Original Article

Assessment of the Eating Disorders and Relationship with Dental Caries, Age, Gender, and Body Mass Index in a Sample of Turkish Adolescents Aged 9 Through 15

B Gokkaya, B Kargul[1]

Clinic of Pediatric Dentistry, Bahcelievler Oral and Dental Health Hospital, Istanbul, [1]Department of Pediatric Dentistry, Marmara University, Istanbul, Turkey

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Abstract

Background and Aims: Eating disorders (ED) are an important public health problem for adolescents due to changing eating attitudes. Using the Eating Attitude Test (EAT-26) with a sample of Turkish adolescents aged 9–15 years, this study evaluated the behavioral risk of ED and its association with dental caries, age, body mass index (BMI), and gender. **Subjects and Methods:** The EAT-26 scoring system was used, and variables examined included demographic, familial, sociocultural, social, and clinical features. Data were analyzed using SPSS® Statistics for Windows, version 20.0. (IBM, New York, NY, USA). **Results:** A total of 112 adolescents, 46 (41.1%) boys, and 66 (58.9%) girls (mean age 11.46 ± 1.91 years), were evaluated. EAT-26 mean scores were 16.0 (10.0–21.0) for girls and 14.0 (12.0–23.0) for boys (Mann Whitney U test; P = 0.509). There was no statistically significant difference between the mean BMI scores and the mean EAT-26 scores for girls and boys (Mann Whitney U test) (P = 0.509) (P = 0.636). The mean DMFT decay-missing-filled and total) was higher in EAT-26 >20 than in EAT-26 <20, and the difference was statistically significant (Mann Whitney U test; P = 0.008). BMI was not correlated with EAT-26 (Spearman rank correlation test, r = –0.013, P = 0.156), but there was a statistically significant positive correlation between the development of caries and age (Spearman rank correlation test, r = 0.405, P < 0.05). **Conclusion:** Early diagnosis of ED is crucial because it primarily starts during childhood and adolescence. It is responsible for the dft of the deciduous teeth. BMI is related to decay,missed,filled,total (DMFT), decay, filled, total (dft), and age in adolescents aged 9–15 years. Furthermore, we searched subgroups of EAT-26 for dental caries. Dieting score may be a significant factor for dental caries for ED. However, observing ability is an important factor for dentists because they can inform parents and provide information on preventing ED.

Keywords: *Caries detection, eating behaviors, preventive dentistry*

Introduction

Eating disorders (EDs) are an important public health problem.[1,2] Young adults are at risk of ED due to habits such as body dissatisfaction, unhealthy food preference, and dietary attitude to lose weight.[3] It is critical to determine individuals with disordered eating inclinations for early diagnosis and treatment.[4]

There are three main diagnoses in which eating disorders are classified according to the Diagnostic and

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Address for correspondence: Dr. B Gokkaya, Clinic of Pediatric Dentistry, Bahcelievler Oral and Dental Health Hospital, Eski Londra Asfaltı 141/2, 34180 Bahcelievler, Istanbul, Turkey.
E-mail: bernagokkaya78@hotmail.com

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Statistics Manual of Mental Disorders Manual - DSM 5: anorexia nervosa, bulimia nervosa, and binge-eating disorder.[5]

Anorexia nervosa (AN) is the third most common chronic disease among adolescents, and bulimia nervosa (BN) affects over 1% of female adolescents.[6] These two types of ED affect mainly adolescent and young adult women[7,8] and demonstrate harmful effects on oral health.[9-11] Because reversing is impossible to oral health and psychological effects,[12,13] dentists should thoroughly investigate for oral findings and symptoms.[13]

The differences in caries rates among eating disorder patients can be attributed to personal characteristics, such as the individual's oral hygiene, cariogenicity of the diet, malnutrition, genetic predisposition, fluoride experience during tooth development, and ingestion of certain types of medications.[14]

Eating disorders present unique psychological, medical, nutritional, and dental patterns. However, there is a lack of awareness of the fundamental importance of the dentist's participation in the multidisciplinary treatment of affected patients. The dental team may be the first healthcare provider to detect and diagnose, and this professional team should refer the patient for treatment with a psychologist, physician, and nutritionist.[8,15,16]

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There are limited studies in the literature that assess the risk of ED and its relationship with body mass index (BMI) and caries experience using the Eating Attitude Test-26 (EAT-26), including children aged 9–10 years old children.[17-19] But, EAT-26 has been applied in many more studies on college and high school students[1] or adults.[20,21]

Using EAT-26 with a sample of Turkish adolescents aged 9–15 years, this research evaluated the risk of ED and its relationship with caries, BMI, age, and gender.

Materials and Methods

Ethics

Ethical approval was given by Bakirkoy Dr. Sadi Konuk Training and Research Hospital Committee with approval number 2019-328. All participants answered all questions willingly after being informed about the aim of the study and provided written informed consent.

Participants

Participants aged between 9 and 15 years attended Bahcelievler Oral and Dental Health Hospital's Pediatric Dentistry Clinic from September to December 2019. Exclusion criteria included if they had a psychiatric disorder and chronic diseases (such as diabetes and hypo/hyperthyroidism).

Informed consent was obtained from all participants/parents after informing them about the study based on the provisions of the Declaration of Helsinki regarding research on human subjects.

EAT-26

EAT-26 was used to evaluate participants' behavior for dieting, eating, and personal control of overeating.[12,13] It was developed to highlight eating behaviors and attitudes and determine those with a highly disordered eating inclination.[22] This scale contains 26 questions on a 6-point Likert scale, with total scores ranging from 0 to 78.[12] In this study, we used a 1 (never)–6 (always) scoring system to increase the normality of responses.[12]

The subdivision of EAT-26 into three subscales, D (dieting), B (bulimia), O (oral control), allowed us to obtain more information from the same questionnaire[18]:

The dieting questionnaire (13 items) is closely correlated with a distorted body image;

The blumia questionnaire (6 items) is closely associated with body weight; it provides information about body image and tendency towards bulimic behavior;

The oral control questionnaire (7 items) reflects the tendency to self-control. High scores in this area are related to low weight and the absence of bulimia.

Savasir and Erol[23] demonstrated the accuracy and reliability of EAT-26 Turkish version and found higher reliability coefficient scores for the test. Previous validations of the EAT-26 reported good reliability coefficients across studies ranging from 0.79 to 0.94.[24] In the present study, Cronbach's alpha was found to be 0.866, showing good internal consistency.

BMI (kg/m^2)

Bodyweight and height were measured using an electronic scale (Seca, 767). Each participant was evaluated for BMI for age using the standard procedure of the World Health Organization.[25] According to the World Health Organization classification, a BMI value less than 18.5 is considered below normal (underweight); between 18.5 and 24.9 is considered normal (healthy); between 25 and 29.9 is considered overweight; and higher than 30 is obese.[25] The BMI expressed as the percentage of a cut-off percentile for overweight or

obesity has been proposed as a better alternative than BMI z-scores when monitoring children and adolescents with severe obesity.[26]

Intraoral examination

A dental examination was performed by dentists using mirrors and a dental probe. The results were recorded for both permanent and primary teeth. DMF-T (decay-missing-filled and total)) index was used to evaluate caries for both dentition. DMF-T = 0 (no caries experience) and DMF-T ≥1 (caries experience) were used to confirm the experience and presence of dental caries.[27]

Statistical analyses

Data were analyzed using SPSS® Statistics for Windows, version 20.0.(IBM, New York, NY, USA). Descriptive statistical analysis was then performed. Chi-square and Mann–Whitney U tests were used to assess the relationship between caries and other factors. For all analyses, a *P* value of 0.05 was considered to be statistically significant. This report conforms to the Strengthening the reporting of observational studies in epidemiology (STROBE) guidelines for cohort studies.

Results

A total of 112 adolescents, 46 (41.1%) boys and 66 (58.9%) girls aged between 9 and 15 years (mean age, 11.46 ± 1.91 years) were studied [Table 1]. Fifty percent of the adolescents had high BMI. The characteristics of participants according to sociodemographic and clinical variables are presented in Table 1. Regarding EAT-26, 41 adolescents (36.60%) had a score equal to or greater than 20; that is, these children were at risk of ED. EAT-26 scores of 17 (41.5%) boys, and 24 (58.5%) girls scores were higher than 20.

The Mann-Whitney U tests showed no statistically significant difference between the mean BMI scores and the mean EAT-26 scores for girls and boys ($P = 0.509$) ($P = 0.636$) [Table 2].

The mean dft was higher in EAT-26 >20 than in EAT-26 <20, and the difference was statistically significant ($P = 0.008$). Additionally, there were no statistically significant differences between age, BMI, DMF-T, and EAT-26 scores ($P = 0.145$) ($P = 0.840$) ($P = 0.812$) [Table 3].

Table 1: Characterization of participants according to sociodemographic and clinical variables

	n	%
GENDER		
boys	46	41.1
girls	66	58.9
EAT -26		
<20	71	63.4
>20	41	36.6
BMI		
underweight	17	15.2
healthy	56	50
overweight	30	26.8
obese	9	8
Mother's education		
illiterate	5	4.5
primary	44	39.3
high	52	46.4
university	10	8.9
postgraduate	1	0.9
Father's education		
illiterate	1	0.9
primary	36	32.1
high	50	44.6
university	16	14.3
postgraduate	1	0.9

Table 2: Distribution of EAT-26 and BMI scores of participants according to gender

Scores	Girls Median (25-75%)	Boys Mean (25-75%))	*Z*	*P*
EAT-26	16.0 (10.0-21.0)	14.0 (12.0-23.0)	–0.660	0.509
BMI	18.95 (16.70-21.90)	18.99 (17.00-22.27)	–0.473	0.636

**P* is significant at 0.05, Mann-Whitney *U* test

Table 3: The mean DMFT, dft and BMI for EAT-26 <20 and EAT-26 >20

	EAT-26 <20 Mean (SD)	EAT-26 >20 Mean (SD)	*P*
Age	11.66 (1.81)	11.10 (2.05)	0.145
BMI	24.33 (4.04)	19.19 (2.64)	0.840
DMFT	3.35 (3.02)	3.27 (2.52)	0.812
dft	1.13 (2.29)	2.49 (3.03)	0.008*

**P* is significant at 0.05, Mann-Whitney *U* test

Table 4: Distribution of DMFT and dft in dieting, bulimia, and oral control subgroups

	Dieting	Blumia	Oral Control	Dieting and Oral Control
EAT-26 >20				
DMFT	17 (65%)	0 (%)	7 (50%)	
dft	8 (31%)	0 (%)	5 (36%)	
Equal	1 (4%)	0 (%)	2 (14%)	
Total (*n*=41)	26 (64%)	0 (%)	14 (34%)	1 (2%)
EAT-26 <20				
DMFT	26 (67%)	1 (25%)	17 (74%)	
dft	7 (18%)	3 (75%)	4 (17%)	
Equal	6 (15%)	0 (%)	2 (9%)	
Total (*n*=71)	39 (55%)	4 (6%)	23 (32%)	5 (7%)

Table 5: The number and % of BMI percentiles for EAT-26, DMFT, dft and gender

BMI	Underweight *n* (%)	Normal weight *n* (%)	Overweight *n* (%)	Obese *n* (%)	*P*
EAT-26					
<20	11 (15.5)	40 (56.3)	14 (19.7)	6 (8.5)	0.156†
>20	6 (14.6)	16 (39.0)	16 (39.0)	3 (7.3)	
Gender					
Boys	5 (29.4)	27 (48.2)	10 (33.3)	4 (44.4)	0.404†
Girls	12 (70.6)	29 (51.8)	20 (66.7)	5 (55.6)	
BMI	**Median (25-75%)**	**Median (25-75%)**	**Median (25-75%)**	**Median (25-75%)**	***P***
DMFT	3.00 (2.00-4.00)	2.00 (0.00-5.00)	4.00 (2.00-6.00)	4.00 (2.00-5.00)	0.360‡
DFT	0.00 (0.00-0.00)	0.00 (0.00-3.00)	0.50 (0.00-6.00)	0.00 (0.00-0.00)	0.160‡

*P <0.05 is significant, ‡Mann-Whitney U test, †Chi-square test

Table 6: Relationship between BMI and age, EAT-26, caries experience

variables	BMI	
	r	*P*
age	0.299	0.001*
DMFT	0.250	0.008*
DFT	–0.255	0.007*
EAT-26	–0.013	0.889

*P is significant at 0.05, r: Spearman rank correlation test

64% of participants had higher dieting scores, and 34% of participants had higher oral control scores at EAT-26 >20 group. There were no participants who had a higher bulimia scores in this group. DMFT and dft were found 17 (65%) and 8 (31%), respectively, in the dieting score groups. But they were found, 7 (50%) and 5 (36%) in the oral control score groups at EAT-26 >20 group [Table 4].

39 (55%) of participants had a higher dieting score (55%) at EAT-26 <20; but 4 (6%) of participants had a higher bulimia score at EAT-26 <20. DMFT and dft were found 26 (74%) and 7 (18) respectively in higher dieting score groups and 17 (74%) and 4 (17%) in oral control score groups at EAT-26 <20 group [Table 4].

Focusing on BMI, 17 (15%) of the surveyed adolescents were defined as underweight (12 (70.6%) girls and 5 (29.4%) boys). About 30 (27%) of the respondents were overweight (20 (66.7%) girls and 10 (33.3%) boys), whereas 9 (8%) were obese (5 (55.6%) girls and 4 (44.4%) boys) (P = 0.404). EAT-26 >20 was found to be 39% normal and overweight**.** DMFT was found higher at overweight and obese group (4,00 (2,00–6,00)) [Table 5].

Regarding the relationship between BMI and EAT-26, the results revealed that BMI was not correlated with EAT-26, with no statistically significant association (P = 0.889). However, there was a statistically significant positive correlation between BMI, DMFT, dft, and age (P < 0.05) [Table 6].

Discussion

The results focused on the EAT-26 and the relationship with BMI, age, gender, and dental caries in a group of Turkish adolescents. Although EAT-26 has been used as a research instrument for ED, scores alone do not output a diagnosis of an ED.[22] High scores explain "disordered eating," such as food avoidance and ban, binging, or skipping of meals, but cannot be confined to ED.[28] In different countries, the prevalence of ED has changed due to study design.[29,30] Brytek-Matera[31] found that disordered eating attitudes ranged from 33.1% to 40.1%.

ED mainly affects female adolescents,[32,33] especially those aged 15–19 years.[32] In a clinical study, early-onset ED was identified among boys aged 5 to 13.[10] Similarly, one study revealed ED in 26.6% of male adolescents and young adults.[34] Our study results said that ED affects 41.5% of girls and 58.5% of boys. We found that the mean EAT-26 scores for girls and boys were 16.00 and 14.00, respectively. Rosen *et al*.[35] found that high school students had lower EAT scores, especially girls.

In the present study, we highlight that children with normal BMI had no ED tendencies for girls and boys, and there was no association between EAT-26 and BMI. In contrast, Rouzitalab *et al*.[36] study determined a positive correlation between EAT-26 and BMI.

Feeding with cariogenic foods, poor oral hygiene, and salivary reduction cause dental caries.[37] Some studies have found conflicting relationships between dental caries and ED.[9,38] One study[39] explained that anorexics show a high caries rate if they use antidepressants. Because antidepressants can cause xerostomia and it may increase the incidence of cervical carious lesions.

In contrast, some studies[38,40-42] found that the incidence of caries in anorexia nervosa patients was similar to the incidence in the non-affected population. Studies provide conflicting results because dental caries in ED patients is a complex, multifactorial, and controversial subject. Investigations should include the analysis of

diet, salivary issues, and details of behavioral purgative episodes of self-induced vomiting.[16]

We found that the mean of dft was higher in EAT-26 >20 than in EAT-26 <20, and the difference was statistically significant. Older children will have better knowledge of dental hygiene and maintain the cleanliness of their teeth. In addition, children aged between 6 and 8 years have the highest caries risk due to the eruption of the first permanent molar teeth.[43] All of these factors explain our findings regarding the relationship between dft values and ED. There was no study in the literature about ED and its relationship with dental caries on deciduous molars.

In this study, there was no correlation between BMI and gender. Conversely, there was a statistically significant positive correlation between BMI, caries experience, and age. Hooley *et al*.[44] reported that early childhood caries is associated with both high and low BMI, and health-related behaviors of younger children (aged 0 to 6 years) develop during the pre-school years, and to parental or familial influences on the development of these patterns. Koksal *et al*.[45] found that low body weight increased the risk of developing dental caries compared to overweight-obese children. Modéer *et al*.[46] suggested that obese children are at risk of dental caries because they consume higher carbohydrate foods and have diminished salivary flow. In addition, obese children may suffer from protein deficiency.[47]

We found that the dieting score was higher at EAT-26 >20. Contrary, the oral control score was higher at EAT-26 <20. DMFT was higher in dieting, and oral control subgroups, both EAT-26 >20 and EAT-26 <20 groups. Besides, dft was higher in EAT-26 >20 groups than EAT-26 <20 in dieting and oral control subgroups. We thought that further investigation on possible links between ED subgroups and dental caries is greatly needed but is beyond the scope of the present study.

Our study results said that BMI correlated with DMFT, age, and dft, but did not correlate with ED. Some studies concluded that ED inclination was not associated with BMI or gender.[31,47,48] Although some studies have shown that BMI is negatively associated with the age range 6 to 18 years, it is not associated with the range of 2 to 5 years old.[49] In a study including both genders and different age groups, Cinar and Murtomaa[50] indicated no association between BMI and dental caries.

The current study has some limitations. First, we employed a single self-report questionnaire to determine disorders of eating. Second, many studies have investigated the relationship between ED and dental erosion and dental caries. We did not evaluate the relationship between dental erosion and ED because we wanted to focus only on ED and its relationship with caries. Third, we did not research subgroups for ED such as bulimia, oral control, and diet. This is because it is not important which subgroup is increasing to cause dental caries. Fourth, the use of the WHO criteria for the diagnosis of dental disease does not allow the diagnosis of initial enamel lesions, only the registration of lesions cavitated in dentin. Therefore, future studies are required.

Although ED is found to be an important risk factor for dental caries in younger age groups, BMI is positively correlated with dental caries and age. Early diagnosis of ED is crucial because it primarily starts during childhood and adolescence. It is responsible for the dft of deciduous teeth. Furthermore, we searched subgroups of EAT-26 for dental caries. Dieting score may be a significant factor for dental caries at ED. Observing ability is an important factor for dentists because they can inform parents and provide information on preventing ED. The dental team may be the first healthcare provider to detect, diagnose, and lead the patient to medical treatment, thereby providing multidisciplinary treatment with a favorable prognosis.

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Conflicts of interest

There are no conflicts of interest.

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