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Food Cravings, Nutritional Status and Physical Activity in Patients with Major Depression in Turkey

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Abstract: Our goal was to determine food cravings, nutritional status and physical activity of patients diagnosed with major depression. The study was conducted on 203 (144 women, 59 men) patients, aged 20-64 years, who were diagnosed with major depression at three psychiatry centers. Anthropometric measurements, demographic data, current health status, depression duration, drug use, eating habits, food craving status (Food Craving Questionnaire-Trait/FCQ-T), food consumption frequency, energy and nutrient intake and physical activity level (International Physical Activity Questionnaire-Short Form/IPAQ) were evaluated. Depression duration, the frequency of antidepressant use and FCQ-T scores were higher in females than males. We found a positive correlation between FCQ-T score with the frequency of antidepressant use, depression duration and eating speed ($p < 0.05$). Also, depression duration was negatively correlated with folate, vitamin B6, vitamin C and zinc ($p < 0.05$). Lastly, depression duration and FCQ-T were positively correlated with body weight, body mass index, waist circumference, hip circumference, body fat (%) and fat tissue (kg) ($p< 0.05$). In addition, physical activity is a very important statement for FCQ-T scores. Both men and women, the risk of FCQ-T score who exercised for <600 Met-min/week were greater relative to that of those who exercised for ≥3000 Met-min/week. The results of this study showed that an inverse correlation between a number of nutrients intake and depression duration, antidepressant use or FCQ-T scores. It also emphasizes the beneficial effects of habitual exercise participation on food cravings. Future research exploring the nutritional status of individuals with depression is warranted.

Keywords: *Major depression, food cravings, nutritional status, physical activity level, eating patterns.*

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Introduction

Major depression is a type of mood disorder which develops as a result of hereditary, environmental or hormonal disturbances (England and Sim, 2009). Major depression is an important public health issue, with a lifetime prevalence of approximately 11–15% worldwide (Bromet et al., 2011). According to WHO (World Health Organization), major depression ranks fourth among the 20 most common diseases that cause premature death and disability, and it is expected that by 2020 depression will be the second most common among these diseases (Kessler and Ustun, 2004). These rates could be considered a proxy indicator of the population's mental health, and to reduce this burden, it is necessary to identify crucial risk factors associated with major depression prevention and management.

Several studies have shown that major depression is directly related to change in appetite, consumption of high caloric foods, weight gain, constipation, dehydration, and change in serum vitamin-minerals levels (Kaner et al., 2015). Furthermore, change in eating behaviours of major depression patients may cause various problems in the treatment of depression. For example, in elderly men and women, consumption of fish, vegetables, olive oil, and cereals was negatively correlated with severity of depressive symptoms (Mamplekou et al., 2010). The Mediterranean diet including high levels of vegetables, fruits, nuts, cereals, legumes, and fish, moderate alcohol intake, and low amount of meat or meat products and whole-fat dairy intake was protective against the development of depression (Sanchez-Villegas et al., 2006). On the other hand, depressive symptoms are also positively associated with consumption of sugary foods (Jeffery et al., 2009). Similarly, in another study, high consumption of fast food and processed pastries was associated with an increased risk for depression (Sanchez-Villegas et al., 2012). These results suggested that eating behaviour is associated with major depression. However, it is known that eating behaviour is a complex process with

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internal, environmental and social effects, especially in major depression patients have very different eating habits and one of these habits is food craving.

Food craving is a recently popularized concept, and the number of literature on this concept is gradually increasing. Food craving is the experience which refers to an intense desire to consume a specific food and which can occur in the absence of hunger (Meule, Richard and Platte, 2017). Additionally, food cravings are prevalent in Western societies characterized by abundant food environments and craved foods are usually high in sugar and fat (Richard, Meule, Reichenberger and Blechert, 2017).

Food cravings are multidimensional experiences with cognitive, motivational and behavioural, and it can be described as a result of the physiological or psychological situation, and it is frequently associated with mood disorders (Meule, Hermann and Kubler, 2014). For example, in a study by Dye, Warner and Bancroft (1995), there was found the severity of food craving was very strongly related to the reported severity of depression (Dye, Warner and Bancroft,1995). Additionally, gender differences in food cravings and eating behaviours may result from numerous factors including psychological or physiological changes related to menstruation differences in nutrition awareness and knowledge, cultural influences, and differences in dietary and mood-regulating neurotransmitters (Hormes and Timko, 2011; Chao, Grilo, and Sinha, 2016). For example, some researchers have found differences in the prevalence of general food cravings with cravings being more common in females than males (Cepeda-Benito et al., 2003; Lafay et al., 2001), others have found no differences (Burton, Smit, & Lightowler, 2007). There are close connections between socio-cultural factors (e.g., gender, age, race), eating behaviours and general habits in major depression.

Recently, several studies suggested that physical activity was related to mental health outcomes (Teychenne, Ball, and Salmon, 2010; Hamilton, et al., 2008; Tremblay, et al., 2010). For example, one cross-sectional study found that sitting time was positively associated with major depression. Sitting for long periods (>10 h/d) was significantly related to higher risk of major depression in both men and women. Sitting for 8–10 h/d was associated with risk of major depression in both sexes; however, the association was statistically significant only in women. In addition, physical activity was inversely related to major depression risk, although this association was non-significant (Nam, et al., 2017). In similarly, a previous Spanish study that examined the combined effect of sitting time and physical activity on depression. The results showed that risk of mental disorders in those with high physical activity levels and short periods of sedentary behaviour was 25% lower relative to that of those with low physical activity levels and long periods of sedentary behaviour (Sanchez-Villegas et al., 2008).

These results suggest that nutritional status, eating habits, food cravings and physical activity are significantly associated with major depression in adults. Therefore, the present study was conducted to determine food cravings, nutritional status and physical activity in patients with major depression.

Material and Method

Participants and Procedures

The sample of the study included 203 patients (59 males and 144 females), who volunteered to participate in the study, among those who were diagnosed with major depression at three psychiatric centers between January and March of 2015.

The criteria for inclusion were diagnosed with major depression and age of was between 20-64 years (mean 37.1±11.98). Exclusion criteria included pregnancy and lactation. Participants completed questionnaires within the 30-minutes period. Among the participants, nobody showed any comprehension and/or language difficulties.

Measurements

The questionnaire included an overview of individuals typical socio-demographic characteristics, current health status, depression duration, drug use, eating habits, food craving status (Food Craving Questionnaire-Trait), food consumption frequency, energy and nutrient intake and physical activity level (International Physical Activity Questionnaire-Short Form), and it was applied by the researcher. The anthropometric evaluation consisted of measuring height (in centimetres), using a stadiometer, and weight (in kilograms), using a digital portable scale. Then, from these data, it was calculated the body mass index (BMI) using the following formula: weight (kg.)/[height (m)]^2 (Centers for Disease Control, 2015). Body compositions (fat mass, fat free mass, total body water) were measured by body impedance analysis (BIA) using a Tanita Mc780 variable frequency impedance machine.

The nutritional behaviour of participants was determined by food consumption frequency. Nutrient Database (BeBiS, Ebispro for Windows, Germany; Turkish Version/BeBiS 7) was used to determine energy and nutrient intake; results were compared to Dietary Guidelines for Turkey (Dietary Guidelines for Turkey, 2006). Additionally, eating habits and food craving status of participants was determined by Turkish version of Food Craving Questionnaire-Trait (FCQ-T) (Muftuoglu, Kiziltan, and Ok, 2017). FCQ-T consists of 39 questions, divided into nine dimensions and answers are recorded on a Likert scale, ranging from 1 (Never) to 6 (Always). Thus, the minimum and maximum scores can range from 39 to 234 and high scores indicate increased food craving (Cepeda-Benito, et al., 2001)

Physical activity levels of participants were determined by Turkish short version of International Physical Activity Questionnaire (IPAQ) (Saglam, et al., 2010). The IPAQ questionnaires list activities and request estimates of durations and frequencies for each activity engaged in over the past week. Durations are multiplied by known Mets per activity, and the results for all items are summed for the overall physical activity score. Scores for walking and for moderate and vigorous activities are sums of corresponding item scores. A sitting question is not included in physical activity score (Craig et al., 2003).

Data Analysis

Descriptive statistics were given depending on the categorical or quantitative nature of the data collected in the study. Categorical variables were expressed as numbers (n), while quantitative variables were expressed as mean, standard deviation (SS), median and interquartile range values. The normality of the distribution of quantitative data was evaluated by the one sample Kolmogorov–Smirnov test. Comparison between two groups was performed by Mann–Whitney U-test for continuous data was not normally distributed and among more than two groups was performed by Kruskal–Wallis test. In addition, the correlation coefficient and statistical significance between two quantitative variables were calculated by using Pearson Correlation Analysis. Point-Biserial Correlation Analysis was used when one of the variables was categorical and the other quantitative. The level of significance in all hypotheses tests was evaluated by taking $p \leq 0.05$.

Results

Participants' characteristics are shown in Table 1. The study population (n= 203) was composed of 144 females (70.9%) and 59 males (29.1%). The mean age of the patients was 37.1±11.98 years. The depression duration in males and females was 13.1±7.78 months and 12.5±7.45 months, respectively. For female participants, the mean BMI was 26.8±5.73 kg/m^2 (34.0% overweight), the mean waist to hip ratio was 0.85±0.8 cm whereas for males, the average BMI was 26.5±4.12 kg/m^2 (44.1 % overweight) and the mean waist to hip ratio was 0.88±0.7 cm. Walking was the preferred activity for all participants and contributed the highest proportion of activity for all participants. A total of 55.1% (n=112) of participants indicated walking was the only form of physical activity they had engaged in during the previous 7 days (Table 1).

In this study, eating habits and food craving status of participants was determined by (FCQ-T). The mean FCQ-T score of the patients was 119.8±40.11. The median of the number of main meals was 3 (Q_1=2, Q_3=3) and the median of the number of snacks was 2 (Q_1=1, Q_3=2). We found that 47.2% of the participants skipped a meal, 61.1% of them gained weight in the last year. Patients gained minimum 1 kg, maximum 20 kg and an average of 7.04±4.36 kg of weight in the last year (Table 1).

The results of Table 2 show the correlation between depression duration, the frequency of antidepressant use, FCQ-T scores and some characteristics, eating habits, nutritional status, anthropometric measurements and physical activity level. Accordingly, depression duration, frequency of antidepressant use and FCQ-T scores were higher in females than males, in patients with chronic diseases than patients without chronic diseases and in patients not receiving diet treatment; but the differences were not statistically significant (p>0.05). Additionally, a positive and statistically significant correlation was found between FCQ-T score with frequency of antidepressant use (r=0.244,p=0.001), depression duration (r=0.211, p=0.001) and eating speed (r=0.241, p=0.001) (Table 1).

Table 1. Patients' Characteristics

Characteristics	**Patients *n* (%) 203 (100)**
Age, mean (SD)*	37.1 (11.98)
Sex, female (%)	144 (70.9)
male (%)	59 (29.1)
Married, yes (%)	114 (56.1)
Education, university or high, yes (%)	113 (55.7)
Employed, yes (%)	116 (57.14)
Chronic disease, no (%)	117(57.6)
Depression duration, mean (SD), female	12.5 (7.4)
male	13.1 (7.78)
Antidepressant drug use, **yes (%),** female	114 (79.2)
male	47 (79.7)
BMI, mean (SD), female	26.8 (5.73)
male	26.5 (4.12)
Waist to hip ratio, mean (SD), female	0.85 (0.8)
male	0.88 (0.7)
Physical activity, walking (%)	112 (55.1)
moderate (%)	86 (42.4)
vigorous (%)	5 (2.5)

Table 1. Continued

Characteristics	Patients *n* (%) 203 (100)
FCQ-T score, mean (SD)*	119.8 (40.11)
Main meals, median (Q_1-Q_3)**	3 (2-3)
Snacks, median (Q_1-Q_3)**	2 (1-2)
Skipped a meal, yes (%)	96(47.2)
Weight gain in 12 months, yes (%)	124 (61.1)

*SD: standard deviation **Q_1-Q_3: first quartile and third quartile

We examined consumption of certain food, and a positive correlation was found between FCQ-T score and chocolate and chocolate products (r=0.147, p=0.036), cream cake (r=0.314, p=0.000), pastry (r=0.252, p=0.000), fast food (r=0.225, p=0.001), French fries (r=0.202, p=0.004). Similarly, there was a positive correlation between frequency of antidepressant use and chips (r=0.170, p=0.015), carbonated beverages (r=0.217, p=0.002), fast-food (r=0.160, p=0.022) and French fries (r=0.163, p=0.020). However, frequency of antidepressant use was negatively correlated with fruit consumption (r=-0.192, p=0.002).

We analyzed the nutritional status of the patients and depression duration was negatively correlated with many micronutrients intake (vitamin A, thiamine, riboflavin, niacin, calcium, magnesium, iron), but only folate (r=-.0184, p=0.010), vitamin B_6 (r=-0.173, p=0.015), vitamin C (r=-0.189, p=0.017) and zinc (r=-0.210, p=0.001) were statistically significant. Similarly, a negative correlation was found between frequency of antidepressant use and many micronutrients intakes (vitamin E, thiamine, riboflavin, niacin, calcium, zinc, magnesium, iron), on the other hand, a positive correlation was found between FCQ-T score and all micronutrients intake. However, these correlations were not statistically significant.

In this study, a positive correlation was found between depression duration, the frequency of antidepressant use, FCQ-T score and many macronutrients, except protein and fiber intake. Lastly, this study showed that there was a positive correlation between depression duration and FCQ-T score and body weight (r=0.239, p=0.001; r=0.154, p=0.028, respectively), BMI (r=0.216, p=0.002; r=0.157, p=0.025, respectively), waist circumference (r=0.212, p=0.003; r=0.203, p=0.005, respectively), hip circumference (r=0.184, p=0.011; r=0.203, p=0.005, respectively), body fat (%) (r=0.187, p=0.010; r=0.159, p=0.022, respectively) and fat tissue (kg) (r=0.238, p=0.001; r=0.181, p=0.013, respectively) (Table 2).

Table 3 presents the estimated odds ratios (ORs) from the multiple logistic regression analyses. Risk of FCQ-T score, in women, was approximately twice that observed in men (OR:1.99, 95% CI: 1.49-2.67). Regarding Metabolic Equivalent Values (Mets), the risk of the FCQ-T score in women who exercised for <600 Met-min/week was greater relative to those who exercised for ≥3000 Met-min/week (OR: 2.04, 95% CI: 1.12–373). Similarly, the risk of FCQ-T, in men who exercised for <600 Met-min/week was greater relative to that of those who exercised for ≥3000 Met-min/week (OR: 1.62, 95% CI: 1.08–2.42). Both men's and women's risk of FCQ-T score who had for ≥15 years depression duration was greater relative to that of those who had for <5 years depression duration (OR: 1.75, 95% CI: 0.93-3.31, OR:4.27, 95% CI: 1.72-10.58, respectively).

Table 2. Correlations between the depression duration, antidepressant use, FCQ-T scores and several variables.

	Depression duration		Frequency of antidepressant use		FCQ-T scores	
	r	**p**	**r**	**p**	**r**	**p**
Characteristics						
Age	-0.004	0.959	0.006	0.899	-0.010	0.891
Gender#	-0.033	0.639	-0.047	0.514	-0.028	0.687
Chronic disease#	-0.028	0.689	-0.094	0.196	-0.088	0.212
Antidepressant use#					0.244	0,001*
Depression duration#					0.211	0.001*
Eating habits and consumption of certain food						
Number of main meals	0.092	0.193	0.103	0.091	0.024	0.735
Number of snacks	0.131	0.062	0.090	0.198	0.075	0.285
Eating speed#	-0.022	0.751	0.184	0.002*	0.241	0.001*
Diet treatment#	-0.135	0.054	-0.103	0.131	-0.108	0.124
Chocolate and chocolate products	0.108	0.124	0.031	0.659	0.147	0.036*
Cream cakes	0.120	0.087	0.137	0.052	0.314	0.000*
Chips	0.023	0.748	0.170	0.015*	0.099	0.160
Carbonated beverages	0.011	0.872	0.217	0.002*	0.108	0.124
Fast-Food	0.009	0.893	0.160	0.022*	0.225	0.001*

Table 2. Continued

	Depression duration		Frequency of antidepressant use		FCQ-T scores	
	r	p	r	p	r	p
French fries potatoes	0.004	0.950	0.163	0.020*	0.202	0.004*
Bread	0.002	0.975	0.000	0.995	0.137	0.052
Pasta	0.048	0.493	0.044	0.529	0.112	0.113
Pastry	0.064	0.365	0.082	0.245	0.252	0.000*
Dried nuts and fruits	0.025	0.719	0.116	0.098	0.108	0.125
Ice cream	0.099	0.159	0.011	0.882	0.123	0.080
Fruit	0.087	0.219	-0.192	0.002*	0.079	0.263
Nutritional status						
Total energy (kcal/day)	0.009	0.902	0.063	0.380	0.094	0.192
Carbohydrate (TE %)	0.021	0.772	0.057	0.426	0.016	0.819
Protein (TE %)	-0.147	0.040*	0.037	0.607	-0.139	0.050*
Total fat (TE %)	0.023	0.751	0.013	0.861	0.054	0.452
Saturated fatty acid (%)	0.030	0.681	0.004	0.951	0.086	0.229
Monounsaturated fatty acid (%)	0.014	0.850	0.073	0.310	0.043	0.551
Polyunsaturated fatty acid (%)	0.003	0.969	0.075	0.293	0.027	0.707
Fiber (g)	-0.118	0.099	-0.078	0.276	-0.044	0.536
Vitamin A (µg/RE)	-0.017	0.810	0.065	0.362	0.012	0.869
Vitamin E (mg)	0.005	0.948	-0.053	0.458	0.018	0.801
Thiamine (mg)	-.0044	0.540	-0.005	0.940	0.053	0.462
Riboflavin (mg)	-0.027	0.710	-0.058	0.417	0.094	0.191
Niacin (mg)	-0.062	0.392	-0.096	0.180	0.134	0.060
Folate (mcg)	-.0184	0.010*	0.015	0.835	0.069	0.334
Vitamin B_6 (mg)	-0.173	0.015*	0.065	0.365	0.077	0.281
Vitamin B_{12} (mcg)	0.032	0.659	0.105	0.145	0.124	0.084
Vitamin C (mg)	-0.189	0.017*	0.130	0.070	0.068	0.344
Calcium (mg)	-0.078	0.274	-0.044	0.542	0.017	0.811
Zinc (mg)	-0.210	0.001*	-0.078	0.275	0.136	0.057
Magnesium (mg)	-0.113	0.115	-0.036	0.614	0.055	0.448
Iron (mg)	-0.084	0.241	-0.045	0.529	0.048	0.496
Anthropometric measurements						
Body weight	0.239	0.001*	0.047	0.502	0.154	0.028*
BMI	0.216	0.002*	0.041	0.559	0.157	0.025*
Waist circumference	0.212	0.003*	0.017	0.818	0.204	0.005*
Hip circumference	0.184	0.011*	0.048	0.513	0.203	0.005*
Waist/hip ratio	0.136	0.057	-0.034	0.643	0.121	0.097
Body fat percentage (%)	0.187	0.010*	0.012	0.873	0.159	0.022*
Body fat tissue (kg)	0.238	0.001*	0.023	0.750	0.181	0.013*
Lean body mass (kg)	-0.137	0.061	0.088	0.230	0.033	0.655
Body water (L)	-0.138	0.060	-0.056	0.444	-0.051	0.488

*p<0.05

[♯] The correlation was calculated by Point-Biserial Method.

Table 3. Association between Metabolic Equivalent Values and FCQ-T scores

	Women		Men		Total	
	OR	95%CI	OR	95%CI	OR	95%CI
Metabolic Equivalent Values (MET)						
<600 met-min/week	2.04	(1.12-3.73)	1.62	(1.08-2.42)	1.71	(1.23-2.39)
600<-<3000 met-min/week	1.58	(1.10-2.25)	1.59	(0.89-2.84)	1.56	(1.15-2.11)
≥3000 met-min/week	1.00		1.00		1.00	
Sex						
Men					1.00	
Women					1.99	(1.49-2.67)

Table 3. Continued

	Women		Men		Total	
	OR	**95%CI**	**OR**	**95%CI**	**OR**	**95%CI**
Depression duration						
<5 years	1.00		1.00		1.00	
5≤-<10 years	1.86	(0.85-4.06)	1.39	(0.92-2.10)	1.27	(0.89-1.80)
10≤-<15 years	2.50	(1.02-6.10)	1.65	(1.03-2.65)	1.80	(1.21-2.67)
≥15 years	4.27	(1.72-10.58)	1.75	(0.93-3.31)	1.85	(1.14-3.02)
Main meals						
2	1.41	(0.96-2.07)	1.44	(0.72-2.89)	1.30	(0.81-2.08)
3	1.00		1.00		1.00	
Snacks						
1	1.67	(1.20-2.33)	1.79	(0.95-3.36)	1.55	(1.05-2.30)
2	1.17	(0.86-1.59)	1.27	(0.72-2.25)	1.15	(0.80-1.67)
3	1.00		1.00		1.00	
Diet treatment						
Yes	1.13	(0.91-1.41)	1.04	(0.69-1.58)	1.16	(0.90-1.50)
No	1.00		1.00		1.00	
BMI (kg/m²)						
Low-weight (< 18.5)	1.79	(1.08-2.97)	3.72	(1.61-8.62)	2.01	(1.31-3.09)
Normal (18.5–24.9)	1.00		1.00		1.00	
Overweight (25.0–29.9)	1.19	(0.94-1.93)	1.15	(0.73-1.61)	1.13	(0.57-1.11)
Obesity (≥ 30.0)	1.50	(0.89-2.55)	1.13	(0.41-3.11)	1.42	(0.89-2.26)
Waist circumference						
<88 cm	1.00					
≥88 cm	1.45	(0.97-1.19)				
<102 cm			1.00			
≥102 cm			1.40	(0.87-2.10)		

Discussion

The aim of this study was to determine food cravings, nutritional status and physical activity in patients with major depression. In this study, we wanted to use FCQ-T for patients about craving situation, therefore we first made the validity and reliability of the Turkish version of Food Craving Questionnaires-Trait (Muftuoglu, Kiziltan and Ok, 2017). After validity and reliability analyses of FCQ-T, the questionnaire was applied to patients participated in the study. The minimum, maximum and average scores obtained from the questionnaire of the patients were 49, 219, and 119.8±40.11, respectively. In the analysis of the questionnaire, high scores indicate increased food craving. Accordingly, it can be said that study participants had the medium level food craving.

Studies on food craving in major depression commonly report that not all foods induce food craving, and this effect is more pronounced in fatty, salty and sweet products, and products with additives (Wilson, 2010). Therefore, clinical studies were focused on foods with simple carbohydrates such as chocolate and sugar (Avena and Gold, 2011, Davis et al 2009). It was observed that these products have measurable psychoactive effects; and anger, tension, and some depressive symptoms reduces after their consumption (Saper et al., 2002).

It is thought that if nutrition was controlled only with homeostatic systems, everyone should be at their ideal weights, but because of the relationship of award system of the brain with taste and pleasure, individuals tend to consume certain foods excessively (O'Doherty et al., 2002). Different physiological effects according to consumed food, for instance, the content of the food (sweet and/or fatty), consolidates eating behaviour. Also, secretion of various biological substances affects eating behaviour (Lowe, Bocarsley and DelParigi, 2008).

From this perspective, it has been reported that depressive mood states are related to the increase in food cravings. Particularly foods with high content of sugar, fat, and carbohydrate (Moreno-Dominguez, Rodríguez-Ruiz, Martín, and Warren, 2012). In this study, as expected, a positive correlation was detected between FCQ-T scores and especially sweet and fatty foods craved by patients.

Besides, we found that patients using antidepressants had higher FCQ-T scores compared to patients not using antidepressants. Moreover, there was a positive and statistically significant correlation between frequency of antidepressant use and chips, carbonated beverages, fast-food and French fries. However, a negative and statistically significant correlation was found between frequency of antidepressant use and fruit consumption. This finding may be due to the effects of antidepressants on appetite. Similarly, we found a linear correlation between FCQ-T score and chocolate and chocolate products, cream cake, pastry, fast food, French fries.

In this study, an inverse correlation between depression duration and many micronutrients intake (vitamin A, thiamine, riboflavin, niacin, calcium, magnesium, iron) but only folate, vitamin $B_{6,}$ vitamin C and zinc were statistically significant. Similarly, a negative correlation was found between frequency of antidepressant use and many micronutrients intakes (vitamin E, thiamine, riboflavin, niacin, calcium, zinc, magnesium, iron), on the other hand, a positive correlation was found between FCQ-T score and all micronutrients intake. Additionally, a positive correlation was found between depression duration, the frequency of antidepressant use, FCQ-T score and many macronutrients, except protein and fiber intake.

Results from this study indicated that major depression patients increase their food intake as a response to negative emotions. Similar to this finding, Konttinen et al. (2010) investigated an association between emotional eating and depressive symptoms. Emotional eating was related to higher consumption of sweet foods. In addition, depressive symptoms were related to a lower consumption of vegetables and fruits (Konttinen et al., 2010).

We found an inverse correlation between a number of nutrients intake and depression duration, antidepressant use or FCQ-T scores. We examined studies on this subject, and first of all, vitamins C and A are thought to be effective in depression due to their roles in the oxidative processes (Bodnar and Wisner, 2005; Jorm et al., 2002). Oishi and Kawakami (2009) indicated the negative association between depressive symptoms and carotene and vitamin C intakes. On the other hand, folate and vitamin B_{12} are necessary for normal functioning of nervous system. They are also required for single carbon metabolism responsible for synthesis and metabolism of serotonin and other neurotransmitters (Bjelland, Ueland and Vollset, 2003). Miller (2008) reported a low level of folate intake in depressed patients. Similar to the present study, in the Coronary Health Improvement Project (CHIP), it was conducted to decrease depression by modifying selected daily nutrients from food, a decrease in depression was achieved by increasing pyridoxine (Merrill, Taylor, and Aldana, 2008). Lastly, we examined other nutrients intake, and magnesium deficiency is known to cause neuropathologies. Lack of magnesium leads to depression because of neuron damage occurring as a result of not meeting the magnesium requirement of neurons (Eby and Eby, 2006). On the other hand, inadequate dietary zinc and iron intake contribute to depressive symptoms (Maserejian, Hall and McKinlay, 2012; Lehto et al. 2013; Shariatpanaahi et al. 2007).

Physical activity is a very important statement for FCQ-T scores. Both men and women, the risk of FCQ-T score who exercised for <600 Met-min/week were greater relative to that of those who exercised for ≥3000 Met-min/week. Beneficial effects of an active lifestyle on the control of eating have been shown previously (J. Blundell, 2011; Grothe et al., 2013; Horner et al., 2016). Especially, habitual chronic exercise participation was also associated with lower food cravings (Horner, Finlayson, Byrne and King, 2016), while a 6-months exercise intervention did not show any changes in appetite measures (Cornier et al., 2012). However, given the importance of hedonic components of appetite in the regulation of eating behavior (Berthoud, 2006; Finlayson and Dalton, 2012), the possible interaction between exercise and food hedonics requires further investigation as it may have implications for our understanding of the role of exercise as a strategy for eating control (King et al., 2012).

We detected a positive and statistically significant correlation between depression duration and FCQ-T score with weight, BMI, waist circumference, hip circumference, and fat tissue. Based on our findings, we can say that food craving and increased depression duration negatively affects body composition of the patients. In the same way, other studies have identified food cravings, especially cravings for high-fat foods, have been reported to be associated with higher body mass index (Chao, Grilo, White, and Sinha, 2014; Franken and Muris, 2005). The majority of literature demonstrates a high prevalence of depression in people with high BMI. It is still not clear whether depression leads to obesity in response to changing appetite and medicines, or obesity contributes to depressive disturbances. In addition, waist and hip circumferences and waist to hip ratios which show body fat distribution are important because chronic diseases, symptoms, and low quality of life are affected (De Wit et al., 2010).

In summary, results from the present study show that the relationship between food craving, anthropometric measurements, certain foods and physical activity in major depression. Also, this study shows an inverse correlation between a number of nutrients intake and depression duration, antidepressant use or FCQ-T scores. It also emphasizes the beneficial effects of habitual exercise participation on food cravings. Because of all these reasons, future research exploring the overall nutritional status of individuals with depression is warranted in order to assist in understanding

and treatment of the condition and to promote healthy lifestyles that may help in depression management. Lastly, in this study, there are some limitations such as our small sample size. Large-scale studies are needed on this issue in the future studies.

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