

Effects of COVID-19 Pandemic on Lifestyle Behaviours among Italian Physically Active Population

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ABSTRACT

Objective: The 2019 coronavirus disease (COVID-19) is a global public health emergency resulting in lockdowns, associated food habits and lifestyle changes and constraint public health delivery. The aim of this study was to investigate the impact of the COVID-19 induced lockdown in Italy on lifestyle behaviours among physically active population adults.

Materials and Methods: A cross-sectional online survey was conducted from April to June 2020 on 175 subjects (48.6% males and 18–66 age range) by a structured questionnaire to collect information on demographic characteristics, anthropometric data, lifestyle factors and dietary habits.

Results: It merged that 40% of the sample gained weight (≈ 1 kg) with no significant differences between genders. Alcohol consumption and physical activity practice and duration significantly decreased during lockdown, while physical activity frequency, sedentary activities, sleep times, daily breakfast habits and consumption of sweets significantly increased. A multiple logistic regression model showed that education level, nutritional status, frequency of physical activity, eating between meals, and sweet consumption had a significant effect on weight gain during COVID-19.

Conclusions: Lockdown had a bi-directional impact (both positive and negative) on lifestyle changes, because more time was spent at home. These results need to be confirmed with further longitudinal studies among a larger population sample to better understand the lasting effects of this pandemic on lifestyle behaviors and their changes.

Keywords: Covid-19, lifestyle behaviour, lockdown, pandemic, physical activity.

INTRODUCTION

The World Health Organization (WHO) announced on March 11, 2020 the outbreak of the novel 2019 coronavirus disease (COVID-19) and declared it a global pandemic.¹ The COVID-19 has had far-reaching health, social, and economic implications related also to the measures taken by Governments.²

At its outbreak, the Italian Government decided stringent containment measures to contrast and contain the spread of COVID-19 pandemic, such as the ban on mass gatherings and events, and on meeting up for no urgent reasons. The #iorestoacasa

Italian decree (translated as #stayathome decree) involved a sudden and drastic change in the habits and lifestyles of the population, as well as a severe reduction of socialization. Physical distancing and self-isolation strongly impacted citizens' lives, and mainly affected daily eating habits and behaviours.³

In fact, the COVID-19 control measures and travel restrictions have compromised the ability to keep physical activity and maintain healthy lifestyles, and often determined reduced consumption of healthy diets.

Practice of physical activity (PA) was initially allowed for both athletes and amateurs provided that the interpersonal distance of at least one meter was maintained. Then, all activities practiced in gyms, sport centers and swimming pools were interrupted, and closure was laid down. At a later stage, access to public parks and gardens was also prohibited to further counteract the spread of the virus. In addition, the practice of outdoor recreational PA was allowed only near homes, not in group-based settings, and provided that the distance of at least one meter from other people was respected. Because of these increasingly restrictive containment measures, practice of PA has been progressively limited.⁴

Considering that adults are recommended to have at least 150 min of moderate physical activity per week to prevent weight gain,⁵ it is pivotal to remain physically active by frequent walking, jogging, cycling, doing physical exercises recreationally or utilitarian.

The aim of this study was to investigate the effects of the COVID-19, induced by the lockdown in Italy, on lifestyle behaviours among physically active adult population.

MATERIALS AND METHODS

Study design and data collection

The survey was conducted from April to June 2020, among the Italian physically active population, by means of an online platform, accessible through any device with Internet connection. The survey was available through private social networks (e.g., WhatsApp, Twitter, Facebook). A total of 175 participants completed the questionnaire. The survey was carried out in agreement with the Declaration of Helsinki (2000) and national and international regulations. All participants were informed about the study and on the fact that data were analyzed for research purposes only and for possible publication, in accordance with current privacy regulations, and agreed to

participate in the data collection. Participants' personal information was anonymous to maintain and protect confidentiality. Given the anonymous nature of the survey carried out via web, which does not allow tracking of sensitive personal data, this study did not require the approval of the ethics committee. The final database was downloaded as a Microsoft Excel sheet.

Questionnaire

The questionnaire was built ad hoc by using Google Form and included a total of 51 questions organized into 4 sections: (1) personal data (i.e., questions on age, gender, hometown, current employment and especially possibility of working at home); (2) anthropometrics information (i.e., questions on reported weight and height, and if weight had increased during lockdown); (3) lifestyle factors (i.e., questions about smoke and alcohol habits, hours of sleep, PA in terms of activity type, frequency and duration of practice, time spent in studying, watching TV, and other pastimes, such as reading, cooking, using social networks before and during the lockdown); (4) dietary habits information (i.e., questions on breakfast habits, daily consumption of certain foods, such as as sweet and fruit and vegetables, and eating between meals).

Anthropometric data

Height and weight information retrieved by the questionnaire was all self-reported by the respondents. Body Mass Index (BMI) was calculated as the weight in kilograms divided by the square of the height in meters (kg/m^2). Weight status was classified according to WHO⁶ categories as follows: underweight (BMI < 18.5), normal weight (BMI between 18.5–24.9), overweight (BMI between 25 and 29.9) and obese (BMI \geq 30).

Statistical analysis

The descriptive analyses were presented as means \pm standard deviations for quantitative variables, and as

percentages for categorical variables. Chi-square test and T-tests were used to test for significant proportion and mean differences, respectively, while McNemar analysis was used to investigate the difference between categorical variables before and during the COVID-19 emergency.

A multiple logistic regression model, backward stepwise method, was employed to evaluate the association of selected lifestyle factors and weight gain (dependent variable). Analyses were conducted with unadjusted and adjusted covariates.

For all the tests, p -values < 0.05 were considered to be statistically significant. All statistical analyses were performed using MedCalc Software version 19.4.0 for Windows.

RESULTS

Characteristics of the study participants are shown in Table 1. The percentage of females in the sample slightly exceeded that of males (51.4% vs 48.6%, respectively). Subjects were 38.1 ± 14.5 years of age and had weight 71.2 ± 13.5 kg, height 172.7 ± 10.3 cm, BMI 23.7 ± 3.0 kg/m². During COVID-19, weight was 72.1 ± 13.8 kg and BMI 24.1 ± 3.2 kg/m², as a matter of fact 40% of the sample gained weight without significant differences between genders. The prevalence of overweight/obesity was 32.6% with higher and significant values in males than females (44.7% vs 21.1%; $p=0.0009$). Also, the percentage of the sample who attended high school was higher than those who had university degree and who had less than middle school (respectively 55.4% vs 34.3% and 10.3%) with no significant differences between females and males.

Table 1. Study sample characteristics (means \pm standard deviation, n and %)

Characteristics	All sample n=175 (100%)	Males n=85 (48.6%)	Females n=90 (51.4%)	<i>p</i> -value
Age (years)	38.1 \pm 14.5	39.0 \pm 14.8	37.2 \pm 14.4	<0.0001 ^a
Weight (kg)	71.2 \pm 13.5	80.3 \pm 11.1	62.6 \pm 9.3	<0.0001 ^a
Height (cm)	172.7 \pm 10.3	180.5 \pm 7.1	165.3 \pm 6.7	<0.0001 ^a
BMI	23.7 \pm 3.0	24.6 \pm 2.7	22.9 \pm 3.1	<0.0001 ^a
Weight during COVID-19	72.1 \pm 13.8	81.3 \pm 11.5	63.5 \pm 9.7	<0.0001 ^a
BMI during COVID-19	24.1 \pm 3.2	24.9 \pm 2.8	23.2 \pm 3.4	<0.0001 ^a
Age class				
18-30	67 (38.3)	30 (35.3)	37 (41.1)	0.1646 ^b
31-50	52 (29.7)	22 (25.9)	30 (33.3)	
51-66	56 (32.0)	33 (38.8)	23 (25.6)	
Education				
Less than middle school	18 (10.3)	10 (11.8)	8 (8.9)	0.7464 ^b
High School	97 (55.4)	45 (52.9)	52 (57.8)	
University degree	60 (34.3)	30 (35.3)	30 (33.3)	
Nutritional status				
Normal weight	118 (67.4)	47 (55.3)	71 (78.9)	0.0009 ^b
Overweight/obese	57 (23.6)	38 (44.7)	19 (21.1)	
Smartworking				
Yes	65 (37.1)	33 (38.8)	32 (35.6)	0.6557 ^b
No	110 (62.9)	52 (61.2)	58 (64.4)	
Weight changes during COVID-19				
Gained	70 (40)	35 (41.2)	35 (38.9)	0.7582 ^b
No changes	105 (60)	50 (58.8)	55 (61.1)	

^a Comparison between males and females based on t-test

^b Comparison between males and females based on chi-square test

Table 2 shows the changes in lifestyle-related practice before and during COVID-19. Alcohol consumption and the practice and duration of PA significantly decreased during lockdown (from 78.9% to 62.3%; $p < 0.0001$ for alcohol, from 100% to 85.7%; $p < 0.0001$ for practice of PA, and

from 71.5% to 44.3%; $p < 0.0001$ for 60 or more minutes a day of PA), even if the daily frequency of PA increased significantly (from 6.4% to 16.0%; $p = 0.0041$ for everyday PA). Also smoking decreased during the covid-19 pandemic but not significantly.

Table 2. Behaviour lifestyle pre and during COVID-19

Variables	Pre COVID-19	During COVID-19	p-value
Smoking			
Yes	34 (19.4)	29 (16.6)	0.0625
No	141 (80.6)	146 (83.4)	
Alcohol consumption			
Yes	138 (78.9)	109 (62.3)	<0.0001*
No	37 (21.1)	66 (37.7)	
Sleep time			
≥7h	109 (62.3)	127 (72.6)	0.0175*
<7h	66 (37.7)	48 (27.4)	
Physical activity			
Yes	175 (100)	150 (85.7)	<0.0001*
No	0 (0.0)	25 (14.3)	
≥60 min	113 (71.5)	70 (44.3)	<0.0001*
<60 min	45 (28.5)	88 (55.7)	
Every day	10 (6.4)	25 (16.0)	0.0041*
No every day	146 (93.6)	131 (84.0)	
Watching Tv			
≥2 h/day	68 (38.9)	99 (56.6)	<0.0001*
<2h/day	107(61.1)	76 (43.4)	
Study time			
≥2 h/day	71 (40.6)	81 (46.3)	0.0414*
<2h/day	104 (59.4)	94(53.7)	
Other pastimes			
≥2 h/day	85 (48.6)	125 (71.4)	<0.0001*
<2h/day	90 (51.4)	50 (28.6)	
Breakfast habits			
Every day	138 (78.9)	151 (86.3)	0.0044*
No every day	37 (21.1)	24 (13.7)	
Eating between meals			
Yes	103 (58.9)	113 (64.6)	0.1539
No	72 (41.1)	62 (35.4)	
Fruit and vegetable consumption			
≥5 serving/day	3 (1.7)	7 (4.0)	0.1250
<5 serving/day	172 (98.3)	168 (96.0)	
Sweet consumption			
≥1 serving/day	49 (28.0)	61 (34.9)	0.0169*
<1 serving/day	126 (72.0)	114 (65.1)	

p-value according to McNemar test; *statistical significance is expressed as p<0.05 exp

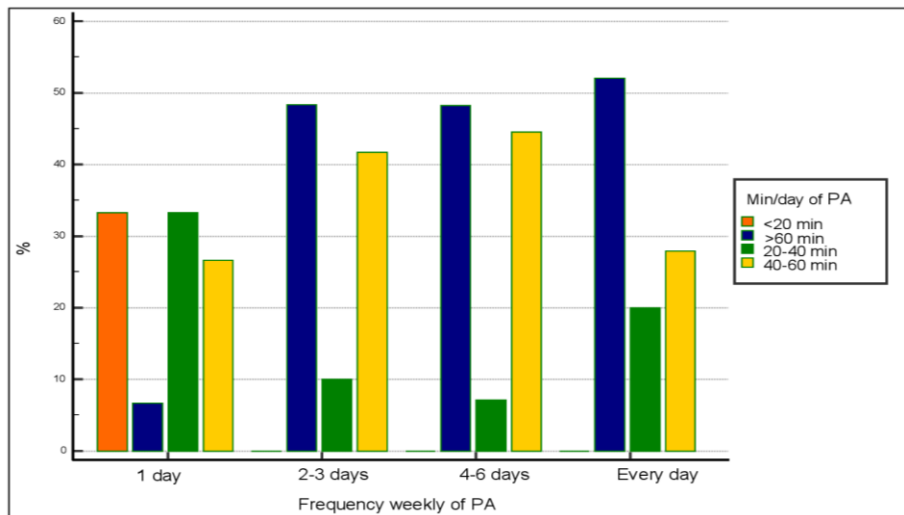


Figure 1 Physical activity (PA) during lockdown

Sedentary activities (e.g., watching TV, study time and other pastimes, such as reading, cooking, using social networks), sleep time, daily breakfast habit, and consumption of sweet significantly

increased during lockdown. In particular, watching TV for 2 or more hours a day increased from 38.9% to 56.6% (p <0.0001); studying for 2 or more hours a day raised from 40.6% to 46.3%

($p=0.0414$); the percentage of those who spend 2 or more hours in other pastimes increased from 48.6% to 71.4% ($p<0.0001$). Also the percentage of those who sleep 7 or more hours a night (as per international recommendations) increased from 62.3% to 72.6% ($p = 0.0175$), while the habit of

having breakfast every day and the consumption of 1 or more serving a day of sweets increased from 78.9% to 86.3% ($p0.0044$) and from 28.0% to 34.9% ($p = 0.0169$), respectively. In addition fruit and vegetable consumption and eating between meals increased, but not significantly.

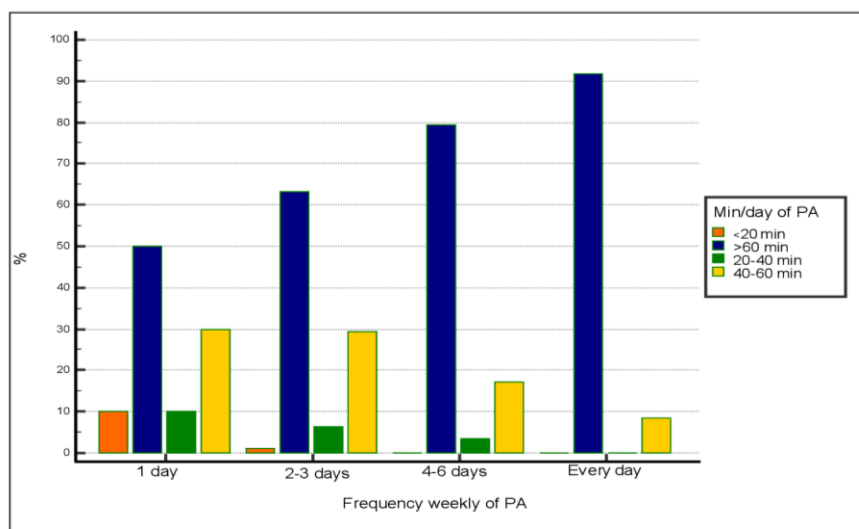


Figure 2 Physical activity (PA) before lockdown

Table 3. Association between selected lifestyle factors and weight gain. Odds ratios (OR) and 95% Confidence Intervals (CI) from logistic regression analysis

Independent variables	Weight gain		aOR (95% CI)	p-value
	cOR (95% CI)	p-value		
Gender				
Males vs females	1.100 (0.601-2.015)	0.7575	0.997 (0.459-2.167)	0.9941
Age				
31-66 vs 18-30	1.200 (0.642-2.243)	0.5679	2.557 (0.972-6.725)	0.0571
Education level				
High school and less vs University	1.720 (0.892-3.316)	0.1057	2.955 (1.170-7.468)	0.0220*
Nutritional status				
Overweight/obese vs normal weight	2.695 (1.406-5.163)	0.0028*	3.120 (1.309-7.436)	0.0103*
Physical activity				
No vs yes	1.000 (0.421-2.373)	1.0000	0.218 (0.018-2.592)	0.2276
Frequency physical activity				
No every day vs every day	4.044 (1.315-12.440)	0.0148*	6.053 (1.689-21.691)	0.0057*
Breakfast habit				
No vs yes	2.375 (0.989-5.704)	0.0530	1.984 (0.598-6.575)	0.2626
Eating between meals				
Yes vs no	1.495 (0.785-2.847)	0.2213	2.593 (1.069-6.287)	0.0350*
Sweet consumption				
≥ 1 serving/day vs < serving/day	1.987 (1.054-3.745)	0.0337*	2.966 (1.292-6.809)	0.0103*
Fruit and vegetable consumption				
<5 serving/day vs ≥ 5 serving/day	1.700 (0.321-9.018)	0.5331	1.486 (0.162-13.677)	0.7263
Watching TV				
>2 hours/day vs ≤ 2 hours/day	1.263 (0.684-2.332)	0.4553	1.220 (0.563-2.644)	0.6147
Sleep time				
<7 hours vs ≥ 7 hours	1.393 (0.712-2.726)	0.3338	1.234 (0.493-3.089)	0.6535

cOR= Crude odds ratio; aOR= Adjusted odds ratio; CI= confidence interval, p-value according to Chi-square test; *statistical significance is expressed as $p<0.05$

Regarding PA, the frequency and duration before and during the lockdown are shown in figures 1 and 2. It is interesting to

highlight that before the pandemic, the increase in PA frequency also determined a greater duration of the activity, well beyond

60 minutes; while during lockdown the subjects involved in the present study who stated that they continued being active, did PA every day but with less duration (40-60 min and 20-40 min).

Crude and adjusted odd ratios for lifestyle factors associated with weight gain, obtained from a multiple regression model are shown in Table 3. Education level, nutritional status, frequency of physical activity, eating between meals and sweet consumption had a significant effect on weight gain, whereas gender, age, physical activity, breakfast habits, fruit and vegetable consumption, watching TV and sleep time had no significant association. The results show that those who attended high school were at a three-fold higher risk of gaining weight compared to those who had university degree (aOR 2.96, 95% CI 1.17-7.47, $p=0.0220$). Also the obese/overweight were about 3 times more likely to be at risk of gaining weight than normal weight (aOR 3.12, 95% CI 1.31-7.44, $p=0.0103$). In addition, those who were not physically active every day, were even 6 times at risk of gaining weight compared to those who did PA every day (aOR 6.05, 95% CI 1.69-21.69, $p=0.0057$).

With regard to eating habits, those who ate between meals were 2.6 times at risk of gaining weight compared to those who did not eat snacks (aOR 2.59, 95% CI 1.07-6.29, $p=0.0350$), and those who consumed sweets one or more times a day were at a three-fold higher risk of gaining weight than to those who ate them less of once a day (aOR 2.97, 95% CI 1.29-6.81, $p=0.0103$).

DISCUSSION

This cross-sectional study examined the effects of the COVID-19 pandemic induced by lockdown in Italy on lifestyle behaviours among physically active adult population.

Maintaining a healthy and balanced diet and being physically active are among the recommendations given at present to support the immune system.⁷ The current

study showed that alcohol consumption smoking and the practice and duration of PA decreased during lockdown, while PA frequency, sedentary activities (e.g., watching TV, study time and other pastimes such as reading, cooking, using social networks), sleep time, breakfast habit every day, fruit and vegetable consumption, as well as eating between meals and consumption of sweets increased during lockdown.

The data on alcohol consumption is controversial. Some research reported an increase in alcohol consumption,^{8,9} while other studies reported a decrease.^{3,10}

In this study a decline in physical activity of 15% and a reduction in time of activity were observed, with the sedentary activities (predominantly television viewing) being simultaneously prolonged; however, there was an increase of PA frequency every day. It is evident that the recommendations by the Government to limit movement outdoors and the restrictions on doing group sports, having walks, doing exercise and gym, accessing parks and sport grounds is related to the decrease in active participation in PA. However, thanks to PA classes at home through various social media platforms, as well as to other means such as treadmills or bodyweight training, present results show that it has been possible for individuals to maintain adequate and daily normal PA patterns with various home activities. A lot of studies reported a decrease of PA and increase in sitting or screen time during COVID-19 pandemic¹⁰⁻¹⁵ while few researches observed opposite results showing an increase in PA.^{3,16} These differences may be related to the policies on movement restrictions taken by the different Governments during this period.¹⁷

Based on the results of the present study, more than 70% of participants met the recommended sleeping hours during the pandemic, compared to 60% before pandemic. Rienzo et al. reported that during lockdown people slept more hours than beforehand³ and similar surveys conducted

in Spain showed that the number of short sleepers decreased during the first three weeks of lockdown.¹⁸ In the study of Canello et al. 22% of subjects declared sleeping 1-2 hours more than usual, even if they described symptoms of insomnia and perceived sleep as less restful.¹⁹

The findings about changes in food habits went both towards positive and negative directions. If on the one hand there has been a strong increase in the consumption of sweets and eating between meals, on the other hand there has been, in fact, an improvement in the consumption of fruit and vegetables, as well as a significant increase of people who had breakfast daily. A possible explanation could be that, as people stayed at home during lockdown, there was more free time for cooking and eating either better or worse.

Similar results were reported by Scarmozzino and Visioli, who found that half of the participants of an Italian sample showed an increase in the consumption of sweets and about 21% increased the intake of fresh fruit and vegetables.²⁰

In addition, our data confirm the previous findings that both positive and negative changes in food habits were observed during the pandemic: some studies showed more frequent and higher consumption of sweets, biscuits and cakes, a lower intake of fruit and vegetables, and more frequent eating out of control.^{8,9,11,13,15} Other surveys reported an increased consumption of fruit and vegetables and a decreased consumption of carbonated or sugary drinks.^{3,10}

The present study indicates that the COVID-19 pandemic and the subsequent lockdown resulted in self-reported weight gain of about 1 kg in less than half of the subjects. Lower education level, overweight/obese nutritional status, lack of daily PA, eating between meals, and greater sweet consumption were significantly associated with weight increase. Similar results were reported by a study from Dogas et al., where 30% of respondents affirmed,

they had gained weight during the lockdown.²¹

Other studies also support our data on weight gain^{3,9,13,17,22,23} and evidence shows that even a small positive energy balance over time is enough to cause weight gain in many individuals.²⁴

However, considering that about 60% of the respondents did not gain weight, the current study showed that this sample of sportsmen managed to keep fit during the lockdown.

Some limitations must be, however, acknowledged to the present study. Firstly, all data, including anthropometric measurement, PA, dietary habits, smoking and sleeping habits, were self-reported which may be less reliable and biased. In addition, BMI was calculated based on self-reported data on weight and height; it is thus possible that underestimation of overweight and obesity occurred. Secondly, the cross-sectional study that precludes the investigation of casual relationships was conducted on a small sample size.

Strength of our study was represented by the fact that it was the first survey conducted on a sample of physically active population in the most critical period of the COVID-19 epidemic in Italy.

CONCLUSION

This study provided information on lifestyle behaviours of a physically active sample during the COVID-19 pandemic in Italy. The lockdown had a bi-directional impact on lifestyle changes, both positive and negative, because more time was spent at home. In fact, if on the one hand alcohol consumption and smoking decreased, and time sleep, daily breakfast habit, fruit and vegetable consumption and daily frequency PA improved. On the other hand, sedentary activities, eating between meals, consumption of sweets increased, and practice and duration of PA worsen.

These results need to be confirmed with further longitudinal studies among a larger population sample to gain higher insight into the lasting effects of this

pandemic on lifestyle behaviours and their changes.

Acknowledgement

The authors gratefully thank the people and their families who participated in this study.

Funding Source

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of Interest

The authors have no conflicts of interest to declare.

Ethical Approval: Approved

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How to cite this article: Galfo M, Maccati F, Melini F. Effects of COVID-19 pandemic on lifestyle behaviours among Italian physically active population. *Int J Health Sci Res*. 2021; 11(4): 12-20. DOI: <https://doi.org/10.52403/ijhsr.20210402>
