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Original Article

# Breakfast habits and diet quality among university students and its effect on anthropometric measurements and academic success

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**Summary.** *Background and Aim:* Breakfast consumption is important especially for children and young people for mental development and school/academic success and also it has shown to be protective against obesity. The aim of this study is to investigate whether breakfast habits and diet quality affect anthropometric measurements and academic success among university students. *Materials and Methods:* A total of 365 students, aged between 17-27 years, attending a state University in Turkey, were enrolled for this study. A questionnaire on their eating habits and a diet quality index was designed for the students, anthropometric measurements and students' final Grade Point Average (GPA) were taken. *Results:* Having regular breakfast and a high quality diet has been recorded to have positive effects on the waist circumference as well as waist/hip ratio and GPA scores. *Conclusion:* It was concluded that regular breakfast habits and a diet of good quality have positive impact on school, academic and the overall health.

**Key words:** breakfast, academic achievement, diet quality

## Introduction

An adequate and a balanced diet is an important part of a healthy lifestyle. Good nourishment is provided by getting adequate amounts of energy and food items of high quality for their age and gender, preparing and cooking foods with healthy methods, and consuming sufficient fluid. Unhealthy eating habits such as skipping meals, frequent consumption of fast food or snacks instead of proper meals, excessive intake of foods high in refined carbohydrates and fat may lead to inadequate nutrient intake of varying degrees and some nutritional problems (1). Besides, adequate intake of daily energy and nutrients according to their age, sex and activity level, together with a balanced distribution of nutrients consumed during the day, is important for a healthy diet. Breakfast is considered the most important meal of the day for a healthy diet (2). Energy obtained from food in a balanced breakfast should meet 1/4 or at least 1/5 of daily energy intake (3). Despite its known effects on mental and physical health, breakfast is reported to be usually skipped by college students in various studies at the rate of 34.1- 54.5% (4,5). According to the findings from US National Health and Nutrition Survey, 19% of young people in the United States tended to skip their breakfast (6). According to the findings in Turkey Nutrition and Health Survey (TNHS) – 2010, 21.0% of the participants aged between 15-18 years and 20.4% of them aged between 19-30 years skipped their breakfast (7).

Breakfast habit is considered as a vital part of a healthy and balanced diet for all age groups. Maintaining a regular, daily breakfast consumption, positively affect mental development and school achievement in children as well as academic achievement in young people (8-11). Besides having regular breakfast, the variety of foods consumed for breakfast affects the physical and mental health of young people (12).

Breakfast meals with low glycemic index foods, reduce the amount of food consumed and the received energy in the lunch meal (13). Consumption of cereals, fresh fruit juice, low-fat milk in breakfast have been reported to limit the amount of daily intake of saturated fatty acids, cholesterol, sodium, and added sugar (6).

Breakfast consumption is known to have an inverse correlation with body composition, and regular breakfast consumption is an important indicator of a healthy lifestyle and also it has shown to be protective against obesity in several studies (14-18). According to data of Turkey Statistical Institute (19), 34.8% of the Turkish population above the age of 15 were overweight and 17.2% were obese. Obesity rates were 13.7% for males and 20.9% for females above 15 years of age (19). In a study investigating the frequency of breakfast among the university students who had continued their education in the health field, 28.6% of male students and 5.8% of the female students were overweight and 16.7% of all students who had breakfast everyday were overweight (20).

Regular breakfast consumption is necessary to ensure a balanced diet at all ages. Breakfast consumption is important especially for children and young people for mental development and school / academic success. This study aimed to investigate breakfast habits and diet quality among university students and its effect on anthropometric measurements and academic success.

## Materials and Methods

This study was conducted among university students aged between 17-25 years, attending a state University in Turkey. A total of 365 students consisting of 86 men (23.6%) and 279 girls (76.4%) were enrolled for this study. A questionnaire administering face-to-face interviews with students, included questions about their demographic characteristics, dietary habits and frequency of food consumption. Also, the Mediterranean Diet Quality Index (KIDMED) was applied and some anthropometric measurements were taken.

Pertaining to the eating habits section of the questionnaire, the most skipped meals and reasons for skipping meals, frequency of consuming some foods and beverages in breakfast were questioned.

KIDMED scale was used to evaluate the quality of diet. The scale was developed based on the principles of Mediterranean-Style Diet by "Serra-Majem L, Ribas L, García A, Pérez-Rodrigo C, Aranceta J" (21). Questions about the scale which consisted of six questions are answered as either yes or no. According to the Mediterranean diet, negatively featured answers are scored with "-1 point", and positively featured ones with "+1 point". Total points vary between 0-12 points. The total scores from the KIDMED scale are considered; "≥8 points" as optimum diet quality, "4-7 points" as moderate diet quality (improvements are needed in the diet) and "≤3 points" as very low diet quality (22).

Students' final, overall academic average values are considered in evaluating the academic success. General academic Grade Point Average (GPA) values were obtained from the relevant departments of the University's student affairs division.

Anthropometric measurements of body weight, height, waist circumference and hip circumference were measured by researchers. Body weight and height measurements was carried out using a Tanita WH2 brand digital weighing with length meter. Body weight measurement is taken in the morning when participants are hungry. Frankfort plane was provided when measuring height, as head, shoulders, back, hips and heels touch the length gauge. Waist circumference was measured with a stretch measure by measuring the area between the lower ribs and crista iliac bone. Hip circumference measurements were taken by measuring the area from the highest point of the hip circumference by the side of the individual. BMI (Body Mass Index) was calculated according to known formula as body weight (kg) / (height (m))$^2$ and evaluated by the World Health Organization (WHO) classification as <18.50 kg / m$^2$ lean, 25.00-29.99 kg / m$^2$ overweight and <30.00 kg / m$^2$ was considered to be obese (23). A waist circumference ≥80 cm in women and ≥94 cm in men were considered to be at risk of metabolic diseases; ≥88 cm in women and ≥102 cm in men were considered to be at high risk of metabolic diseases; ≥0.85 Waist / Hip Ratio (WHR) in women and ≥0.90 in men were considered as high risk for metabolic complications (24).

The ethical approval of the study was obtained using the decision number of OMU KAEK 2015/15

from Samsun Ondokuz Mayis University, Clinical Research Ethics Committee dated 15.01.2015.

Statistical analysis of the data was performed using SPSS (Statistical Package for the Social Sciences) 21 software package program with independent t-test, ANOVA(Analysis of Variance), Mann-Whitney U test and Pearson's correlation. P<0.05 was considered statistically significant.

## Results

*Socio - Demographic Characteristics*

A total of 365 students participated in this study including 279 females (76.4%) and 86 males (23.6%). Mean age of students was 19.7 ± 1.8 years (17-25 years) and 62.2% of them have been living in the hostels. Majority of the students' mothers (33.7%) graduated from primary school, the majority of fathers (37.3%) graduated from the high school. While 74.8% of the mothers were housewives, majority of fathers (36.2%) were civil servants. The percentage of students who declared they were healthy was 95.1% and 5.5% of them make use of vitamin- mineral supplementation for various reasons. Percentage of families who had regular breakfast was 93.7%.

*Nutritional Status*

Students consumed an average of 3.02 ± 0.85 meals per day and breakfast was the most skipped meal with a rate of 30.1% . It was reported that insufficient time is the reason behind majority of students not having breakfast (23.8%). The majority of students had their breakfasts and dinners at home (67.7 % and 75.1% respectively) and lunches (64.4%) at school cafeteria.

The average BMI of the meal skippers (22.14 ± 2.55 kg / $m^2$) was higher than those who did not skip meals (21.39 ± 2.13 kg / $m^2$) (p<0.05); while achievement scores of meal skippers were significantly lower than non skippers. (2.71 ± 0.49 points and 3.16 ± 0.45 points; respectively, p <0.05).

Relationship between the number of meals consumed in a day by students and waist / hip ratio was investigated with Pearson's correlation. As the number of meals increased, Waist / Hip Ratio (WHR) decreased (r=-0.183, p<0.05). On the other hand, while the number of meals increased, grade point average also increased (r=0.365, p<0.05). Skipping meal status of the students, skipped meals and the distribution of reasons behind skipping meals are shown in Table 1.

In Table 2, the average values of BMI, waist circumference, WHR and GPA scores of students are given in accordance with their having breakfast status. Frequency of having breakfast is not associated with BMI. However, while only 7.9% of students who had breakfast regularly had BMI over 25 kg/$m^2$, 11.9% of those who had breakfast sometimes had BMI over 25 kg/$m^2$. The average WHR of students who had breakfast daily (0.79 ± 0.06) was significantly lower than those who had sometimes (0.82 ± 0.07) (p<0.05); the average Waist Circumference (WC) of those who had breakfast daily (74.87± 8.06 cm) was significantly lower than those who had sometimes (77.26 ± 8.68 cm) (p<0.05).

Breakfast habits was found to be associated with the academic success score. Academic success score of those who had breakfast every day (3.17±0.37) was

**Table 1**. Skipping meals status of students, skipped meals and distribution of reasons to skip meals

| Variables | N | % |
|---|---|---|
| Skipping meals status | | |
| Yes | 113 | 31.0 |
| No | 67 | 18.4 |
| Sometimes | 185 | 50.7 |
| Skipped meals | | |
| Breakfast | 110 | 30.1 |
| Lunch | 100 | 27.4 |
| Dinner | 15 | 4.1 |
| Breakfast and lunch (both meals) | 53 | 14.5 |
| Breakfast and dinner (both meals) | 12 | 3.3 |
| Lunch and dinner (both meals) | 10 | 2.7 |
| Reasons to skip meals | | |
| Lack of time | 107 | 29.3 |
| Poor appetite | 80 | 21.9 |
| Not to be late | 44 | 12.1 |
| The absence of someone preparing food | 26 | 7.1 |
| Weight loss request | 5 | 1.4 |
| Lack of habits | 43 | 11.8 |

**Table 2**. BMI, waist circumference, WHR values and GPA scores according to their breakfast having habits

| Features | Breakfast having habits | | |
|---|---|---|---|
| | Daily breakfast having grup | Sometimes breakfast having grup | Never having breakfast |
| | $\bar{x} \pm S$ | $\bar{x} \pm S$ | $\bar{x} \pm S$ |
| BMI (kg/m$^2$)[a] | 21.67±2.55 | 22.02±2.47 | 22.14±1.97 |
| Waist circumference[b] | 74.87±8.06 | 77.26±8.68 | 77.15±7.24 |
| WHR[b] | 0.79±0.06 | 0.82±0.07 | 0.83±0.07 |
| GPA score[b] | 3.17±0.37 | 2.82±0.41 | 2.46±0.49 |

*[a] p>0.05, [b] p<0.05*

*Anthropometric Features*

**Table 3**. Comparison of anthropometric measurements by gender

| | Male (n=86) | Female (n=279) | Total (n=365) |
|---|---|---|---|
| Anthropometric Measurements | $\bar{x} \pm S$ | $\bar{x} \pm S$ | $\bar{x} \pm S$ |
| Body weight (kg)* | 74.72 ± 8.10 | 57.26 ± 7.14 | 61.38 ± 10.45 |
| BMI (kg/m$^2$)* | 23.66 ± 2.22 | 21.32 ± 2.27 | 21.87 ± 2.47 |
| Waist circumference (cm)* | 85.91 ± 6.59 | 73.18 ± 6.30 | 76.18 ± 8.35 |
| Hip circumference (cm)* | 97.56 ± 11.92 | 93.36 ± 6.56 | 94.35 ± 8.32 |
| WHR* | 0.89 ± 0.07 | 0.78 ± 0.04 | 0.81 ± 0.07 |

**p<0.05*

higher than those who had sometimes (2.82 ± 0.41) and those who never had (2.46 ± 0.49) (p<0.05); success score of those who had breakfast sometimes was significantly higher than those who never had (p<0.05).

According to BMI, 84.4% of students were at normal range, 9.3% was overweight, and 6.0% was lean. Average BMI of male students (23.66±2.22 kg/m$^2$) was significantly higher than the BMI of female students (21.32±2.27 kg/m$^2$) (p<0.05). The average WHR of male students (0.89±0.07) was higher than the WHR of female students (0.78±0.04) (p<0.05).

A comparison of anthropometric measurement by gender is shown in Table 3.

*Diet Quality*

The average diet quality scores of male and female students is 4.87±2.83 and 3.96±2.67, respectively. Diet quality scores were significantly higher in females than males (p<0.05). 44.7% of the students have diet quality scores between 4-7 points, their diet qualities were moderate.

Table 4 shows GPA points by diet quality. Accordingly, the average success scores of those with optimal diet quality (3.13±0.41) was higher than those with middle and low diet quality (respectively 2.94 ± 0.43 and 2.72 ± 0.48); the average success score of the moderate diet quality group was higher than the diet quality group (p<0.05).

*Food Consumption*

Black tea was the most consumed beverage (74.2%) for breakfast by students and the most consumed foods were white bread (64.7%), white cheese (41.1%), whole-grain bread (36.4%), fresh vegetables (26.3%), eggs (17.5%) and jam (13.2%), respectively. Rate of foods that had never been consumed by students were 38.9% for milk, 69.9% for fresh fruit juice, 61.9% for packaged ready juice, 70.4% for breakfast cereals, 51.5% for butter, 82.5% for margarine.

*Evaluation of success states of students*

Mean GPA score of the students was 2.91 ± 0.47;

**Table 4**. GPA score values according to diet quality scores

| | GPA score | |
|---|---|---|
| Diet quality scores | x̄ | S |
| ≥8 (the optimal diet quality) | 3.13 | 0.41 |
| 4-7 (the moderate diet quality) | 2.94 | 0.43 |
| ≤3 (the low diyet kalitesi) | 2.72 | 0.48 |

*p<0.05*

the lowest score was 1.31 points, the highest one was 3.90 points. Mean achievement score for females (2.95±0.48) was significantly higher than the score for males (2.72±0.37) (p<0.05). While there was no significant difference between BMI and success score, a significant relationship between success score with breakfast habit were found; mean success score of those who had breakfast everyday (3.17 ± 0.37) was higher than score of those having breakfast occasionally (2.82 ± 0.41) or who never had (2.46 ± 0.49) (p<0.05). In addition, diet quality was found to have a correlation with or effect on academic success, those who had higher diet quality score were found to have higher success scores as well (p<0.05) (Table 4).

## Discussion

In a study comparing some anthropometric characteristics between boys and girls (25); male students were found to have significantly higher values in terms of body weight, BMI, waist circumference. In our study, although the mean BMI values were in the normal range for both sexes, male students were found to have higher values for body weight, BMI and waist circumference than females (Table 3). WHO reported the ranges for the risk threshold of waist circumference towards metabolic diseases as 94 cm for males and 80 cm for females (24). In our study, the mean values of waist circumference in both genders were below the cut off points for metabolic risks that have been reported by WHO (for females and males respectively; 73.18 ± 6.30 cm and 85.91 ± 6.59 cm).

In a survey conducted with university students in Ankara (25), breakfast (%47.7) and lunch (%25.2) were found to be the most skipped meals. In our study, the rate of breakfast skippers was lower (30.1%), while rate of lunch skippers was higher (27.4%). The reasons for lower rate of the skipping breakfast in our study, is because, it is thought that living in a smaller city than Ankara might have been effective, students have less worry about transportation to school and being late. Most students (23.8%) skip breakfast because of insufficient time. 67.7% of the students who eat breakfast regularly reported they had breakfast at home. HELENA's study, conducted in ten European countries, investigated the breakfast habits of 3,528 adolescents (26), the study showed that half of the participants had regular breakfast, with girls having regular breakfast habits less than boys. In the study of eating habits examined by Lebanese University students (27), 53.3% of females and 52.1% of males were found to have breakfast every day or 3-4 times per week. In another study, the breakfast habits of families has been shown to significantly affect breakfast habits of adolescents (28). In this study, 93.7% of the students' families had breakfast every day. Nevertheless, only 44.9% of the students had breakfast every day. This may be due to majority of students (83.3%) living in another city and being away from their families as well as unfavorable socio-economic conditions because of University education. Hallstrom et al have identified that family's breakfast habit is effective for breakfast consumption in adolescents (26). Budak et al, in their study of University students (29) found 47.1% of students who have breakfast at home with their family. In our study, 55.7% of students who live with their family have developed breakfast habit. In addition, 67.7% of the students have breakfast in their house. It is assumed that these results may be affected by the opportunities available where they live in as well as the socio-economic and individual characteristics of the students. In the study of Grieger and Cobiac (30), 20% of male adolescents around 12-16 years skip breakfast. Ahadi et al, in their study among children and adolescents around 6-18 years (31), found that 19% of respondents skip breakfast and individuals who skipped breakfast has been found to have higher BMI. In the study of Maddah et al, 65.7% of adolescents who skip breakfast was overweight (32). This study found no significant correlation between BMI and breakfast skipping (p>0.05). Breakfast is an important meal of the

day and almost 1/3 (30.1%) of the students skipped their breakfasts. For college students still undergoing growth and development, breakfast is important for both physiological requirements and mental functions. Hence, students should be informed about the importance of breakfast and also should be educated on easy to prepare, edible and nutritious foods that can be consumed at breakfast.

In a survey conducted about the types of food consumed for breakfast by University students (33), 71.4% of male and 82.3% of female students consume milk, 60.8% of male and 79.2% of female students consume cereals for breakfast. In this study, 19.7% of the students consume milk 1-2 times a week, 64.7% of students consume white bread every day. In a study investigating the effect of breakfast habits among Australian adolescents (30), breakfast cereal consumption was found to be 42% and the cereal consuming group was determined to have more calcium, iron, thiamine, riboflavin, zinc, folate, magnesium, iodine and less sodium and fat. Cereal consumption for breakfast (cereals, cooked grains, such as bread) reduce BMI and waist circumference measurements (34,35). In our study, the rate of consumption of breakfast cereals 1-2 times a week is 10.1%, percentage of those who never consume breakfast cereal is 70.4%, consumption rates were lower based on the results of similar studies. From the result of some studies carried out in our country, the consumption of cereals has been reported not to be very common (7,36). Having breakfast as well as foods consumed for breakfast are important. Breakfast cereals are foods that can be recommended to students who have been reported to skip breakfast because of lack of time. Breakfast cereals are easy to prepare and consume and are also enriched with various nutrients.

In a study evaluating the relationship between a typical Italian breakfast and cardiovascular disease in Italian adults (37), foods consumed for breakfast were also evaluated. In a typical Italian breakfast, flakes, coffee, sugar, milk, biscuits, jam and tea are often consumed. Hence in the study, coffee, milk, jam and tea consumption was reported as 93.9%, 67.7%, 37.3% and 33.4%. In our study, (74.2%) tea is mostly preferred as a beverage, consumption rate of coffee (11.5%) and milk (10.7%) was lower. It is remarkable that the rate of milk consumption is very low. Adolescents should be encouraged to increase their milk consumption or intake. Studies showed that food and drinks consumed for breakfast vary according to the country's cultural properties (30,33,37). While coffee, cereals and sugar which Italians often consume for their breakfast, are consumed less frequently by Turkish students, jam and tea which are rarely consumed by Italians, are consumed frequently by University students in our country. The variation in the nutritional habits is thought to be the cause of the social, cultural, regional, traditional, and individual differences. A study was conducted to determine the eating habits of a University's female students staying in dormitories In Ankara,Turkey at two different socio-economic levels (38), in this study, most beverages consumed during breakfast was reported to be, tea (66.0%), prepared fruit juice (16.3%), milk (13.7%) and instant coffee (4.0%) respectively. From the study assessing the nutritional status of Turkish students living in Germany and Turkey (39), students living in Turkey prefer cheese, butter, bread, eggs, honey, jams, cakes and tea for their breakfast, while Turkish students living in Germany prefer cereals and fruit juice for breakfast. In this study, foods consumed by students daily are black tea, white bread, multigrain bread, feta cheese, fresh vegetables, eggs and jam, respectively. From these two studies, while students living in Turkey were found to be alike due to the foods they consume for breakfast; existing differences between the rate of food consumption of students living in Turkey and Turkish people living in Germany have been observed. These results are thought that might have been affected by although they are from the same nationality, students living in Germany are in interaction with a different culture and have adapted to a new culture.

Several studies have shown that tea is the preferred drink in our country (7,40,41). Although, tea consumption during breakfast is a common habit in our country, the tannins in the tea consumed with food decreases the absorption of iron by binding (1). In our study, the low levels of consumption of fresh vegetables and fruits by students suggests that vitamin C intake which is needed to increase the absorption of iron may also be insufficient. Therefore, a reduction in the consumption of tea and an increase in the intake of fresh fruits and milk or juice consumption for breakfast will

enhance the nutritional value of the meal.

From the study of Budak et al, conducted by Erciyes University students (29), and similar to the results of our study, academic achievement scores of students who have breakfast is higher, and there is a statistically significant relationship between having breakfast and academic achievement. Achievement scores of students who have breakfast esvery day were significantly higher than those who have breakfast sometimes or never have (Table 2). In our study, there was no correlation between BMI and having breakfast, while among those who had regular breakfast, 10.4% of them was weak, 81.7% of them was normal and 7.9% of them was overweight (BMI ≥25 kg / m2) according to BMI. In our study, having breakfast was found to be associated with WHR and waist circumference, waist circumference and WHR values of those who eat breakfast regularly were lower. These results showed that regular breakfast habit is effective for reducing the health risks associated with body weight and composition. In a study conducted in primary schools in Greece (42), a negative correlation between abdominal obesity and academic achievement was discovered and compliance with the Mediterranean diet was found to be an important determinant of academic success. In the Sahingöz ve Sanlier study (43), 59.2% of students have a moderate diet quality, 22.9% of them have optimal diet quality and 17.9% have a very low quality diet. In a study assessing diet qualities of adolescents aged between 10-14 years using the KIDMED scale (44), 10.5% have low diet quality, 64.2% have moderate diet quality and 25.3% have optimal diet quality. In our study, 37.5% of students have low, 44.7% moderate and 17.8% were found to have an optimal quality diet. In our study, the proportion of students having low quality diet was higher when compared with the results obtained from similar studies. This condition is believed to have worsened the due to the fact that majority of students (62.2%) stay in dorms and the unfavorable economic conditions. According to the results of this study, academic achievement scores of those who have higher diet quality is higher than those of medium and low quality (Table 4). In the study by O'Sullivan et al (12), the quality of food consumed for breakfast were positively correlated with diet quality, the breakfast with healthy snacks is shown to reduce BMI (45).

Breakfast reduces excessive food intake in other meals of the day and so it is important in terms of impact for the maintenance of an ideal body weight. Regular consumption of breakfast result in success at school in children and young people, academic / business success in adult and body composition across all age groups. Beginning from childhood, developing breakfast habits in individuals through family education and the school curriculum will further contribute to the preservation of health.

Our study suggests that regular breakfast habits and a diet of good quality have positive impact on anthropometric measurements and academic success among University students. Parents, educators and administrators are needed to create awareness to encourage regular breakfast consumption and for improvement in the diet quality of children and young people.

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