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# **ORIGINAL PAPERS**

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# Physical activity and eating changes during lockdown periods during the COVID-19 pandemic – threat of obesity pandemic

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A – Study Design, B – Data Collection, C – Statistical Analysis, D – Data Interpretation, E – Manuscript Preparation, F – Literature Search, G - Funds Collection

Summary Background. The lockdown implemented due to the pandemic has the risk of setting the stage for type 2 diabetes, weight gain and cardiovascular diseases by limiting physical activity.

Objectives. The aim of this study is to determine the changes in physical activity and eating habits of people during the COVID-19 lockdown.

Material and methods. The data used in this study was obtained using a 25-question questionnaire and the International Physical Activity Questionnaire – Short Form (IPAQ-SF) through communication networks.

**Results.** The mean age of the participants in the study was  $43.33 \pm 11.35$ , 45.3% (n = 541) were male, and 54.7% (n = 652) were female. There was a significant increase in the weight of the participants before and after the 2-month lockdown during the pandemic (mean weight before: 69.19  $\pm$  9.11, mean weight after: 70.47  $\pm$  9.47, p < 0.001). It was determined that participants with higher education levels gained significantly more weight (p = 0.01). It was determined that home office workers, retirees and unemployed gained significantly more weight than employee during the lockdown period (p < 0.001). According to IPAQ-SF scale scores, a significant difference was found in vigorous activity, moderate activity and walking times before and after lockdown (p < 0.001).

Conclusions. During the lockdown period, those with a higher education level and those who were married or female tended to gain more weight. It was determined that home office workers and retirees gained significantly higher weight during the lockdown period. Guidelines should be created for these lockdown periods.

Key words: COVID-19, exercise, obesity.

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# Background

Physical activity and regular eating habits reduce or delay the risk of avoidable diseases, primarily cardiovascular disease and type 2 diabetes [1, 2]. In addition, it is accepted that balanced and adequate nutrition and physical activity have a healing and regulating effect on the immune system [3, 4]. However, due to the COVID-19 pandemic we are experiencing, outdoor walking and sports activities, have been interrupted many times all over the world for more than 2 years [5]. If there was no opportunity to do sports at home, most of people faced the danger of inevitable inactivity. Restricting physical activity carries the risk of worsening chronic diseases. Along with the pandemic, this threat has been discussed in the reports of many countries [6]. They pointed out that with the boredom caused by the pandemic, eating habits will change considerably [7]. Different societies may be affected differently from this guarantine period in terms of their rituals, eating habits and physical activity [8, 9]. In Turkey, there was a full closure period between April 2020 and June 2020, when the pandemic accelerated. During this period, many researchers predicted that there would be changes in people's physical activities and eating habits and drew attention to the possible dangers. When we examine the studies carried out in Turkey, these were generally studies conducted by students, teachers or a certain occupational group examining only a part of society [10, 11]. During the COVID-19 lockdown period, it was observed that there was no large study covering all segments of society examining

both physical activity and eating habits. The aim of this study is to determine the changes in physical activity and eating habits of people during the quarantine period in Turkey to prevent the spread of COVID-19.

# **Material and methods**

### Study design

The data used in this study was obtained using a 25-question questionnaire and the International Physical Activity Questionnaire – Short Form (IPAQ-SF) through communication networks. Approval was obtained from Düzce University Faculty of Medicine Ethics Committee for the study (Approval No: 2020/107). A survey was created using Google Forms to obtain the study data quickly and securely. During the distribution of the created survey, WhatsApp, with its high utilisation rate and demographic diversity in Turkey, was selected. Participants were recruited using the snowball sampling technique, which they were asked to communicate to WhatsApp contacts. To estimate the required sample size, an *a priori* power analysis was conducted. Based on the total population of adults in Turkey ( $n = \approx 80$  million), with 95% confidence levels, and a conservative 3% margin of error, a total of 1,100 participants were needed for the study. The survey was made available online through social media for two weeks, from 01 July to 15 July. Informed consent was requested at the beginning of the online survey. When the sufficient num-

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ber of samples was reached, distribution of the questionnaire was stopped.

#### Measuring tools

#### Socio-demographic information form

This form was developed by the researchers in order to determine some demographic characteristics of the participants. In the questionnaire, the participants were asked about their demographic information, as well as smoking, pre- and postlockdown weight and dietary changes.

#### International Physical Activity Questionnaire - Short Form

We used the short, self-administered version in the present study. The IPAQ short form consists of a 9-item scale assessing the amount of minutes spent in vigorous and moderate-intense activity and walking over the last 7 days [12]. The short form records four types of physical activity: vigorous activity such as aerobics; moderate-intensity activity such as leisure cycling; walking; sitting. According to the IPAQ scoring protocol, total physical activity level (MET-min/wk) was calculated using the following equation: 8.0 METs × total duration of vigorous activity + 4.0 METs × total duration of moderate activity + 3.3 METs × total duration of walking.

# Statistical analysis

Statistical analyses were done with SPSS v.22 software, and the level of significance was considered as 0.05. Numerical data was summarised with mean  $\pm$  standard deviation as appropriate, and categorical data was summarised with frequency and percentage. Normality assumption for numerical data was analysed with the Shapiro-Wilk test, and the Wilcoxon signed-rank test or paired-samples *t*-Tests were used to compare groups where appropriate based on IPAQ-SF. The data was also analysed by using the one-way ANOVA and Tamhane post-hoc test. Pearson's  $\chi^2$  test or the Fisher-Freeman-Halton test was used to analyse categorical data according to the expected count rule.

# **Results**

The mean age of the participants in the study was  $43.33 \pm 11.35$ , 45.3% (n = 541) were male, and 54.7% (n = 652) were female. The socio-demographic characteristics of the participants are summarised in Table 1.

Table 1. Socio-demographic characteristics of the participants				
		Number ( <i>n</i> )	Percent (%)	
Gender	male	541	45.3	
	female	652	54.7	
Marital status	married	892	74.8	
	single	301	25.2	
Education	primary school	301	25.2	
	high school	416	34.9	
	university	476	39.9	
dof	housewife	176	14.8	
	worker	176	14.8	
	civil servant	494	41.4	
	self-employed	182	15.3	
	student	46	3.9	
	unemployed	33	2.8	
	retired	86	7.2	
Smoking	yes	411	34.5	
	no	782	65.5	

In the study, 82.5% (n = 985) of the participants stated that their eating habits changed during lockdown. When questioned about what these eating changes were, 60.2% (n = 719) of the participants ate more frequently and in larger amounts, 44.1 (n = 527) snacked more frequently between meals, 58.3% (n = 696) ate more because they were bored, 52.7% (n = 629) stated that they consumed more carbohydrates, 79.2% (n = 945) stated that they consumed more fruit, and 42.9% (n = 512) consumed more protein. 59.5% (n = 711) of the participants stated that they ate more and frequently to be more resistant to COVID-19 (Figure 1). According to the results, 51.2% (n = 612) of the participants who used additional products and vitamins to protect themselves from the pandemic said that they used these additional products and vitamins without a doctor's prescription.



Figure 1. Changes in participants' eating habits during the lockdown period

\* Participants marked more than one option for this question.

When we asked about the products and vitamins used during lockdown, 69.7% (n = 832) of the participants said that they used additional food or complementary products for protection from COVID-19, and 62.4% (n = 745) said that they used vitamins to protect themselves from COVID-19. The most frequently used supplement and supplementary products are shown in Figure 2.



Figure 2. Additional products and vitamins used by participants during the lockdown period against COVID-19

\* Participants marked more than one option for this question.

In the study, 24.9% (n = 295) of the participants stated that they did not leave the house for 2 months during the lockdown period. 26.3% (n = 312) said that they could only go out for a limited time to meet their basic needs. However, 69.0% (n =823) of the participants emphasised that they needed to exercise. There was a significant difference between the mean physical activity of the participants before and after the 2-month lockdown period during the pandemic (p < 0.001). According to IPAQ-SF scale scores, a significant difference was found between

Table 2. Physical activity levels before and after lockdown, obtained with IPAQ-SF							
Physical activity	Before lockdown	After lockdown	p				
Total physical activity (MET-min/week)	567.86 ± 447.92	226.38 ± 305.59	< 0.001				
Vigorous physical activity (MET-min/week)	157.93 ± 129.11	132.28 ± 102.90	< 0.001				
Moderate to vigorous physical activity (MET-min/week)	180.31 ± 136.69	123.43 ± 56.52	< 0.001				
Walking (MET-min/week)	429.60 ± 347.44	170.66 ± 229.42	< 0.001				

Table 3. Socio-demographic characteristics and weight changes during lockdown							
		Number of participants with increased weight	Number of participants maintaining the same weight	Number of participants losing weight	p		
Age		605	438	36			
	Mean age ± SD*	45.39 ± 11.47	41.18 ± 10.88	41.78 ± 10.43	< 0.001		
Gender	female	414	215	23	0.01		
	male	305	223	13			
Marital status	married	539	324	29	< 0.001		
	single	145	138	18			
Education	primary school	184	115	2	0.01		
	high school	261	140	15			
	university	274	183	19			
dof	housewife	99	76	1	< 0.001		
	worker	122	54	0			
	civil servant	330	146	18			
	self-employed	94	80	8			
	student	36	10	0			
	unemployed	25	7	1			
	retired	13	65	8			
Smoking	yes	290	137	8	< 0.001		
	no	429	301	28			
Working status (in/out)	unemployed/retired/ home office	431	146	16	< 0.001		
	office worker	288	243	20			

\* SD - Standard Deviation.

vigorous activity, moderate activity and walking times before and after lockdown (p < 0.001, Table 2).

There was a significant increase in the weight of the participants before and after the 2-month lockdown during the pandemic (mean weight before: 69.19 ± 9.11, mean weight after: 70.47  $\pm$  9.47, p < 0.001). When weight change in lockdown is examined according to socio-demographic characteristics, a significant difference was found between gender, marital status, educational status, occupational group, smoking status and weight change. The age of the participants who gained weight was significantly higher than those participants who did not gain or lose weight (p < 0.001). Married participants gained significantly more weight than single individuals (p = 0.02). It was determined that females gained significantly more weight than males during the lockdown period (p = 0.01). It was determined that participants with a higher education level gained significantly more weight (p = 0.01). Non-smokers gained significantly more weight than smokers (p < 0.001). Civil servants and self-employed individuals gained significantly more weight than the other groups (p < 0.001). It was determined that home office workers, retirees and unemployed individuals gained significantly more weight than employed individuals during the lockdown period (p < 0.001, Table 3).

### Discussion

To the best of our knowledge, this is the first study in Turkey to examine changes in population-based physical activity and eating habits before and after the lockdown. The most important result we obtained in our study is that significant physical activity and weight changes were observed in the participants before and after the quarantine due to the COVID-19 pandemic. As we mentioned at the beginning of our article, it was predicted that there would be some changes in physical activity and eating habits in people whose movement was suddenly restricted. Studies conducted in other societies have also pointed out that people affected by the lockdown were under the threat of inactivity and an unhealthy diet [13, 14]. In our study, it was determined that there was a significant increase in the weight of the participants after 2 months of lockdown. The participants stated that the most common changes in eating habits were spending too much time at home and snacking due to boredom. In a study conducted during the 1-month lockdown period in Italy, boredom and unhealthy snacks were also reported as the most common cause of weight gain [15, 16].

A significant number of the participants in our study stated that there was an increase in eating to increase resistance. Along with the chaos in the pandemic, it was emphasised that the urge to eat during lockdown periods increases the risk of excessive food consumption [17].

Another remarkable result of the study is that there was a significant increase in the fruit consumption of the participants. It is common knowledge that fruit consumption is protective against viral diseases with their antioxidant effect [18]. However, the amount of food eaten determines the benefit and/ or harm it will create in an organism. Considering the amount of sugar and calories, it should be conveyed to people that there is no need to increase the amount of fruit that should be eaten daily. It seems more advantageous to gain antioxidant and nutritive effects from low-calorie vegetables rather than fruits. In fact, it has been reported that the consumption of extra fruit in healthy people who have been followed for a long time, has no benefit in antioxidant capacity, DNA repair and vascular health markers [19]. According to the results of the study, being married, being older and being female were associated with more weight gain. In a large-scale study conducted in China, it was stated that this trend continued after the lockdown for the same groups [20].

As it is known, COVID-19 in obese patients is more severe and complicated [21, 22]. The increase in BMI of obese patients who are already at risk will make these individuals more vulnerable to the disease. In addition, those who gain weight during quarantine may not return to their pre-pandemic weight. Preventing problems before they occur is the primary task of preventive medicine [23]. The threats highlighted by these studies should be a warning for possible future lockdowns. Exercise programmes that can be applied at home should especially be developed for the population under cardiac and metabolic risk.

Another result in our study is related to the fact that smokers gain less weight. As is known, smoking has effects on reducing stress [24]. It is possible that smokers suppressed the urge to eat related to boredom by smoking. This does not mean that smoking prevents weight gain in lockdowns. The coexistence of smoking with viral diseases also brings severe complications [25, 26]. The point to be emphasised here is that stress and boredom during a lockdown causes the urge to eat more unhealthy foods and smoke, which lowers the body's resistance. The situation we have to struggle with is to try to minimise impulsive acts by being aware of both the pandemic and its secondary reflections. As a matter of fact, the fact that the non-smoking participants in our study gained more weight suggest that they tended to eat impulsively to relieve boredom while spending time at home. Entering a sudden quarantine situation results in a radical change in the lifestyle of society, and physical activity is recommended because it reduces the anxiety caused by lockdowns during a pandemic [27].

#### Strengths and limitations of the study

First of all, since the sample selection was made with power analysis, and the predicted number of participants was provided in the study, we can say that the results represent the society. In addition, the results of the study provide important clues for the predictive factors of weight gain. This study also has some limitations. The major limitation of the current study is that weight change was self-reported. Due to social distancing rules, this study was made through an online survey. First, research based on an anonymous online survey excludes the possibility of verifying the data on objective grounds. BMI was not directly measured before and after quarantine but was declared by those surveyed. Therefore, it should be treated as a rough estimate, not an exact value.

# Conclusions

The most important result of the study is that it has determined the factors that caused an unhealthy diet and weight gain during the lockdown period. Thus, it provides warning information so that individuals at risk do not encounter irreversible problems. According to the results of the study, during the lockdown period, those with a higher education level and those who are married and female tend to gain more weight. In addition, it was determined that home office workers, retirees and unemployed gained significantly more weight than the employed individuals during the lockdown period. Guidelines should be created so that people whose working rituals change are not adversely affected by these emergency periods. Another result that should be read carefully in the results of the study is that the majority of the participants consumed more fruits and foods to be resistant to COVID-19. For this purpose, foods that are not high in calories should be recommended. In addition, the excess of vitamins and supplements used to be more resistant to COVID-19 is another point that should be carefully evaluated.

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