

## Research Paper:

# Disordered Eating Attitudes During the COVID-19 Pandemic: The Predictive Role of Physical Activity, Body Mass Index, and Gender

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## ABSTRACT

**Background & Aims of the Study:** COVID-19 pandemic has affected the essential components of a healthy lifestyle, including healthy eating and physical activity. This study aimed to investigate the disordered eating attitudes during the COVID-19 pandemic and the predictive role of physical activity, body mass index, and gender.

**Materials and Methods:** A total of 705 Iranian men and women older than 18 years participated in the present study from September 12 to October 3, 2020. The study data were collected online by self-administered questionnaires. The eating attitudes test and Baecke physical activity questionnaire were used for this purpose. One-sample t test, paired t test, and multivariate linear regression were used to analyze the data ( $P < 0.05$ ).

**Results:** The present study results showed that only women experienced a significant increase in disordered eating attitudes during the COVID-19 pandemic ( $P = 0.0001$ ), and no significant change was observed in men in this regard ( $P = 0.54$ ). However, the COVID-19 pandemic has significantly reduced physical activity levels in Iranian women and men ( $P = 0.0001$ ;  $P = 0.001$ , respectively). In this regard, three variables of physical activity, body mass index, and gender were the most important predictors of disordered eating attitudes during the COVID-19 pandemic.

**Conclusion:** It seems that the COVID-19 pandemic has adverse consequences on essential elements of a healthy lifestyle, including healthy eating and physical activity. Teaching nutritional behaviors and using a healthy diet, and how to increase physical activity during the COVID-19 pandemic seems to be very vital and essential.

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## 1. Introduction

In late 2019, several cases of unknown infectious diseases were identified in Wuhan (China). This novel pathogen was named nCov-2019, and the World Health Organization (WHO) named it COVID-19. This illness is an acute respiratory disease closely related to SARS coronavirus, whose primary symptoms include pneumonia, fever, muscle aches, and fatigue [1-4]. The disease spread so fast that WHO declared a pandemic in early March [1]. In late November 2020, more than 65 million people were infected with COVID-19, and more than 1.5 million people died. In late December 2020, COVID-19 has infected 900000 cases and claimed more than 46000 lives in Iran. Since information about the novel, coronavirus is limited, and no treatment has been developed so far, and the world has faced a global public health emergency. Therefore, WHO and many countries, including Iran, are implementing particular public health protocols such as strict quarantine restrictions to control COVID-19.

The crisis of COVID-19 and measures such as social distancing may have significant social consequences beyond the lost lives [5-7]. For example, Daly et al., based on data collected before and during restrictions imposed to control COVID-19 in the United Kingdom, reported that the number of adults experiencing mental health problems had increased about 50% [8]. Brooks et al. also argued that COVID-19 related restrictions caused increased negative psychological consequences such as stress and anxiety [9]. The effects of these restrictions and their adverse psychological consequences on essential elements of a healthy lifestyle and weight-related behaviors, including physical activity and healthy nutrition, are not apparent but probably will bear significant adverse consequences [10]. Stress and anxiety caused by this pandemic may change the nutrition pattern and eating attitudes [11]. Attitude to eating is the core of all disordered eating practices, ranging from healthy disordered eating attitudes to unhealthy dieting [12]. Ammar et al. reported that in the first few months of COVID-19 related restrictions, dietary intake in most parts of the world moved toward unhealthy patterns [13].

Iran has also imposed public health restrictions since the beginning of the pandemic. For example, the duration of sports activities or outdoor sports activities is limited. Besides, many people, especially the elderly and women, have restricted their outdoor physical activities due to fear of COVID-19 [5]. In this regard, Tison et al. examined the global impact of COVID-19 on physical

activity and reported that only during the first month of the pandemic the number of walked steps was reduced by 27.3%; while it was reduced by 48.7% in Italy [10]. It may cause several health consequences such as obesity, diabetes, Cardiovascular Diseases (CVDs), and cancer as well as increased prevalence of COVID-19 risk factors. However, evidence regarding eating attitudes and physical activity of Iranian men and women is limited, and no research has investigated this issue. Hence, providing evidence will help the government as well as sports organizations in developing more effective public health policies, reducing the consequences of the disease, and promoting the public health of society. This study aimed to investigate disordered eating attitudes and physical activity in Iranian men and women during the COVID-19 pandemic.

## 2. Materials and Methods

This work is a descriptive-analytical, cross-sectional study that was conducted using a self-administered online questionnaire. The statistical population was all men and women aged 18 years and older living in urban areas of Iran (nearly 40 million, based on the last population census in 2016). Based on previous studies and by considering a confidence interval of 95%, significance level of 5%, and Cochran Formula 1:

$$1. (n = \frac{Nz^2pq}{Nd^2 + z^2pq}),$$

the sample size was determined as 385 [14]. In Cochran's formula for a limited community, N is equal to the size of the community, Z is equal to 1.96, p is equal to 0.5, and d is equal to 0.05. However, because we were using an online questionnaire (<https://forms.gle/qYC4fJZbJEukm2yPA>) and to increase the validity of results and to address the possible problems, 770 people were invited to complete the questionnaire. In total, 705 questionnaires were filled. The questionnaire link was sent to potential participants (randomly and non-randomly; from September 12 to October 3, 2020), emphasizing those aged at least 18 years. The questionnaire contained demographics (age, gender, place of residence, education level, marriage status) and personal information (height and weight). The collected information from all individuals was anonymous and completely confidential.

The Baecke Physical Activity Questionnaire (BPAQ) was used to collect information regarding physical activity both before and after the COVID-19 pandemic. It contains three distinct dimensions. First, physical activ-

ity, which contains eight items scored on a 5-point Likert scale. The second part (items 9 to 12) is for those who have first and second exercises. In this part, the total score was divided by four. The third part is "physical activity during leisure" (items 13 to 16). The total scores of this part were divided by four. The sum of the three parts gives an indicator of the total physical index. The highest score is 15. The validity and reliability of BPAQ are investigated in various countries, including Iran. Beck et al. in 1982 reported a Cronbach alpha of 0.73. Soury et al. reported a reliability coefficient of 0.78 and an internal consistency of 0.87 [15].

To investigate the disordered eating habits before and after the COVID-19 outbreak, the Eating Attitudes Test (EAT-26) developed by Garner et al. was used [16]. This test is widely using to measure attitudes and behaviors regarding disordered eating. The EAT is scored on a 3-point Likert scale, ranging from 1 to 3. For items 1 to 25, also, a 3-point Likert scale was used, ranging from 1 (always) to 3 (often). For item 26, the scale ranged from sometimes to never. Therefore, the total EAT-26 score ranges from 0 to 78. A score higher than 20 indicates suspected disordered eating, and the subject should be treated. In addition to a total score, this measure also yields three subscales: dieting (13 items), bulimia and food preoccupation (6 items), and oral control (7 items). Shayghan and Vafaei reported a Cronbach alpha of 0.76 [17].

The Kolmogorov-Smirnov test was applied to test the normal distribution. The findings are described using mean, standard deviation, minimum, maximum, and frequency percentage. Then, the 1-sample t test, paired t test, and multivariate linear regression were used for inferential analysis. Statistical significance was considered when the P-value was less than 0.05. Data are analyzed using SPSS version 21.

### 3. Results

In the present study, 705 adults aged at least 18 years filled the questionnaire (502 females and 203 males). The Kolmogorov-Smirnov test indicated a normal distribution ( $P > 0.05$ ). Some of the individual characteristics of participants (age, height, weight, and Body Mass Index) are presented in Table 1.

In Table 2, some demographic characteristics of participants in terms of age, gender, marriage status, degree of education, and Body Mass Index (BMI) are described.

Concerning the eating attitudes, a score higher than 20 indicates that the person is suspected of disordered eating and should refer to healthcare centers. Based on Table 3 and the results of the 1-sample t test, the level of eating attitudes of Iranian men and women before the COVID-19 outbreak were significantly lower than 20 ( $t = -4.52$ ,  $P = 0.0001$ ,  $t = -3.01$ ,  $P = 0.003$ , for women and men, respectively). In this regard, and according to the results of the paired t test, after the COVID-19 outbreak, the level of disordered eating attitudes in women has increased significantly ( $t = -5$ ,  $P = 0.0001$ ; 5.3%). However, there was no significant change in the disordered eating attitudes of men ( $t = -0.6$ ,  $P = 0.54$ ). Based on the findings, the COVID-19 outbreak, regardless of gender, had significantly increased the disordered eating attitudes of Iranians (Table 3).

Based on Table 4 and the results of the 1-sample t test, the level of physical activity of Iranian women before the COVID-19 pandemic was significantly lower than the average level ( $t = -4.7$ ,  $P = 0.001$ ). In this regard, according to the paired t test, since the onset of the pandemic, the women's physical activity has significantly declined by 3% ( $t = 7.04$ ,  $P = 0.0001$ ). For men, also before the COVID-19 pandemic, the physical activity level was higher than the average, but it was not statistically significant ( $t = 1.74$ ,  $P = 0.083$ ). Similar to women, men's physical activity has declined since the onset of the pandemic by 2.47% ( $t = 4.3$ ,  $P = 0.001$ ). Based on the findings, regardless of gender, the physical activity of Iranian adults has decreased significantly since the onset of the COVID-19 pandemic (Table 4).

Moreover, multivariate linear regression was used to predict disordered eating attitudes during the COVID-19 pandemic based on age, gender, marital status, education, BMI, and physical activity. The results showed that about 23% of changes in disordered eating attitudes during the COVID-19 outbreak were explained by these factors ( $R = 0.48$ ,  $R^2 = 0.23$ ). Considering that the analysis of variance of regression was significant ( $F = 5.57$ ,  $P > 0.01$ ), the standardized beta coefficient was used to determine the most effective predictive modeling among the aforementioned variables (Table 5). Based on the findings, three variables of physical activity ( $\beta = 0.17$ ), BMI ( $\beta = 0.11$ ), and gender ( $\beta = 0.072$ ), respectively, were the most important predictors of disordered eating attitudes during the COVID-19 pandemic. In other words, considering the positive and significant association between these variables and disordered eating attitudes, those with high BMI or more intensive physical activity are more likely to experience increased disordered eating during the COVID-19 pandemic. Besides, the same

**Table 1.** Individual characteristics of the subjects as a whole and gender separation

Variables	Min.	Max.	Mean±SD	Gender (Mean±SD)	
				Female, n=502 (71.2%)	Male, n=203 (28.8%)
Age (y)	18	75	29.71±10.66	28.4±9.88	32.94±11.78
Height (cm)	146	198	167.74±8.44	164.19±5.92	176.52±7.24
Weight (kg)	40	130	68.4±12.52	64.65±10.87	77.67±11.5
Body mass index (kg/m <sup>2</sup> )	15.6	42.97	24.27±3.88	23.99±3.95	24.95±3.63

is true concerning gender, and women are more likely to experience disordered eating during the COVID-19 pandemic (Table 5).

#### 4. Discussion

The COVID-19 pandemic has caused significant psychological consequences and adverse effects, which in turn have affected essential components of a healthy lifestyle and weight-related behaviors, including healthy nutrition and physical activity. Therefore, the present study

aimed to evaluate the level of disordered eating attitudes and physical activity among Iranian men and women during the COVID-19 pandemic. This study demonstrated that the COVID-19 pandemic has significantly reduced the physical activity of Iranian men and women. However, only women experienced a significant increase in disordered eating attitudes during the COVID-19 pandemic, and no significant changes were observed in men. Of course, the results showed that, regardless of gender, since the onset of the COVID-19 pandemic, the level of disordered eating attitudes in Iranian adults has increased

**Table 2.** Demographic and individual characteristics of subjects

Variables		No. (%)	Gender, No. (%)	
			Female	Male
Age, y	18-30	468 (66.4)	359 (71.5)	109 (53.7)
	31-45	148 (21)	97 (19.3)	51 (25.1)
	Over 45	89 (12.6)	46 (9.2)	43 (21.2)
Marriage status	Single	425 (60.3)	308 (61.4)	117 (57.6)
	Married	280 (39.8)	194 (38.6)	86 (42.4)
Degree of education	Diploma and sub-diploma	285 (40.0)	184 (36.7)	101 (49.8)
	Post-diploma and bachelor's degree	362 (51.3)	284 (56.6)	78 (38.4)
	Masters and PhD	58 (8.2)	34 (6.8)	24 (11.8)
BMI, kg/m <sup>2</sup>	Underweight (<18.5)	34 (4.8)	28 (5.6)	6 (3)
	Normal weight (18.5-24.9)	398 (56.5)	292 (58.2)	106 (52.2)
	Overweight (25-29.9)	223 (31.6)	152 (30.3)	71 (35)
	Obese (>30)	50 (7.1)	30 (6)	20 (9.9)

**Table 3.** Eating attitudes and their subscales before and during the COVID-19 pandemic as a whole and gender separation

Eating Attitudes Subscales	Mean±SD					
	Before the COVID-19 Pandemic			After the COVID-19 Pandemic		
	Female	Male	Total	Female	Male	Total
Dieting	10.19±3.11	8.61±2.89	9.73±2.07	10.73±4.79	8.96±3.46	10.22±3.73
Bulimia & food preoccupation	2.6±1.3	2.87±1.83	2.68±1.5	2.82±1.46	2.83±1.07	2.82±1.4
Oral control	4.68±1.1	5.34±1.76	4.87±1.3	4.73±1.01	5.21±2.31	4.87±1.15
Eating disordered attitudes	17.38±4.95	16.83±3.93	17.22±4.54	18.3±5.82*	17±4.79	17.93±5.1 <sup>†</sup>

\*P<0.01, Significant differences compared to before the COVID-19 pandemic in female; <sup>†</sup>P<0.01, Significant differences compared to before the COVID-19 pandemic.

significantly. In this line, three variables of physical activity, BMI, and gender were the most important predictors of disordered eating attitudes during the COVID-19 pandemic, and there was a positive and significant association between these variables and disordered eating attitudes.

Despite all the advice that restrictions and staying at home should not hinder people's physical activity [18], the present study demonstrated that the COVID-19 outbreak had reduced all subscales of physical activity so that both women and men experienced reduced levels of sports activity (3.79% and 2.72%, respectively) and physical activity during leisure time (3.26% and 1.93% for women and men, respectively). However, this decrease was more evident in women than in men. Similar results are reported by Ammar et al. [13], Sánchez et al. [3], Robinson et al. [5], and Maugeri et al. [4]. Oliveira et al. argued that the onset of the COVID-19 pandemic and its restrictions dramatically affected lifestyle activi-

ties, such as participating in various sports and everyday physical activities [19]. Ammar et al. also reported that decreased physical activity was associated with increased sedentary habits such as sitting for long periods. It is worth noting that the impact of the COVID-19 pandemic on physical activity depends on various factors such as the severity of restrictions and public health protocols. So that, in China, different regional policies and socioeconomic factors have been associated with different levels of physical activity [13]. Regarding gender, as in the present study, Sánchez et al. noted that the decrease in physical activity was much more significant in women than in men [3]. In contrast to the present study results, Maugeri et al. reported that men experienced more drops in their physical activities than women [4]. This difference can be attributed to psychological factors, cultural differences, and lifestyles of men and women in different societies and countries, so that women are less engaged in sports activities and outdoor leisure due to stress and

**Table 4.** Physical activity and its subscales before and during the COVID-19 pandemic as a whole and gender separation

Physical Activity Subscales	Mean±SD					
	Before the COVID-19 Pandemic			After the COVID-19 Pandemic		
	Female	Male	Total	Female	Male	Total
Work	2.67±0.64	2.95±0.71	2.75±0.67	2.59±0.66	2.9±0.7	2.68±0.69
Sports	2.11±0.68	2.2±0.69	2.14±0.68	2.03±0.68	2.14±0.67	2.07±0.68
Leisure time	2.45±0.67	2.59±0.7	2.49±0.68	2.37±0.67	2.54±0.73	2.42±0.69
Total	7.2±1.41	7.68±1.54	7.34±1.46	7±1.46*	7.49±1.5 <sup>#</sup>	7.14±1.49 <sup>†</sup>

\*P<0.01, Significant differences compared to before the COVID-19 pandemic in females; <sup>#</sup>P<0.01, Significant differences compared to before the COVID-19 pandemic in males; <sup>†</sup>P<0.01, Significant differences compared to before the COVID-19 pandemic.



**Table 5.** Coefficients of predictive variables of eating disordered attitudes during the COVID-19 pandemic

Variables	Unstandardized Coefficients		Standardized Coefficients	t	P
	B	Std. Error	Beta		
Age	-0.069	0.058	-0.056	-1.18	0.23
Gender (female)	2.09	1.1	0.072	1.89	0.05
Marriage status (single)	-1.72	1.19	-0.064	-1.44	0.15
Degree of education (Diploma and sub-diploma)	-1.08	0.79	-0.051	-1.36	0.17
Body mass index	0.38	0.13	0.11	2.82	0.005
Physical activity	1.48	0.32	0.17	4.53	0.0001

anxiety caused by the pandemic and respect more the restrictions of COVID-19. However, Maugeri et al. reported that, before the COVID-19 pandemic, men had a high level of physical activity compared to women (2998 MET-min/wk vs 1994 MET-min/wk). But since the onset of the COVID-19 outbreak, men's physical activity has decreased more compared to women (1754 vs 1443 MET-min/wk). The lower decline of physical activity among women can be attributed to factors such as household chores, dancing, aerobics, and yoga at home [4]. Physical inactivity can cause various physical diseases such as CVDs, diabetes, and cancer [20, 21]. WHO reported that around 3.2 million deaths could be attributed to physical inactivity annually [22]. Mattioli et al. stated that the COVID-19 pandemic, quarantine, and restrictions could be associated with unhealthy lifestyles and increased anxiety, resulting in decreased physical activity and undesirable changes in the diet. These conditions can also cause long-term consequences such as CVDs [20].

Concerning disordered eating attitudes, regardless of gender, the COVID-19 pandemic has increased the disordered eating attitudes of Iranian adults significantly by about 4.12%; while for women, it has increased by 5.3%, but the increase was not considerable men (around 1%). Although, in the present study, the mean score of eating attitudes of Iranian men and women was lower than 20, which does not indicate eating disorders in either period before or after the COVID-19 pandemic; however, there are two essential points. First, before the pandemic, the disordered eating attitudes for women (17.38) and men (16.83) had been less than 20, which were somehow high and worrying. Furnham et al. reported a rate of 10.85 for Indians, 11.27 for Pakistan, and 16.34 for Bangladesh is [23]. Secondly, regarding the importance of healthy

nutrition in preventing the COVID-19, this increase in disordered eating attitudes, especially in women, is undesirable and may disrupt healthy nutrition. Papandreou et al. reported that undesirable nutrition behaviors and stress have significantly increased since the onset of the COVID-19 pandemic in Spain and Greece [24]. Brooks et al. also stated that restrictions related to COVID-19 are associated with increased anxiety, discomfort, nervousness, and loneliness. In addition to negative physical consequences, these factors may cause negative emotional and effects on people's eating attitudes and behaviors [9]. Eating attitude is the core of disordered eating, ranging from healthy attitudes to disordered eating [12]. Disordered eating is a public health problem that has significantly increased since the 1970s. Anorexia nervosa and bulimia are common disordered eating in women [25]. Refraining from eating to control weight or overeating in times of excitement and stress are also common [26]. A meta-analysis study showed that 0.5% of people with anorexia die per year, 20% of whom are due to suicide [27]. Furthermore, those with a family history of disordered eating are at increased risk of wrong eating behaviors [28]. Therefore, preventing disordered eating attitudes and identifying high-risk individuals is crucial, especially during the COVID-19 pandemic [11].

Also, based on the findings, in addition to gender, there is a significant association between disordered eating attitudes with BMI and physical activity. In other words, the higher the BMI or, the more severe the physical activity, the higher is the disordered eating attitudes. Robinson et al. reported that unhealthy eating patterns and behaviors were more prevalent among people with higher BMI during the COVID-19 outbreak. In other words, those with higher BMI have lower levels of physical activity, their dieting is of lower quality, and they have

more overeating [5]. Sánchez et al. also reported similar results [3]. It seems that regardless of the COVID-19 outbreak and its stress and anxiety, overweight and obese people are more susceptible to disordered eating attitudes and behaviors. Caradas et al. reported that the prevalence rates of EAT-26 score over 20 in people with underweight, normal weight, overweight, and obese were 9%, 18%, 24%, and 33%, respectively [29]. However, the association between BMI and eating attitudes disordered is mutual, and they aggravate each other. This issue is more critical during the COVID-19 pandemic. Eventually, although the level of physical activity of Iranian men and women has declined during the COVID-19 pandemic, the positive association between disordered eating attitudes and physical activity indicates that more active people are more susceptible to disordered eating. It is well-documented that athletes and active individuals are more prone to disordered eating (e.g. anorexia mentale, anorexia athletica), which may be due to their worries about the shape of their body or other psychological factors, such as stress for optimal performance and perfectionism [30, 31], which the COVID-19 pandemic may exacerbate. The findings of the present study can be used for promoting public health during the COVID-19 pandemic. On the other hand, there is no clear end to the pandemic. Motivating individuals to increase their mobility and increasing the cost of energy along with promoting healthy nutrition not only help prevent the COVID-19 but will also help to avoid other complications. It seems that training nutritional behaviors and using a healthy diet along with increased physical activity are of crucial importance during the COVID-19 pandemic. The current study had limitations, including a low sample size and a high proportion of participating women compared to their proportion in society. The questionnaire contained several items, and therefore it was not possible to directly measure the stress and anxiety. The participants were asked to remind their physical activity before the pandemic, which increases the risk of recall bias. However, further studies are needed to address the gaps.

## 5. Conclusion

This study demonstrated that the COVID-19 pandemic and its restrictions negatively affect healthy lifestyles and behaviors related to disordered eating attitudes and physical activity. The COVID-19 pandemic has reduced the physical activities of both men and women. However, only women experienced a significant increase in disordered eating attitudes. Also, women, those with high BMI, and those with more severe physical activity

are at increased risk of disordered eating attitudes during the COVID-19 pandemic.

## Ethical Considerations

### Compliance with ethical guidelines

The present study was approved by the Ethics and Research Committee of Allame Qazvini University (No. 99/pk/1k/1001).

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### Authors' contributions

Conceptualization and supervision: Hassan Pourrazi, Shagayeg Modaberi; Data collection and data analysis: Hassan Pourrazi, Rahele Kabiri; Writing – original draft, and writing – review & editing: Rahele Kabiri

### Conflict of interest

The authors declared no conflict of interest

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