Journal Pre-proof

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Please cite this article as: M. Merve Tengilimoglu-Metin , Damla Gumus , Are Depression, Resilience and Fear of COVID related to Eating Behaviour and Nutrition Status of University Students?, *Nutrition* (2022), doi: https://doi.org/10.1016/j.nut.2022.111884

Are Depression, Resilience and Fear of COVID related to Eating Behaviour and Nutrition Status of University Students?

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HIGHLIGHTS

1. More than the quarter of the students had moderate or severe depression.

2. Participants with higher severity of depression had higher emotional eating score.

3. Fear of COVID was related with emotional, external, and restrictive eating.

4. A positive correlation between fear of COVID and daily energy intake was observed.

5. Higher psychological resilience was linked with lower total DEBQ scores.

Abstract

Objective: This study was designed to examine eating behaviours and their association with fear, depression states concerning COVID-19 among students in Turkey.

Methods: A total number of 499 students, 336 (67.3%) female and 163 (32.7%) males, participated in an online-based cross sectional study. The survey collected data on the Dutch eating behaviour questionnaire (DEBQ), along with measuring psychological impact by using Fear of COVID-19 scale (FCV-19S), Beck depression inventory (BDI), and Brief resilience scale (BRS). In addition, 24-hour dietary records were used to calculate the daily energy and macronutrient intakes in the study.

Results: Correlation between brief resilience and fear of COVID was found negatively. Total and subdomains DEBQ scores were positively correlated with fear of COVID; conversely, there was a negative correlation with brief resilience ($p<0.05$). More than half (58.9%) of students were in depression, and students who had moderate and severe depression had higher total DEBQ and emotional eating scores. Students with severe depression had the highest levels of fear of COVID. Students having higher daily energy intake had greater fear concerning COVID-19, and the daily energy intake was negatively correlated with restrained and external eating.

Conclusion: During the pandemic, negative psychological effects result in unfavorable dietary behavioural consequences depending on the increasing levels of stress.

Keywords: Emotional eating, External eating, Restrained eating, Mental health, Pandemic

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Introduction

In December, 2019, the Coronavirus disease 2019 (COVID-19) begun in Wuhan, Hubei, China, had a tendency to spread rapidly in the world, became a serious infection threat to public health in many countries and had been declared by the WHO as a global outbreak that requires emergency intervention [1, 2]. Public health authorities started to recommend wearing a mask, social distancing, hygiene, and individuals were forced into numerous restrictions including a whole and/or partial lockdown by governments to minimize the risk of transmission [3]. Temporary closures, isolation practices and restrictions have affected the physical and mental health of many individuals and have led changes to habitual dietary and physical activity state [4-6]. Many psychological problems including stress, anxiety, depression, insomnia, frustration emerged as important consequences of the COVID-19 outbreak, and studies highlights college students are among the most strongly affected by the pandemic due to uncertainty regarding academic success [7-9]. During the interrupted education process, students have introduced with digital learning and had to continue attending classes online to support government's "stay-at home" mandates [10]. A longitudinal cohort study conducted in the United Kingdom reported greatest increase mental distress in people aged 18-24 years due to home confinement [11]. In a study focusing on Chinese medical college students reported that about 24.9% of the students experienced anxiety pertaining to COVID-19 outbreak [12]. In the United State, spending extensive time (8 or more hours) on screens by college students found as a risk factor for higher levels of psychological impact of COVID-19 outbreak [13]. Another study from Pakistan showed that 23% of the health science students experienced moderate to severe depression, about 44% of the sample experienced moderate to severe anxiety [14]. There have been reports that stress affects not only individual's mental well-being, but also eating habits, eating behaviours and food intake of individuals has been affected [15]. Some studies have shown that when

individuals feel stressed, they tend to develop unhealthy dietary pattern and prefer the consumption of hyperpalatable, high-sugar and high-fat foods, while other studies have reported that their food consumption decreases [16]. This study was conducted to assess fear of COVID-19, depression, and resilience scores of students and how this influences their eating behaviour during pandemic in a developing country, Turkey.

Methods

Participants

A web-based cross-sectional survey was carried out on students aged 18-25 studying at 92 different universities in Turkey between November and December 2021. An online questionnaire was developed via the Google Form and the link of the questionnaire was sent to the participants via social media (Facebook, Instagram, Linkedin, Twitter, Whatsapp) using the snowball sampling method. Exclusion criteria included using drugs (antidepressants, metformin, etc.), having conditions affecting appetite, chronic or systemic diseases, psychiatric diseases and/or receiving eating behaviour therapy, pregnancy, or lactation. Students studying medicine/health sciences were also excluded. Hacettepe University Non-Interventional Clinical Researches Ethics Board approved the protocol (Approval number: GO 21/938). Detailed information about the study were given to the students who met the criteria of the study and agreed to participate in the study. Sample size was calculated as minimum 462 with 85% power and 5% significance. Sample size calculation was done using Gpower 3.1.9.2 package. Overall, 521 participants were reached during the study period. 22 participants were excluded because of the missing data and inconsistency with inclusion criteria. Therefore, 499 subjects were included within the study.

Procedure

The data including socio-demographic variables, The Dutch Eating Behaviour Questionnaire (DEBQ), Fear of COVID-19 Scale (FCV-19S), Beck Depression Inventory

(BDI) and Brief Resilience Scale (BRS) were collected on the Google forms website. All surveys were applied during the pandemic.

Measures

Dutch Eating Behaviour Questionnaire (DEBQ)

The DEBQ is a 33-items measure, designed to examine eating behaviours. The questionnaire was developed by Van Strein et al. [17], and tested for its Turkish validity and reliability [18]. The participants rated all of the items scored on a 5-level ranging from 1, "never" to 5, "very often". These include 3 sub-dimensions evaluating as emotional eating, external eating, and restrained eating. A higher total sub-dimension score indicates a tendency for the eating behaviour sub-dimension. "Emotional eating" represents eating desire to alleviate the effects of stress. "External eating" refers to responsiveness to the environmental food cues. "Restrictive eating" is related to the behaviour of deliberately restricting consumption of food. *Fear of COVID-19 Scale (FCV-19S)*

The FCV-19S, consisted of 7-items are scored from 1, "strongly disagree" to 5, "strongly agree" with higher score indicating greater level fears of the novel coronavirus. The scale was developed by Ahorsu et al. [19] and adapted to the Turkish context by Satici et al. [20].

Beck Depression Inventory (BDI)

The BDI is a self-administered instrument, containing of 21 multiple-choice questions. It is used for assessing the severity of the depression. The inventory was developed by Beck et al. [21], and Turkish validity and reliability the inventory was carried out by Hisli [22]. Each item is responded on a 4-points range with scoring from 0 to 3. Depression level is classified into none/minimal, mild, moderate, or severe according to the total score.

Brief Resilience Scale (BRS)

The BRS is a 6-item, self-reported scale, measures individual's ability to recover from stress, and resilience is recognized as a protective factor for depression. The BRS was developed by Smith et al. [23], and Turkish version of the scale was validated by Dogan [24]. Participants were requested to answer on 5-items Likert types scale from 1, "strongly disagree" to 5, "strongly agree" for each items. Higher total scores indicate higher resilience of the participant.

Daily Energy and Nutrient Intake

24-hour dietary records were taken for 2 consecutive days consisted of weekend and weekday, and these records were analyzed with the BEBIS program to calculate the daily energy and macronutrient intakes of the participant.

Statistical Analyses

Statistical analyses were performed with the Statistical Package for the Social Sciences (SPSS 23.0) software. The normality of the data was evaluated by the Shapiro-Wilk Test. BDI, FCV-19S, BRS, DEBQ scores of female and male were compared with T-test, while the difference between depression level were analyzed with Chi-squared test. Correlation between the scale scores were determined with Pearson Correlation. Scores of scales and daily energy and macro nutrient intake according to BMI classification and depression levels were statistically analyzed with ANOVA, and Tukey test was applied for the determination of the significant differences between the groups with more than two categories. The p value < 0.05 was considered as statistically significant.

Results

Demographic and anthropometric characteristics

The study group consisted of 499 university students in total (336 females and 163 male). Demographic characteristics and anthropometric measurements of the students are

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given in Table 1. Mean BMI of female and male were 21.8 ± 3.3 and 24.6 ± 3.4 kg/m^2, respectively. 12.5% of female and 9.2% of male were underweight, while 68.8% and 49.1% of female and male were normal weight, respectively according to the BMI classification. Frequency of being overweight and obesity were 11% and 7.7% in female, while were 35.6% and 6.1% in male.

Insert Table 1

Eating habits and dietary intake

Table 2 displays eating habits and dietary intake of the students during COVID-19. More than half of the students declared increased consumption of food (57.4%) and more frequent snack consumption (69.5%) during the pandemic. On the other hand, 51.9% of the students had a decreased fast-food consumption (51.9%) compared to the pre-pandemic period. Majority of the students stated having 2-3 meals (77.6%) and 2-3 times snacks (68.6%) during a day. Pandemic caused an increase in food preparation and cooking practices at home for both female and male (63.4% and 49.1%, respectively). Pandemic's effects on food intake, fast food and snack consumption were not statistically different between female and male (p>0.05). On the other hand, increasing effects on food preparation and cooking practices at home were statistically higher in female comparing to the male (p<0.05). 56.7% and 25.5% of the students reported consuming breakfast every day and almost every day, respectively. Depending on the dietary records, energy intake of students were 1515.6 ± 437.7 kcal/day and 1921.6 ± 667 kcal/day in female and male, respectively. Daily protein, carbohydrate and fat intake were 55.2 ± 17.5, 161.9 ± 57.3 and 70.5 ± 23.9 g/day, respectively in female, and 74.6 ± 27.5, 205.6 ± 88.8 and 86.9 ± 34.1 g/day, respectively in male.

Insert Table 2

Eating behaviour, depression, fear of COVID, resilience and dietary intake

According to the BDI, 41.1% of the students had none or minimal depression, while 32.3% had mild, 20% had moderate and 6.6% had severe depression (Table 3). Total BDI scores and depression levels of female and male were not statistically different ($p>0.05$). On the other hand, fear of COVID levels of male were higher than female ($p<0.05$), while brief resilience levels were higher in female than male ($p<0.05$). Furthermore, total DEBQ, restrained eating and emotional eating scores of male were higher comparing to female ($p<0.05$). Besides, external eating scores were not different according to the genders ($p>0.05$).

Insert Table 3

Correlation between eating behaviour, brief resilience, depression, fear of COVID and daily energy intake are shown in Table 4. Total DEBQ scores, restrained eating, emotional eating, and external eating were positively correlated with fear of COVID; conversely, there was a negative correlation between brief resilience and total DEBQ and sub-scale scores ($p<0.05$). BDI scores were positive correlated with total DEBQ ($r = 0.218$, $p<0.01$) and emotional eating ($r = 0.222$, $p<0.01$). Furthermore, brief resilience and fear of COVID was negatively correlated ($r = -0.195$, $p<0.05$). In addition, daily energy intake was negatively correlated with restrained ($r = -0.216$, $p<0.01$) and external eating ($r = -0.152$, $p<0.01$). In contrast, energy intake was positively correlated with fear of COVID ($r = 0.113$, $p<0.05$).

Insert Table 4

Eating behaviours, fear of COVID, resilience, daily energy, and macro nutrient intake of the students according to the depression levels are shown in Table 5. Students with moderate and severe depression had higher total DEBQ and emotional eating scores than others ($p<0.01$). On the other hand, students who had moderate depression had the lowest external eating scores ($p<0.05$), while restrained eating scores did not statistically differ according to the depression levels ($p>0.05$). Notably, students with severe depression had highest levels of fear of COVID ($p<0.05$). Nonetheless, daily energy and macro nutrient intake of the students were not statistically different according to the depression levels ($p>0.05$).

Insert Table 5

As seen in Table 6, BDI and brief resilience were not different according to BMI classification of the students ($p>0.05$). On the other hand, underweight students had the highest total DEBQ and restrained eating scores ($p<0.01$), and underweight and obese students' emotional eating scores where higher than normal and overweight ($p<0.01$). In addition, obese students' fear of COVID levels were statistically higher than underweights ($p<0.01$). Students who were in healthy weight group had the lower daily energy intake than overweight and obese students ($p<0.01$). Furthermore, overweight, and obese students' protein intake were significantly higher than underweight and healthy weight students' ($p<0.01$). Besides, daily carbohydrate and fat intake were not statistically different according to BMI classification ($p>0.05$).

Insert Table 6

Discussion

The present study was conducted to investigate the possible association between eating behaviours and nutrition status with depression, resilience and fear concerning COVID-19 among students in Turkey. Considering the known fact that young adults are vulnerable in terms of mental health including pre-pandemic period, it is possible for this group to be more affected by factors which worsen mental health during the pandemic period [25, 26]. Although young people are considered as a less risky group in terms of COVID's effects, they have been reported as a susceptible group for the risk of experiencing COVID-related mental disorders [26]. To date, several studies have investigated the depression rate during the pandemic [26-28]. In the current study, more than the quarter of the students (26.6%) had moderate or severe depression. Similar to current study's findings, the moderate and severe depression rate was found 21.8% in a study conducted in the early phase of the pandemic in Turkey [27]. In another study conducted on Turkish population showed that people aged between 18-29 had the highest level of depression during the pandemic period among all participants [28]. Furthermore, a previous study examining the differences in mental health of university students in nine different countries during the pandemic showed that students in Turkey had the highest depression risk than other countries [26]. The major cause of depression might be due to the rapid worldwide spread, strict lockdown, distance learning, uncertainty of pandemic progression, fear and anxiety about COVID-19. Thus far, available literature has shown that female had higher levels of depression during the pandemic than male [29, 30]. Previous studies conducted in Turkey illustrated that female students' depression levels were higher than male [31, 32]. Conversely, a recent study conducted by Lee and Crunk [33] reported that depression levels of male were higher than female in the United States. However, in the present study, depression levels of the students did not differ according to the genders. Psychological health status of people might vary in between

different countries as well as within the same country, even if they are people of similar age groups and status [26].

It has long been known that fear has triggering effects on mental health and well-being [34]. As fear of infection in previous pandemics had negative effects on mental health, fear of COVID also has potential adverse effects [35]. In the current study, fear of COVID-19 scale measured anxiety about COVID-19 was used and students who were severe depression experienced more fear of COVID-19. In accordance with these results, the available literature revealed a similar association [36-38]. In the present study, fear of COVID scores of male students were found higher than female. Contrarily, in a study conducted in India revealed that being female is a significant factor on fear of COVID among youth [39]. A previous study conducted in Italian students showed that male students had lower fear of COVID levels than female [40]. Another study conducted in Ecuador also showed that male students had lower fear of COVID [35]. This rather contradictory result of the present study might be due to the fact that different populations from different parts of the world have experienced the pandemic with different severity. The diversity of the measures and restrictions applied in different countries might also have affected this result.

A study carried out in the early stage of COVID in Australia revealed that the energy intake of the undergraduate students increased while their physical activity levels were decreased comparing to the pre-pandemic period. Researchers stated that these habits had potential undesirable effects on well-being and mental health of young adults in long term [41]. In this study, majority of participants declared increased food intake, snack consumption and frequent food preparation practices at home comparing to pre-pandemic period. These results are in accordance with previous reports [5, 6]. In the present study, no statistically significant effect of depression level on daily energy and macro nutrient intake was observed, however there was a significant positive correlation between fear of COVID and daily energy

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intake. This result might be explained by participants with a higher fear level may have used eating behaviour as a strategy for coping with fear and may develop unhealthy eating patterns, especially the preference of foods with high energy density. Negative emotions and psychological states generally have been characterized with a higher daily energy intake [42, 43]. One possible explanation for the reason energy and macronutrient intake did not significantly differ according to depression levels in the present study might be the fact that lockdowns, restrictions, and consequent boredom during the pandemic had a similar effect on food consumption regardless the level of the severity of depression.

Data from several studies suggest that risk of contamination and disease, social isolation, uncertainty, exhaustion cause stress and might affect behaviour including eating habits as well as mental health [44-46]. In the present study, total DEBQ, restrained eating and emotional eating scores of male were higher than female. Furthermore, external eating was not statistically different between genders. On contrary, previous studies results indicated that restrictive, emotional, and external eating behaviours were higher in female. Kalkan Ugurlu et al. [31] reported that female students had higher restrictive, emotional, and external eating behaviour than male students. Similarly, in another study conducted in Turkey showed that emotional and external eating behaviour of female were higher than male among university students [46]. Although the research was conducted on the same country population, reasons such as the different data collection time, the level of knowledge about the pandemic, the long-term effects caused by the pandemic, the different characteristics of the student groups included in the studies, and inclusion and exclusion criteria of studies might have affected this contrary results.

It is well known that resilience are associated with coping strategies of a person, and might be helpful for fighting against the effects of stress factors [7]. Furthermore, resilience is considered as an important factor in decreasing and preventing the undesirable psychological

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effects of COVID [47]. A negative correlation between fear of COVID and psychological resilience were found in this study. In accordance with the present results, studies conducted in the Philippines [48], and China [49] illustrated that fear had negative correlation with resilience among students during the pandemic. Besides, a study conducted in the earlier stage of the pandemic revealed that psychological resilience was negatively correlated with depression in adult Turkish population [32]. However, no significant correlation of resilience and depression was observed in the present study. In spite of that, there was a negative correlation between total DEBQ and resilience scores. Furthermore, total DEBQ scores were positive correlated with BDI and fear of COVID. In our study, highest total DEBQ and emotional eating scores were observed in moderate and severe depressed students. Emotional eating behaviour is defined as a tendency to eating that arises in response to emotional situations and closely related to many states such as stress, anxiety, depression, and negative moods [50] and the current study showed an association of depressive severity with total DEBQ scores and emotional eating behaviour. These results are in line with a previous study conducted on Turkish adult population, where a relationship between fear, depression and emotional eating was found during the pandemic period [51]. However, in another study conducted in Turkey [52] showed that the effect of fear of COVID-19 on emotional eating is minimal. Moreover, restrained, emotional and external eating were negatively correlated with BRS and positively correlated with fear of COVID. Results of this study shows that higher levels of fear and depression, and lower psychological resilience negatively affect eating behaviour of students. A previous study by Usubini et al. [53] indicated that depression, anxiety, and stress were related with emotional eating in Italian young adults during the second wave lockdown of pandemic.

Recent meta-analyses revealed an association between obesity and depression [54, 55]. In a study conducted in Turkey the during pandemic revealed that nursing students who were

overweight had higher depression levels [31]. However, in this study although BDI scores of overweight and obese students were higher than normal and underweight students, this difference was not statistically significant. Besides, underweight students had the highest total DEBQ and restrained eating scores. Moreover, underweight, and obese students' emotional eating scores were higher than others. In accordance with present results, Kalkan Ugurlu et al. [31] found that obese Turkish nursing students had higher emotional, restrictive, and external eating behaviour than others. Likewise, Cechetto et al. [45] reported that DEBQ emotional eating scores were statistically significantly higher in those who had higher BMI in Italian population during pandemic. In the present study, obese students had higher fear of COVID than underweights. Obesity poses a risk for COVID due to the presence of accompanying diseases and inflammation [56]. A possible explanation for the obese participants had a higher level of fear might be due to obesity is an important factor for the severity of the infection.

Conclusion

This study supports the view that psychological and nutritional well-being of students have been affected due to the COVID-19 pandemic stress. The total DEBQ and emotional eating scores were found positively linked with more severe levels of depression. Fear of infection, the pandemic situation, new daily routine, unexpected lockdowns, and implementation of online classes might be potential reasons to cause stress and changes related eating behaviours. In order to relieve adverse mental health conditions, students should increase their awareness of stress-related eating outcomes and should be trained towards individual healthy food choice and eating habits.

Acknowledgments

Conflict of Interest

Ethical Standards

The study protocol was approved by the Ethics Committee of Hacettepe University (protocol number: GO 21/938), conducted in accordance with Declaration of Helsinki. All participants gave written consent after receiving verbal and written information.

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Table 1

Descriptive statistics for demographic and anthropometric variables of participants

	Female (n= 336)	Male (n= 163)	Total (n= 499)
Age (years)	22±2.8	22.4±2.5	22.1±2.7
Marital status			
Married	12 (3.6%)	7 (4.3%)	19 (3.8%)
Single	324 (96.4%)	156 (95.7%)	480 (96.2%)
Mother's education			
≤ High school	263 (71.9%)	126 (77.3%)	389 (77.9%)
> High school	73 (28.1%)	37 (22.7%)	110 (22.1%)
Father's education			
≤ High school	215 (64%)	106 (65%)	318 (63.7%)
> High school	121(36%)	60 (35%)	181 (36.3%)
Household size			
One to four person	183 (54.5%)	104 (63.8%)	287 (57.5%)
Five people or more person	153 (45.6%)	59 (36.2%)	212 (42.5%)
Residency			
Living with family members	252 (75%)	108 (66.3%)	360 (72.2%)
Living with friends	29 (8.6%)	22 (13.5%)	51 (10.2%)
Living alone	10 (2.9%)	29 (17.8%)	39 (7.8%)
Living in a dorm	45 (13.5%)	4 (2.4%)	49 (9.8%)
Anthropometric measurements			
Height (cm)	164.8 ± 5.8	179.6 ± 6.3	169.6 ± 6.2
Weight (kg)	59.3 ± 9.8	79.7 ± 13	65.9 ± 14.5
BMI (kg/m^2)	21.8 ± 3.3	24.6 ± 3.4	22.8 ± 3.6
BMI classification			
Underweight	42 (12.5%)	15 (9.2%)	57 (12.7%)
Normal weight	231 (68.8%)	80 (49.1%)	331 (66.3%)
Overweight	37 (11%)	58 (35.6%)	95 (19%)
Obese	26 (7.7%)	10 (6.1%)	36 (7.2%)

Table 2

Students' eating habits and dietary intake during COVID-19

	Female (n= 336)	Male (n= 163)	Total (n= 499)	Significance
Food intake				
Increased	190 (56.6%)	96 (58.9%)	286 (57.4%)	
Decreased	87 (25.8%)	37 (22.7%)	124 (24.8%)	0.531[†]
Did not change	59 (17.6%)	30 (18.4)	89 (17.8%)	
Snack consumption				
Increased	232 (69.1%)	115 (70.5%)	347 (69.5%)	
Decreased	67 (20%)	31 (19%)	98 (19.6%)	0.424[†]
Did not change	37 (11%)	17 (10.4%)	54 (10.9%)	
Fast food consumption				
Increased	76 (22.6%)	31 (19%)	107 (21.4%)	
Decreased	184 (54.8%)	75 (46%)	259 (51.9%)	**0.014**[†]
Did not change	76 (22.6%)	57 (35%)	133 (26.7%)	
Number of meals during a day				
1 meal	2 (0.6%)	1 (0.6%)	3 (0.6%)	
2-3 meals	260 (77.4%)	127 (77.9%)	387 (77.6%)	0.490[†]
>4 meals	74 (22%)	35 (21.5%)	109 (21.8 %)	
Number of snacks during day				
1 time	59 (17.6%)	40 (24.5%)	99 (19.8%)	
2-3 times	234 (69.7%)	108 (66.2%)	342 (68.6%)	0.244[†]
>4 times	43 (12.8%)	15 (9.2%)	58 (11.6%)	
Food preparation and cooking at home				
Increased	213 (63.4%)	80 (49.1%)	293 (58.7%)	
Decreased	82 (24.4%)	62 (38%)	144 (28.9%)	**0.006**[†]
Did not change	41 (12.2%)	21 (12.9%)	62 (12.4%)	
Breakfast consumption				
Everyday	196 (58.3%)	87 (53.4%)	283 (56.7%)	
Almost everyday	87 (25.9%)	40 (24.5%)	127 (25.5%)	0.542[†]
Sometimes	39 (11.6%)	26 (16%)	65 (13%)	
Never	14 (4.2%)	10 (6.1%)	24 (4.8%)	
Daily energy and macro nutrient intake				
Energy (kcal/day)	1515.6 ± 437.7	1921.6 ± 667	1641.8 ± 552.1	**<0.001**[††]
Protein (g/day)	55.2 ± 17.5	74.6 ± 27.5	61.2 ± 22.9	**<0.001**[††]
Carbohydrate (g/day)	161.9 ± 57.3	205.6 ± 88.8	175.5 ± 71.5	**<0.001**[††]
Fat (g/day)	70.5 ± 23.9	86.9 ± 34.1	75.6 ± 28.5	**<0.001**[††]

[†]Chi-squared test, [††]t-test. Bold indicates statistically significant P values.

Table 3

Students' BDI, FCV-19, BRS, DEBQ scales scores

	Female (n=336)	Male (n=163)	Total (n=499)	Significance
BDI total score	13.3 ± 8.8	11.7 ± 9.2	12.8 ± 8.9	$0.073^{\dagger}$
Depression level				
None or minimal depression	128 (38.1%)	77 (47.2%)	205 (41.1%)	
Mild depression	115 (38.1%)	46 (28.2%)	161 (32.3%)	$0.259^{\dagger\dagger}$
Moderate depression	69 (20.5%)	31 (19%)	100 (20%)	
Severe depression	24 (7.1%)	9 (5.5%)	33 (6.6%)	
FCV-19	25.5 ± 4.2	28.9 ± 5.3	26.6 ± 5.4	$\mathbf{<0.001^{\dagger}}$
BRS	17.8 ± 1.9	16.3 ± 2.5	17.1 ± 2.1	$\mathbf{0.025^{\dagger}}$
DEBQ score	105.9 ± 20.9	114.8 ± 18.9	108.8 ± 20.6	$\mathbf{<0.001^{\dagger}}$
DEBQ – Restrained eating	33.4 ± 8.6	36.9 ± 7.9	34.6 ± 8.5	$\mathbf{<0.001^{\dagger}}$
DEBQ – Emotional eating	44.4 ± 14.9	49.4 ± 11.9	46.1 ± 14.1	$\mathbf{<0.001^{\dagger}}$
DEBQ – External eating	28.1 ± 5.8	28.5 ± 5.9	28.2 ± 5.8	$0.407^{\dagger}$

†t-test, ††Chi-squared test.
Bold indicates statistically significant P values.

Table 4

Correlation between DEBQ, BDI, BRS, fear of COVID scores and daily energy intake of students

	DEBQ score	Restrained eating	Emotional eating	External eating	BRS	BDI	FCV-19	Daily energy intake
DEBQ score	1	.574**	.892**	.536**	-.228**	.218**	.165**	.046
Restrained eating	.574**	1	.241**	-.015	-.152**	-.084	.195*	-.216**
Emotional eating	.892**	.241**	1	.379**	-.153**	.222**	.144**	.002
External eating	.536**	-.015	.379**	1	-.179**	.109	.196*	-.152**
BRS	-.228**	-.152**	-.153**	-.179**	1	.060	-.195*	-.083
BDI	.218**	-.084	.222**	.109	.060	1	-.078	-.090
FCV-19S	.165**	.195*	.144**	.196*	-.195*	-.078	1	.113*
Daily energy intake	.046	-.216**	.002	-.152**	-.083	-.090	.113*	1

Pearson correlation. *$p<0.05$, **$p<0.001$.

Table 5

Scores of DEBQ, BRS, fear of COVID scales, daily energy and macro nutrient intake of participants according to the depression level

	Depression Level				
	None or minimal depression (n=205)	**Mild depression (n=161)**	**Moderate depression (n=100)**	**Severe depression (n=33)**	**Significance**[†]
DEBQ score	100.4 ± 21.2^{a}	103.3 ± 28.1^{a}	113.1 ± 19.4^{b}	109.7 ± 18.4^{b}	**<0.001****
Restrained eating	35.2 ± 8.92	35.1 ± 8	33.1 ± 7.7	33.1 ± 10.2	.115
Emotional eating	41.1 ± 15.7^{a}	42.1 ± 18.3^{a}	49.2 ± 12.6^{b}	45.9 ± 12.9^{b}	**<0.001****
External eating	28.7 ± 5.7^{a}	27.8 ± 5.5^{a}	26.4 ± 6.3^{b}	28.2 ± 5.9^{a}	**0.035***
FCV-19	26.4 ± 5.4^{a}	25.9 ± 4.8^{a}	25.9 ± 5.9^{a}	27.5 ± 6.1^{b}	**0.026***
BRS	17.4 ± 2.1	17.6 ± 2	17.8 ± 2.2	17.6 ± 2.4	0. 469
Energy intake (kcal/day)	1684.9 ± 566.7	1645.4 ± 554.2	1585.4 ± 539.6	1508.6 ± 463.3	0.319
Protein intake (g/day)	63.2 ± 22.6	60.01 ± 22.6	59.5 ± 25.1	59.9 ± 25.1	0.524
Carbohydrate intake (g/day)	177.4 ± 74.5	177.9 ± 74.9	173 ± 67.1	157.1 ± 71.5	0.553
Fat intake (g/day)	78.6 ± 29.5	75.7 ± 27.5	70.9 ± 27.2	69.7 ± 28.7	0.134

The results are given as mean ± standard deviation.

[†]ANOVA. Means having the different letters (a–b) in the same rows are significantly different ($p < 0.05$).

*$p < 0.05$, **$p < 0.001$. Bold indicates statistically significant P values.

Table 6

Scores of DEBQ, BRS, BDI, fear of COVID scales, daily energy and macro nutrient intake according to BMI classification

	BMI Classification				
	Underweight (n=57)	**Healthy weight (n=331)**	**Overweight (n=95)**	**Obese (n=36)**	**Significance[†]**
BDI total score	10.7 ± 7.6	12.6 ± 8.8	14.2 ± 9.7	13.1 ± 9.7	0.222
DEBQ total score	120.8 ± 18.9^a	109.2 ± 20.4^b	104.4 ± 19.1^b	98.4 ± 25.8^b	**<0.001****
Restrained eating	43 ± 5.9^a	34.1 ± 8.6^b	33.4 ± 7.1^b	$33.5 \pm 9.9^{\ b}$	**<0.001****
Emotional eating	$50.6 \pm 13.4^{\ a}$	$37.9 \pm 15.14^{\ b}$	43.1 ± 13.8^b	46.7 ± 14.1^{ab}	**0.002***
External eating	27.2 ± 6.1	28.4 ± 5.8	28 ± 5.9	27 ± 5.6	0.491
FCV-19	25.1 ± 4.8^a	26.3 ± 5.4^{ab}	27.8 ± 5.8^{ab}	29.7 ± 3.8^b	**0.004***
BRS	17.9 ± 1.7	17.6 ± 2.1	17.4 ± 2.4	17.6 ± 1.5	0.622
Energy intake (kcal/day)	1684.7 ± 451.1^{ab}	1586.2 ± 488.7^a	1788.6 ± 697.6^b	1897.8 ± 932.9^b	**0.009***
Protein intake (g/day)	59.9 ± 16.1^a	59 ± 20.7^a	68.6 ± 29.6^b	70.7 ± 29.2^b	**0.004***
Carbohydrate intake (g/day)	186.3 ± 57.5	167.9 ± 64.7	193.9 ± 87.7	202.6 ± 115.6	0.10
Fat intake (g/day)	76.5 ± 24.7	73.9 ± 26.1	79.9 ± 34.8	87.3 ± 44.4	0.181

The results are given as mean ± standard deviation.

[†]ANOVA. Means having the different letters (a–b) in the same rows are significantly different (p<0.05).

*p<0.05, **p<0.001. Bold indicates statistically significant P values.

Credit Author Statement

M.T.M. designed the study and collected data. D.G. performed the statistical analyses.

M.T.M. and D.G. wrote the manuscript. All authors read and approved the findings.