How Indian obese population managed their lifestyle during first and second lockdown during COVID-19 pandemic? - A comparative study

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ABSTRACT

Background: People from all over the world have been affected by the COVID-19 (SARS-CoV-2) pandemic. The lockdown during the pandemic has impacted the lifestyle of most of the population. The aim of the present study is to compare the effect of COVID lockdown-1 and lockdown-2 on the lifestyle of the obese Indian population. Methods: This was a cross-sectional study conducted during the COVID-19 lockdown on obese adults. A well-structured questionnaire was developed and administered among the study population. The study was conducted in two phases (lockdown-1 and lockdown-2). A total of 390 subjects were included in the study (260 subjects in the lockdown-1 phase and 130 subjects in the lockdown-2 phase). Data on diet, sleep, stress, and physical activity were obtained and analyzed. Results: The mean age of the participants of phase-1 in the study was 41.7 ± 10.2 years and the participants of phase-2 were 44.5 ± 9.2 years. Statistically significant differences were observed between lockdown-1 and lockdown-2 in terms of monitoring of weight and other comorbid conditions, changes in the consumption of refined flour and processed foods, sugar and sugar-sweetened foods, oils and ghee, duration of physical activity, changes in the duration of sleep, and the stress levels related to COVID-19 (P < 0.001). Conclusion: The impact of the lockdowns on health was very significant and different areas of lifestyle were affected in both the lockdowns. Weight gain was reported in both phases of the lockdown. The monitoring of health parameters, eating frequency, diet, and stress levels were affected during lockdown-1, whereas during lockdown-2, sleep duration and physical activity were affected. A comprehensive lifestyle modification plan is required to be developed to avoid these effects in the future.

Keywords: COVID-19, India, lifestyle, lockdown-1, lockdown-2, obese

Introduction

The novel coronavirus infection is spreading worldwide at an alarming rate. In 2019, a virus majorly affecting the respiratory system was identified as having pneumonia-like symptoms.[1] Later, in February 2020, this virus was named COVID-19 or SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) by the World Health Organization.[2] The first outbreak of this virus was reported in the Wuhan city of central Hubei province of China.[3] In March 2020, the World Health Organization declared the outbreak of this virus a global pandemic.[4] In India, starting from January 3, 2020, till October 15, 2021, a total of 34,037,592 confirmed COVID-19 cases and 451,814 deaths were reported.[5] The first lockdown was imposed from March 23, 2020, to May 31, 2020, and the second lockdown was imposed from April 5, 2021, to June 15, 2021. Normal social, economic,
occupational, leisure, and religious activities were disturbed by the lockdown. This pandemic also had a direct impact on the global health and the economy of the country.\cite{6,8} Due to the changes in daily morning walk routine, playing on the grounds, going to offices and schools, etc., there was a drastic decrease in the physical activity leading to an increase in the symptoms of anxiety and depression leading to an increase in mental health problems.\cite{7,9} Due to the increase in prices of essential commodities like food and decreased health facilities, and food availability, panic attacks, sudden increase or decrease in appetite, and insomnia were reported by a majority of the population.\cite{10,11} Given the changes that took place in the lives of the majority of the population in response to the lockdown, it is worthwhile to further investigate the relationship between different aspects of human life like stress, sleep, diet, physical activity, and lockdown. So, the focus of this study is to examine the impact of house confinement on the physical activity duration and type, self-reported stress, sleep duration, and food consumption among the population during lockdown-1 and lockdown-2 and compare the changes in these variables. Since this pandemic situation may occur multiple times in the form of various waves, it is essential to understand how the obese population is adapting to these lockdowns and what areas in the lifestyle management require novel interventions.

Methodology

This was a cross-sectional study conducted in two phases. Phase-1 was conducted from July 1, 2020, to October 1, 2020, and phase-2 was conducted from June 1, 2021, to August 31, 2021. The duration of the study was 14 months. The patients with obesity along with comorbidities (hypertension, diabetes mellitus, heart disease, chronic lung disease, and other diseases) who attended the medicine OPD and Obesity and Metabolic Clinic of the All India Institute of Medical Sciences, New Delhi, were included in the study.

Tools and techniques of data collection

A well-structured questionnaire was developed and used to collect data on lifestyle changes of the participants. All the participants were contacted telephonically during the lockdown and physically after the reopening of the OPD and the questionnaires were filled during both the lockdowns. A total of 390 subjects were included in the study. In phase-1, 260 subjects were included and in phase-2, 130 subjects were enrolled. During phase-2, 50% of the subjects of the sample size of phase-1 were included in the study.

Approval from the Institutional Ethics committee (IEC) of the All India Institute of Medical Science (AIIMS) was obtained before conducting the study. Privacy and confidentiality of the data were maintained throughout the study. Consent in writing or through electronic messaging was taken from all the participants of the study.

Data processing and analysis

All the data obtained through the questionnaire were cleaned, coded, and recorded using Microsoft Excel and analyzed in STATA version 12. The mean, median, standard deviation, and range were obtained using quantitative data analysis. The Chi-square test was used to determine the difference between the two groups. The analyzed data were organized and presented in tabular, graphical, and narrative forms accordingly. A P value <0.05 was considered statistically significant.

Results

This study included a total of 390 participants [phase-1, n = 260 (66.7%) and phase 2, n = 130 (33.3%) participants]. Information related to the sociodemographic profile of the participants was collected. The sociodemographic information included age, religion, educational status, occupation, and monthly income of the participants.

The mean age of the participants of phase-1 in the study was 41.7 ± 10.2 years and the participants of phase-2 was 44.5 ± 9.2 years. Most of the participants of phase-1 had a Body Mass Index (BMI) of between 33–40 kg/m² and the participants of phase-2 had a BMI of between 31–34 kg/m². More than half of the participants recruited in the study were females. The details of the sociodemographic information are given in Table 1.

Effect of lockdown on the health management practices

During the lockdown, most of the participants of phase-1, 213 (81.92%), and phase-2, 94 (72.31%), did not monitor their weight and other comorbid conditions such as blood sugar and blood pressure at regular intervals. The monitoring of weight and other comorbid conditions significantly decreased during the second lockdown as compared to the first lockdown with 36 (27.69%) participants not monitoring their parameters during lockdown-2. During lockdown-1, in 45 (17.31%) participants, monitoring was increased.

The lockdown imposed due to the COVID-19 infection had negatively affected the health of almost all the participants (94.6%) during the first lockdown. But during the second lockdown, the response of the participants was divided with about 46 (35.4%) participants believing that their health was negatively affected by the lockdown whereas 84 (64.6%) participants expressed that their health was not negatively affected by the lockdown. Overall, significant differences were observed between the phase comparisons over time in terms of the negative effects of the lockdown on health and quality of care for obesity and other comorbid conditions (P-values < 0.001). Weight gain was observed in 39.6% of the participants in phase-1 as well as in phase-2 (44.6%) due to the changes in lifestyle patterns due to the pandemic. Though weight gain during the second lockdown was slightly higher than the first lockdown, the difference was not statistically significant. In our study, the change in the frequency of eating meals during the first and second lockdowns was similar and it was mostly unchanged from the regular working days as shown in Figure 1.
Overall, in most of the subjects, dietary habits were unchanged during the first and second lockdowns but an increase in the consumption of refined flour, processed/packed and frozen foods, sugar and sugar-sweetened foods, and oils, ghee, and butter was observed to be higher during the first lockdown in comparison to the second lockdown ($P < 0.001$) as shown in Table 2. During the second lockdown, dietary consumption of refined flour and processed foods was mostly unchanged which was mostly increased (34.23%) during the first lockdown. Thus, it can be concluded that dietary changes were more prominent during lockdown-1 in comparison to lockdown-2 and this might be due to well preparedness and learning from the impacts of phase-1 lockdown. Consumption of fresh fruits and vegetables and dairy products was comparatively higher during lockdown-2.

In the present study, the effect of lockdown on physical activity was found to be statistically significant in both phases. During the first lockdown, the overall physical activity was increased in 29.6% of the participants as against only about 4% during lockdown-2 [Figure 2]. But a drastic decrease in physical activity...
was observed during the second lockdown in about 50% of the participants.

The decrease in physical activity was mostly seen in domestic chores but some decrease was also observed in yoga, aerobic exercises, or any sports-related physical activity [Table 3].

In the present study, it was observed that there was a statistically significant increase in the duration of sleep among phase-1 participants as compared to phase-2 participants. The duration of sleep was increased in 46.9% of the participants during lockdown-1 which was about 17% in lockdown-2. The increase in sleep duration was significantly high in phase-1 of the lockdown in comparison to phase-2. About 58% of the participants reported no change in the duration of sleep during lockdown-2; rather it was decreased during lockdown-2 as shown in Figure 3.

A similar significant association was obtained in the level of stress. A total of 65% of the participants in phase-1 and 58.5% of the participants in phase-2 reported no stress during the lockdown period. Although stress due to the COVID-19 infection was higher in phase-1 in comparison to phase-2, it was statistically significant. The status of stress due to the COVID-19 infection in both phases is shown in Figure 4.

### Discussion

To our knowledge, this is the first study comparing the effects of two lockdowns on the lifestyle of the obese Indian population, summarizing the key findings of the cross-sectional surveys and attempting to highlight the changes in the lifestyle behavior and dietary changes during the first and second lockdowns imposed due to the COVID-19 pandemic. Multiple studies

### Table 2: Consumption of different food groups among the participants

| Food Items                                      | Remained Unchanged n (%) | Increased n (%) | Decreased n (%) | P   |
|------------------------------------------------|--------------------------|----------------|-----------------|-----|
| Refined flour, Processed/packed and frozen foods | 151 (58)                 | 91 (70)        | 89 (34.2)       | 19 (7.7) | 20 (15.4) | 0.001 |
| Sugar and sugar-sweetened foods                 | 182 (70.0)               | 84 (64.6)      | 64 (24.6)       | 20 (15.4) | 14 (5.4)   | 26 (20) | 0.001 |
| Fresh fruits and vegetables                     | 188 (72.3)               | 85 (65.4)      | 42 (16.2)       | 24 (18.4) | 30 (11.5)  | 21 (16.2) | 0.368 |
| Dairy products, pulses                          | 205 (78.8)               | 89 (68.5)      | 38 (14.6)       | 27 (20.7) | 17 (6.5)   | 14 (10.7) | 0.112 |
| Oils, ghee and butter                           | 147 (56.5)               | 91 (70)        | 88 (33.8)       | 20 (15.5) | 25 (9.6)   | 19 (14.6) | 0.001 |
| Eggs, meat and meat products                    | 238 (91.53)              | 113 (86.92)    | 12 (4.62)       | 9 (6.92)  | 10 (3.85)  | 8 (6.15)  | 0.470 |

### Table 3: Physical activity pattern among the participants

| Activities                                      | Remained Unchanged n (%) | Increased n (%) | Decreased n (%) | P   |
|------------------------------------------------|--------------------------|----------------|-----------------|-----|
| Domestic chores like cooking and cleaning utensils, washing clothes in machine | 189 (72.69)              | 95 (73.08)     | 57 (21.92)      | 19 (14.62) | 14 (5.38) | 16 (12.31) | 0.041* |
| Domestic chores like moping, dusting, washing clothes by hand | 194 (74.61)              | 93 (71.54)     | 54 (20.77)      | 21 (16.15) | 12 (4.62) | 16 (12.31) | 0.034* |
| Walking/running                                 | 125 (48.07)              | 75 (57.69)     | 26 (10.00)      | 7 (5.38)  | 109 (41.92) | 48 (36.92) | 0.05 |
| Yoga/resistance exercises                       | 187 (71.92)              | 94 (72.31)     | 22 (8.46)       | 3 (2.31)  | 51 (19.62) | 33 (25.38) | 0.05 |
| Aerobic exercises/dancing/Skipping etc.          | 232 (88.43)              | 106 (81.54)    | 5 (1.92)        | 3 (2.31)  | 23 (8.85) | 21 (16.15) | 0.15 |
| Any sport which requires movement of whole body (badminton, tennis etc.) | 235 (90.38)              | 112 (86.15)    | 5 (1.92)        | 2 (1.54)  | 20 (7.69) | 16 (12.31) | 0.43 |
conducted during the period reported a negative impact of the lockdown on lifestyle practices.[12–18] In a recent study, conducted by Chin et al. 2022,[18] in Malaysia, it was reported that 41.2% of the participants reported that their eating patterns were healthier, physical activities were reduced by 36.3%, and 25.7% had a poorer sleep quality.

In our study, weight gain was observed in 39.6% of the participants in phase-1 as well as in phase-2 (44.6%) due to changes in lifestyle patterns due to the pandemic. Weight gain was observed in other studies similar to the present study due to changes in lifestyle because of the ongoing pandemic.[16–18] Dey et al., 2020,[16] reported during lockdown-1 that rapid weight gain was observed in 16.7% of the study population. Although one study conducted on Saudi women reported no change in weight in the Saudi women during and after the lockdown.[19] Therefore, multiple factors may have increased the intake of unhealthy or comfort foods during the COVID-19 lockdown, including already overweight or obese, more sedentary time at home, and an overall change in dietary habits/patterns.

The present study results showed increased consumption of some food groups like refined flour, processed/packaged and frozen foods, sugar and sugar-sweetened foods, oils, ghee, and butter in most of the subjects but it was observed that dietary changes were more prominent during the first lockdown. The present study results agree with the recent studies showing that lockdowns during a pandemic had adversely influenced lifestyle activities worldwide as well as the participation in sports and physical activities.[13,20,21] A study by Jia et al. 2020,[24] also reported increased consumption of these food groups.

Our study reported that consumption of refined flour and processed food increased in about 34% of the obese subjects during lockdown-1, which was limited to only about 15% of the subjects during lockdown-2. Similarly, the consumption of sugar and sweetened food was increased in about a quarter of the participants in phase-1 and about 15% during lockdown-2. The consumption of fats and oils increased much more during lockdown-1 (33.8%) in comparison to lockdown-2 (15.4%). Ghosh et al., 2020,[22] conducted a study on type 2 diabetes subjects and reported that the quality of diet changed; carbohydrate consumption increased in 21% whereas 13% of the patients reported increase in the consumption of fat. Sankar et al., 2020,[23] reported an increased consumption of snacks and fried or processed foods among 24.5% of the study participants. In a study conducted by Pietrobelli et al., 2020,[14] it was found that the consumption of unhealthy foods including potato chips, red meat, and sugary drinks significantly increased during the lockdown in a sample of 41 young people in Italy who were classified as obese (P < 0.005–0.001). Another study conducted by Pellegrini et al., 2020,[18] used a questionnaire in 150 obese participants in Northern Italy and found that unhealthy food consumption, specifically sweet intake increased by 50%. This increase was associated with weight gain during the lockdown which may have been related to increased anxiety. Another change was observed in the consumption of fresh fruits and vegetables in our study with about 16.2% of the participants in lockdown-1 and 18.4% in lockdown-2 reporting an increased intake. This finding was in contrast to another study conducted by Paul et al., 2020,[4] which reported increased consumption of fruits in about 52% of the general public. Deschasaux-Tanguy et al. 2021[20] reported that 27.4% of the participants were buying fewer fresh products due to poor access to the usual food products. Rodríguez-Pérez et al., 2020[17] (23) reported that just over a quarter (27%) had issues with buying certain foods which included meat (23.83%) and vegetables (13.86%).

The prevalence of any kind of stress was reported to be higher almost in all the studies.[26–28] In a study conducted by Kaur et al., 2021,[28] 22% reported stress symptoms which are similar to our findings during lockdown-1 where 21.54% of the participants reported to being stressed due to COVID-19. Due to an increase in the prices of essential commodities like food and decreased food availability, panic attacks, sudden increase or decrease in appetite and insomnia were reported in many studies. Increased anxiety was also reported due to fear of the COVID-19 infection.[7]

As mentioned above, stress and anxiety may have a significant influence on food habits during the lockdown as Mitchell et al., 2020[29] found through a self-reported food intake questionnaire in 3,81,564 participants in pre-COVID-19 and during the COVID-19 lockdown. Similar to our results, a review study also concluded that the consumption of fresh fruits and vegetables decreased during the pandemics.[30] Another study reported that over the 4-week lockdown period, 57.8% informed that vitamin A-rich fruit and vegetable intake was reduced, 48.5% reported a decrease in other vegetable intake, and 64.9% informed a decrease in other fruit intake, with a reduction in fresh produce associated with higher anxiety.[31]

The precautions during COVID-19 had overall decreased the physical activity and exercises among participants in both the phases of the lockdown although this decrease was more prominent in the participants of phase-2 (50%) compared to phase-1 (34.4%). Similar findings were reported by Nair et al., 2020,[32] where 58.6% of the participants did little or no exercise.

Figure 4: Stress level during lockdown-1 and lockdown-2

| Not stressed at all | Stressed earlier but less stressed now | Not stressed earlier but very stressed now |
|---------------------|---------------------------------------|------------------------------------------|
| Phase-1 (%)         | Phase-2 (%)                           |
| 70                  | 60                                    | 50                                       |
| 40                  | 30                                    | 20                                       |
| 10                  | 0                                     | 10                                       |

Not stressed at all  Stressed earlier but less stressed now  Not stressed earlier but very stressed now
This corroborates with another study by Chopra et al., 2020[21] on adult Indians indicating similar results, which reported a significant reduction in moderate-intensity aerobic exercises as well as leisure-related activities. Despite the increased physical activity guidance and courses presented on social media, the current results showed that it was not possible for the participants with home activities to maintain their regular physical activity patterns adequately. Recently, it was reported that individuals exhibited a greater use (15%) of data and communications technology during the quarantine period.[25] Hence, future physical activity intervention during a pandemic can be based on communications technology solutions fitness apps to promote an active and healthy lifestyle during the quarantine.

Many studies including the present study reported an increase in the duration of sleep. Increased duration of sleep was observed among the phase-1 participants while an unchanged sleep pattern was observed among the phase-2 participants. This corroborates with the study by Chopra et al., 2020[21] which reported an increase in sleep by 8 h during the lockdown period. Similarly, another study by Sinha et al. 2020,[23] also reported a significant increase in the percentage of the participants who reported sleeping more than 8 h a day. In contrast, the COVID-19 pandemic has been linked to poor sleep quality in a multicentric study.[33]

India is already witnessing the burden of obesity and many other Non-Communicable diseases (NCDs), particularly diabetes, heart disease (CVD), and cancer, therefore, the importance of being physically active and healthy should not be overlooked during this period provided it is carried out in isolation. This is the first study in India comparing the effect of lockdowns on lifestyle management during two lockdowns. In the present study, it was observed that despite multiple awareness campaigns and health care advisories, one or the other areas of lifestyle management activities were affected. Therefore, it is very important even for the primary care physicians to be aware of the lifestyle measures in a more vulnerable population like obese patients, which could be significantly helped in such pandemic situations. Government organizations should also work in the direction of robust campaigning and provide opportunities for adequate adherence to healthy lifestyle practices. An integrated approach including intake of a balanced diet, yoga, and meditation along with standard treatment could be a simple and useful option for prevention as well as post-recovery phase of the COVID-19 management encompassing both physical and mental domains.

**Conclusion**

The impact of lockdowns on health was very significant and different areas of lifestyle were affected in both the lockdowns. During lockdown-1, monitoring of health parameters, eating frequency, and diet and stress levels were affected more whereas, during lockdown-2, sleep duration and physical activity were affected more. Weight gain was reported in both phases of the lockdown. Comprehensive lifestyle interventions are required to be planned and implemented. Primary care physicians can play a very important role in community outreach and creating awareness and guiding the patients in such pandemic situations in the future.

**Authors contributions**

RJ, NV, DT Planned the study. P, MM, MP, KG, TK collected data, RJ, DT analyzed the data, DT, RJ, P, MM sought literature, RJ, DT, P, MM prepared the first draft. RJ, NV, AR, PR, PS gave valuable inputs and, RJ, DT, NV prepared the final draft. NV, AR, PR, PS reviewed the draft.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**

There are no conflicts of interest.

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