

Evaluation of Dietary Habits, Diet Quality and Obesity Status of Primary School Students and Their Mothers

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Abstract:

The aim of this study was to evaluate the diet quality, eating habits and obesity prevalence of 6-10 year-old students and their mothers in Istanbul and Kırşehir provinces. It is a cross-sectional study carried out on a total of 200 people consisting of 100 students aged 6-10 years and their mothers studying in a private primary school in Istanbul and Kırşehir provinces. The nutritional habits, diet quality and obesity status of primary school students and their mothers are important in terms of preventing obesity-related health problems in our country. Socio-demographic form, food consumption frequency questionnaire and 24-hour food consumption record were taken and Eating Habits Index (BAI) and Healthy Eating Index-2015 were applied to the participants by face-to-face interview method. Weight and height measurements of the participants were taken and classified according to Bki and percentile values. Data analyses were performed in SPSS v.27 software. The mean Healthy eating index-2015 (HEI) scores of mothers and students were 43.19 and 41.87, respectively. When the risk level of mothers' and students' eating habits was evaluated, it was determined that 16.0% 15.0% mild risk, 55.0% 48.0% moderate risk, 25.0% 31.0% high risk and 4.0% 6.0% very high risk, respectively. A significant relationship was found between the risk levels of BMI in mothers and children ($p < .001$). According to Body Mass Index (BMI), 35% of the mothers were obese and 56% of the children were in the underweight category according to the percentile value. Among mothers and primary school children, 76% and 87% had poor diet quality in this study. There is a need to improve their eating habits. It has been observed that children and their mothers have unbalanced nutrition and these results may cause many diseases, especially obesity, in children and mothers in the future depending on nutrition.

Keywords: Mother-child nutrition; diet quality; healthy eating index; obesity; eating habits

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I. Introduction

Nutrition is defined as the intake of nutrients necessary for a person's growth and development, and to continue living in a healthy and productive manner¹. Healthy nutrition is associated with a state of adequate and balanced nutrition². Nutrition factor is known as an important determinant in the prevention of chronic diseases and the development of many illnesses³. It is known that the global prevalence of obesity has almost tripled in the last fifty years, posing a threat to future generations⁴. According to research, 23.6% of adult women are obese, 30.9% are overweight, and among men, 16.8% are obese and 40.4% are overweight⁵. In Turkey, it has been reported that 1.5% of second grade elementary school students are underweight, 14.6% are overweight, and 9.9% are obese⁶. Childhood obesity, characterized by an increase in fat cells, is a significant health problem⁷. Early changes in dietary habits can improve health⁸. Unhealthy eating in children leads to problems in later stages⁹. Overnutrition leading to obesity causes emotional, physical, social, and academic problems and contributes to the development of type 2 diabetes, hypertension, metabolic syndrome, and cardiovascular diseases¹⁰. As a result of undernutrition, musculoskeletal problems and rickets related to deficiencies in vitamin D and calcium, goiter and cretinism associated with iodine deficiency, anemia due to iron deficiency, and dental caries, as well as eating disorders, are frequently observed. Dietary diversity is crucial for adequate and balanced nutrition. Fruits, vegetables, and protein-rich foods should be consumed daily. The intake of foods and drinks low in nutritional value but high in energy should be limited. Milk and dairy products are important for children and adolescents in terms of calcium and protein intake¹¹.

To facilitate a global assessment of diet quality, the Healthy Eating Index (HEI) has been developed¹². A study conducted among adults in the USA revealed that the majority of participants had low HEI scores¹³. According to the HEI-2005, a study involving 481 elementary school students in Crete found that 84.5% of the

students had a diet that needed improvement. While 12% of individuals had poor nutrition, only 3.5% had an adequate and high-quality diet score¹⁴. The criteria for the HEI-2015 index have been revised and elevated. A study conducted in Kayseri on healthy and diabetic children aged 8-18 years showed that the diet quality in the diabetic group (HEI-2015: 50.5±10.2, according to TÜBER HEI-2015: 45.5±9.6) was higher than in the group considered healthy (HEI-2015: 43.9±10.7, according to TÜBER HEI-2015: 37.8±10.9). According to the recommended classification, children's total diet quality scores have been found to be in the poor-to-needs-improvement range¹⁵. One of the significant causes of obesity or overweight in children is known to be dietary habits¹⁶. With the increasing trend of unhealthy eating habits in school-aged children, the importance of healthy nutrition becomes more pronounced during this period. Skipping meals, reduced consumption of the meat group, dairy products, fruits, and vegetables, along with increased consumption of sweets, sugary drinks, and fast food, are examples of common negative eating habits encountered in childhood¹⁷. Eating while watching television, frequent consumption of high-fat foods and sugary drinks, and lower intake of fruits and vegetables are known to lead to imbalanced nutrition in children¹⁸. Parents, especially mothers, play a significant role in the nutrition of 6-10 year old primary school children. Studies have shown that children of obese mothers tend to be obese, and the unhealthy dietary habits of parents are often reflected in their children¹⁹⁻²⁰. Therefore, this study aims to assess the diet quality, eating habits, and obesity prevalence among children and their mothers.

II. Materials and Methods

2.1. Study Design and Participants

This cross-sectional and descriptive study was conducted from January to July 2023 with students aged 6-10 and their mothers, who agreed to participate and were attending a private school campus. The study involved face-to-face interviews and was carried out with a total of 200 participants, comprising 100 students and 100 mothers. Inclusion criteria were children aged 6-10 who agreed to participate with their mothers and had no communication barriers. This research protocol was approved by the Istanbul Aydin University Non-Interventional Clinical Research Ethics Committee (date: 28.03.2023, decision no: 2023/44, serial no B.30.2.AYD.0.00.00-050.06.04/44).

2.2. Data Collection Tools

In our study, statistical and document analysis methods were used. Data were obtained through face-to-face interviews and questionnaires. During the face-to-face interviews, individuals' demographic characteristics, eating habits, anthropometric measurements, 24-hour food consumption records, and food consumption frequency were queried using a form. Data were entered into the BEBIS program for the calculation of nutrient intake, and diet quality was assessed using the Healthy Eating Index 2015²¹.

The general information section of the questionnaire included questions about age, gender, chronic health conditions, eating habits, physical activity habits and frequency. The Eating Habits Index (EHI), developed and later updated by Demirezen, consists of six items and assesses the eating habits of both children and adolescents²². Based on the scores obtained, the "risk level of eating habits" is relatively determined. The risk levels are defined as follows: 0 = no risk, 1-6 = mild risk, 7-12 = moderate risk, 13-18 = high risk, 19-24 = very high risk. Demirezen and Coşansu have determined the Cronbach's alpha value of the index as 0.68²³. The total HEI-2015 score is categorized as: 0-50 points indicating inadequate diet quality, 51-80 points suggesting improvable diet quality, and 80-100 points reflecting high-quality diet²⁴.

2.3. Evaluation of Anthropometric Measurements

During the anthropometric measurements, the height, weight, and waist-hip circumference of the participants were measured. Weight measurement of the participants was conducted using a classic scale without shoes and in light clothing, while height measurement was done using a non-stretchable tape measure. To calculate the Body Mass Index (BMI), the formula "body weight (kg) / height squared (m²)" was utilized. For the assessment of BMI results, a reference index was used, considering the growth and development curves for children and adolescents. According to the percentile chart, those falling at or below the 5th percentile are classified as underweight, those between the 5th and 85th percentile as normal, those between the 85th and 95th percentile as overweight, and children and adolescents above the 95th percentile are classified as obese²⁵. The results for adults were examined according to the World Health Organization's classification. Accordingly, individuals with a BMI below 18.5 kg/m² are considered underweight, those between 18.5-24.9 kg/m² are normal weight, those between 25.0-29.9 kg/m² are overweight, and those with a BMI of 30.0 kg/m² and above are classified as obese²⁶.

2.4. Statistical Evaluation of Data

In this study, data analyses were conducted using SPSS version 27. Descriptive statistics for categorical variables were examined using frequency and percentage values, while numerical variables were analyzed using means and standard deviations, among other appropriate statistics. In hypothesis testing to examine the relationships and differences between variables, an alpha significance level of $p < 0.05$ was considered. During the analysis process, descriptive statistics were used to graphically represent participants' overall BMI statuses. The t-Test was utilized to examine differences according to gender. Additionally, Chi-square analyses were conducted to explore relationships among BMI, HEI, EHI, EHI risk level, and skipping main meals. BEBIS 7.2 was used for calculating the frequency of individuals' consumption.

III. Results

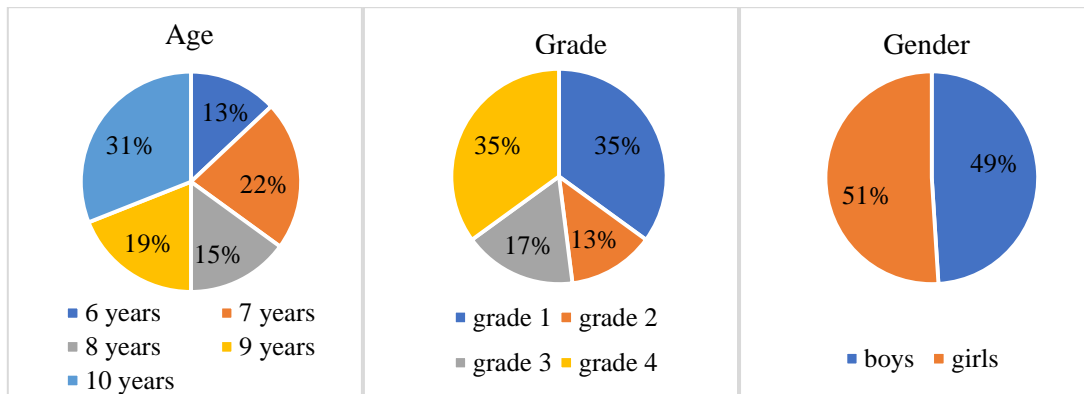


Figure 1. Demographic Characteristics of Students

The study included 100 mothers, with 44% being in the 34-40 years old age range, 35% being university graduates, 65% being homemakers, and 51% reporting that their income and expenses were equal (Figure 2). 31% of the students were 10 years old, 35% were in the 4th grade, and 51% were girls, while 49% were boys (Figure 1).

Descriptive Characteristics of Mothers (%)

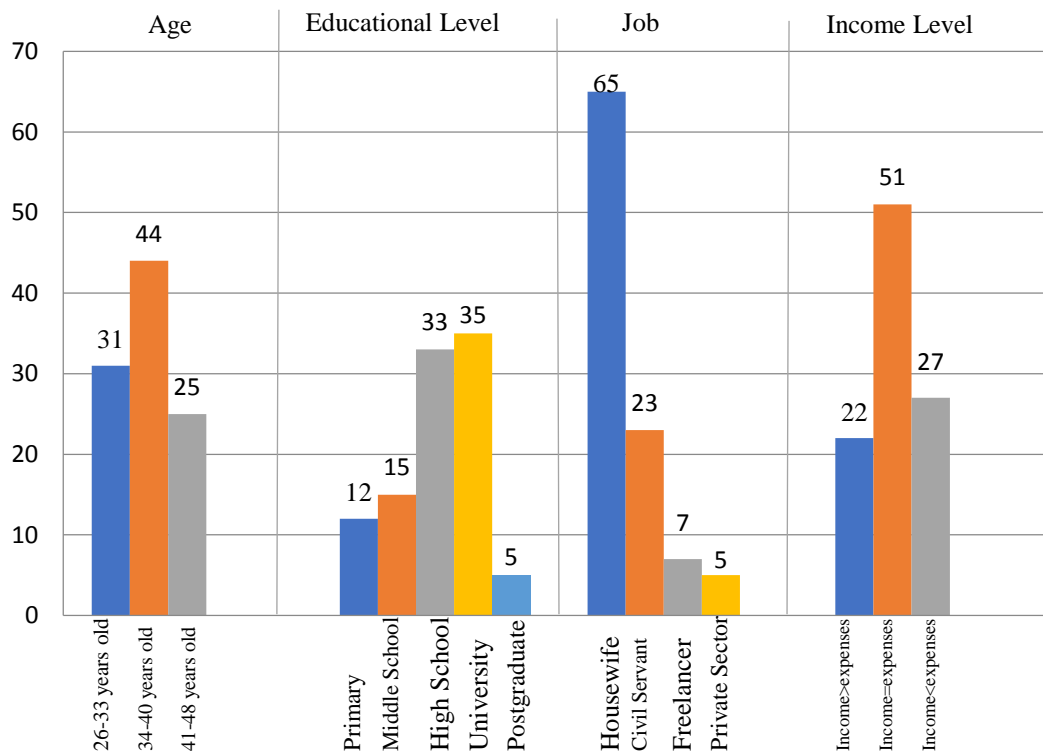


Figure 2. Descriptive Characteristics of Mothers

Figure 3 assesses the frequency and duration of regular physical activity among mothers and students. It was found that 74% of mothers and 58% of students do not engage in regular physical activity. Furthermore, 73% of mothers and 52% of students engage in physical activity for less than one hour.

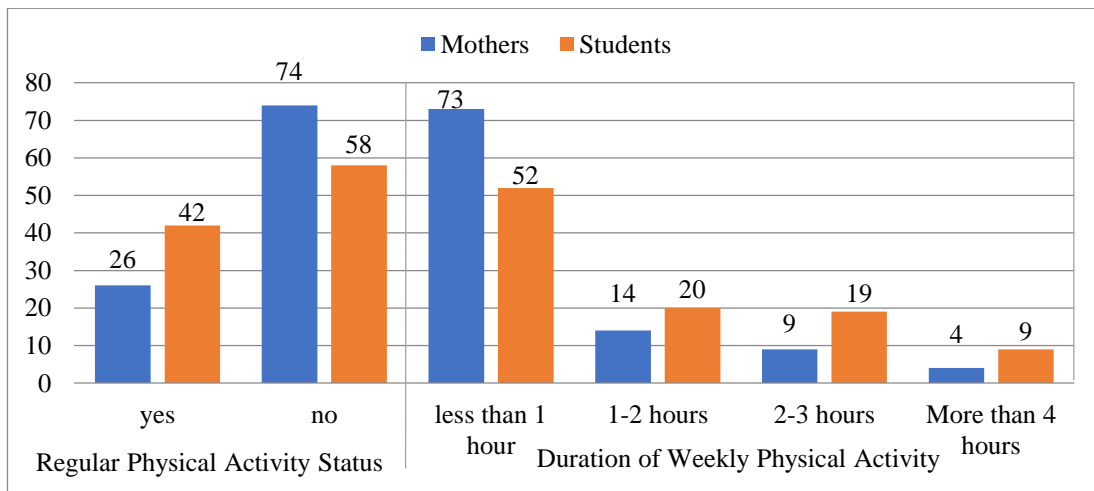


Figure 3. Distribution of Mothers and Students by Regular Physical Activity Status and Duration of Weekly Physical Activity

Figure 4 shows that 75% of mothers skip main meals, 48% consume 3 main meals, and 44% have 1 snack. It has been observed that 62% of students skip main meals, 70% consume 3 main meals, and 37% have 2 snacks.

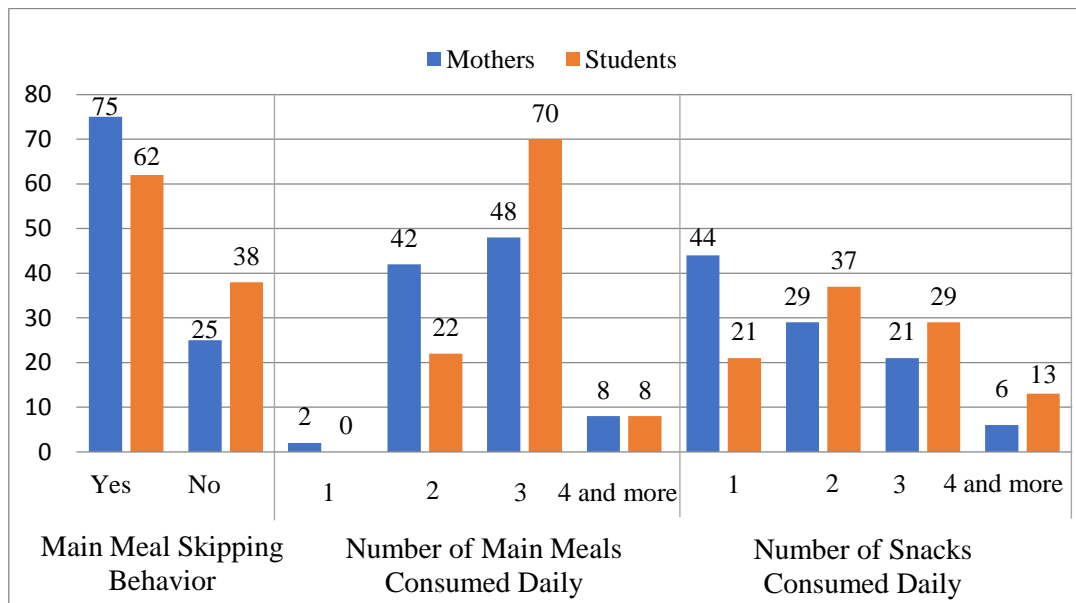


Figure 4. Distribution of Mothers and Students' Main Meal Skipping Behavior, According to the Number of Main and Snack Meals Consumed Daily

Figure 5 assesses the most frequently skipped main meals. It has been determined that among mothers, lunch is the most frequently skipped meal, while for students, it is breakfast.

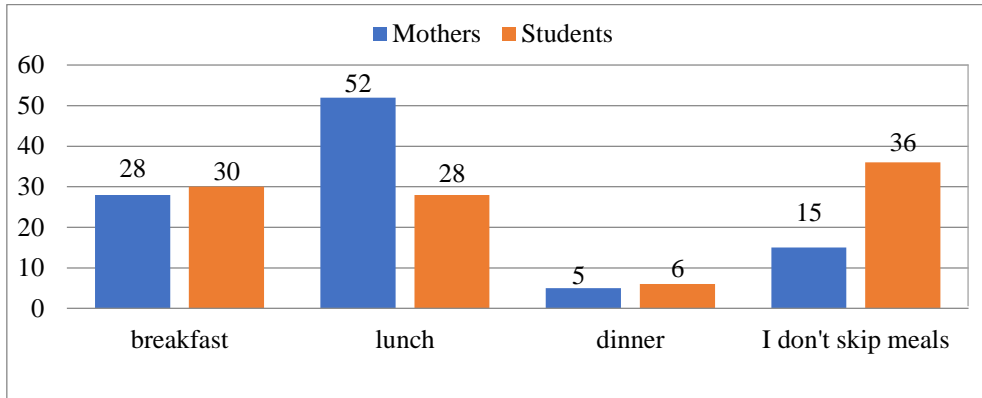


Figure 5. The Meals Most Frequently Skipped by Mothers and Students

In Figure 6, the relationship between the mother's BMI and the child's percentile values was examined using graphs and Chi-square analysis (Pearson Chi-Square: 14.140, df = 12, p = .292). This finding indicates that there is no direct significant relationship between the mother's BMI status and the child's percentile status. It has been observed that 66.7% of the mothers of overweight and obese children are obese.

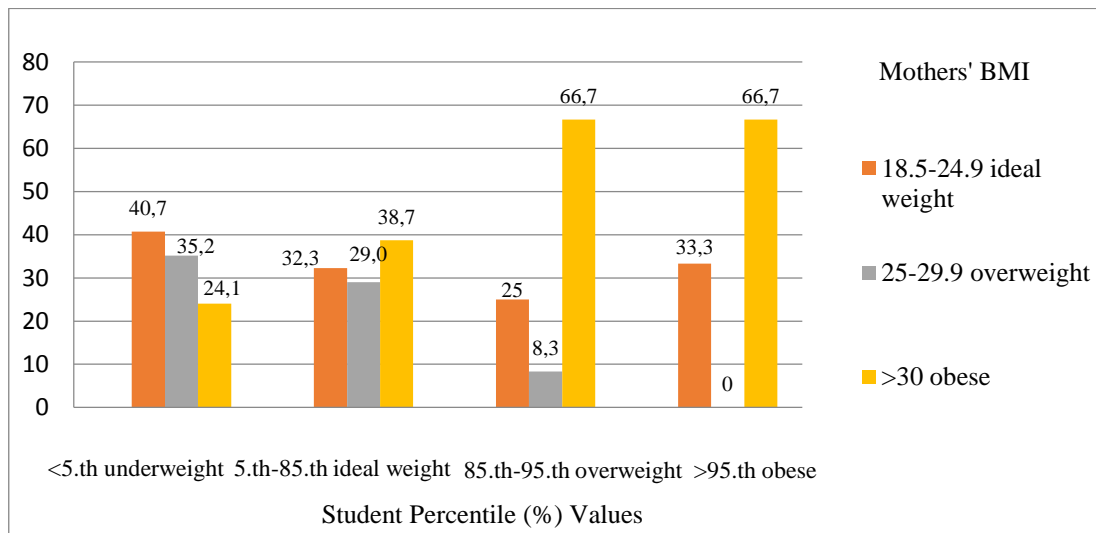


Figure 6. The Relationship Between Mothers' BMI and Children's BMI/Percentile Values

In Figure 7, it is shown that 54% of the children are underweight, while 35% of the mothers are obese.

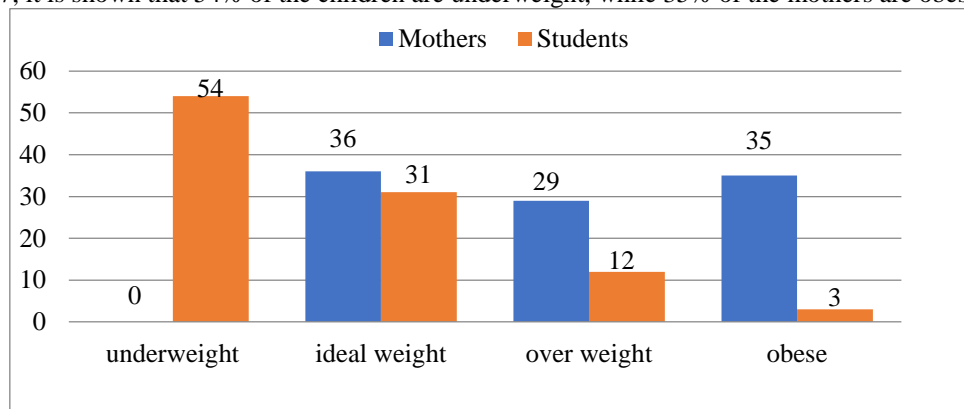


Figure 7. Distribution of Percentile and BMI Categories of Mothers and Students (%)

In Figure 8, it was determined that 65% of students purchase food from the school canteen, with the most commonly bought items being bagels and pastries, along with packaged products.

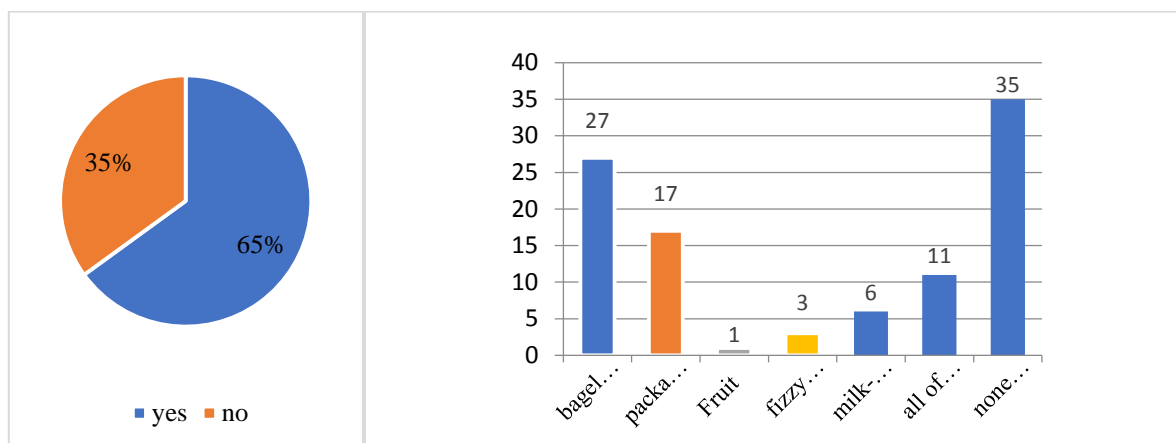


Figure 8. Distribution of Students' Purchasing Behavior from the Canteen

When evaluating the risk levels of eating habits of mothers and students, it was found that 16.0% and 15.0% are at mild risk, 55.0% and 48.0% at moderate risk, 25.0% and 30.0% at high risk, and 4.0% and 7.0% at very high risk, respectively, as presented in Table 1. Chi-square results have been evaluated (Pearson Chi-Square: 41.921, $df = 9$, $p < .001$). These results indicate a statistically significant relationship between the EHI risk levels of mothers and children.

Table 1. Cross Tabulation of Mothers and Children EHI Risk Levels

Mother's EHI risk level	Mild risk (1-6 points)		Moderate risk (7-12 points)		High risk (13-18 points)		Very high risk (19-24 points)		Total
	n	%	n	%	n	%	n	%	
Mild risk	7	46.7	9	18.8	0	0	0	0	16
Moderate risk	7	46.7	31	64.6	16	51.6	1	16.7	55
High risk	1	6.7	8	16.7	13	41.9	3	50.0	25
Very high risk	0	0	0	0	2	6.5	2	33.3	4
Total	15		48		31		6		100

The average score of the Healthy Eating Index (HEI) for mothers was found to be 43.19, while the average HEI score for children was 41.87. These findings indicate that both mothers and children are overall in the poor/inadequate nutrition category (0-50 points).

Table 2. Average HEI Scores of Mothers and Students

Measurement	Mothers' HEI Score	Students' HEI Score
Average	43.19	41.87

The results of the Pearson Chi-Square analysis conducted to determine the relationship between the HEI scores of mothers and students show that this relationship is significant (Pearson Chi-Square: 16.760, $df = 1$, $p < .001$). This finding indicates that mothers' healthy eating habits have a significant impact on their children's eating habits.

Table 3. Cross Tabulation of HEI Score Values for Mothers and Students

Mother's HEI Group	Child's HEI Group (0-50)		Child's HEI Group (51-80)		Total
	n	%	n	%	
0-50 (poor)	72	82.8	4	30.8	76
51-80(needs improvement)	15	17.2	9	69.2	24
Total	87	100	13	100	100

IV. Discussion

Intervening to determine children's food preferences is essential for preventing obesity and fostering healthy eating habits in children. In a study involving children aged 10-17 years, it was found that 28.0% frequently skipped meals, with breakfast being the most commonly skipped meal²⁷. According to the 2017 Turkey Nutrition and Health Survey (TNHS) results, among women aged 15 and over, 13.6% skipped breakfast, 32.4% skipped lunch, and 4.3% skipped dinner²⁸. In our study, it was observed that 75% of mothers and 62% of students skipped main meals. It was identified that lunch is the most frequently skipped main meal among mothers, while breakfast is the most skipped among students. A study found that parents' eating habits and knowledge levels significantly influence the development of their children's eating behaviors²⁹. In a study involving middle school students in 6th, 7th, and 8th grades in Istanbul, when scores were evaluated according to the Eating Habits Index, 64.1% of this group were found to have moderate risk, 21% high risk, and 14.1% mild risk in their eating habits. Unhealthy eating habits and associated risks were identified in the students²³. In our study, when assessing the risk levels of eating habits of mothers and primary school students, it was determined that 16.0% of mothers and 15.0% of students were at mild risk, 55.0% of mothers and 48.0% of students were at moderate risk, 25.0% of mothers and 30.0% of students were at high risk, and 4.0% of mothers and 6.0% of students were at very high risk. A significant relationship was found between the EHI risk levels of mothers and children ($p < .001$).

In a study in the United States that considered the HEI-2015 and involved 9,000 children aged 2-18, the average score was 54.9, while the total HEI-2015 score for 3,347 children aged 6-11 was found to be 53.9. The study observed that the overall diet quality of American children was generally low³⁰. A study conducted on African girls aged 8-10 found an average HEI-15 score of 53³¹. It was revealed that parents play a significant role in shaping both the nutritional quality and food intake of their children. In this study, which included 114 children and their parents aged 7-10, the average HEI-2015 score for children was found to be 51.96³². Our study's analysis, conducted to determine the relationship between the HEI scores of mothers and students, showed that this relationship was significant ($p < .001$). In a different study examining HEI scores, the average HEI-2015 score for children aged 6-11 was reported as 53.2³³. In a study conducted in Hatay using the HEI-2015 among adults, the group's HEI score was calculated as 48.1 ± 13.10 for men and 50.1 ± 13.36 for women. In our study, 54% of participants were found to have poor diet quality (0-50 points), and 46% had diet quality that needs improvement³⁴. The average HEI-2015 score for mothers was found to be 43.19, and for students, it was 41.87. It was determined that 76% of mothers and 87% of students had poor/inadequate diet quality. When examining HEI scores among students by gender, the average HEI score for female students was identified as 42.85 (SD = 6.40), which is slightly higher compared to the average HEI score of male students at 40.84 (SD = 9.76). It has been observed that neither mothers nor students have adequate and balanced dietary patterns.

It is known that children's eating habits are largely influenced by their parents, and there is also a significant relationship between the BMI-percentile values of parents and children. An increase in obesity among mothers has been observed to correlate with an increase in obesity in their children. In a study conducted with students in grades 1-4 and their mothers, when BMI values were examined, it was found that 14.7% of children were underweight, 47.5% normal, 12.8% overweight, 25.0% obese; whereas 2.8% of mothers were underweight, 46.3% normal, 37.8% overweight, and 13.1% obese³⁵. In a study involving students in grades 1 and 2 and their parents, 58.1% of students were classified as very underweight, 24% as underweight, 16.2% as normal weight, and 1.4% as overweight³⁶. In our study, based on BMI, 35% of mothers were found to be obese, 29% overweight, and 36% normal; while according to percentile values of children, 3% were obese, 12% overweight, 31% normal, and 54% underweight. It was also found in our study that 75% of children with obese mothers were overweight. This situation indicates that children's nutrition is influenced by their mothers. The fact that a significant portion of obese children (66.7%) have obese mothers suggests that the mother's BMI status may have an important effect on the child's percentile status. However, due to only three children being in the obese category in the study, the low number of observations should be considered before making generalizations.

Limitations of the Study

The results of our research are limited to the data of students and mothers in Kırşehir and Istanbul who agreed to participate in the study. It is assumed that the students and mothers provided accurate responses for the survey.

V. Conclusion

The average HEI-2015 scores for students and mothers are respectively 41.87 and 43.19. Our findings indicate that the nutrition of both students and mothers is inadequate. This is due to low consumption of vegetables and whole grains, and high consumption of processed/refined foods (white bread, bagels, pastries). These scores need to be improved to exceed 50 points. The consumption of whole grain products and fruits and vegetables should be increased. Since mothers' nutritional status affects their children, it has been observed that

children of overweight mothers are also overweight. Mothers should be educated on this matter. Nutritionists should provide healthy eating training to families, teachers, students, cafeteria and canteen operators in schools. It has been observed that children consume packaged products and bagels-pastries from school canteens. School administrations and the Ministry of Health should make regulations to ensure canteens offer quality foods. Sales of nuts, seeds like almonds, walnuts, peanuts, and fresh/dried fruits, and whole-grain bagels and pastries can be encouraged. More research is needed to determine and improve the diet quality of mothers and primary school children.

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