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Eating behavior styles and factors associated with disordered eating behaviors in early adolescents: cross-sectional study

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ABSTRACT

Aims: Disordered eating attitudes and behaviors have become a global concern among adolescents. Given that eating behaviors developed during adolescence will determine lifelong adolescent health outcomes, it is important to understand the factors associated with disordered eating behaviors in early adolescents. This study aimed to assess the eating behaviors styles of early adolescents and to determine the relationship between eating behaviors and sociodemographic, lifestyle factors, and dietary patterns.

Methods: This cross-sectional was conducted on 700 middle school students aged 10-14 years old. Sociodemographics, dietary, and lifestyle data were collected using a questionnaire. Anthropometric measurements were performed. The Dutch Eating Behavior Questionnaire Children (DEBQ-C) was used to evaluate adolescents' restrained, emotional, and external eating styles. Mediterranean Diet Quality Index (KIDMED) was used to assess adherence to the Mediterranean diet (AMD).

Results: Girls had higher scores in all three eating styles compared to boys. Students with overweight/obese scored higher in restrained, but lower in external and emotional eating style compared to students with normal weight. Students with excessive energy, carbohydrate, and protein intake had higher external eating but lower restrained eating scores than those with low or normal intake. Being female, higher KIDMED score, less screen time, higher BMI z score, higher waist/hip ratio, and body dissatisfaction were positively associated with restrained eating behavior. Being female (β =0.085, p=0.024), screen time < 2 hours (β =-0.086, p =0.027), and BMI z score (β =-0.211, p =<0.001) were found to be significant predictors of external eating behaviors, while being female and older age were associated with emotional eating behaviors among early adolescents.

Conclusion: There are differences in early adolescents eating behavior styles based on gender, nutritional status, body dissatisfaction, perceived health, screen time, physical activity status, AMD, and dietary intake.

Keywords: Eating behaviors, body image dissatisfaction, dietary intake, lifestyles

INTRODUCTION

Disordered eating behaviors are conditions that involve a range of unhealthy attitudes and behaviors related to eating, body weight and body shape, and involve struggles with self-control. Disordered eating attitudes and behaviors have become a global concern among adolescents.[1] The risk of developing disordered eating behaviors are highest in the middle and late adolescent periods. However, in recent years, it has been reported that the age of onset of eating disorders has shifted to earlier ages.[2] Studies have shown that many factors including genetic factors, gender, lifestyle behaviors, sociodemographic characteristics, environmental factors and psychosocial factors (body dissatisfaction, perceived health) are associated with disordered eating behaviors.[3-5] However, there are limited studies investigating factors associated with disordered eating behaviors among early adolescents.[4]

Emotional eating" refers to eating to cope with negative emotions to relieve stress by ignoring the satiety signal, without internal physiological hunger signals. "External eating" refers to eating in response to stimuli related to food consumption (the sight or smell of food), regardless of hunger and satiety signals. The theory of "restrained eating" reflects the degree to which one consciously restricts food intake (attempts to avoid eating to lose or maintain a certain weight). Previous research has shown that emotional overeating and restrained eating often co-occur with body dissatisfaction and can eventually develop into more extreme diets or inappropriate compensation methods (bulimia nervosa etc.).[6,7]

Given that eating behaviors developed during adolescence will determine lifelong adolescent health outcomes, it is important to understand the factors

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associated with disordered eating behaviors in early adolescents.[7] Furthermore, considering that the presence of disordered eating attitudes and behaviors in early adolescence is an important predictor of eating disorder symptoms in late adolescence and young adulthood, it is essential to determine factors that influence disordered eating attitudes and behaviors during this period. Thus, prevention-focused strategies could be created. When the literature was reviewed, no study was found that examined the eating behaviors of Turkish children in early adolescence and the factors associated with eating behaviors. Therefore, this study aimed to assess the eating behaviors styles of early adolescents and to determine the relationship between eating behaviors and sociodemographic, psychosocial, lifestyle factors, and dietary patterns. This study' findings could provide a framework for an understanding of predictors of eating behaviors among early adolescents and to plan intervention programs.

METHODS

The study was carried out with the permission of İzmir Katip Çelebi University Non-Interventional Clinical Trials Ethics Committee (Date: 27.04.2023, Decision No: 0206), and parental written consent was obtained on behalf of each of the children. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Study Design and Participants

This cross-sectional study was carried out in early adolescents aged 10-14 years from April to June 2023. The study sample was calculated as 260 by using the sampling formula (N=N-t2-p-q/d2(N-1) þ t2-p-q), which is recommended to be used in cases where the number of individuals in the target group is known, assuming that the standard deviation is 5% and the probability of realisation is 50% since the probability of the phenomenon examined in the light of the literature is not reached. The universe of the study consisted of middle schools in the Karşıyaka district of İzmir province, Turkiye. The sample group of the study consisted of 2 middle schools, which were randomly selected from 19 middle schools affiliated to Karşıyaka District Directorate of National Education. In the selected middle schools, all students were recruited, if they met the inclusion criteria and given consent to participate. The study sample included 700 middle school students of 352 boys and 348 girls. The inclusion criteria were being 10-14 years old, attending grades 5-8 th, and volunteering to participate. Exclusion criteria were: being younger than 10 or older than 14 years old; having a history of chronic disease; the lack of parental approval.

Data collection

Before collecting the data, the schools were visited and the authorized administrator of the school (school principal or deputy school principal) was informed about the study. All 5-6-7-8th grades in the schools were informed about the study, and each volunteer student was asked to deliver an informed consent form to one of their parents and to deliver them to the school administration after they were filled in. The data were collected in the classroom using face-to-face interview techniques by trained research assistants, after informed consent forms were obtained. The researchers explained and clarified the questionnaire to the students before they filled out the questionnaire to avoid mistakes and misconceptions. Afterwards, completed questionnaires were collected from the students.

Questionnaire

The questionnaire consisted of 7 sections. In the first section, socio-demographic characteristics of the students (students age, gender, parents education level, employment status, and the number of siblings) was obtained. In the second section, the eating habits of adolescents were evaluated. In the third section, "Physical activity status was questioned. In the fourth part, anthropometric measurements were taken and recorded. In the fifth section, the Mediterranean Diet Quality Index (KIDMED) questionnaire was applied to evaluate the diet quality of adolescents. In the sixth section, the Dutch Eating Behavior Questionnaire Children (DEBQ-C) scale was applied to evaluate the eating behaviors of adolescents. In the last section, 24-hour food consumption records of adolescents were taken.

Physical Activity Status

The following questions were used to assess students' physical activity status: Do you engage in regular physical activity? (The response possibilities were "Yes" and "No"). Students were asked the following question to determine their average daily screen time: "How many hours do you spend each day watching TV, playing video or computer games, or using a computer for something other than school work?" Screen time was divided into low (≤2 hours/day) and high (> 2 hours/day) categories.[8]

Body Satisfaction and Self-perceived Health

To keep the questionnaire short, body satisfaction was assessed with following question: Are you satisfied with your appearance? (Possible answer 1. yes; 2. no.). Self preceived health was evaluated by asking students the following question: How do you perceive your health in general? (Response options were:1. Bad, 2. Moderate, 3. Good.)

Mediterranean Diet Quality Index (KIDMED)

The KIDMED was used to measure dietary adequacy, and adherence to the Mediterranean diet (AMD). This index consists of 16 statements (12 positive and 4 negative) about the dietary habits of adolescents. "Yes" responses to positive statements about dietary adherence were evaluated as +1 point, "no" responses to statements suggesting less dietary adherence were evaluated as -1 point, and the sums of the scores obtained from the applied index were classified into 3 groups. According to this classification, ≥8 points indicate high AMD (good diet quality), 4-7 points indicate moderate AMD (diet quality should be improved), and ≤3 points indicate low AMD (poor diet quality). It is accepted that the higher the score obtained from the KIDMED questionnaire, the higher the level of AMD.[9] The cronbah's alpha coefficient of the Turkish version of KIDMED was 0.86.[9] In this study, the Cronbach's alpha coefficient was 0.78.

Dutch Eating Behavior Questionnaire Children (DEBQ-C)

In this study, the DEBQ-C, which was adapted for children from the adult version and whose Turkish validity and reliability was performed by Sağlam et al.[10] in 2022, was used to evaluate students' eating behaviors. The test consists of 20 items and has 3 subscales. These subscales are restrictive eating, emotional eating, and external eating. Restrictive eating is obtained by adding the scores of questions 4, 6, 8, 11, 14, 16, and 18; emotional eating score is obtained by adding the scores of questions 2, 3, 9, 12, 12, 15, 17 and 19; and external eating score is obtained by adding the scores of questions 1, 5, 7, 10, 13, and 20. The items in the questionnaire are evaluated with a 5-point Likert scale (1: never, 2: rarely, 3: sometimes, 4: often, 5: very often). The total score of the test is not evaluated, but the 3 subscales are evaluated within themselves. While there is no cut-off point in the scoring of the test, a high total score evaluated within the 3 subscales indicates a negative eating behavior.[10] The Cronbach's alpha reliability coefficient was 0.80, 0.72, and 0.79 for emotional eating, restrained eating, and external eating, respectively.[10] The cronbach's alpha coefficient of the DEBQ was calculated for this study. Accordingly, the cronbach's alpha coefficient was 0.87, 0.75, and 0.74 for emotional eating, restrained eating, and external eating, respectively.

Anthropometric Measurements

The body weight was measured using TANITA BC-532 bioelectrical impedance analyzer. Height was measured with a portable stadiometer in an upright position with the feet side by side, knees straight, heels, hips and shoulder blades in contact with the vertical level and the head in the Frankford plane. Body Mass Index (BMI) was calculated with the formula "BMI=[body weight (kg)/height (m^2)]". Waist, hip, and neck circumferences were measured using a non-flexible tape measure in accordance with the method.[11] BMI and height z scores according to age were determined using the "WHO Antro Plus" program. According to WHO growth curves, adolescents with BMI z scores <-1 SD were considered "underweight", -1 SD ≤-<+1 SD were considered "normal", > +1 SD-< +2 SD were considered overweight, and ≥ +2 SD were considered "obese".[12]

Dietary Intake and Habits

Dietary intake was assessed by 24-h food consumption record. How to fill in the food consumption records was explained in detail to the students trained by the researcher. To verify that students accurately indicated the amount of food they ingested, the "Food and Nutrient Photo Catalogue" was used. The food consumption records were completed by contacting the parents of the students who could not remember or remember incompletely what they ate the previous day. BeBiS (Ebispro for Windows, Germany; Turkish Version/BeBiS 8) was used for analyzing dietary energy and nutrients. The energy and nutrient intakes of the patients were compared according to the dietary reference intake (DRI) and values below 66% were considered as "inadequate intake", 67-133% as "adequate" and above 133% as "excessive intake".[13] Students'main and snack meal consumption status, amount of daily water consumption, and fast food consumption frequencies were questioned to obtain information about the dietary habits.

Statistical Analysis

SPSS 25 software program was used to analyze the data. Descriptive statistics were expressed as mean±standard deviation or median (interquartile range). Categorical variables were presented as frequency and percentage. Kolmogorov-Smirnov test, histogram, and probability graphs were used to evaluate the conformity of the data to normal distribution. In intergroup comparisons, "Independent Samples t test" was used to compare the measurement values of two independent groups with normal distribution, and "one way ANOVA" test was used to compare the measurement values of three or more independent groups. Posthoc tests were carried out when a significant difference was observed between the three groups. Tukey's test was used if variances were homogeneous, and the Tamhane's T2 test was used if variances were not homogeneous. Pearson or Spearman correlation analysis was carried out to evaluate the relationship between the DEBQ subscales and some variables. Linear regression analysis was performed to examine the predictors of restrictive, emotional, and external eating styles. In all analyses, a p- value less than 0.05 was considered statistically significant.

RESULTS

The general characteristics of students are shown in Table 1. Overall, 50.3% were boys and 49.7% were girls, and the mean age was 12.5±1.11 years. While 53.9% of the students had normal body weight, 42.0% were overweight/obese. 31.4% of the students were 8th-grade students. Of the total students, 20.4% had low, 55.1% had moderate, and 24.4% had good AMD.

Table 1. General characteristics of the students

	Boys (n=352)	Girls (n=348)	Total (n=700)
Grade n(%)			
5th	61 (17.3)	79 (22.7)	140 (20.0)
6th	101 (28.7)	88 (25.3)	189 (27.0)
7th	82 (23.3)	69 (19.8)	151 (21.6)
8th	108 (30.7)	112 (32.2)	220 (31.4)
Age ($\bar{x}$±SS)	12.5±1.13	12.5±1.10	12.5±1.11
Height z score ($\bar{x}$±SS)	0.7±1.14	0.5±1.14	0.6±1.15
BMI z score($\bar{x}$±SS)	0.7±1.48	0.5±1.36	0.6±1.43
BMI groups n (%)			
Underweight	13 (3.7)	16 (4.6)	29 (4.1)
Normal	179 (50.9)	198 (56.9)	377 (53.9)
Overweight/Obese	160 (45.5)	134 (38.5)	294 (42.0)
DEBQ-C ($\bar{x}$±SS)			
Restrained Eating	2.6±0.88	2.6±0.88	2.6±0.88
Emotional Eating	1.9±0.93	1.9±0.93	1.9±0.93
External Eating	2.7±0.86	2.7±0.86	2.7±0.86
KIDMED groups n (%)			
Low	65 (18.5)	78 (22.4)	143 (20.4)
Moderate	206 (58.5)	180 (51.7)	386 (55.1)
Good	81 (23.0)	90 (25.9)	171 (24.4)
Dietary Intake median (IQR)			
Energy (kcal)	1581.8 (814.17)	1355.6 (779.5)	1449 (813.20)
Carbohydrate (TE %)	48.0 (14.00)	48.0 (14.00)	48.0 (14.00)
Protein (TE %)	15.0 (5.00)	15.0 (6.00)	15.0 (5.00)
Fat (TE %)	37.0 (12.00)	38.0 (13.00)	37.0 (12.00)

KIDMED: Mediterranean Diet Quality Index; DEBQ-C: Dutch Eating Behavior Questionnaire Children; BMI: body mass index

The eating behaviors of the students according to sociodemographic variables are presented in Table 2. Girls scored higher in all three eating styles compared to boys. Students with overweight/obese scored higher in restrained (p<0.001), but lower in external eating (p<0.001) and emotional eating style (p=0.048) compared to students with normal weight. Students who were dissatisfied with their appearance (body dissatisfaction) scored higher in all three eating styles than those who were satisfied with their appearance. Students who reported engaging in regular physical activity had higher restrained eating scores (p<0.001). Students with > 2 hours of screen time had lower restrained eating scores (p<0.001), and higher external eating scores (p=0.002) than those with ≤2 hours of screen time. The emotional and restrained eating scores of students who perceived their health as "bad" were higher than those who perceived their health as "good" (p=0.015, p=0.034).

The eating behaviors of students according to dietary patterns is presented in Table 3. Restrained eating scores of students with high adherence to the MD were higher than those with moderate and low adherence to the MD (p<0.001). Students who reported skipping main meals had higher restrained eating scores than those who reported not skipping meals (p=0.002). Students who reported eating breakfast regularly had lower emotional (p=0.001) and external eating scores (p=0.006) than those who reported not eating breakfast regularly. Restrained eating scores of students with inadequate energy, carbohydrate, and protein intake were higher than those with excessive energy, carbohydrate, and protein intake. The emotional eating scores of students with excessive energy intake were higher than those with normal and insufficient energy intake (p=0.031). Students with excessive energy, carbohydrate, and protein intake had higher external eating scores than those with low or normal intake (p<0.001). Students who reported consuming fast food 2 times a week or more had higher external (p=0.006) and emotional eating scores (p=0.042) than those who reported not consuming fast food, while students who reported consuming fast food once a week had a higher restrained eating score than those who reported consuming fast food twice or more (p=0.003).

The correlation between students' eating behaviors and some anthropometric and dietary parameters is given in Table 4. Restrained eating score was positively correlated with BMI z score, waist circumference, waist/hip ratio, neck circumference, KIDMED score, protein intake and fat intake, but negatively correlated with age, energy, carbohydrate (TE%) and external eating score. Emotional eating score was inversely correlated with BMI z score, KIDMED score, protein, and fat intake, whereas positively correlated with age, carbohydrate intake and external eating score. There was an inverse relationship between external eating score and BMI z score, waist circumference, neck circumference, waist and neck circumference, and protein (TE%), and a positive relationship between age and energy intake.

According to the results of the regression analysis (enter method), when the significance level corresponding to the F value was taken into account, Model 1, Model 2, and Model 3 established were statistically significant (F=21.915; p<0.001 for Model 1; F=9.116; p<0.001 for Model 2, F = 8.453; p < 0.001) (Table 5). In the first model, age, gender (being female), body dissatisfaction, skipping main meal, KIDMED score, engaging in physical activity, waist/hip ratio, and BMI z score explained 21.2% of the variance in restrained eating behaviours (adjusted R^2=0.212). Except age, all of

these variables significantly predicted restrained eating behavior. Being female, KIDMED score, less than 2 hours of screen time, BMI z score, waist/hip ratio, body dissatisfaction were positively associated with restrained eating behavior. In the second model, age, gender (being female), BMI z score, eating breakfast regularly, KIDMED score, perceived health status (bad) and body dissatisfaction explained 7.5 % of the variance in emotional eating behaviors (adjusted R^2= 0.075). The analysis showed that only age (β=0.076, p=0.044) and being female (β=0.203, p <0.01) significantly predicted emotional eating behavior. In the third model, accounting for age, gender, BMI z score, KIDMED score, body satisfaction, perceived health status (bad), and eating breakfast regularly, the regression model was significant and explained 6.9 % of the variance in external eating scores (adjusted R^2= 0.069). The analysis demonstrated that gender (being female) (β =0.085, p=0.024), screen time < 2 hours (β =-0.086, p=0.027) and BMI (β =-0.211, p <0.001) significantly predicted external eating behavior. There was a significant effect of BMI z score on external eating, indicating that students with higher BMI z score had lower external eating scores. There were no autocorrelation problems in the established models. Durbin Watson's values for each model were between 1.5 and 2.5.

Table 2. DEBQ-C scores of the students according to sociodemographic and lifestyle characteristics

	Restrained Eating	p value	Emotional Eating	p value	External Eating	p value
Gender		<0.001		<0.001		0.003
Boys (n=352)	2.5±0.85		1.7±0.77		2.6±0.82	
Girls (n=348)	2.7±0.89		2.1±1.03		2.8±0.90	
Mother education		0.128		0.856		0.853
Iliterate/Literate (n=52)	2.5±0.79		1.8±0.77		2.6±0.92	
Primary /secondary school (n=225)	2.5±0.92		1.9±0.92		2.7±0.84	
High school (n=281)	2.7±0.86		1.9±0.98		2.7±0.90	
University (n=142)	2.6±0.89		1.9±0.94		2.7±0.81	
Father education		0.187		0.688		0.585
Iliterate/Literate (n=49)	2.4±0.77		2.0±0.94		2.7±0.97	
Primary /secondary school (n=219)	2.5±0.91		1.9±0.91		2.7±0.87	
High school (n=266)	2.6±0.88		1.9±0.96		2.7±0.86	
University (n=166)	2.7±0.89		1.8±0.92		2.6±0.83	
Mother employment status		0.729		0.821		0.747
Unemployed (n=448)	2.6±0.88		1.9±0.93		2.7±0.85	
Employed (n=252)	2.6±0.90		1.9±0.95		2.7±0.88	
BMI groups		<0.001		0.048		<0.001
Underweight/Normal (n=406)	16.9±5.93		14.0±6.88		17.2±5.22	
Overweight/Obese (n=294)	20.4±6.04		13.0±6.08		15.2±4.99	
Body satisfaction		0.001		0.007		0.029
Yes (n=436)	16.6±5.74		13.1±6.13		16.0±4.95	
No (n=264)	18.3±6.29		14.5±7.17		16.9±5.59	
Perceived health		<0.929		0.015		0.034
Bad (n=71)[a]	2.6±0.86		2.2±1.08	a>c~	2.9±0.88	a>c~
Moderate (n=237)[b]	2.6±0.88		1.9±0.93		2.7±0.83	
Good (n=392)[c]	2.6±0.89		1.8±0.90		2.6±0.87	
Screen Time		<0.001		0.066		0.002
≤2 hours (n=310)	2.7±0.88		1.8±0.88		2.6±0.87	
>2 hours (n=390)	2.5±0.87		2.0±0.97		2.8±0.85	
Sleep duration		0.278		0.868		0.603
0-6 hours (n=81)	2.6±0.90		1.9±1.15		2.8±0.92	
6-8 hours (n=376)	2.5±0.89		1.9±0.94		2.6±0.89	
9-12 hours (n=208)	2.7±0.88		1.9±0.86		2.7±0.81	
>12 hours (n=35)	2.5±0.81		2.0±0.83		2.7±0.86	
Engage in physical activity		<0.001		0.131		0.051
Yes (n=488)	2.7±0.89		1.9±0.90		2.6±0.84	
No (n=212)	2.4±0.85		2.0±1.01		2.8±0.92	

DEBQ-C: Dutch Eating Behavior Questionnaire Children; BMI: Body mass index. p values were calculated using one way ANOVA or Independent samples t test. ~Tukey test

Table 3. DEBQ-C scores of students according to dietary patterns

	Restrained eating	p value	Emotional eating	p value	External eating	p value
KIDMED score group						
Low adherence (n=143)[a]	2.3±0.82	<0.001	2.0±0.98	0.109	17.0±5.33	0.268
Moderate adherence (n=386)[b]	2.6±0.89	c>a,c>b,b>a~	1.9±0.91		16.2±5.11	
High adherence (n=171)[c]	2.8±0.86		1.9±0.94		16.2±5.35	
Skipping the main meal						
Yes (n=388)	2.7±0.90	0.002	1.9±0.93	0.885	2.6±0.86	0.191
No (n=312)	2.5±0.85		1.9±0.94		2.7±0.86	
Eating breakfast regularly						
Yes (n=440)	2.6±0.88	0.829	1.8±0.87	0.001	2.6±0.83	0.006
No (n=260)	2.6±0.90		2.1±1.01		2.8±0.92	
Frequency of consumption of fast food						
Never consume (n=88)[a]	2.6±1.00	0.003	1.8±0.98	0.042	2.5±0.86	<0.001
One day a week (n=395)[b]	2.7±0.88	b>c*	1.9±0.93	c>a*	2.6±0.88	c>b,c>a*
Two days or more days a week (n=217)[c]	2.4±0.81		2.0±0.92		2.9±0.81	
Energy intake						
Inadequate (n=362)[a]	2.7±0.90	0.024	1.9±0.91	0.031	2.6±0.83	<0.001
Normal (n=301)[b]	2.5±0.85	a>c~	1.9±0.93	c>a	2.8±0.84	c>a,c>b
Excessive (n=37)[c]	2.4±0.85		2.3±1.07	c>b~	3.1±1.06	b>a~
Carbohydrate intake						
Inadequate (n=87)[a]	2.8±0.94	0.001	1.7±0.77	0.146	2.4±0.74	<0.001
Normal (n=302)[b]	2.7±0.89	a>c~	1.9±0.93		2.6±0.84	c>a,c>b~
Excessive (n=311)[c]	2.4±0.84		1.9±0.97		2.8±0.89	
Protein intake						
Inadequate (n=150)[a]	2.8±0.94	<0.001	1.9±0.99	0.657	2.5±0.86	<0.001
Normal (n=293)[b]	2.7±0.89	a>c,b>c~	1.9±0.90		2.6±0.84	c>a
Excessive (n=257)[c]	2.4±0.84		1.9±0.93		2.8±0.86~	

DEBQ-C: Dutch Eating Behavior Questionnaire Children; KIDMED: Mediterranean Diet Quality Index. p values were calculated using one-way ANOVA or Independent samples t test. Each variable was identified with a different letter (a, b, c) ~Tukey test, *Tamhane's T2 test

Table 4. The correlation between students' DEBQ-C scores and some anthropometric and dietary parameters

	Restrained Eating		Emotional Eating		External Eating	
	r	p	r	p	r	p
Age (years)	-0.111	0.003	0.105	0.005	0.080	0.034
BMI z score	0.331	<0.001	-0.078	0.039	-0.193	<0.001
Waist circumference (cm)	0.261	<0.001	0.005	0.889	-0.124	0.001
Waist/hip ratio	0.244	<0.001	0.008	0.839	-0.050	0.186
Neck circumference (cm)	0.092	0.015	0.049	0.192	-0.092	0.015
KIDMED score	0.153	<0.001	-0.099	0.009	-0.045	0.235
Energy (kcal)	-0.109	0.004	0.038	0.322	0.165	<0.001
Protein (TE %)	0.096	0.011	-0.077	0.044	-0.082	0.031
Carbohydrate (TE %)	-0.109	0.004	0.076	0.047	0.067	0.079
Fat (TE %)	0.076	0.047	-0.050	0.188	-0.035	0.357
Restrained eating score	-	-	-0.040	0.285	-0.134	<0.001
Emotional eating score	-0.040	0.285	-	-	0.507	<0.001
External eating score	-0.134	<0.001	0.507	<0.001	-	-

DEBQ-C: Dutch Eating Behavior Questionnaire Children; KIDMED: Mediterranean Diet Quality Index. p values were calculated using pearson correlation test or spearman correlation test.

Table 5. Multiple Linear Regression Analyses for the Assessment of predictors of DEBQ-C

	Standardized coefficients β	p value	95% Cl	Adjusted R^2	F	Model (p)	Durbin Watson (1.5-2.5)
Restrained Eating				0.212	21.915	<0.001	1.930
Age (years)	-0.014	0.698	-0.068-0.045				
Gender (being female)	0.134	**<0.001**	0.109-0.368				
BMI z score	0.296	**<0.001**	0.137-0.230				
KIDMED score	0.133	**<0.001**	0.015-0.047				
Waist/hip ratio	0.083	**0.035**	0.018-0.514				
Screen time (<2 hours)	0.093	**0.007**	0.045-0.287				
Skipping main meal (Yes)	0.116	**0.001**	0.081-0.333				
Engage in physical activity (Yes)	0.147	**<0.001**	0.152-0.416				
Body dissatisfaction (Yes)	0.090	**0.013**	0.035-0.293				
Emotional Eating				0.075	9.116	<0.001	1.996
Age (years)	0.076	**0.044**	0.002-0.126				
Gender (being female)	0.203	**<0.001**	0.244-0.517				
BMI z score	-0.074	0.055	-0.098-0.001				
KIDMED score	-0.053	0.163	-0.031-0.005				
Body dissatisfaction (Yes)	0.041	0.300	-0.071-0.230				
Eating breakfast regularly (Yes)	-0.066	0.094	-0.279-0.022				
Perceived health (Bad)	0.070	0.067	-0.015-0.451				
External Eating				0.069	8.453	<0.001	2.041
Age (years)	0.006	0.870	-0.054-0.064				
Gender (being female)	0.085	**0.024**	0.019-0.276				
BMI z score	-0.211	**<0.001**	-0.174- -0.082				
Body dissatisfaction (Yes)	0.058	0.149	-0.037- 0.244				
Eating breakfast regularly	-0.073	0.061	-0.269-0.006				
Perceived health (Bad)	0.071	0.063	-0.011-0.423				
Screen Time (<2 hours)	-0.086	**0.027**	-0.285- -0.017				

1)Dummy variables. 0 (ref.): Being male, 1: Being female
2)Dummy variables. 0 (ref.): No skipping main meal, 1: Skipping main meal (yes)
3)Dummy variables. 0 (ref.): No body dissatisfaction, 1: Body dissatisfaction (yes)
4)Dummy variables. 0 (ref.):No engage in physical acticity, 1: Engage in physical activity (yes)
5)Dummy variables. 0 (ref.):Screen time < 2 hours, 1: Engage in physical activity (yes)
6) Dummy variables. 0 (ref.):No eating breakfast regulary, 1: Eating breakfast regularly (yes)

Abbreviations: DEBQ-C: Dutch Eating Behavior Questionnaire Children; KIDMED: Mediterranean Diet Quality Index, BMI: body mass index,

DISCUSSION

This study was conducted to assess the eating behaviors styles of early adolescents and to determine the relationship between eating behaviors and sociodemographic, lifestyle factors, and dietary patterns.

It is well known that sociodemographic variables such as age and gender influence healthy eating behaviors.[14] In a study conducted with 419 Turkish adolescents, it was shown that girls are emotional and external eaters compared to boys.[15] In another study conducted with 346 children aged 10-19 years, the total score and subscale scores of the DEBQ were higher in girls than in boys.[16] Similarly, in this study, girls had significantly higher scores in all three eating styles than boys, and being female was found predictor of three eating styles. These results can be attributed to the fact that cultural pressures that idealize thinness and concerns about body image may influence the development of eating disorders in girls.[3] Consistent with previous studies conducted in adolescents,[5,17] increasing age was found to be a predictor for emotional eating in this study. These results are important for showing that female and older students are in the risk group in terms of eating behaviors and these results can be taken into consideration for health promotion programs.

Body dissatisfaction has been identified as a risk factor for the development of disordered eating behaviors.[18] In studies conducted on Chinese university students,[19] and middle school students,[4] body dissatisfaction was positively associated with the restrained eating style. In line with the literature, this study revealed that body dissatisfaction predicted restrained eating behavior. This result can be explained by the fact that with the onset of physical changes in adolescents, body image gains importance and their desire to be liked and admired increases. In this period, girls try to have thinner or boys try to have more muscular bodies with the desire to have an idealized individual appearance.[20] They constantly compare themselves with idealized bodies. When there is a gap between their real image and ideal image, they

produce negative body images, which can result in restrained eating behaviors.[19] Sze et al.[21] found that emotional eating is associated with lower life satisfaction, poorer mental health, and lower perceived health in Chinese university students. Consistent with Sze et al.[21] study, this study revealed that students who answered the question of how do you find your health as "bad" had high emotional and external eating scores. Taken together, these results suggest that identifying early adolescents with body dissatisfaction or poor health perception is important for the early detection of disordered eating behaviors.

Excessive screen use has been associated with physical activity and disordered eating behaviors.[22] Bawaked et al.[23] found that total screen is negatively correlated with restrained eating and positively correlated with emotional, and external eating behavior in Spanish children. Another study revealed that individuals who engage in physical activity scored higher in terms of restrained behavior than those who did not.[24] Consistent with the literature, less screen and engagement in physical activity were associated with presenting restrained eating behavior in this study. A possible explanation for these findings is that adolescents who engage in physical activity and have less screen time prefer restrictive eating because they pay attention to their nutritional status. Linear regression analysis demonstrated that screen time <2 hours was negatively associated with external eating in this study. This result can be associated with the fact that adolescents who spend a long time in front of the screen may show an external eating tendency as a result of being influenced by food advertisements. It has been reported that screen time may increase eating when satiety is not present due to classical conditioning, diversion from internal hunger and satiety signals, and the prevalence of food-related ads and advertising on TV, and social media platforms.[25]

BMI has been associated with disordered eating behaviors.[5,10] In the present study, adolescents with obesity showed highly restrained and low external and emotional eating styles, and such these findings were also found by Sağlam et al.[10] BMI z score and waist/hip ratio were positively associated with restrained eating behavior in this study. There are different explanations for these results. Van Strien and Oosterveld[26] reported that restrained eaters' lack of self-control causes them to overeat. Some researchers have claimed that the issue of restrained eating would be a behavior exclusive to individuals who are sensitive to weight gain.[27] Since this study is cross-sectional, no conclusions can be drawn about the direction of the relationship. Longitudinal studies are needed to show whether restrained eating is a cause or a reaction to being overweight.

It was shown that as the KIDMED score increased, the restrictive eating behavior increased in university students.[28] Yong et al.[19] showed that university students with high levels of restrained eating tended to consume more fruits and eggs, less sugar-sweetened drinks, and fast food and may thus reduce their energy intake. In parallel with these results, this study found that although restrained eating is positively associated with BMI, a positive relationship is found between high KIDMED score and restrained eating style. Moreover, it was determined that adolescents who skip main meals, consumed fast food less frequently, inadequate energy, carbohydrate, and protein intake had a higher restrictive eating score. Moreover, skipping the main meal was found a predictor of restrained eating in this study. These results suggest that adolescents with restrictive eating tendencies may consume healthy food and skip the main meal to reduce their energy intake. Restrained eating is an attempt at dietary restriction, which means eating less than the desired amount to lose or maintain body weight. In this context, restrained eaters are more concerned with the energy of their diet, which enhances their incentive to suppress their appetite and capacity to minimize unhealthy food intake.

In a study conducted in adults, participants with obesity had higher score on external eating styles than to normal BMI group, in contrast to the results of this study.[29] Similarly, Snoek et al.[17] found that external eating is negatively associated with obesity in adolescents. Marb et al.[30] reported that external eating is associated with a significantly higher energy intake among female adolescents. Consistently, this study showed that students with excessive energy intake and frequent fast food consumption had high emotional and external eating. However, although there was a positive relationship between energy intake and external eating, a negative association was found between external eating and BMI z score. This contradiction can be explained by parental influence. During early adolescence, most food intake is controlled by parents. For example, one study found that parental encouragement was associated with adolescents' consumption of healthy foods.[31] Children and adolescents with higher body weights are subject to more food control and food restrictions.[32] Parents of overweight/obese children are less likely to allow their children to give in to or expose them to unhealthy external cues.[17] This may explain the lower external eating score of early adolescents with overweight and obesity compared to normal-weight adolescents. Another explanation for this conflict that external eating behavior represents a normal tendency in children and tends to decrease with overweight due to modulation of the restrained behavior. In addition, the high restrictive eating score in adolescents with obesity and the positive

relationship between restrained eating and the KIDMED may be associated with parenteral effects. The negative correlation between restrictive eating and external eating is in line with these explanations.

Adolescence is a period of intense emotional changes. During this period, difficulties in emotional regulation can push adolescents to become emotional eaters who tend to consume sweets, salty foods, and other energy-dense foods.[33] Numerous studies conducted on adolescents showed a positive association between emotional eating and consumption of sugary foods, fast foods, high-fat snacks, sweets, and soft drinks.[33,34] Consistently, this study showed that students with excessive energy intake and frequent fast food consumption had high emotional and external eating. These findings suggest that being sensitive to emotional eating and external food cues is associated with unhealthy food consumption. Moreover, in the present study, external eating was positively correlated with emotional eating. This correlation may suggest that emotional eating and external eating both contribute to the facilitation of overeating.[26]

This study has some limitations. First, the causality of the relationship remains unclear, as the study was designed as cross-sectional. Second, data were gathered by self-report, which may result in false reporting and recall bias. However, the present study also has the following strengths: A food consumption record provided more reliable results in calculating dietary intake. To the best of our knowledge, this is the first study to evaluate the associations between eating behaviors and sociodemographic, lifestyle factors, and dietary patterns among early adolescents.

CONCLUSION

The results of study showed that there are differences in early adolescents eating behavior styles based on gender, nutritional status, body dissatisfaction, perceived health, screen time, physical activity status, AMD, and dietary intake. Being sensitive to emotional eating and external food cues is associated with unhealthy food consumption and excessive dietary intake whereas more restrained eating may indicate proneness to healthier food choices and inadequate dietary intake. These issues should be considered when planning healthy nutrition programs for early adolescents. This can make interventions more effective to prevent disordered eating behaviors.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of İzmir Katip Çelebi University Non-Interventional Clinical Trials Ethics Committee (Date: 27.04.2023, Decision No: 0206).

Informed consent: Written informed consent was obtained from the parents of children participating in this study.

Referee Evaluation Process: Externally peer reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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