Lockdown Changed Us in Turkey Eating Behaviors, Depression Levels, and Body Weight Changes during Lockdown

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Abstract. Nationwide lockdown is a proven strategy to decrease inter-human transmission of the COVID-19. Prolonged home stay may be associated with some potential side effects as weight gain, depression, physical inactivity, unbalanced diet, and behavioral addiction disorders. During March-May of the social lockdown, Turkish adults (n:2955) completed an online sociodemographic form, Beck Depression Inventory (BDI) and Three Factor Eating Questionnaire (TFEQ)-21. During lockdown, 51.1% of the participants gained weight and TFEQ-21, emotional and uncontrolled eating scores were increased (p<0.001). Analysis showed that incraese in body weight was significantly related to the TFEQ-21 score, depression level, having a disease, decreased exercise, increased alcohol consumption, dismissal from work and reduced smoking (p<0.001). There were significant changes in uncontrolled and emotional eating, and cognitive restriction during the lockdown period. Additionally, changes in eating habits and physical activity may influence weight gain.

Key words: COVID-19, Pandemic, Lockdown, Body weight management, Eating behaviors, Depression

Introduction

Coronavirus disease (COVID-19) is a viral, infectious disease caused by a newly discovered severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (1, 2). Inter-human transmission of the virus is primarily transmitted from people who are carrying symptoms of COVID-19 to others through respiratory tract by droplets, respiratory secretions, and direct contact for a low ineffective dose (3, 4). The virus has also been isolated in serum, blood, rectal swabs, saliva, urine and stool (ECDC 2020). There were over 6 million confirmed cases and 375,000 deaths of SARS-CoV-2 in the world according to World Health Organization (WHO) in March 6, 7. Turkey, as many other countries, is affected by this pandemic since the first confirmed case on March 11th, 2020 - after a man tested positive upon returning Turkey from Europe. There are over 380,000 confirmed cases and 10,500 deaths in Turkey as of November 1st, 2020 (8). In Turkey, lockdown had started in March and government stated everyone to stay at home, work flexible and asked not to go out unless necessary. The combination of preventative contact tracing, social distancing, and social isolation by staying home seem to be the most effective strategies to keep the COVID-19 outbreak under control (5, 6). Nationwide lockdown has already been a proven strategy to curb the spread of COVID-19 in some countries to decrease inter-human transmission, morbidity, and mortality (8).

Unfortunately, prolonged home stay to inhibit human-to-human transmission of SARS- CoV-2 may be associated with some potential side effects. Some of the most severe consequences of stay-at-home orders and lockdowns on people's health are weight gain (9), depression (10), physical inactivity (11), insufficient sleep (12), unbalanced diet (13, 14), behavioral addiction disorders (i.e.: increased screen time), and increased consumption of addictive substances (i.e.: tobacco, alcohol) (15).

Isolation and depression are strongly linked to anxiety and cognitive decline that may further lead a reduction in self-worth, sense of purpose, and feeling valuable (16). Sedentary behaviors in the younger populations may be an important cause of depression and anxiety (17). Moreover, it is well-known that isolation and additional restrictive measures amplify the neurocognitive, mental, cardiovascular and autoimmune problems for the elderly, already high-risk population, in addition to depression and anxiety (14, 18). Chronic stress acts as a trigger for anxiety and depression by initiating changes in the hypothalamic-pituitary-adrenal axis and immune system. Both, experimental and clinical evidence suggests that an increase in concentrations of pro-inflammatory cytokines and glucocorticoids, as in chronic stressful situations and depression, contributes to depression- related behavioral changes (19).

Nutrition is important for healthy life but there is no specific nutritional recommendation for COVID-19 treatment, by itself (20). However, a healthy and balanced diet has been proven to strengthen the immune system along with physical activity and enough sleep (21). But, the negative direct and in-direct effects of COVID-19 might contribute to nutritional preferences and behaviors. Negative emotional states, such as anxiety and stress, have strong relationships with diet and weight management (22). When negative emotional states are experienced, physiological changes in the body continue similarly with satiety mechanisms. It is thought that loss of appetite and reduced food intake are natural results in such situations (13). On the other hand, if one leverages "food consumption" to cope with unwanted, disturbing emotions, this can be considered as "emotional eating" which leads to uncontrollable weight gain (24).

In depression, weight loss and loss of appetite are generally observed, which result in decreased body weight (25). However, there is a subtype that defined in DSM- 5 as atypical depressive disorder. The main features of atypical depression are mood reactivity and vegetative symptoms. Weight gain and increased appetite are considered to be the main vegetative symptoms (26).

COVID-19 emerged a "new normal" which people should adopt overnight without any anticipation or preparation. The purpose of this study is to measure the direct and indirect health effects of COVID-19's consequences, such as eating attitudes and body weight control on Turkish adults. In this cross-sectional study, we aimed to collect mental and physical health parameters data via a web-based survey form.

Materials and Methods

Participants

This cross-sectional study was performed in Turkey, from March to May, 2020. Data was collected till the 7th week of the lockdown in Turkey. We used an online survey to assess the current eating and psychological response during the lockdown by using an online form. The study group consists of 2955 participants in total who aged between 18-65 years.

Study Design

As the Turkey Government recommended the public to minimize face-to-face interaction and isolate themselves at home, respondents were electronically invited by researchers from social media and e-mail. Participants completed the questionnaires through an online Google survey platform. Ethics approval was obtained from the Medical Research Ethics Board of the Acıbadem Mehmet Ali Aydınlar University (2020-07/6), which conformed to the principles embodied in the Declaration of Helsinki. All respondents were provided informed consent. Data collection took place between 15 March–15 May 2020, after World Health Organization declared the COVID-19 outbreak as a public health emergency of international concern.

Survey Development

Previous surveys on the nutritional and psychological impacts of Severe Acute Respiratory Syndrome (SARS) and influenza outbreaks were reviewed (26). Authors also included additional questions related to the COVID-19 outbreak. The structured questionnaire consisted of questions that covered several areas: (1) demographic data, (2) physical activity level, (3) social media usage time in the past, (4) self-reported body weight and height, (5) Beck Depression Inventory, (6) Three-Factor Eating Questionnaire (TFEQ)-21. Physical activity level, body weight and TFEQ-21 were asked twice as before and after lockdown.

Assessment of Outcomes

In our study, the questionnaire was filled in via online survey by participants. The primary outcome variables were socio-demographic features (age, gender, education level, profession, working and marital status, accommodation, diagnosed diseases, smoking status, alcohol consumption), before the pandemic and the current physical activity levels and social media usage periods were collected. Body weight information and food consumption changes were also collected as before and during lockdown. Body mass index (BMI) was calculated as body weight in kilograms divided by height in meters squared.

Beck Depression Inventory (BDI)

Depression level was determined with 21-item Beck Depression Inventory (BDI) (27). BDI measures the severity of depressive symptoms. Items were scored on a four-point scale. One item concerning weight loss was excluded from the analysis, and the total from the remaining 20 items was calculated. In BDI scoring, higher score indicates severe depression. As recommended cut-off of 17 was used to define depression. BDI is an internally consistent and valid measurement. A valid and reliable Turkish translation of the scale was used (28). Cronbach's alpha coefficients for the sample were 0.88 in the present study.

Three Factor Eating Questionnaire (TFEQ)-21

Participants were applied the Three Factor Eating Questionnaire (TFEQ)-21. Emotional eating was assessed by using the emotional eating subscale of the 18-item Three-Factor Eating Questionnaire (TFEQ-18). Karlsson et al. (2000) developed the TFEQ-18 on the basis of a factor analysis of the original 51-item TFEQ in the Swedish Obese Subjects Study and it has been found to be valid in the general population (29). Further development of the construct validity of the short form resulted in the 21-item version (TFEQ-21) used in the present study (30). The TFEQ-21 has 3 eating behaviors domain: the cognitive restraint subscale (6 items) assesses control over food intake to influence body weight and body shape; the emotional eating subscale (6 items) measures the propensity to overeat in relation to negative mood states, e.g., when feeling lonely, anxious, or depressed; and, the uncontrolled eating subscale (9 items) assesses the tendency to lose control over eating when feeling hungry or when exposed to external stimuli. The dichotomized response format was used in the original TFEQ was converted to a 4-point response scale in the TFEQ-21. Higher scores indicate greater cognitive restraint, uncontrolled eating, or emotional eating. Cronbach's alpha coefficient for this study was 0.87.

Statistical Analysis

Normality distribution was analyzed with Kolmogorov Smirnov Test. Independent Samples Student's t-test was used to detect differences at study baseline between the 2 groups. As a measure of internal consistency, Cronbach's alpha was computed for BDI and TFEQ-21 depression scale in study group. Pearson's Chi square test was used for the comparison of categorical variables. The Paired Sample t-test was used to determine whether the mean difference between two sets of observations. Also, multiple linear regression analyses were used to identify the unique contribution of relevant predictors on the body weight, individually. Results were stated as mean with standard deviation and $p<0.05$ was considered to be statistically significant. All statistical analyses were done with the use of SPSS 21.0 package program.

Results

Characteristics of the participants were presented in Table 1. Mean age of the participants was 35.06±10.34 (36.62±10.01 years for males, 34.97±10.35 years for females) years. The number of female participants was higher than that of males (94.9% vs. 5.1%). Most of the females (61.7%) and males (60.0%) had university degree. In this study, 31.1% (n:920) of the participants were smokers and 42.7% (n:393) of the smokers reported a decrease in smoking after the pandemic. In the entire sample, 376 people (12.7%) were consuming alcohol, and 33.2% (n:125) of them reported an increase in alcohol consumption after the pandemic.

Almost all participants had increased social media usage and the rate of those who exercised 150 minutes or more in a week before lockdown, decreased by 22.8%. While 51.1% of the participants gained weight during the lockdown, 27.9% of the participants lost weight and 21.1% of participants stayed at the same body weight (Table 2). The lockdown had statistically significant impacts on BMI (t = -12.858, p<0.001) and body weight (t = -12.745, p<0.001). In addition, at baseline, mean TFEQ-21 cognitive restriction subscale scores were 52.9±23.8 before the pandemic, and

49.4±24.4 during the lockdown (t = 10.161, p<0.001). The TFEQ-21 emotional eating subscale scores were 35.5±28.6 before the pandemic and 38.3±30.9 during the lockdown (t = -9.233 p<0.001). The TFEQ-21 uncontrolled eating subscale scores were 54.6±31.5 before the pandemic and 58.1±34.2 during the lockdown (t = -8.711, p<0.001) (Table 3).

Multiple linear regression analysis was conducted to determine the independent effects of Beck BDI, cognitive restriction, emotional eating, uncontrolled eating scores and gender, marital status, diagnosed disease, living with family or alone, decreased exercise, increased alcohol consumption, mandatory city change, job dismissal, decreased smoking on body weight change. In Table 4, the results of multiple linear regression analysis showed that body weight increase while staying home was significantly related to the TFEQ-21 score, depression level, diagnosed disease, decreased exercise time, increased alcohol consumption, dismissal and reduced smoking (p<0.001; R=0.487; R2=0.237).

The participants reported a significant increase in the consumption of especially carbohydrates as bread, bakery products, pasta during the lockdown. Results of multiple linear regression analysis indicated that the increase in body weight during the lockdown was

Table 1. Characteristics of the participants

Variables	Male (n=150)	Female (n=2805)	Total (n=2955)
Educational level			
Elementary / secondary school	1 (0.6%)	52 (1.9%)	53 (1.8%)
High school	16 (10.7%)	509 (18.1%)	525 (17.8%)
University	90 (60.0%)	1731 (61.7%)	1821 (61.6%)
Postgraduate	43 (28.7%)	513 (18.3%)	556 (18.8%)
Marital status			
Married	92 (61.3%)	1092 (38.9%)	1184 (40.1%)
Single	58 (38.7%)	1713 (61.1%)	1771 (59.9%)
Smoking			
Yes	54 (36.0%)	866 (30.9%)	920 (31.1%)
No	96 (64.0%)	1939 (69.1%)	2035 (68.9%)
Alcohol consumption			
Yes	27 (18.0%)	349 (12.4%)	376 (12.7%)
No	123 (82.0%)	2456 (87.6%)	2579 (87.3%)
Diagnosed disease			
Yes	48 (32.0%)	1324 (47.2%)	1372 (46.4%)
No	102 (68.0%)	1481 (52.8%)	1583 (53.6%)

Table 2. Body weight, BMI and scales before pandemic and during lockdown

Variables	Male (n=150)		Female (n=2805)		Total (n=2955)	
	Before Coronavirus Pandemic	During Lockdown	Before Coronavirus Pandemic	During Lockdown	Before Coronavirus Pandemic	During Lockdown
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
Body weight (kg)	85.9±16.0	86.2±15.4	63.5±12.4	64.2±12.7	64.7±13.6	65.3±13.7
BMI (kg/m²)	27.0±4.4	27.1±4.1	23.5±4.5	23.8±4.6	23.7±4.5	23.9±4.6
TFEQ-21 Cognitive restriction score Emotional eating score Uncontrolled eating score	45.5±22.6 28.2±25.8 57.2±32.8	45.0±22.7 31.2±28.6 58.9±34.0	53.3±23.9 35.9±28.7 54.5±31.5	49.7±24.4 38.7±31.0 58.1±34.3	52.9±23.8 35.5±28.6 54.6±31.5	49.4±24.4 38.3±30.9 58.1±34.2
BDI score		27.1±4.1		13.5±9.2		13.3±9.2

BMI; Body mass index, TFEQ; Three Factor Eating Questionnaire, BDI; Beck Depression Inventor

Table 3. Frequency of participants' weight change, social media usage, exercise and depression levels

	Male (n=150)		Female (n=2805)		Total (n=2955)	
	Before Coronavirus Pandemic	During Lockdown	Before Coronavirus Pandemic	During Lockdown	Before Coronavirus Pandemic	During Lockdown
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Weight Change Gainer Loser Maintenance	66 (44.0%) 59 (39.3%) 25 (16.7%)		1444 (51.5%) 766 (27.3%) 595 (21.2%)		1510 (51.1%) 825 (27.9%) 620 (21.0%)	
Use of social media						
<1 hours 1-3 hours 4-6 hours ≥7 hours	37 (24.7%) 89 (59.3%) 19 (12.7%) 5 (3.3%)	15 (10.0%) 58 (38.7%) 58 (38.7%) 19 (12.7%)	468 (16.7%) 1877 (66.9%) 408 (14.5%) 52 (1.9%)	111 (4.0%) 910 (32.4%) 1329 (47.4%) 455 (16.2%)	505 (17.1%) 1966 (66.5%) 427 (14.5%) 57 (1.9%)	126 (4.3%) 968 (32.8%) 1387 (46.9%) 474 (16.0%)
Exercise (at least 150 minute/per week)						
Yes No	81 (54.0%) 69 (46.0%)	39 (26.0%) 111 (74.0%)	1444 (51.5%) 1361 (48.5%)	812 (28.9%) 1993 (71.1%)	1525 (51.6%) 1430 (48.4%)	851 (28.8%) 2104 (71.2%)
BDI score						
≥17 <17	19 (12.7%) 131 (87.3%)		862 (30.7%) 1943 (69.3%)		881 (29.8%) 2074 (70.2%)	

BDI; Beck Depression Inventory

significantly related to increased consumption in white bread (homemade), pastries (homemade), whole grain bread (homemade), sherbet dessert, pasta, carbonated beverages with sugar, carbonated beverages (light), seeds and herbal tea (p<0.001; R=0.513; R2=0.253) (Table 5).

Discussion

Starting from China's Wuhan City and spreading rapidly across the world, the World Health Organization (WHO) declared COVID19 outbreak as a pandemic. Turkey, as many other countries in the world,

Table 4. Multiple regression analyses on body weight change in the overall sample

	B	SE	β	t	%95 CI		p
BDI score	-.025	.006	-.074	-4.361	-.037	-.014	**.000**
Cognitive restriction score	-.023	.003	-.155	-7.322	-.029	-.017	**.000**
Emotional eating score	.022	.004	.131	5.270	.014	.030	**.000**
Uncontrolled eating score	.027	.003	.220	7.925	.021	.034	**.000**
Gender[1]	.367	.203	.029	1.806	-.031	.766	.071
Marital status[2]	.001	.097	.000	.009	-.188	.190	.993
Having a diseases[3]	-.231	.089	-.042	-2.598	-.406	-.057	**.009**
Family vs alone[4]	.180	.138	.022	1.304	-.091	.451	.192
Reduce exercise in the pandemic[5]	-.845	.100	-.140	-8.470	-1.040	-.649	**.000**
Alcohol consumption increase in pandemic[6]	.627	.222	.046	2.830	.193	1.061	**.005**
Mandatory city changes in pandemic[7]	-.051	.164	-.005	-.308	-.372	.271	.758
Dismissal in pandemic[8]	.323	.133	.040	2.434	.063	.584	**.015**
Reduce smoking in pandemic[9]	.258	.097	.044	2.667	.068	.447	**.008**

B = beta coefficient; SE = Standard error; β = Standardized beta coefficient; CI: Confidence Interval
[1]1=female; 2=male, [2]1=married; 2=single, [3]0=no; 1=yes, [4]with family=1; alone=2,
[5]0=no; 1=yes, [6]0=no; 1=yes, [7]0=no; 1=yes, [8]0=no; 1=yes, [9]0=no; 1=yes,

Table 5. Multiple regression analyses on body weight change and food consumption change in the overall sample

	B	SE	β	t	%95 CI		p
BDI score	-.026	.006	-.076	-4.532	-.037	-.015	**.000**
Cognitive restriction score	-.021	.003	-.141	-6.699	-.027	-.015	**.000**
Emotional eating score	.024	.004	.143	5.803	.016	.032	**.000**
Uncontrolled eating score	.022	.003	.174	6.247	.015	.028	**.000**
White bread (homemade) [a]	.220	.113	.032	1.945	-.002	.442	**.048**
Pastries (homemade) [a]	.540	.100	.095	5.426	.345	.736	**.000**
Whole grain bread (homemade) [a]	-.252	.128	-.032	-1.973	-.502	-.002	**.049**
White bread (bakery) [a]	.299	.184	.028	1.623	-.062	.661	.105
Pastries (bakery) [a]	.318	.184	.029	1.728	-.043	.679	.084
Whole grain bread (bakery) [a]	.117	.167	.012	.697	-.212	.445	.486
Sherbet dessert [a]	.360	.142	.047	2.541	.082	.639	**.011**
Pasta [a]	.457	.148	.058	3.086	.167	.748	**.002**
Rice [a]	.257	.175	.029	1.467	-.087	.601	.143
Milky dessert [a]	.010	.168	.002	.059	-.320	.340	.953
Carbonated beverages with sugar [a]	.473	.202	.040	2.346	.078	.869	**.019**
Carbonated beverages (light) [a]	.453	.224	.033	2.026	.015	.892	**.043**
Bulgur [a]	-.020	.176	-.002	-.116	-.365	.324	.908
Coffee [a]	.020	.106	.003	.185	-.188	.227	.853
Red meat [a]	-.024	.132	-.003	-.180	-.283	.235	.857
Margarine [a]	-.029	.348	-.001	-.084	-.711	.652	.933

	B	SE	β	t	%95 CI		p
Cheese [a]	-.022	.135	-.003	-.160	-.286	.243	.873
Nuts [a]	.016	.105	.003	.148	-.190	.221	.882
Black tea [a]	-.068	.106	-.011	-.643	-.277	.140	.520
Milk [a]	.186	.151	.033	1.233	-.110	.483	.218
Poultry [a]	-.131	.159	-.015	-.824	-.444	.181	.410
Butter [a]	.147	.157	.017	.937	-.161	.455	.349
Seeds [a]	.432	.140	.053	3.089	.158	.705	**.002**
Yoghurt [a]	-.037	.111	-.006	-.335	-.255	.180	.738
Olive oil [a]	.011	.147	.001	.074	-.278	.300	.941
Sunflower oil [a]	.381	.325	.021	1.170	-.257	1.018	.242
Ayran [a]	-.098	.213	-.008	-.461	-.515	.319	.645
Legumes [a]	-.019	.123	-.003	-.154	-.260	.222	.878
Fish and sea foods [a]	-.014	.195	-.001	-.074	-.396	.368	.941
Herbal tea [a]	-.304	.114	-.045	-2.658	-.528	-.080	**.008**
Fermented foods [a]	-.117	.152	-.013	-.768	-.415	.182	.442
Kefir [a]	-.120	.133	-.015	-.903	-.382	.141	.367
Fruits (Cannned) [a]	.705	.812	.014	.867	-.888	2.298	.386
Vegetables (fresh) [a]	.067	.335	.003	.202	-.589	.724	.840
Fruits (dried) [a]	-.177	.156	-.019	-1.134	-.484	.129	.257
Fruits (fresh) [a]	-.050	.100	-.009	-.503	-.245	.145	.615

B = beta coefficient; SE = Standard error; β = Standardized beta coefficient; CI: Confidence Interval
[a]1=my consumption has increased; 0=my consumption has not changed

BDI; Beck Depression Inventory

implemented social distancing and stay-at-home order as protective measures to keep COVID-19 under control shortly after the first confirmed case on March 11th, 2020. Turkish Government asked citizens for voluntary quarantine and to stay home so that infection rates can reduce and for protecting elderly and those with chronic diseases (31). The COVID-19 pandemic caused many overwhelming stressors for the public: loss of employment, deaths of loved ones, financial insecurity and isolation from others; particularly for those who live alone are a few to name (32).

In a recent study it was reported that twenty-two percent of their participants gained 5–10 pounds during quarantine (33). Within this group of participants, there was a significantly higher percentage of people who reported increased eating in response to sight and smell, stress, and snacking after dinner compared to those who did not change their eating behavior. Similarly, fifty-one percent of the sample reported weight gain between 1–12 kg (2.5±1.7 kg) in our study. Again, increased food consumptions during quarantine were homemade pastries, white bread, nuts, milk, milky dessert, fresh vegetables, fresh fruits. Based on our analysis, "homemade white bread, pastries, homemade whole grain bread, sherbet dessert, pasta, carbonated beverages with sugar, seeds and herbal tea" were food items with increased consumption that may be linked to weight gain. Herbal tea might be a curious case; however, many people add an uncontrolled amount of honey to herbal tea in Turkey. On the other hand, in our opinion, many people in Turkey started to make their own bread, thinking it was more hygienic, which led to an increase in their daily bread and baked goods consumption (34). This high glycemic load indexed eating behavior (35) may contribute to the excessive caloric intake and weight gain, increasing the risk of developing obesity (13). Obesity is associated with chronic inflammation, and a significant risk factor for

heart disease, diabetes, and lung disease demonstrated to increase the risk for more serious complications of COVID-19 (36, 37).

Moreover, unhealthy behaviors and economic crisis contribute to increased health risk, with socially isolated and lonely individuals having less favorable lifestyles (11, 15). Due to anxiety and depression, people tend to purchase packaged and long-self life foods instead of fresh ones and they were at a high risk of problematic eating behaviors such as binge eating (14). This leads to an unhealthy diet poor in antioxidants food i.e. fresh fruit and vegetables that would increase oxidative stress and inflammation (38). In some research, it was found that a large number of adults reported negative changes in eating especially about snacking more (11, 15). Interestingly, in a research it was stated that most of the high education participants (similar to our study) did not change their eating behaviors or food purchases (39). In our study, the participants reported decreases fresh vegetable and fresh fruit consumption. In addition, results of multiple linear regression analysis indicated that increase in body weight during the lockdown was significantly related to the increased consumption in white bread (homemade), pastries (homemade), whole grain bread (homemade), sherbet dessert, pasta, carbonated beverages with sugar, carbonated beverages (light), seeds and herbal tea (p<0.001). Carbonated beverages (light) consumption may be thought as an attempt to decrease caloric intake, since other increased consumption foods were high in calories.

Anxiety, depression, uneasiness, and anger are emotions that commonly accompany chronic stress (40). The responses to acute or chronic stress also include several behaviors such as increased alcohol consumption, smoking, and eating (12). When individuals respond to stress by eating more, evidence suggest that the foods selected are typically high in sugar and fat (41). This desire to consume a specific kind of food is defined as "food craving". Food craving is a multidimensional experience as it includes cognitive (e.g., thinking about food), emotional (e.g., desire to eat or changes in mood), behavioral (e.g., seeking and consuming food), and physiological (e.g., salivation) aspects (38).

Subsyndromal mental health problems are common responses to the COVID-19 pandemic. In a study, depression and anxiety symptoms have been reported with 16–28% of participants (42). Di Renzo et al. (2020) found in their research that females were more anxious than males (12). In a research about depression, it was stated that 50% of participants had severe impact of the lockdown (40). In the current study, BDI scores were high in males during the lockdown. Both depression and obesity are major health issues which require attention in order to reduce the global burden. In terms of mechanisms, a growing body of literature sustains that depression and obesity share some epidemiological, clinical and biological pathways in a bidirectional manner, with obesity increasing the risk of depression and depression increasing the risk of obesity in prospective studies (43–45). Konttinen et al. (2010) reported that emotional eating and depressive symptoms both resulted in unhealthy food choices (46). In our study, there was a significant relation between high depression score and consumption of high carbohydrate foods in lockdown.

Emotional eating should not be linked to gender (9). In our study, both genders had emotional eaters as opposed to the previously published research showing that females were more prone to become emotional eaters than males (47). Significant relations between three dimensions of eating habits (uncontrolled eating, emotional eating, and cognitive restriction) and weight gain were observed during lockdown in our study. Also, body weight increase was associated with uncontrolled and emotional eating in both genders. Our findings showed that uncontrolled eating and emotional eating may be correlated to an increase in BMI, was already reported in previous studies during lockdowns all around the world (9, 14,41). Uncontrolled eating measures tendency to overeat. Higher scores on various measures of uncontrolled eating relate to increased eating in different experimental settings (48-50). Cognitive restriction was significantly related to weight gain in both genders during lockdown in our study. Cognitive restraint is the intention to control food intake to maintain or lose weight (51, 52). The impact of cognitive restriction on body weight is very controversial; many studies have shown a correlation between weight or BMI and cognitive restriction,

either negative (53, 54) or positive (55). On the other hand, social distancing means for people to have far fewer opportunities to be physically active. Especially if activities such as walking or cycling are used as transportation or taking part in leisurely sports activity (i.e., jogging, walking the dog, going to the gym) are being restricted. Furthermore, these drastic measures make it easier to be sedentary at home for long periods of time (17). A UK research reported that during lockdown, BMI increase was associated with decreased physical acitivity (11). Even if we have a result of little increase in body weight similar to an Italian study (10), it was statistically significant and there was a significant relationship between decreased physical activity and increased body weight. While 51.6% of the participants exercised regularly before the pandemic, this rate decreased to 28.8% during the lockdown period.

Conclusion

We have concluded that there were significant changes in uncontrolled eating, emotional eating and cognitive restriction during the lockdown period. Additionally, changes in eating habits and physical activity level influenced weight gain. Maintaining an active lifestyle at home during lockdown is particularly important for the mental and physical health of overall population, and especially, for those with additional risk factors and older people. Global action promoting a healthy diet and sufficient physical activity to encourage people to return to a good lifestyle is necessary. This action needs to be firmer for individuals from lower socioeconomic groups who will suffer more from further restrictions and economic impact following a prolonged lockdown period. This action needs to be more available for individuals in lower socioeconomic groups who will suffer more from restriction and economic impact after a prolonged lockdown period.

Our study has several limitations. First, causal inferences can be made because it was an online survey and a cross-sectional study. Second, body weight and height were self-reported and it may have caused bias. Third, we had largely well-educated sample, and a largely female sample, therefore we have a limitation in the generalizability of the sample to the wider Turkish community. Despite these limitations, the results from the present study, obtained during first weeks of lockdown, shows a valuable data about the relations between the COVID-19 pandemic, food choices, depression and eating behaviors. Our findings suggest that depression may be related to the lockdown and social isolation might increase the risk of unhealthy eating behaviors. Screening for high-risk individuals and providing effective intervention may help to change healthy eating behaviors and physical activity levels.

Appendices: BMI; Body mass index, TFEQ; Three Factor Eating Questionnaire PA: Physical Activity, BDI: Beck Depression Inventory.

References

1. Gorbalenya AE, Baker SC, Baric RS, et al. Coronaviridae Study Group of the International Committee on Taxonomy of Viruses. The species severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. Nature Microbiology 2020; 5: 536–544.
2. Lippi G, Sanchis-Gomar F, Henry BM. Coronavirus disease 2019 (COVID-19): the portrait of a perfect storm. Annals of Translational Medicine 2020; 8: 497.
3. Lee PI, Hsueh PR. Emerging threats from zoonotic coronaviruses-from SARS and MERS to 2019-nCoV. J Microbiol Immunol Infect 2020; 53: 365–367.
4. Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. N Engl J Med 2020; 26: 1199–1207.
5. European Center for Disease Prevention and Control (ECDC). Coronavirus disease 2019 (COVID-19) pandemic: increased transmission in the EU/EEA and the UK – seventh update. 2020. Available from: https://www.ecdc.europa.eu/sites/default/files/documents/RRA-seventh-update-Outbreak-of-coronavirus-disease-COVID-19.pdf.

6. European Center for Disease Prevention and Control (ECDC). Outbreak of novel coronavirus disease 2019 (COVID-19): increased transmission globally. 2020. Available from: https://www.ecdc.europa.eu/sites/default/files/documents/RRA-outbreak-novel-coronavirus-disease-2019-increase-transmission-globally-COVID-19.pdf.

7. World Health Organization (WHO). Coronavirus disease 2019 (COVID-19) Situation Report − 65. 2020. Available from: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200325-sitrep-65-covid-19.pdf?sfvrsn=ce13061b_2.

8. Republic of Turkey Ministry of Health. COVID-19 - Yeni Koronavirüs Hastalığı. 2019. Available from: https://covid-19bilgi.saglik.gov.tr/tr/.

9. Papandreou C, Arija V, Aretouli E, Tsilidis KK, Bulló M. Comparing eating behaviours, and symptoms of depression and anxiety between Spain and Greece during the COVID-19 outbreak: Cross-sectional analysis of two different confinement strategies. Eur Eat Disord Rev 2020; 28: 836-846.

10. Pellegrini M, Ponzo V, Rosato R, Scumaci E, Goitre I, Benso A, et al. Changes in weight and nutritional habits in adults with obesity during the "lockdown" period caused by the COVID-19 virus emergency. Nutrients 2020; 12(7): 2016.

11. Robinson E, Boyland E, Chisholm A, Harrold J, Maloney NG, Marty L, et al. Obesity, eating behavior and physical activity during COVID-19 lockdown: A study of UK adults. Appetite 2020; 7: 104853.

12. Di Renzo L, Gualtieri P, Pivari F, Soldati L, Attinà A, Cinelli G, et al. Eating habits and lifestyle changes during COVID-19 lockdown: an Italian survey. J Transl Med 2020; 18: 1-5.

13. Sidor A, Rzymski P. Dietary choices and habits during COVID-19 lockdown: experience from Poland. Nutrients 2020; 12: 1657.

14. Holt-Lunstad J, Smith TB, Baker M, Harris T, Stephenson D. Loneliness and social isolation as risk factors for mortality: a meta-analytic review. Perspect Psychol Sci 2015; 10: 227-237.

15. Armitage R, Nellums LB. COVID-19 and the consequences of isolating the elderly. The Lancet Public Health 2020; 5: e256.

16. Flaudias V, Iceta S, Zerhouni O, Rodgers RF, Billieux J, Llorca PM, et al. COVID-19 pandemic lockdown and problematic eating behaviors in a student population. J Behav Addict 2020; 9: 826-835.

17. Bélair MA, Kohen DE, Kingsbury M, Colman I. Relationship between leisure time physical activity, sedentary behaviour and symptoms of depression and anxiety: Evidence from a population-based sample of Canadian adolescents. BMJ Open 2018; 8: e021119.

18. Leonard BE. The concept of depression as a dysfunction of the immune system. Curr Immunol Rev 2010; 6: 205−212.

19. High KP. Nutritional strategies to boost immunity and prevent infection in elderly individuals. Clin Infect Dis 2001; 33: 1892−1900.

20. Simpson RJ, Kunz H, Agha N, Graff, R. Exercise and the regulation of immune functions. Prog Mol Biol Transl Sci 2015; 135: 355−380.

21. Greeno CG, Wing RR. Stress-induced eating. Psychol Bull 1994; 115: 444−464.

22. Schachter S, Goldman R, Gordon A. Effects of fear, food deprivation, and obesity on eating. J Pers Soc Psychol 1968; 10: 91−97.

23. Spoor STP, Bekker MHJ, van Strien T, van Heck GL. Relations between negative affect, coping, and emotional eating. Appetite 2007; 48: 368−376.

24. American Psychological Association (APA). Diagnostic and Statistical Manual of Mental Disorders: Depressive Disorders. Diagnostic and Statistical Manual of Mental Disorders, American Psychiatric Publishing, Inc. 2013. Available from: https://doi.org/10.1176/appi.books.9780890425596.dsm04

25. Lee AM, Wong JG, McAlonan GM, Cheung V, Cheung C, Sham PC, et al. Stress and psychological distress among SARS survivors 1 year after the outbreak. Can J Psychiatry 2007; 52: 233-40.

26. Wu P, Fang Y, Guan Z, Fan B, Kong J, Yao Z, et al. The psychological impact of the SARS epidemic on hospital employees in China: exposure, risk perception, and altruistic acceptance of risk. Can J Psychiatry 2009; 54: 302-311.

27. Beck AT, Steer RA. Internal consistencies of the original and revised Beck Depression Inventory. J Clin Psychol 1984; 40: 1365-1367.

28. Hisli N. Beck Depresyon Envanterinin Geçerliği Üzerine Bir Çalışma (A study on the validity of Beck Depression Inventory.). Psikoloji Dergisi 1988; 23: 3-13. Available from: https://ci.nii.ac.jp/naid/10019355297/

29. Karlsson J, Persson LO, Sjöström L, Sullivan M. Psychometric properties and factor structure of the Three-Factor Eating Questionnaire (TFEQ) in obese men and women. Results from the Swedish Obese Subjects (SOS) study. Int J Obes Relat Metab Disord 2000; 24: 1715-1725.

30. Karakuş SŞ, Yıldırım H, Büyüköztürk Ş. Üç faktörlü yeme ölçeğinin Türk kültürüne uyarlanması: geçerlik ve güvenirlik çalışması (Adaptation of three factor eating questionnaire (TFEQ-21) into Turkish culture: a validity and reliability study). TAF Preventive Medicine Bulletin 2016; 15(3): 229-237.

31. Shader RI. COVID-19 and Depression. Clin Ther 2020; 42: 962-963.

32. Zachary Z, Brianna F, Brianna L, Garrett P, Jade W, Alyssa D, et al. Self-quarantine and weight gain related risk factors during the COVID-19 pandemic. Obes Res Clin Pract 2020; 14: 210-216.

33. Dilber A, Dilber F. The Effect of Coronavirus (COVID-19) Disease on the nutritional habits of individuals. Journal of Tourism and Gastronomy Studies 2020; 8: 2144-2162.

34. Błaszczyk-Bębenek E, Jagielski P, Bolesławska I, Jagielska A, Nitsch-Osuch A, Kawalec P. Nutrition behaviors in Polish adults before and during COVID-19 lockdown. Nutrients 2020; 12: 3084.

35. Hefni ME, Thomsson A, Witthöft CM. Bread making with sourdough and intact cereal and legume grains – effect on glycaemic index and glycaemic load. Int J Food Sci Nutr 2021; 72(1): 134-142.

36. Heraclides AM, Chandola T, Witte DR, Brunner EJ. Work stress, obesity and the risk of type 2 diabetes: gender-specific bidirectional effect in the Whitehall II study. Obesity (Silver Spring) 2012; 20: 428-433.

37. Wu C, Chen X, Cai Y, Xia J, Zhou X, Xu S, et al. risk factors associated with acute respiratory distress syndrome and death in patients with Coronavirus disease 2019 pneumonia in Wuhan, China. JAMA Intern Med 2019; 180: 934-943.

38. Mattioli AV, Sciomer S, Cocchi C, Maffei S, Gallina S. Quarantine during COVID-19 outbreak: changes in diet and physical activity increase the risk of cardiovascular disease. Nutr Metab Cardiovasc Dis 2020; 30: 1409-1417.

39. Poelman MP, Gillebaart M, Schlinkert C, Dijkstra SC, Derksen E, Mensink F, et al. Eating behavior and food purchases during the COVID-19 lockdown: A cross-sectional study among adults in the Netherlands. Appetite 2020; 157: 105002.

40. Odriozola-González P, Planchuelo-Gómez Á, Irurtia MJ, de Luis-García R. Psychological effects of the COVID-19 outbreak and lockdown among students and workers of a Spanish university. Psychiatry Res 2020; 290: 113108.

41. Scarmozzino F, Visioli F. Covid-19 and the subsequent lockdown modified dietary habits of almost half the population in an Italian sample. Foods 2020; 9: 675.

42. Rajkumar RP. COVID-19 and mental health: a review of the existing literature. Asian J Psychiatr 2020; 52: 102066.

43. Tyrrell J, Mulugeta A, Wood AR, Zhou A, Beaumont RN, Tuke MA, et al. Using genetics to understand the causal influence of higher BMI on depression. Int J Epidemiol 2019; 48: 834-848.

44. Milaneschi Y, Simmons WK, van Rossum EFC, Penninx BW. Depression and obesity: evidence of shared biological mechanisms. Mol Psychiatry 2019; 24: 18-33.

45. Wurtman J, Wurtman R. The trajectory from mood to obesity. Curr Obes Rep 2018; 7: 1-5.

46. Konttinen H, Männistö S, Sarlio-Lähteenkorva S, Silventoinen K, Haukkala A. Emotional eating, depressive symptoms and self-reported food consumption. A population-based study. Appetite 2010; 54: 473-479.

47. Hantsoo L, Epperson CN. Anxiety disorders among women: a female lifespan approach. Focus (Am Psychiatr Publ) 2017; 15: 162–172.

48. Bongers P, Jansen A. Emotional eating is not what you think it is and emotional eating scales do not measure what you think they measure. Frontiers in Psychology 2016; 7: 1932.

49. Bryant EJ, King NA, Blundell JE. Disinhibition: its effects on appetite and weight regulation. Obes Rev 2008; 9: 490-419.

50. Espel-Huynh HM, Muratore AF, Lowe MR. A narrative review of the construct of hedonic hunger and its measurement by the Power of Food Scale. Obes Sci Pract 2018; 4: 238–249.

51. Hofmann W, Adriaanse M, Vohs KD, Baumeister RF. Dieting and the self-control of eating in everyday environments: an experience sampling study. Br J Health Psychol 2014; 19: 523–539.

52. Julien Sweerts S, Apfeldorfer G, Kureta-Vanoli K, Romo L. Les thérapies émotionnelles dans les problématiques de surpoids ou d'obésité (Emotional therapies for overweight or obesity). Encephale 2019; 45: 263–270.

53. de Lauzon-Guillain B, Clifton EA, Day FR, Clément K, Brage S, Forouhi NG, et al. Mediation and modification of genetic susceptibility to obesity by eating behaviors. Am J Clin Nutr 2017; 106: 996–1004.

54. Singh A, Bains K, Kaur H. Relationship of eating behaviors with age, anthropometric measurements, and body composition parameters among professional Indian women. Ecol Food Nutr 2017; 56: 411–423.

55. Banna J, Panizza C, Boushey C, Delp E, Lim E. Association between cognitive restraint, uncontrolled eating, emotional eating and BMI and the amount of food wasted in early adolescent girls. Nutrients 2018; 10: 1279.

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