Determination of Obesity Tendency in Individuals During COVID-19 Pandemic: An Observational Study in Istanbul, Turkey

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Abstract

Objective: Lockdown-period and confinement at home during COVID-19 pandemic is suggested to have changed the eating habits and physical activity in adults globally.

Materials and Methods: This study was conducted to determine obesity tendency in adults, during COVID-19 pandemic, by examining the changes in anthropometric measurements, eating habits (meal numbers/day), and physical activity as per statements provided by them through online questionnaire method inquiring anthropometric measurements, eating habits and physical activity before and during the pandemic. SPSS (Statistical Package for Social Sciences for Windows) version 21.1 was used for statistical analyses. Descriptive statistics as frequency (n), mean ($\overline{X}$), standard deviation (SD), percentages (%) were calculated. Fisher's chi-square test was conducted to determine the difference between groups (95% confidence limit; $p<0.05$).

Results: Seven hundred and twenty-five (725) individuals (414 females, 311 males) aged between 18-65 years ($\overline{X}$=37±11.8) participated in the tof body mass index (BMI), there was an increase in obese and pre-obese categories during COVID-19 pandemic ($p<0.05$). On determining metabolic risk based on WHO waist circumference (WC) criteria, a significant increase in the high-risk category was observed during pandemic period ($p<0.05$).

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Conclusion: The study indicated that individuals were prone to obesity during COVID-19 pandemic due to changes in eating behaviors (meal numbers/day), physical activity and were at a risk from general health perspectives as well as pre-disposition to COVID-19. Nutritional counseling should be given to individuals by dietitians or other health professionals during pandemic periods, in order to decrease death rates, enable quick discharge from hospitals and increase health recovery rates.

Keywords: COVID-19, Coronavirus, Obesity, Pandemic.

Introduction

The Coronavirus Disease 2019 (COVID-19) caused by Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) first appeared in Wuhan Hubei province China in December 2019 and since then has spread rapidly all over the world (1). As of March 2022, the global outbreak, has infected approximately 469 million and resulted in the death of more than 6 million individuals, (2) whose main clinical symptoms include fever, dry cough, fatigue, muscle pain, shortness of breath, respiratory tract infection and gastro-intestinal symptoms as vomiting and diarrhea.

Obesity characterized by abnormal or excessive fat accumulation has been defined by World Health Organization (WHO) in terms of BMI value of 30 kg/m^2 or more. Obesity is considered as an increasing global epidemic and increases the risk of chronic diseases as well as leads to the development of certain respiratory diseases. Studies have shown that obesity or being overweight adversely affect outcomes of COVID-19 infection and the potential mechanism has been suggested as chronic inflammation, comorbid complications, immune dysregulation, endocrine dysfunction, respiratory compromises and so on (3-5). Studies indicate that with the increase in BMI, severity of COVID-19 diseased condition worsened and there were complications in treatment as prolonged stay in intensive care unit, being intubated or connected to mechanical ventilation for a longer period. Therefore, obese individuals may be considered as a vulnerable and risk group for COVID-19 disease. Since chronic diseases as diabetes, hypertension, cardiovascular heart diseases, certain cancers are related to obesity and such diseases would be a risk factor in COVID-19 patients; it is necessary to control obesity in order to alleviate the course of the disease and ease the treatment period (4-6).

The quarantine period in the COVID-19 pandemic caused social restrictions and significantly affected the nutritional habits, diet patterns and physical activity level of individuals in general (7). Psychological factors such as depression, fear and stress during the pandemic period resulted in an increase in the desire to consume fast food, refined sugar and sugary drinks for hedonic reasons (7, 8). Decreased physical activity during quarantine was reported to cause positive energy balance leading to unwanted body weight gains and obesity during this period (9).

Understanding the changes in life style and obesity during the pandemic period would be helpful in controlling COVID-19 and increasing awareness among individuals. This study was conducted to examine the changes in BMI and waist circumference, which is also an important indicator of abdominal obesity of adults and to evaluate the tendency of obesity during the COVID-19 pandemic period.

Materials and Methods

This cross-sectional study was conducted in Istanbul between May-June 2021 on a total of 725 Turkish adults aged between 18-65 years. Considering the adult population in the city, sample size was calculated by means of G-power analysis (95% power, effect size 0.1 and α=0.05) and minimum sample size was determined to be 385. However, all participants who volunteered to participate in the study were included. Individuals who did not qualify the defined range of age, who had eating disorders, had clinical cachexic conditions as cancer, or had dementia were excluded from the scope of the study. Ethical approval was obtained from Istanbul Medipol University Ethics Committee dated 25.05.2021 with approval number E-10840098-772.02-2388.

An online questionnaire comprising of questions related to anthropometric measurements (height, weight, waist circumference), eating habits and physical activity of participants before and during the pandemic was applied to the participants. BMI was calculated from the height and weight data provided by the participants (weight in kg/height in m^2). The participants were given instructions by means of you a tube video clip tutorial regarding the measurement of waist circumference (waist circumference measured while standing and placing the measuring tape around the waist

just above the hipbone) (10). The height and waist circumference were recorded in cm and weight in kg. BMI and metabolic risk classification categories based on waist circumference was based on WHO classification. WHO defines the metabolic risk category based on waist circumference as <94 cm as low risk, 94-102 cm as moderate risk and >102 cm as high risk. For females, waist circumference of <80 cm is considered as low risk, 80-88 cm as moderate and >88 cm as high risk (11).

SPSS (Statistical Package for Social Sciences for Windows) version 21.1 was used for statistical analyses of the data obtained. Descriptive statistics as frequency (n), mean ($\overline{X}$), standard deviation (SD), percentages (%) upper lower limits were calculated. Fisher's chi-square test was conducted to determine the difference between groups. The results were evaluated at 95% confidence interval, at the $p<0.05$ significance level.

Results

Seven hundred and twenty-five (725) adult Turkish individuals who voluntarily agreed to participate in the online questionnaire were included in the study. The participants were between 18-65 years of age and 57.1% (n= 414) were females and 42.9% (n= 311) were males. Of the participants, 65.4% were between 31-60 years, 31.4% were between 18-30 years, 3.2% were between 61-65 years. The mean ($\overline{X}$) age of the participants was 37±11.8 years.

Regarding medical history of the participants, majority (75.9%) stated that they did not have any disease, while 24.1% had at least one chronic disease but under control (diabetes, hypertension, cardiovascular diseases and/or others).

Regarding pre-pandemic BMI values, as per WHO categorization, 43.2% of the participants were normal, 35.9% were pre-obese, 13.2% were obese, and 0.3% were super-obese. The pre-pandemic BMI average value of the participants was 24.7 kg/m^2 (not shown in the tables). However, during pandemic (date of survey) the mean BMI value had risen to 25.14 kg/m^2 (not shown in the tables) which was statistically significant ($p<0.05$).

Table 1. Demographic and anthropometric characteristics of participants during COVID-19 pre-pandemic and pandemic period

	Frequency (n)	Percentage (%)
Gender		
Female	414	57.1
Male	311	42.9
Age (years)		
18-30	228	31.4
31-60	474	65.4
61+	23	3.2
BMI Category (Pre-pandemic)		
Underweight	54	7.4
Normal	313	43.2
Pre-obese	260	35.9
Obese	96	13.2
Super obese	2	0,3
BMI Category (During pandemic)		
Underweight	46	6.3
Normal	293	40.4
Pre-obese	282	38.9
Obese	100	13.8
Super obese	4	0.6
WC Category (Pre-pandemic)		
Normal (no risk)	439	60.5
Risk (moderate)	131	18.1
High Risk	155	21.4
WC Category (During pandemic)		
Normal (no risk)	424	58.5
Risk (moderate)	124	17.1
High Risk	177	24.4

On evaluating the change on BMI categories during COVID-19 pandemic, a fall in numbers was noted in underweight and normal category whereas an increase in numbers were noted in all the obese (pre-obese, obese, super-obese) categories (Table 1). Regarding risk categories based on waist circumference; during COVID-19 pandemic, there was a decrease in number of individuals in no risk category (n=15) and moderate risk category (n=07) and an increase in the number of individuals in the high-risk category by 3% (n=22) which was found to be significant ($p<0.05$). (Table 1)

Table 2. Other life style parameters of participants during COVID-19 pandemic

	Frequency (n)	**Percentage (%)**
Meal Numbers/day		
Decreased	105	14.5
No change	402	55.4
Increased	218	30.1
Chronic Diseases		
None	550	75.9
Hypertension	34	4.7
Diabetes	16	2.2
Hypercholesterolemia	6	0.8
PCOS	6	0.8
Non-alcoholic fatty liver disease	3	0.4
Other	110	15.2
Physical activity (During pandemic)		
Decreased	506	69.8
No change	146	20.1
Increased	73	10.1
Sleeping duration (During pandemic)		
0-6 hours	152	21.0
6-9 hours	438	60.4
9-12 hours	0	16.7
12 hours+	14	1.9

While 69.8% of the participants stated that their physical activity level decreased, 20.1% stated that their physical activity status did not change, and 10.1% stated that their physical activity status increased during the pandemic process. Although the sleeping duration for majority of the individuals (60.4%) was between 6-9 hours; however, 21% reported to have slept for less than 6 hours during pandemic period (not shown in the table).

Of the participants, 14.5% stated that the number of consumed meals in a day decreased, 55.4% stated no change, and 30.1% reported that the number of consumed meals in a day increased during the pandemic process (Table 2).

In Table 3, waist circumference was evaluated for both genders separately for pre-pandemic period as per statements provided by the participants.

Table 3. Waist circumference according to gender (pre-pandemic period)

	Category			
Gender n (%)	**Normal (No Risk) n (%)**	**Moderate Risk n (%)**	**High Risk n (%)**	**Total n (%)**
Female 414 (100)	271 (65.4)	55 (13.3)	88 (21.3)	414 (100)
Male 311 (100)	168 (54.0) *	76 (24.4) **	67 (21.5) **	311 (100)

* Chi square test, significantly lower $p<0.05$

** Chi square test, significantly higher $p<0.05$

When metabolic risk in this study group was evaluated according to waist circumference and gender in pre-pandemic period; 65.4% of females were found to have no risk, 13.3% were at moderate risk and 21.3% were at high risk. Among males, 54.0% were at no risk, 24.4%, were at moderate and 21.5%. were at high-risk group. As per chi-square analysis, it was observed that during pre-pandemic period, males had a significantly higher metabolic risk compared to females in terms of waist circumference ($p<0.05$). (Table 3)

Table 4. Waist circumference according to gender (during pandemic period)

	Category			
Gender n (%)	**Normal (No Risk) n (%)**	**Moderate Risk n (%)**	**High Risk n (%)**	**Total n (%)**
Female 414 (100)	268 (64.7)	51.0 (12.3)	95 (22.9)	414 (100)
Male 311 (100)	156 (50.1) *	73 (23.4) **	82 (26.5) **	311 (100)

* Chi square test, significantly lower $p<0.05$

** Chi square test, significantly higher $p<0.05$

When metabolic risk was evaluated according to waist circumference and gender during pandemic period; 64.7% of females were found to have no risk, 12.3% were at moderate risk and 22.9% were at high risk. Among males, 50.1% were at no risk, 23.4%, were at moderate and 26.5%. were at high-risk group. As per chi-square analysis, during pandemic period, males had a significantly higher metabolic risk compared to females in terms of waist circumference ($p<0.05$) (Table 4).

In both genders, there was an increase in the number of individuals in the high-risk group during COVID -19 pandemic; the increase was more in case of males (Table 3 and 4).

Discussion

This study indicates a weight gain among the participants during COVID-19 pandemic, evaluated as an increase in the body mass index. Based on the provided statements, in 30.1% of participants there was an increase in meal frequency. On the other hand, 69.8% of the participants stated that their physical activity level decreased (Table 2). In a study performed on 727

adults in USA, 40% of participants stated to have gained weight post-lock-down period and change in BMI was found to be significant ($p<0.01$). The participants stated that they engaged in much less physical activity and craved snacks and ultra-processed food items (12). When inquired about their sleeping duration, approximately 21% stated that they slept less than 6 hours which is below the recommendations for adult individuals, by American Academy of Sleep Medicine (AASM) and Sleep Research Society (SLS) (13). It may be suggested that factors such as lack of physical activity, increased frequency of meals, increased sleeping hours may lead to weight gain and obesity during lock-down period. Increased sleep time may be related to increased stress and poor quality of sleep-in individuals. In a study conducted on 1959 adults in Poland during COVID-19 lockdown period, 57% of the participants reported moderate and 29% high stress levels respectively. Moreover, 64% of them reported poor quality of sleep. It was found that increased physical activity improved the quality of sleep in the participants (14). Stress, anxiety and poor-quality sleep have also been related to weight gain and obesity due to uncontrolled and emotional eating attitudes, consumption of highly processed sugary foods and beverages (15).

Several studies indicate that an obesity state promotes chronic inflammation, vitamin D deficiency, hinders immunity and causes mechanical lung compression. These increase susceptibilities to COVID-19 infection, complications including the requirement of invasive ventilation. Existing co-morbidities enhances these complications (16-18). In this study, less than 25% of individuals stated to have been diagnosed with at least one disease and few stated to have been diagnosed with chronic diseases as hypertension, diabetes, cardio-vascular heart diseases. Globally, approximately one in three of all adults suffer from multiple chronic conditions (MCCs) with prevalence rates from 16% to 58% in UK, 26% in US and 9.4% in urban south Asians (19). Some of the major chronic diseases have been related to obesity and therefore indirectly related to eating habits, physical activity, stress and sleep (20).

COVID-19 pandemic situation poses a risk for individuals with chronic diseases and puts them into the higher risk category for hospitalization and mortality and irrespective of positive or negative alterations in their

anthropometric measurements, their nutrition and physical activity status should be followed professionally.

In this study, the BMI values of the individuals were found to increase significantly during COVID-19 lockdown period ($p<0.05$). On comparing the waist circumference risk categories, the male participants were significantly at a higher risk as compared to females during pre-pandemic as well as pandemic periods ($p<0.05$). There were more individuals in the high-risk category based on waist circumferences in both genders (indicated in the form of metabolic risk categories) during pandemic period (Table 3 and 4).

In a study conducted on 14,382 adult males and 11,484 adult females (19-75 years), waist circumference was found to be related to age and after the age of 40-45 years, approximately 34.9% of females and 51.1% of males were at moderate and high risk based on WHO waist circumference metabolic risk category classification (21). Prevalence of Obesity in Turkey is approximately 32%, and obesity related chronic metabolic diseases as hypertension, type 2 diabetes mellitus, cardiovascular heart diseases, non-alcoholic fatty liver diseases have shown 2-3-fold increase in the last 15-20 years (22). COVID-19 pandemic has increased the prevalence of obesity related health risks in the world including Turkey.

Limitations and Drawbacks of the Study

This study has certain limitations. Data regarding anthropometric measurements, meal frequency, physical activity, sleeping habits before and during pandemic, of the participants were based on statements provided by them. Meal frequency is not sufficient to understand the food habits of participants during pandemic. Food frequency chart or food consumption records would have been useful; however, these could not be applied due to the online questionnaire conducted on participants from variable spheres of the society with different educational levels.

Conclusion

The results of this study indicated that COVID-19 lockdown period resulted in changes in eating habits, physical activity and sleeping hours leading to weight gain and predisposition to obesity. Obesity on the other hand

increases vulnerability and risk of chronic diseases as well as COVID-19 incidences with severe outcomes as hospitalization, ventilation, slow recovery and increased mortality. In line with all this information, nutritional status should not be ignored during pandemic periods, it is necessary to provide dietitian support for risky groups if necessary. Finally, it is recommended that nutritional follow-up of individuals be done on a routine basis and public awareness be created in this aspect.

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