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Was diet quality related to COVID-19 depression and fear states in adults during the COVID-19 pandemic in Turkey?

A qualidade da dieta estava relacionada aos estados de depressão e medo da COVID-19 em adultos durante a pandemia de COVID-19 na Turquia?

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ABSTRACT

Objective

This study was designed to examine diet quality among adults in Turkey, and its association to depression and fear states concerning COVID-19.

Methods

A total number 105 volunteers participated, 56 (53.3%) females and 49 (46.7%) males aged between 19 and 64 years old, in an online-based cross-sectional study. The questionnaire was prepared to determine information about participant's demographic characteristics, dietary habits, fear of COVID-19 (FCV-19S), depression, anxiety, stress levels (DASS-21) and diet quality (Healthy Eating Index, HEI-2015).

Results

It was observed that 42.9% of participants increased home cooking and 51.4% of those decreased ready meal consumption during COVID-19 ($p < 0.05$). The mean FCV-19S and DASS-21 scores of females were higher than males (F/M: $20.3 \pm 6.40 / 16.9 \pm 6.78$, $p = 0.012$; $36 / 16$, $p = 0.036$; respectively). Also 19.6% of females had moderate depression, while 16.3% of males had extremely severe depression in anxiety subscales. A statistically significant correlation was found between FCV-19S and DASS-21 ($r = 0.416$, $p < 0.001$). No significant correlation was found between HEI-2015 and neither FCV-19S nor DASS-21. The mean HEI-2015 scores of females and males identified respectively 64.0 ± 13.07 and 55.3 ± 11.62 ($p < 0.001$). Daily energy intake, carbohydrate and fat intake were negatively correlate with HEI-2015 (0.000). Daily carbohydrate intake was negatively correlate between DASS-21 ($r = -0.209$; $p = 0.033$).

Conclusion

Reducing depression, stress, anxiety, and fear levels during the pandemic will ensure a good level of diet quality by affecting the nutritional habits of individuals. For this reason, it will be essential for individuals to receive support from a multidisciplinary team of dietitians and psychologists.

Keywords: Covid-19. Depression. Diet quality. Dietary habits.

RESUMO

Objetivo

Este estudo foi projetado para examinar a qualidade da dieta e sua associação com depressão e estados de medo em relação ao COVID-19 entre adultos, na Turquia.

Métodos

Um total de 105 voluntários, 56 (53,3%) do sexo feminino e 49 (46,7%) do sexo masculino com idades entre os 19 e 64 anos, participaram em um estudo transversal online. O questionário foi preparado para identificar informações sobre características demográficas dos participantes, hábitos alimentares, medo do COVID-19 (FCV-19S), depressão, ansiedade, níveis de estresse (DASS-21) e qualidade da dieta (Índice de Alimentação Saudável, HEI-2015).

Resultados

Foi identificado que 42,9% dos participantes aumentaram a comida feita em casa e 51,4% deles diminuíram o consumo de refeições prontas durante a COVID-19 ($p < 0,05$). As médias dos resultados FCV-19S e DASS-21 das mulheres foram maiores que as dos homens (F/M: $20,3 \pm 6,40 / 16,9 \pm 6,78$, $p = 0,012$; $36 / 16$, $p = 0,036$; respectivamente). Também 19,6% das mulheres tiveram depressão moderada e 16,3% dos homens tiveram depressão extremamente grave. Foi encontrada correlação estatisticamente significativa entre FCV-19S e DASS-21 ($r = 0,416$, $p < 0,001$). Nenhuma correlação significativa foi encontrada entre HEI-2015, FCV-19S e DASS-21. Os resultados médios do HEI-2015 de mulheres e homens identificaram respectivamente $64,0 \pm 13,07$ e $55,3 \pm 11,62$ ($p < 0,001$). A ingestão diária de energia, carboidrato e gordura apresentaram correlação negativa com o HEI-2015 (0,000). A ingestão diária de carboidratos correlacionou-se negativamente entre DASS-21 ($r = -0,209$; $p = 0,033$).

Conclusão

Reduzir os níveis de depressão, stress, ansiedade e medo durante a pandemia assegurará um bom nível de qualidade da dieta, afetando os hábitos nutricionais dos indivíduos. Por esta razão, acredita-se que será essencial que os indivíduos recebam apoio de uma equipe multidisciplinar de nutricionistas e psicólogos.

Palavras-chave: Covid-19. Depressão. Qualidade da dieta. Hábitos alimentares.

INTRODUCTION

The Coronavirus Disease-2019 (COVID-19), which started in Wuhan province, China, spread rapidly worldwide and was declared a pandemic by the World Health Organization (WHO) [1]. As the disease spread through the globe, it seriously affected many fields such as education, health, and economy. Governments around the world have responded to the pandemic differently based on their economic status, social structures, and political systems [2]. Following the first cases of COVID-19, numerous countries started to quarantine at the national level to control the disease [3]. Turkey was among the countries that reacted early to the pandemic [4]. They initiated a series of precautions early on, with the help of the Pandemic Influenza National Preparedness Plan and established both the Operations Center and the Scientific Committee before the first case was even reported [2]. After the first case seen in Turkey on March 10 (2020), social isolation, quarantine, and travel restrictions were introduced just like other countries [3,5]. Every person in society has been affected by the COVID-19 outbreak, and the disease has had negative consequences not only medically but also, economically, and psychologically [2]. According to studies conducted during the COVID-19 pandemic, it has been reported that quarantine and social isolation are associated with findings such as mood disorders, depression, anxiety, fear, and stress in individuals [3,6].

It is known that psychological symptoms such as depression and anxiety affect nutritional behaviors and diet quality [7]. At the beginning of the COVID-19 pandemic, social quarantine enforced by governments expanded the time people spent at home, consequently increasing stress levels and

easy access to the food have affected dietary behaviors [8]. In addition, while the pandemic period reduced the consumption of vegetables and fruits, it caused an increase in the consumption of fast foods. On the contrary, adequate and balanced nutrition plays a key role in preventing disease during COVID-19 [9]. Psychological factors such as fear, stress, and depression, which emerged because of the uncertainty, brought by the pandemic period, affected the eating behaviors of individuals [10,11]. Therefore, the intense fear and depression that occurred during the COVID-19 pandemic affected the diet quality. Literature studies have been conducted during the pandemic, focusing on the evaluation of dietary behaviors [12,13] and psychological state [14,15], analyzing Turkish adults. However, so far, no study has evaluated dietary quality, the collective effect of fear of COVID-19 and depression levels. Therefore, this research was conducted to investigate COVID-19 fear and depression levels and to examine their relation to diet quality of adult individuals during the COVID-19 pandemic, in a developing country, such as Turkey.

METHODS

In this web-based cross-sectional study, 105 healthy participants (56 females, 49 males) between the ages of 18-65 years old, were randomly selected to be included in this research. Hacettepe University Non-Interventional Clinical Researches Ethics Committee approved the protocol (approval number: G021/176). Since there isn't studies in the literature that discusses. The Fear of Covid-19 Scale (FCV-19S)", "Depression, Anxiety and Stress Scale-21 (DASS-21)" and "Healthy Eating Index-2015 (HEI-2015)", this study combined all of these themes together. A pilot study was conducted with 15 individuals to identify the sample size and with its results it was predicted that there would be a correlation of 0.284 size between FCV-19S and HEI-2015 (Cohen's Effect Size=0.284), and the number of individuals required to be included in the study was calculated as 95, thus, considering the individuals who might drop out of the study, (dropout rate 10%) sample size was obtained as 105. The power of the test was taken as $(1-\beta)=0.80$ and $\alpha=0.05$, and the sample size was calculated with the help of G*Power program. Overall, 112 participants were reached during the study period, seven of whom were excluded because of missing data. Data collection was carried out with an anonymous online self-administrated questionnaire between March 2021 and May 2021. The questionnaire was prepared on "Google Forms" and the answers of the participants were recorded anonymously. To reach the participants, the online survey link was shared on social media (Facebook, Instagram, Twitter, Whatsapp, and LinkedIn etc.) using the snowball sampling method. Before proceeding to the survey questions, an "Informed Consent Form" was presented to the participants, and they were asked to tick the checkbox to show that they had given their consent. Individuals who did not select the "I Accept" option on the page containing the "Informed Consent Form" were not included in the study. Individuals diagnosed with any chronic disease, users of antidepressant, antipsychotic drugs, pregnant and breastfeeding women were not included in the study.

The data included general characteristics of individuals (gender, age, education level, occupation, marital status, weight and height), eating behaviors during the pandemic, "Covid-19 Fear Scale (FCV-19S)", Depression, Anxiety and Stress Scale (DASS 21)" and 24-hour dietary recall were collected on Google Forms. All data was collected during the pandemic.

Determination of general characteristics

General information about participants such as age, gender, marital status, education, occupation, body weight, and height were questioned. Since the participants could not be interviewed

face-to-face due to the COVID-19 pandemic, body weight and height measurements were obtained from their statements. Since Body Mass Index (BMI) was calculated from the reported body weight (kg) was divided by the square of their reported height (m) ($BMI = kg/m^2$). According to the World Health Organization (WHO) cut-off points, BMI was divided into four groups (underweight, normal, overweight, and obese) [16].

Eating behaviors

The dietary habits of the participants were questioned in detail to learn about their main meal consumption and frequency of snacking. In addition, dietary habits (consumption of main meals and snacks, frequency of cooking at home, consumption of fast foods) and the change in body weight during the COVID-19 pandemic were questioned by presenting three options as increased, decreased, and unchanged.

Covid-19 Fear Scale

In the determination of COVID-19 fear levels, developed by Ahorsu et al. [17] and adapted to the Turkish context by Satıcı et al. [18] "Covid-19 Fear Scale (FCV-19S)" was applied. The scale consists of 7 items, scored from 1 to 5 (1: strongly disagree, 2: disagree, 3: undecided, 4: agree, 5: strongly agree) using a 5-point Likert-type scaling. All items on the scale are scored positively and a score between 7 and 35 is taken from the scale with higher scores indicating increased levels of COVID-19 fear [17].

Depression, Anxiety, Stress Scale-21 (DASS-21)

Depression, anxiety, and stress levels were assessed by means of the Turkish version of "Depression, Anxiety, Stress Scale-21 (DASS-21)". The scale developed by Lovibond and Lovibond [19] subsequently Brown et al. [20] validated short form as DASS-21 and adapted Yılmaz et al. [21] to the Turkish language. DASS-21 which measures depression, anxiety, stress sub-diffraction is a 4-point Likert-type scale, and each emotional state is measured with 7 items. High scores were taken from the scale, indicating a greater number of symptoms [19-21].

Healthy Eating Index-2015 (HEI-2015)

The 24-hour dietary recall was obtained to determine the diet quality of the participants. The participants were asked to report their 24-hour dietary recall based on the example document (paying attention to the measurement and cooking method etc.) provided via an online questionnaire. Also, due to the study conducted online, an information text and sample measurement units (tablespoons, etc.) were included to accurately identify the amount of food consumed by participants. Participants who wished to provide contact information were able to do it at the end of the survey. They were contacted in case their food consumption record couldn't be understood. Nutrition Information Systems (BeBiS; Turkish version, Pasifik Company), which is a food software program in compliance with Turkish foods was used for the assessment of nutrients, food and food groups. Furthermore, HEI-2015 was used to obtain diet quality. The HEI-2015 is an index for adherence to the 2020 Dietary Guidelines for Americans. The index contains 13 components: total fruits, whole fruits, total vegetables, greens and beans, total protein foods, seafood, plant proteins, whole grains, dairy, fatty

acids, refined grains, sodium, added sugars, and saturated fats [22]. As a result of the evaluation, a score between 0-100 was taken. HEI-2015 score was divided in three categories: less than 50, between 50 and 80, and more than 80, and they mean, respectively, inadequate, average and optimal [23].

The data was analyzed using the IBM®SPSS® Version 23.0. Before statistical analyses, the normality of variable distribution was checked with a Shapiro-Wilk test. Descriptive statistics with normal distribution were expressed as mean, standard deviation, minimum and maximum. For numerical variables that do not show normal distribution, descriptive statistics are expressed as median, interquartile range, minimum, and maximum. Moreover, data was expressed as frequency and percentage for categorical data. Group differences on the demographic variables and baseline clinical data were analyzed using independent sample *t* test, One-way ANOVA, Mann-Whitney U test, or Kruskal-Wallis test as appropriate. Categorical variables were compared using the χ^2 test or Fisher exact test, as appropriate. Even if there is a relationship between the total score points to be obtained from the scales it was examined with the Pearson correlation coefficient, when parametric assumptions were provided and with the Spearman correlation coefficient when parametric assumptions were not provided. Statistical significance for all tests was set at a *p*-value of 0.05.

Table 1 – Descriptive statistics for demographic and anthropometric variables of the participants study in Turkey (March-May 2021).

Demographic and anthropometric characteristics	Female (n=56)	Male (n=49)	Total (n=105)	Test value	<i>p</i> -value
Age	27 (16.0%) [20-53]	36 (22.5%) [22-60]	30 (20.0%) [20-60]	3.217	0.001^a
Marital Status					
Single	34 (60.7%)	21 (42.9%)	55 (52.4%)	2.663	0.103 ^b
Married	22 (39.3%)	28 (57.1%)	50 (47.6%)		
Education Status					
Primary school	2 (3.6%)	2 (4.1%)	4 (3.8%)		
Secondary school	2 (3.6%)	0	2 (1.9%)		
High school	14 (25.0%)	18 (36.7%)	32 (30.5%)	3.121	0.071^c
Graduate	30 (53.5%)	22 (44.9%)	52 (49.5%)		
Postgraduate	8 (14.3%)	7 (14.3%)	15 (14.3%)		
Occupation					
Housewife	8 (14.3%)	0	8 (7.6%)		
Officer	13 (23.2%)	16 (32.7%)	29 (27.6%)		
Employee	12 (21.4%)	18 (36.7%)	30 (28.6%)		
Self-employment	1 (1.8%)	3 (6.1%)	4 (3.8%)	15.429	0.012^c
student	13 (23.2%)	5 (10.2%)	18 (17.1%)		
Retired	4 (7.2%)	5 (10.2%)	9 (8.6%)		
Unemployment	5 (8.9%)	2 (4.1%)	7 (6.7%)		
Body mass index (kg/m ²)	21.7 (5.1) [15.8-31.2]	25.3 (3.6) [18.6-34.5]	24.2 (5.7) [15.9-34.5]	2054.5	0.001^a
Underweight	6 (10.7%)	0	6 (5.7%)		
Normal	38 (67.8%)	23 (46.9%)	61 (58.1%)	15.522	0.001^c
Overweight	9 (16.1%)	23 (46.9%)	32 (30.5%)		
Obese	3 (5.4%)	3 (6.2%)	6 (5.7%)		

Note: * The median (interquartile range) [minimum-maximum] values are given for numerical variables that do not provide normality, and the frequency distribution for categorical variables. a: Mann Whitney-U test, b: chi-square test, c: Fisher's exact test. *p*<0.05 is significant and is shown in bold.

RESULTS

Demographic and anthropometric characteristics

A total 105 participants (n=56, 53.3% female and n=49, 46.7% male) completed questionnaire (Table 1). The median (interquartile range) [minimum-maximum] age of the participants was calculated as 30 (20) [20-60]. The median (interquartile range) [minimum-maximum] BMI was calculated as 24.2 (5,7) [15.75-34.48] kg/m², and 58.1% of the participants were classified as normal.

Dietary intake and eating behaviors

The impact of the COVID-19 on the participant's eating behaviors are shown in Table 2. There was no statistically significant difference between the main meal consumption status of female and male individuals. However, it has been observed that frequency of snack consumption in male is less than female's consumption ($p < 0.001$). The pandemic has not caused change in main meal consumption, but snack consumption has increased in females and not changed in males during the pandemic (respectively 48.2% and 69.4%) ($p = 0.007$). The majority of females stated that their fast food consumption decreased during pandemic ($p = 0.040$). Regarding dietary records, energy intake was 1611 ± 58 kcal/day among females and 1977 ± 62 kcal/day among males. Dietary carbohydrate, protein, and fat intakes were 173.5 ± 8.02 g/day, 73.5 ± 3.49 g/day, 66.4 (29.3) g/day, respectively, among females and 196.9 ± 66.28 g/day, 79.3 ± 25.8 g/day, 72.9 (69.9) g/day, respectively, among males.

Fear of COVID-19, depression, dietary quality, and dietary intake

When the distribution of the score from the scales were examined (Table 3), FCV-19S scores of females were found to be significantly higher compared to males (F: 20.3 ± 6.40 [7-33] and M: 16.9 ± 6.78 [7-33], $p = 0.012$). Similarly, DASS-21 scores of females were statistically more than males ($p = 0.049$) 36 (42) [3-108], 16 (46) [0-108], respectively). A statistically significant difference was found according to gender in the depression and anxiety subscales of the DASS-21 scale but was not found in the stress subscales. 19.6% of females had moderate depression and 16.3% of males had extremely severe depression in anxiety subscales. While 19.6% of females have moderate anxiety and 19.6% have severe anxiety, only 16.4% of males have severe anxiety. On the other hand, HEI-2015 scores are significantly higher in females than males ($p < 0.001$) (Respectively, 64.0 ± 13.07 and 55.3 ± 11.62). When the distribution of HEI-2015 scores were examined according to the classification as inadequate, average and optimal, it was found that the majority of those in the inadequate were males and the majority of those in the optimal were females.

Correlation between scales like as FCV-19S, DASS-21, HEI-2015 and daily macro nutrients and daily energy intake are shown in Table 4. There was a positive and statistically significant relationship between FCV-19S and DASS-21 ($r_s = 0.416$, $p < 0.001$). According to the moderate correlation value, the participant's DASS-21 scores and FCV-19 scores are in parallel. A significant relationship was not found between HEI-2015 and neither FCV-19S nor DASS-21 ($p > 0.05$). Daily energy intake, carbohydrate and fat intake were negatively correlate with HEI-2015 (Respectively, $r = -0.354$; $r = -0.274$; $r = -0.334$ and $p < 0.001$, $p = 0.005$, $p = 0.001$). As a result of this weak correlation, as participant's daily energy, carbohydrate and fat intake increases, their HEI-2015 scores decrease. Another weak negative correlation was found between daily carbohydrate intake and DASS-21 ($r = -0.209$; $p = 0.033$).

According to BMI, daily energy intake, macro nutrients and scale scores are given in Table 5. There was a positive relationship between DASS-21, energy intake, carbohydrate intake and BMI classification (respectively, $p=0.009$, $p=0.009$).

Table 2 – Dietary intake and Eating habits of participants by gender between March-May 2021 in Turkey.

Dietary intake and eating behaviors	Female (n=56)	Male (n=49)	Total (n=105)	Test value	p-value
Meal Consumption					
Main meal	2 (1) [1-3]	2 (1) [1-3]	2 (1) [1-3]	1337.5	0.795 ^a
Snack	2 (1) [0-5]	1 (2%) [0-5]	2 (1) [0-5]	709.0	0.001^a
Total	4 (2) [2-6]	3 (1) [2-6]	4 (2) [1-7]	953.5	0.004^a
In the pandemic					
Meal Consumption					
Increased	13 (23.2%)	8 (16.3%)	21 (20.0%)	2.362	0.307 ^b
Decreased	11 (19.6%)	6 (12.2%)	17 (16.2%)		
Not changed	32 (57.2%)	35 (71.5%)	67 (63.8%)		
Snack Consumption					
Increased	27 (48.2%)	10 (20.4%)	37 (35.2%)	9.872	0.007^b
Decreased	6 (10.7%)	5 (10.2%)	11 (10.5%)		
Not changed	23 (41.1%)	34 (69.4%)	57 (54.3%)		
Home cooking					
Increased	30 (53.6%)	15 (30.6%)	45 (42.9%)	5.794	0.062 ^c
Decreased	3 (5.4%)	3 (6.1%)	6 (5.7%)		
Not changed	23 (41.0%)	31 (63.3%)	54 (51.4%)		
Fast foods					
Increased	5 (8.9%)	10 (20.4)	37 (35.2%)	6.414	0.040^d
Decreased	35 (62.5%)	19 (38.8)	54 (51.4%)		
Not changed	16 (28.6%)	20 (40.8)	36 (34.3%)		
Body weight change					
Increased	21 (37.5%)	17 (34.7%)	38 (36.2%)	0.125	0.940 ^d
Decreased	7 (12.5%)	7 (14.3%)	14 (13.3%)		
Not changed	28 (50.0%)	25 (51.0%)	53 (50.5%)		
Daily energy and macronutrient intake					
Energy (kcal/d)	1611±58 [868-2717]	1977±62 [1063-3365]	1780±473 [868-3365]	-4.194	0.001^d
Carbohydrate (g/d)	173.5±8.02 [50.6-327.0]	223.7±9.05 [80.9-356.9]	196.9±66.28 [50.6-356.9]	-4.156	0.001^d
Protein (g/d)	73.5±3.49 [36.2-146.8]	86.05±3.44 [32.3-131.4]	79.3±25.80 [32.3-146.8]	-2.538	0.013^d
Fat (g)	66.4 (29.3) [24.3-150.2]	79.2 (30.6) [42.4-195.8]	72.9 (69.9) [24.3-195.8]	989	0.014^a

Note: Data are presented as median (25 percentile-75 percentile) [minimum-maximum] and mean±SD, appropriate. Categorical variables reported as frequency (percent). a: Mann-Whitney U test; b: Likelihood; c: Fisher exact test; d: Independent variables t test. $p<0.05$ is significant and is shown in bold.

Table 3 – Participant's Fear of COVID-19 Scale, Depression, Anxiety and Stress Scale and Healthy Eating Index points according to gender between March-May 2021 in Turkey.

Variables	Female (n=56)	Male (n=49)	Total (n=105)	Test value	p-value
FCV-19S	20.3± 6.40 (7-33)	16.9±6.78 (7-33)	18.7±6.76 (7-33)	2.556	0.012^a
DASS-21	36 (42) [3-108]	16 (46) [0-108]	24 (45) [0-108]	1065.5	0.049^b
Depression					
Normal	24 (42.9%)	32 (65.3%)	56 (53.3%)		
Mild	9 (16.1%)	3 (6.1%)	12 (11.4%)		
Moderate	11 (19.6%)	6 (12.3%)	17 (16.2%)	10.259	0.036^c
Severe	5 (8.9%)	0	5 (4.8%)		
Extremely severe	7 (12.5%)	8 (16.3%)	15 (14.3%)		
Anxiety					
Normal	22 (39.4%)	35 (71.4%)	57 (54.3%)		
Mild	6 (10.7%)	2 (4.1%)	8 (7.6%)		
Moderate	11 (19.6%)	1 (2.0%)	12 (11.4%)	14.566	0.004^c
Severe	6 (10.7%)	3 (6.1%)	9 (8.6%)		
Extremely severe	11 (19.6%)	8 (16.4%)	19 (18.1%)		
Stress					
Normal	32 (57.1%)	36 (73.5%)	68 (64.8%)		
Mild	6 (10.7%)	2 (4.1%)	8 (7.6%)		
Moderate	10 (17.9%)	5 (10.2%)	15 (14.3%)	5.773	0.215 ^d
Severe	7 (12.5%)	3 (6.1%)	10 (9.5%)		
Extremely severe	1 (1.8%)	3 (6.1%)	4 (3.8%)		
HEI-2015	64.0±13.07	55.3±11.62	60.0±13.11	3.602	0.001^e
Poor	8 (38.1%)	13 (61.9%)	21 (20.0%)		
Needs improvement	41 (55.4%)	33 (44.6%)	74 (70.5%)	3.203	0.202 ^e
Optimal	7 (70.0%)	3 (30.0%)	10 (9.5%)		

Note: Data are presented as median (25 percentile-75 percentile) [minimum-maximum] and mean±SD, appropriate. Categorical variables reported as frequency (percent). a: Independent sample *t*- test; b: Mann-Whitney U test; c: Chi square test; d: Fisher exact test; e: Pearson chi square test. *p*<0.05 is significant and is shown in bold.

Table 4 – The relationship between participant's scores on Fear of COVID-19 Scale, the Depression, Anxiety and Stress Scale, and the Healthy Eating Index between March-May 2021 in Turkey.

Variables	FCV-19S		DASS-21		HEI-2015	
FCV-19S	1		0.416		0.085	
<i>r_s</i>			0.001*		0.387	
<i>p</i>						
DASS-21			1		0.087	
<i>r_s</i>					0.377	
<i>p</i>						
HEI-2015					1	
<i>r_s</i>						
<i>p</i>						
Daily energy and macronutrient intake	FCV-19S		DASS-21		HEI-2015	<i>p</i>
	<i>r_s</i>	<i>p</i>	<i>r_s</i>	<i>p</i>	<i>r_s</i>	
Energy (kcal/d)	-0.056	0.568	-0.128	0.193	<i>r_p</i> -0.354	0.001*
Carbohydrate (g/d)	-0.117	0.234	-0.209	0.033*	<i>r_p</i> -0.274	0.005*
Protein (g/d)	0.037	0.708	-0.081	0.411	<i>r_p</i> -0.066	0.502
Fat (g/d)	0.071	0.470	0.086	0.383	-0.334	0.001*

Note: **p*<0.01. *r_s*: Spearman correlation coefficient; *r_p*: Pearson correlation coefficient. FCV-19S: Fear of COVID-19 Scale; DASS-21: Depression, Anxiety, Stress Scale; HEI-2015: Healthy Eating Index. *p*<0.05 is significant and is shown in bold.

Table 5 – Daily energy, macronutrient intake and scale scores according to BMI between March-May 2021 in Turkey.

Variables	Body Mass Index (n=105)				Test value	p-value
	Underweight (n=6)	Normal (n=61)	Overweight (n=32)	Obese (n=6)		
FCV-19S	19.7±7.42 (11-33)	19.7±7.10 (7-33)	17.2±5.79 (7-29)	16.3±6.69 (9-25)	1.237	0.300^a
DASS-21	44 (48) [12-108]	30 (48) [0-108]	13 (21) [4-66]	43 (62) [6-96]	10.641	0.014^b
HEI-2015	54 (21) [43-85]	61 (18) [35-92]	56 (21) [30-82]	59 (22) [32-71]	5.008	0.171^b
Energy (kcal/d)	1389 (771) [1061-2100]	1674 (589) [868-2619]	2026 (607) [1029-3365]	1431 (414) [1255-1831]	11.653	0.009^b
Carbohydrate (g/d)	155.9 (106.9) [92.5-264.7]	196.5 (90.0) [50.6-326.9]	236.3 (109.4) [80.9-356.9]	153.8 (78.6) [100.1-213.4]	11.635	0.009^b
Fat (g)	64.1 (40.9) [36.2-92.8]	69.9 (27.0) [24.3-121.5]	72.3 (30.3) [42.1-195.8]	60.5 (46.1) [32.4-99.8]	2.531	0.470^b
Protein (g/d)	65.7 (13.8) [53.8-77.0]	79.3 (44.3) [32.3-146.8]	87.3 (34.6) [40.1-131.4]	62.0 (47.8) [39.2-100.4]	6.534	0.088^b

Note: The median (interquartile range) [minimum-maximum] values are given for numerical variables that do not provide normality, and the frequency distribution for categorical variables. a: One-way Anova; b: Kruskal-Wallis test. HEI-2015: Healthy Eating Index; FCV-19S: Fear of COVID-19 Scale; DASS-21: Depression, Anxiety, Stress Scale. $p < 0.05$ is significant and is shown in bold.

DISCUSSION

The present study was conducted to understand whether the fear of COVID-19 and depression effected on diet quality among adults in Turkey, during the COVID-19 pandemic.

During the COVID-19 pandemic, individual's dietary habits have changed [11]. In a study conducted by thirty-five research organizations in Europe, America, East Asia, and North Africa, it was observed that physical activity and eating behaviors of individuals were negatively affected during the COVID-19 pandemic [10]. It was found that with the impact on supply chains during the COVID-19 pandemic process, fear of not being able to access fresh foods occurred in individuals and their purchasing habits changed, as well as their tendency towards fast foods rich in salt, sugar and saturated fat increased [24]. In another study, it was reported that individuals preferred meat, dairy foods and easy snacks more frequently and less frequently vegetables and fruits, during the pandemic [9]. Pietrobelli et al. [25] reported the total meal consumption of individuals participating in a study conducted in Italy was 4.17 ± 0.95 . The data obtained from the study is 4 [2], which is in line with the literature [1-7]. Several studies conducted in the early stages of the pandemic showed that meal consumption increased in the COVID-19 pandemic [26-28]. However, in current study, meal or snack consumption most of participants did not change during the pandemic. Similarly, in a study revealed in the post exposure of COVID-19 pandemic, participants consuming snacks such as junk foods did not constitute majority [29]. It is considered that the reason for this may be related to the collection of the data of current study in the second year of the pandemic. A study was conducted to understand if the frequency of cooking at home had increased [9] and the results showed that: in the USA it had increased 60% [30], in Lithuania it had increased 62.1% [27] and in Poland it had increased 62.3%. In this study, 53.6% of female and 30.6% of male individuals stated that the frequency of cooking/eating at home increased. When the consumption of fast foods was analyzed, it was found that 62.5% of female and 38.8% of males decreased the frequency of consumption of fast foods ($p=0.040$). When all these results were evaluated, these changes in eating behaviors reflect the increased awareness of the importance of a healthy eating environment during the COVID-19 pandemic [31]. The reason for this is the compulsory return of individuals to their lifestyles before the emergence of technology and today's opportunities (fast foods, take-out meals, etc.), in line with the restrictions that were introduced with the pandemic. In addition, for this study, the higher frequency of work in male individuals compared to females may also be effective in this situation.

It is known that many situations might increase feelings of fear and stress, such as being separated from family and friends, due to the social restrictions and not having enough information about the COVID-19 [32,33]. In a study conducted in China, it was determined that half of the participants in the study experienced fear of contracting COVID-19, along with severe psychological problems related to the pandemic [34]. Similarly, Asmundson et al. [35] reported that one of three Canadian citizens was concerned about COVID-19. In a study conducted in Brazil was found that the overall mean score of FCV-19S as 19.8 (5.3) and higher scores in females than males (respectively 20.4, 18.0) [36]. In another study conducted in Portugal, the fear of COVID-19 was found 7.38 ± 4.80 [37]. To this date several studies have investigated the fear of COVID-19 in Turkey [38-41]. In a study conducted by Kaya et al. [42] with 1012 Turkish adults, COVID-19 fear scale scores were found to be 19.2 ± 6.3 . In another study conducted by Koçak et al. [41], it was reported that the fear of COVID-19 was higher in female participants compared to male participants. Similarly, in the current study fear of COVID-19 scale scores of females (20.3 ± 6.40) were observed higher than scores of males (16.9 ± 6.78) ($p=0.012$). These results may be because females experience twice as much fear as males, as stated by the American Psychiatric Association [43]. In addition, in this study, the fact that female participants had a higher level of education compared to male participants and their awareness of health-related events was higher compared to male participants may also have led to this result. As well as in this study the data were collected by the questionnaire method and the self-statements of participants were taken as a basis. Therefore, male participants were more prejudiced in sharing their fears compared to female participants.

Many studies showed that the fear of COVID-19 was related to distress during the pandemic and this rising fear of COVID-19 increases psychological symptoms such as depression, anxiety and stress [44,45]. In a study conducted in Philippines during the COVID-19 and using the DASS-21 scale, an increase in depression, stress and anxiety levels was found [44]. In the current study, female's DASS-21 scores were found to be statistically higher than male's DASS-21 scores ($p=0.049$). Similarly, the results of some studies are in parallel with this finding [34,45]. Besides a study conducted by Özdin et al. [46] during pandemic in Turkey supports the finding from current study in terms of the high incidence of anxiety in females. In this study, it was observed that the frequency of mild, moderate and severe stress levels was higher in females and the incidence of very advanced stress levels was higher in males ($p>0.05$). In most of the studies in the literature, a significant relationship between stress and female gender has been reported [34,45]. This difference between gender may be because females are more susceptible to stress than males [47]. However, there is also a study supporting the data obtained in this study in which higher stress levels were observed in male participants [32]. Considering that work life is associated with stress in working participants, the main reason for this is that the majority of male participants were working while working females participants were not included in this study.

Most of studies showed that COVID-19 related to quarantine might affect eating behaviors and worsen the diet quality [42,48]. Within the scope of the NutriQuebec study by Lamarche et al. [49,50], it was determined that the Healthy Eating Index Scores of the participants showed that it should be improved during COVID-19. Similarly, in this study, a majority of participants were in the score range that needed to be improved. A study that aimed to determine diet quality in Turkey stated that gender affects the diet quality [51]. It was concluded that females consume more fruits and vegetables than males. In the present study, females have higher level of diet quality than males ($p<0.001$). Also, in line with the literature [51-53], females have higher diet quality than males in the

current study. Therefore, women have more knowledge about adequate and balanced nutrition to improve the quality of their diets due to their higher health awareness.

It is known that eating behaviors can be affected by psychological symptoms, such as depression, anxiety and stress, and it has been mentioned before that individual's eating behaviors and diet quality have changed as a result of the conditions developed during COVID-19 [10,54]. A study conducted by Chi et al. [55] reported that participants with a fear of COVID-19 tend to show more depression and anxiety symptoms. They also reported that participants who has higher diet quality showed less depression and anxiety symptoms. A study carried out in Turkey stated that fear of COVID-19 led to depression in the second wave of the pandemic [33]. In a study conducted by Amatori et al. [56], it was revealed that participants with low diet quality had more depression symptoms. Along with that in another study showed a significant relationship between depression and anxiety symptoms and diet quality [54]. After all these results there was no significant relationship between diet quality and fear of COVID-19 or psychologic symptoms such as depression, stress, anxiety ($p>0,05$). The diversity of measures and the time of study in the first half of 2021 might have influenced this result. It is thought that this may be due to the adaption of changing conditions with the gradual transition to normal life. With the COVID-19 pandemic, increasing mortality rates, economic losses and social isolation rules have triggered emotions such as depression, stress and fear in individuals, and nutrient intakes of individuals have been affected because of changing eating behaviors [57]. In a study examining the effect of nutrient intakes on depression, stress and anxiety, a statistically significant relationship was reported between carbohydrate (%) and protein (%) intakes and depression [58]. Similarly, in a study in which data of 11106 adults were analyzed, a negative relationship was reported between Healthy Eating Index scores and saturated fat intake [59]. In addition, there are other studies in the literature showing that individuals with poor diet quality as a result of low Healthy Eating Index scores have higher energy intake [60,61]. In this study, a statistically significant negative relationship was found between dietary carbohydrate, fat and energy intakes and diet quality. While the results of this study are in parallel with the literature for daily fat intake and energy, there are contrary findings in the literature for carbohydrate intake. In a study conducted in Iran, it was reported that low carbohydrate consumption decreased the risk of depression [62]. However, there are studies showing that beyond the absolute amount of carbohydrates consumed, the type of carbohydrate matters [63,64].

Stress plays a role in the development of obesity by influencing environmental factors such as dietary preference and food consumption along with emotional eating [65]. On the other hand, a study reported that obese and overweight individuals have higher levels of stress [66]. In addition to stress levels, other psychiatric disorders such as depression and anxiety are also associated with BMI [67]. In a study conducted in an Asian population, it was reported that being obese was associated with stress and anxiety [68]. In addition, in a study conducted in Turkey during the COVID-19, a significant relationship was reported between BMI values and depression, stress and anxiety levels of individuals [69]. In this study, the results introduces a significant relationship that was found between BMI and DASS-21 scores, which is an indicator of depression, stress and anxiety.

The study has several limitations. Firstly, due to the survey nature of the study, self-reported unverified measurements had to be used to evaluate the hypothesis. Taking into consideration that reasons such as being accepted in a society or misremembering may cause bias in self-reported studies [70]. Second, since the study was conducted online, the eating behaviors were observed by taking a 24-hour recall. In this method, the data obtained reflect the instantaneous diets of the participants.

The importance of this study lies on the fact that no study in the literature that examines the relationship between diet quality and depression, stress, anxiety and COVID-19 fear situations from a holistic view in the COVID-19 pandemic.

CONCLUSION

As a result of this study, the COVID-19 fear, and depression symptoms were observed in individuals during the pandemic. It is considered that these psychological symptoms affect diet quality, however no statistically significant relationship was found between diet quality and these symptoms. Although the trends are mixed, the overall results show a trend toward a decrease in diet quality, which may indicate future health problems. In the event of a future possible pandemic, mandatory quarantine should be kept as short as possible, adequate information should be provided by public health authorities and attention should be paid to process management to prevent psychological damage to individuals and facilitate their access to food.

CONTRIBUTORS

B ERDOGAN contributed to the work's conception, design, acquisition, analysis, interpretation of data and writing of the manuscript. A ACIKGOZ PINAR contributed significantly to the work's conception, design, and acquisition, analysis, interpretation of data, critical writing of the manuscript and review of the manuscript. H AVCI contributed to analysis and interpretation. All authors have read and approved the final manuscript.

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