
Absent (36)	6	30	
Post-diagnosis Hospitalization due to Diabetes (n=42)			
Present (13)	3	10	0.58
Absent (29)	5	24	
Symptomatic Severe Hypoglycemia Attack (n=42)			0.60
Present (8)	1	7	
Absent (34)	7	27	
Economical Situation (n=35)			0.32
Low Income Level (30)	6	24	
Normal Income Level (5)	2	3	
STAI-I	49 (40-51)	30 (24.5-45)	0.01
STAI-II	49 (45-49)	36.5 (31-43.5)	0.05
BDI	14 (6-21)	5 (2-9)	0.4

STAI-I = State Anxiety Inventory; STAI-II = Trait Anxiety Inventory; BDS = Beck Depression Scale; DKA = Diabetic Ketoasidosis. Values are given as median (interquartile range)

Child Depression Inventory (CDI)

This scale developed by Kovacs is used to measure the level of depression in children. It is a self-assessment scale and can be applied to children and adolescents between the ages of 6-17. The scale consists of 27 items in total. In each item, there are three sentences for the child to choose between, evaluating the last two weeks. Each set of sentences contains statements about the symptoms of childhood depression. The scale can be filled in by reading it to the child or by the child herself/himself. The child is asked to evaluate her/his situation in the last two weeks and choose the most appropriate sentence among three options. Points between 0 and 2 are given to the answers given. The depression score is obtained by adding these scores. The highest score that can be obtained from the scale is 54. The higher the total score, the higher the severity of the depression level. Suggested cut-off point was 19 (20). A validity-safety test has been conducted by Öy in Turkey. The Cronbach's alpha factor of the scale .77. The test-retest reliability value was found to be .80 (21).

State-Trait Anxiety Inventory for Children (STAIC)

This self-report scale consists of two subscales, measuring state and trait anxiety. The scale provides Likert type measurement. Trait Anxiety scale consists of 20 items. The child is asked to evaluate how he / she "usually" feels, and to specify the most appropriate option according to the frequency of the situation given in the item. Choosing the "often" option among the options selected as "almost never", "sometimes" and "often" for each situation results in the highest score of 3, and the option of "almost never" leads to the lowest score 1. In the State Anxiety Scale, children are asked to evaluate how they feel in the "moment" they are in and choose one of the 3 related options. The highest score that can be obtained from the Trait Anxiety scale and State Anxiety scale is 60 and the lowest score is 20. [22] Validation and reliability studies in Turkish have been conducted by Özusta. The Cronbach's alpha factor of the state anxiety scale was .82, and the trait anxiety scale was .81. [23]

Beck Depression Scale (BDS)

This self-report scale consists of 21 items and is indicative of presence of depressive symptoms over a score of 17. The scale provides a four-point Likert type measurement (0- Positive Statements About Depression, 3- Negative Statements About Depression). High scores indicate an increase in the severity of depressive complaints. Thus, the total score that can be obtained from this scale varies between 0 and 63.[24] Validation and reliability studies in Turkish have been conducted by Hisli. The Cronbach's alpha factor of the scale .80 [25]

State-Trait Anxiety Inventory (STAI)

State Anxiety Inventory determines how the person feels at a certain moment and certain conditions. Trait Anxiety Inventory determines how the person feels independently from the current state and conditions. The scale consists of 20 items in total and provides a four-point Likert type measurement. (1-almost never, 4- almost always). Total score from both inventories range between 20 to 80. Lower point shows lower level of anxiety and higher point shows higher level of anxiety. Validation and reliability studies in Turkish have been conducted by Öner.[26] The invariance coefficients calculated by the Pearson moments product correlations were found between .71 and .86 for the trait anxiety scale, and .26 and .68 for the state anxiety scale.[27]

Statistical Analysis

Statistical assessments were made using "SPSS (Statistical Package for Social Sciences) for Windows 17.0" program. Data were presented as median (interquartile range) or n (%). Mann-Whitney U-test and $\chi 2$ or Fisher exact test were used to compare numerical and categorical variables, respectively. Spearman relation analysis was used in parametric data in order to assess the sociodemographic, clinical and scale points. Statistical significance limit was defined as $p<0.05$.

RESULTS

A total of 43 cases with type 1 DM, including 29 females (67.4%) and 14 males (32.6%), were enrolled in our study. Clinical characteristics and scores of the scales were given in table 1&2. In seven cases (16.3 %), chronic diseases other than type 1 DM ((thyroiditis (n=3), epilepsy (n=1), atrial septal defect (n=1), neuropathy secondary to Fournier's gangrene (n=1), right hemiparesis secondary to history of cerebral thrombosis (n=1)) were accompanied. When family history for chronic conditions was inquired, seven mothers (16.2 %) had chronic conditions (1 asthma, 1 breast malignity, 4 depression, 1 hypertension) and seven fathers (16.2 %) had chronic conditions (two type 1 DM, three type 2 DM, two hypertension). Depression was detected in 2.3 % (n=1), state anxiety in 23.2 % (n=10) and trait anxiety in 25.5 % (n=11) of the children with type 1 DM. In eight cases (18.6 %), both state and trait anxiety levels were high. According to both scales, no difference was detected between children with high anxiety level and low anxiety level, with respect to clinical and socio-demographic characteristics (Table 3). Mild depression was detected in 24.4 % (n=10), moderate depression was detected in 6.9 % (n=3) of mothers. There was a state anxiety in 7.3 % (n=3), trait anxiety in 11.6 % (n=5) of the mothers. No difference was seen among subgroups (gender, puberty, metabolic control, economical status etc.) with respect to anxiety and depression inventory scales. The rate of trait anxiety in patients with fathers having a chronic disease, was higher compared to those, whose fathers had no chronic disease (p=0.01).

Table 4. Correlation between the Depression, State and Trait Inventory Scores of Mothers and Children

		BDS	STAI-I	STAI-II	STAIC-II	STAIC-II	CDI
BDS	r	-	0.46	0.62	0.39	0.43	0.38
	p	-	0.02	<0.00	0.01	0.008	0.02
STAI-I	r		-	0.75	0.57	0.66	0.64
	p		-	<0.00	<0.00	<0.00	<0.00
STAI-II	r			-	0.68	0.68	0.76
	p			-	<0.00	<0.00	<0.00
STAIC-I	r				-	0.81	0.72
	p				-	<0.00	<0.00
STAIC-II	r					-	0.58
	p					-	<0.00

STAI-I = State Anxiety Inventory; STAI-II = Trait Anxiety Inventory; BDS = Beck Depression Scale; STAIC-I = State Anxiety Inventory for Children; STAIC-II = Trait Anxiety Inventory for Children; CDI = Children Depression Inventory.

There was a significant correlation between the depression, state and trait anxiety inventory scores of mothers and children (Table 4). No correlation was found between age, diabetes duration, HbA1c, average blood glucose measurement and inventory scores. On logistic regression analysis, it was determined that one-point increase in state and trait anxiety score of the child, increased the depression risk of mother (OR: 1.1, CI: 1.01-1.2, p=0.02, OR: 1.1, CI: 1.01-1.24, p=0.03). It was found that increase in depression scale point of child, affected trait anxiety score of mother (OR: 1.2, CI: 1.01-1.49), (p=0.02).

DISCUSSION

In our study, the rate of depressive disorder in children and adolescents with type 1 DM has been found as 2.3% and this was lower than the rates given in literature (12.9-18 %). Adal et al.[28] has determined the depression incidence in children and adolescents with type 1 DM as 12.9%. This difference may be caused by mean age (14.7 years) and high rate of adolescents in that study. [28] In another study, depression incidence in children of 8-12 years of age with type 1 DM, has been determined as 12.3% and similar to our study a correlation has been detected between the depression scores of children and mothers. These differences may be dependent on ethnic characteristics, family structure and lifestyle changes.[10]

State and trait anxiety levels were high in 26.3% and 28.9% of our patients respectively and this was not associated with metabolic control. These rates were higher than the reported ones specified in the literature (13.4-17 %). Similarly, this difference may have been caused by the choice of sample age, pubertal status, sample size, methodological differences and differences in screening methods. And also high levels of anxiety clearly show that, type 1 DM diagnosis could be a risk factor for anxiety disorder.[28,29] In our study consistent with the literature, we found that there was a correlation between child and parent anxiety scores and increase in anxiety score of child, increases the depression risk of mother.[30] It was found that diabetes affected the life of family and caused anxiety, conflicts and also the parents had intensive anxiety concerning the diabetes and long-term complications of diabetes and reflected the same on the children.[31] This conclusion showed that the attitude of parents affected the children.[32]

In our society, the father assumes material responsibilities and the mother mostly stays at home and in hospital with the child and assumes the care of children during the day. Since fathers spend time outside of home, maybe it is easier for them to cope with stress. The mothers of children with chronic conditions experience exhaustion and incompetence more frequently. Therefore they may have increased anxiety levels. In the literature the importance of factors such as the severity of condition of the child, duration, mortality risk, socioeconomic level, educational status of parent, family support and marriage harmony were mentioned in high or low anxiety level of parents[33-35] The rate of high trait anxiety level in children whose fathers have a chronic disease was higher compared to those with healthy fathers. These result also supported our cultural characteristics. In our study, the majority of families (85%) have low socioeconomic level. Since the educational level of mothers was low, most of them didn't work and the father was the provider for family. Mother was responsible to provide care, trust and support for father and children. In case of loss of the provider of the family (the father), the life of child will be affected in many aspects. In particular the presence of a chronic condition in father who plays a great role in subsistence of family, may have increased anxiety level in child.

In our study, no correlation has been found between inventory scores and age, duration of diabetes, mean HbA1c, age of parents, blood glucose measurement frequency. In a study conducted on adolescents with type 1 DM, although a weak correlation had been found between depression scores and HbA1c, after logistic regression analysis, it has been shown that depression score was irrelevant with HbA1c.[28] Similarly, Jaser et al.[10] have stated that HbA1c level did not have an effect on depression scores. Herzer et al.[30] have detected a relationship between anxiety scores and HbA1c, BG measurement frequency, depressive symptoms and have interpreted this result to state that anxiety might have affected metabolic control.

Limitations

Lack of a control group in our study may have prevented a more clear understanding of the risk, posed by type 1 DM for mental disorders. This has been contemplated as one of the restrictions of our study.

Conclusion

The risk of anxiety disorder in children with type 1 DM was high and this was found to be in correlation with the anxiety status of mothers and has been a risk factor for depression of mothers.

During follow-up of patients, more efficient approaches must be considered to mitigate the negative effects of anxiety and depression.

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REFERENCES

1. Grey M, Whittemore R, Tamborlane W. Depression in type 1 diabetes in children: Natural history and correlates. J Psychosom Res 2002;53(4):907-11.

2. Hood KK, Huestis S, Maher A, Butler D, Volkening L, Laffel LMB. Depressive symptoms in children and adolescents with type 1 diabetes: Association with diabetes-specific characteristics. Diabetes Care 2006;29(6):1389-91.

3. Kovacs M, Obrosky DS, Goldston D, Drash A. Major depressive disorder in youths with IDDM: A controlled prospective study of course and outcome. Diabetes Care 1997;20(1):45-51.

4. Whittemore R, Kanner S, Singleton S, Hamrin V, Chiu J, Grey M. Correlates of depressive symptoms in adolescents with type 1 diabetes. Ped Diabet 2002;3(3):135-43.

5. Kovacs M, Goldston D, Obrosky D, Bonar LK. Psychiatric disorders in youths with IDDM: rates and risk factors. Diabetes Care 1997;20:36-44.

6. Goldston DB, Kelley AE, Reboussin DM, Daniel SS, Smith JA, Schwartz RP, et al. Suicidal ideation and behavior and noncompliance with the medical regimen among diabetic adolescents. J Am Acad Child Adolesc Psychiatry 1997;36:1528-36.

7. Northam EA, Matthews LK, Anderson PJ, Cameron FJ, Werther GA. Psychiatric morbidity and health outcome in type 1 diabetes-perspectives from a prospective longitudinal study. Diabetes Med 2005;22:152-57.

8. Hart HE, Redekop WK, Bilo HJ, Meyboom-de Jong B, Berg M. Health related quality of life in patients with type I diabetes mellitus: generic & disease-specific measurement. Indian J Med Res 2007;125:203-16.

9. Rubin RR, Peyrot M. Quality of life and diabetes. Diabetes Metab Res Rev 1999;15:205-18.

10. Jaser SS, Whittemore R, Ambrosino JM, Lindemann E, Grey M. Mediators of depressive symptoms in children with type 1 diabetes and their mothers. J Pediatr Psychol 2008;33:509-19.

11. Fritsch SL, Overton MW, Robbins DR. The interface of child mental health and juvenile diabetes mellitus. Child Adolesc Psychiatr Clin N Am 2010;19:335-52.

12. Lewinsohn PM, Clarke GN, Seeley JR, Rohde P. Major depression in community adolescents: Age at onset, episode duration, and time to recurrence. J Am Acad Child Adolesc Psychiatry 1994;33(6):809-18.

13. Helgeson VS, Siminerio L, Escobar O, Becker D. Predictors of metabolic control among adolescents with diabetes: A 4-year longitudinal study. J Ped Psychol 2008;34:254-70.

14. La Greca AM, Swales T, Klemp S, Madigan S. Adolescents with diabetes: Gender differences in psychosocial functioning and glycemic control. Children's Health Care 1995;24(1):61-78.

15. Mortensen HB. Findings from the Hvidøre study group on childhood diabetes: Metabolic control and quality of life. Horm Res 2002;57(1):117-20.

16. Naar-King S, Idalski A, Ellis D, Frey M, Templin T, Cunningham PB. Gender differences in adherence and metabolic control in urban youth with poorly controlled type 1 diabetes: The mediating role of mental health symptoms. J Ped Psychol 2006;31(8):793-802.

17. Cameron LD, Young MJ, Wiebe DJ. Maternal trait anxiety and diabetes control in adolescents with type I diabetes. J Ped Psychol 2007;32(7):733-44.

18. Gonder-Frederick LA, Fischer CD, Ritterband LM, Cox, DJ, Hou L, DasGupta AA, Clarke WL. Predictors of fear of hypoglycemia in adolescents with type 1 diabetes and their parents. Ped Diabet 2006;7:215-22.

19. Kamps JL, Roberts, Varela ER. Development of a new fear of hypoglycemia scale: Preliminary results. J Ped Psychol 2005;30:287-91.

20. Kovacs M. Rating scale to assess depression in school aged children. Acta Paedopsychiatr 1981;46:305-15.

21. Öy B. Çocuklar için depresyon ölçeği: Geçerlik ve Güvenirlik Çalışması. Türk Psikiyatri Derg 1991;2:132-36.

22. Spielberger CD. The measurement of state and trait anxiety: Conceptual and methodological issues. Monogr 1976;2:713-15.

23. Özusta Ş. Çocuklar İçin Durumluk-Sürekli Kaygı Envanterinin Uyarlama, Geçerlik ve Güvenirlik Çalışması. Turk J Psychol 1995;10:32-44.

24. Beck, A.T, Ward C, Mendelson M. Beck depression inventory (BDI). Arch Gen Psychiatry 1961;4:561-71.

25. Hisli N. Beck depresyon envanterinin üniversite öğrencileri için geçerliliği, güvenirliliği. Psikol Derg 1989;7:3-13.

26. Öner N, LeCompte A. Durumluk-Sürekli Kaygı Envanteri El Kitabı. İstanbul: Boğaziçi Üniversitesi Matbaası, 1985:1-26.

27. Aydemir Ö, Köroğlu E. Durumluluk-Sürekli Kaygı Envanteri (STAI). in: Psikiyatride Kullanılan Klinik Ölçekler, Aydemir Ö, Köroğlu E eds. Ankara: HYB Basım Yayın, 2009:221-29.

28. Adal E, Önal Z, Ersen A, Yalçın K, Önal H, Aydın A. Recognizing the Psychosocial Aspects of Type 1 Diabetes in Adolescents. J Clin Res Pediatr Endocrinol 2015;7(1):57-62.

29. Şahin N, Öztop DB, Yılmaz S, Altun H. Tip 1 Diyabetes Mellitus Tanılı Ergenlerde Psikopatoloji, Yaşam Kalitesi ve Ebeveyn Tutumlarının Değerlendirilmesi. Arch Neuropsychiatr 2015; 52:133-38.

30. Herzer M, Hood KK. Anxiety Symptoms in Adolescents with Type 1 Diabetes: Association with Blood Glucose Monitoring and Glycemic Control. J Ped Psychol 2010;35(4):415-25.

31. Anderson BJ, Coyne JC. Family context and compliance behavior in chronically ill children In: Developmental Aspects of Health Compliance Behavior, Krasnegor N, Epstein I, Johnson SB, Yaffe SJ eds. Hillsdale NJ: Lawrence Erlbaum,1993:77-89.

32. Weinger K, O'donnell KA, Ritholz MD. Adolescent views of diabetes-related parent conflict and support: a focus group analysis. J Adolesc Health 2001;29:330-36.

33. Bloom K. Patterning of infant vocal behavior. J Exp Child Psychol 1977;23:367-77.

34. DuHamel KN, William HR, Vickberg MJ. Behavioral interventions in the diagnosis, treatment and rehabilitation of children with cancer. Acta Oncol 1999;38:719-34.

35. Gortmaker SL, Walker DK, Weitzman M, Weitzman M, Sobol AM. Chronic conditions, socioeconomic risks, and behavioral problems in children and adolescents. Pediatrics 1990;85:267-76.