

Lockdown and its Impact on Food and Exercise Study

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Abstract

Introduction: The COVID-19 pandemic had enforced several restrictions which were necessary to abate the spread of the virus, however, the blow of these limitations on health behaviors and lifestyles remains vague. Therefore, this study was carried out to assess the behavioral and lifestyle consequences of complete lockdown during the pandemic. **Materials and Methods:** The Lockdown and its Impact on Food and Exercise study was a pilot study conducted in the form of a questionnaire which was handed out to the public and circulated electronically. The questions regarding exercise were adapted from the International physical activity questionnaire and those regarding food habits were taken from the Public Library of Science and the Self-regulation of Eating Behavior Questionnaire. This survey was conducted from March 28 to April 14, 2020, during which a complete lockdown prevailed. **Results:** The COVID-19 complete lockdown had a negative impact on all intensity exercise levels, vigorous exercise (64.34% vs. 41.20%, $P \leq 0.00001$), moderate exercise (95.67% vs. 84.57%, $P \leq 0.00001$), and walking (55.42% vs. 42.89%, $P = 0.0003$). Food consumption and meal patterns (58.55% vs. 47.95%, $P = 0.0022$) were also more unhealthy (78.60% vs. 87.94%, $P = 0.0096$) during complete lockdown with only the consumption of late night snack decreasing significantly. **Conclusion:** The results of this analysis indicate that physical activity had decreased significantly and eating behaviors were unhealthy. Hence, our survey will help to develop interventions which would potentially alleviate these negative lifestyle and nutrition behaviors.

Keywords: Complete lockdown, exercise, nutritional behavior

INTRODUCTION

The current public health crisis, COVID-19 had enforced several restrictions on day-to-day activities including home confinement, self-isolation, and social distancing. While these dealings were necessary to decline the spread of the virus, the blow of these restrictions on health behaviors and lifestyle remain undefined.

Exercise is universally prescribed as the initial treatment for all chronic diseases as it is seen as a cost-effective medication.^[1] “Exercise as medicine” is a term used to notify that several medical conditions can be prevented by exercise and physical activity.^[2] Physical fitness is undoubtedly linked with the capability to cope with infections and cardiopulmonary and immunologic complications. There are a number of exercises which can be practiced during the complete lockdown. Regular exercise is necessary for the body and brain.^[3] Some of the

benefits of exercise include weight control, promotion of better sleep, energy boost, and mood improvement.^[4] Hence, exercise is a verified mood-booster and can help decrease stress levels and put together emotional resilience which is crucial during this lockdown due to a spike in suicidal ideas.^[5] Some of the exercises mentioned by world athletics to keep our body fit, focused and sane are: Doing planks, step-ups, free weights, and skipping.^[6]

Food is medicine if it is taken in appropriate amounts. Eating can be healthy if it is kept at bay, as overeating can cause obesity and eating less can cause many complications including mental health problems.^[7] Binge eating is seen as an addiction to food^[8] and can cause obesity which is a health problem that has medical, emotional, and economic consequences.^[9] Hence,

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considerable importance should be given to what we eat and how much we consume.

Officially United Kingdom has the biggest COVID-19 death toll in Europe and is currently experiencing a second wave of COVID due to which Britain has imposed a 6-month curfew.^[10] Since this data was recorded during a complete lockdown, it gives an idea for new interventions and changes that need to take place to maintain physical fitness and proper dietary behavior during such difficult times.

There is minimal evidence on the effects of complete lockdown on exercise and food habits. Our study presents the results of 415 responders on exercise and nutrition behaviors during a complete shutdown. Therefore, we carried out an analysis to evaluate the behavioral and lifestyle consequences of complete lockdown during the pandemic.

MATERIALS AND METHODS

The Lockdown and its Impact on Food and Exercise (LIFE) study was a prospective, observational, pilot study conducted in the form of a questionnaire which was handed out to 415 people, of which 265 (63.86%) were those who had accompanied patients presenting to Sundaram Hospital, a secondary care setting in Trichy, Tamil Nadu, and contacts obtained from them (150 people - 36.14%) to whom the questionnaire was sent electronically and their answers were recorded. Mask and gloves were being worn while handing out questionnaires to the public and a social distance of 1 m was maintained as per World Health Organization (WHO) recommendations. The papers were collected and kept in a plastic file that remained untouched and kept in isolation for 3 days after which they were used for collecting data.

This survey was conducted from March 28 to April 14, 2020, during which a complete lockdown prevailed. LIFE study was disclosed in 2 different languages, namely English and Tamil, and was handed out to the public or uploaded and shared on WhatsApp and E-mails. The survey included 41 questions on their physical activity and nutritional behaviors. The questions regarding exercise were adapted from the “International physical activity questionnaire”^[11] and were offered in a divergent layout, with questions linked to responses “before” and “during” complete lockdown. Moreover, those regarding food habits were taken from “Public Library of Science”^[12] and Self-regulation of Eating Behavior Questionnaire^[13] – A standard questionnaire on food habits.

The baseline characteristics, responses to the physical activity questionnaire, physical fitness trainer question, tempting foods, and sleep hours were evaluated by descriptive statistics. Mean and standard deviation values were assessed for continuous variables. Count and percentages were calculated for categorical variables. Normally distributed continuous variables and categorical variables were compared by two-tailed unpaired *t*-test and Chi-square test, respectively. A $P < 0.05$ was used as the level of statistical significance

for all tests. All statistical calculations were performed using the SPSS statistics version 27 (IMB Corp. Released June 16, 2020, IBM SPSS Stastics for Windows, Version 28.0.Armonk, NY : IBM Corp). The research was conducted by obtaining prior approval from the institutional ethics committee with IECHS approval number: 28. There was no conflict of interest from the authors during this study.

The LIFE study was designed to assess the change in exercise patterns and eating behaviors of people during the complete lockdown. A descriptive analysis was done using SPSS software. According to the “International physical activity questionnaire,” questions related to various intensity exercise levels (vigorous, moderate, and walking) were inquired and the time spent achieving them were recorded. The response preference and their assigned scores for the duration of exercise were as given: 1 = <15 min, 2 = 15–30 min, 3 = 30–45 min, 4 = >45 min. 5 questions were asked regarding the nutritional behaviors of the participants: (i) how likely were they to have a late-night snack/meal and if it was healthy or not (healthy snack include fruits, vegetables, legumes, nuts, and whole grains), (ii) how long have they found themselves binge eating, (Binge eating is defined as frequently consuming unusually large amounts of food in one sitting and feeling that eating behavior is out of control) (iii) do they have snacks between meals, (iv) do they find any of these foods tempting-chocolate, cake, ice cream, pastries, pizza, fried food, popcorn and specify if any other, v) do they intend not to eat too much of the foods they find tempting in the previous question. The questionnaire was divided into 2 sections-“before and during the complete lockdown.” Each question was asked in both sections of the questionnaire. The response preference and their assigned scores for i-iii questions were as given: 1 = Never, 2 = Sometimes, 3 = Most of the time, 4 = Always. Here, “never” assigns no unhealthy dietary behavior, and “always” indicates unhealthy dietary behavior.

RESULTS

Sample description

This study presents the results of 415 responders on exercise and nutrition behaviors from March 28 to April 14, 2020. On the whole, 63.86% of the participants were males and 36.14% were females. Gender, state, age, level of education, employment status, health state, and risk factors are shown in Table 1.

Physical activity “before” and “during” the complete lockdown

Vigorous intensity

Vigorous-intensity exercises included weight lifting, aerobics, jogging (8 km/h), running, cycling (>16 km/h), swimming (slow freestyle laps), and climbing up stairs. This had decreased by 23.14% (64.34% vs. 41.20%, $P \leq 0.01$) during complete lockdown. The duration for which these exercises were done was also decreased ($P = 0.49$). The response preference and their assigned scores for duration questions were as given: 1

= <15 min, 2 = 15–30 min, 3 = 30–45 min, 4 = >45 min. The number of people who had exercised for <15 min before and during lockdown had reduced (96 vs. 61), 15–30 min (74 vs. 49), 30–45 min (23 vs. 22), >45 min (21 vs. 12). Hence the overall duration of exercise had also reduced. On questioning further we found that people jogged on the terrace of their house or on a treadmill and cycled using exercise cycle machines or cycled within their street limits. Reply to the vigorous activity questions recorded “before and during” complete lockdown are presented in Table 2.

Moderate intensity

Moderate intensity exercises included sweeping and scrubbing the house, breathing exercises, and carrying light loads. This had decreased by 11.10% (95.67% vs. 84.57%, $P \leq 0.01$) during complete lockdown. The duration for which these exercises were done was also decreased ($P = 0.52$). Replies to the moderate activity questions recorded “before and during” complete lockdown are shown in Table 3.

Walking

Walking decreased by 12.53% (55.42% vs. 42.89%, $P = 0.01$) during complete lockdown. The duration for which this was done was also decreased ($P = 0.31$). Responses recorded before and during complete lockdown are presented in Table 4.

Time of the day

Times of the day signify exercising in the morning, afternoon, evening, and/or night. Exercising in the morning time had decreased significantly during the lockdown ($P < 0.01$). Recorded responses before and during complete lockdown are presented in Table 5.

All physical activities

The COVID-19 complete lockdown had a negative impact on all physical activities of all intensity levels including vigorous exercise (64.34% vs. 41.20%, $P \leq 0.01$), moderate exercise (95.67% vs. 84.57%, $P \leq 0.01$), and walking (55.42% vs. 42.89%, $P = 0.01$) meaning all forms of exercise were decreased.

Physical fitness trainer

People exercising with a physical fitness trainer to monitor their progress had decreased significantly ($P = 0.01$ [S]). Some people had an online physical fitness trainer to monitor their progress and help them during complete lockdown while others had stopped exercising due to the closure of gyms. Replies to the physical fitness trainer question recorded “before and during” complete lockdown are presented in Table 6.

Dietary behaviors before and during the complete lockdown

The dietary behaviors questionnaire included five questions as mentioned in the materials and methods section of this article. (i and ii) questions were included in both before and during complete lock down sections of the questionnaire whereas (iii–v) questions were asked in the second section of the questionnaire (during complete lockdown).

Table 1: Demographic characteristics of the participants

| Variables | n (%) |
|--------------------------|--------------|
| Gender | |
| Male | 265 (63.86) |
| Female | 150 (36.14) |
| Age (years) | |
| <40 | 228 (54.94)& |
| 40-60 | 117 (28.19) |
| >60 | 70 (16.87) |
| Levels of education | |
| Completed schooling | 59 (14.22) |
| Not completed schooling | 21 (5.06) |
| Employment status | |
| Employed | 226 (54.46) |
| Unemployed | 1 (0.24) |
| Baseline characteristics | |
| Diabetes | 78 (18.80) |
| Hypertension | 80 (19.28) |
| Heart disease | 55 (13.25) |
| Obesity | 57 (13.73) |
| Smoking | 11 (2.65) |
| High cholesterol levels | 16 (3.85) |
| Family history | 75 (18.07) |
| Others | 6 (1.45) |
| Risk factors | 210 (50.60) |

Table 2: Responses to the physical activity questionnaire recorded before and during complete lockdown

| Vigorous exercise | BL | DL | Percentage | P |
|-------------------|----|----|------------|-------|
| Weight lifting | 28 | 0 | 3.37 | <0.01 |
| Aerobics | 7 | 12 | 2.29 | 0.25 |
| Jogging | 59 | 51 | 13.25 | 0.41 |
| Running | 42 | 9 | 6.14 | <0.01 |
| Cycling | 25 | 24 | 5.90 | 0.40 |
| Swimming | 12 | 1 | 1.57 | 0.01 |
| Climb up stairs | 94 | 74 | 20.24 | 0.08 |

BL: Before lockdown, DL: During lockdown

Table 3: Responses to the physical activity questionnaire recorded before and during complete lockdown

| Moderate exercise | BL | DL | Percentage | P |
|----------------------|-----|-----|------------|------|
| Sweep | 101 | 93 | 23.37 | 0.51 |
| Scrub | 72 | 67 | 16.75 | 0.64 |
| Breathing exercise | 89 | 77 | 20.00 | 0.30 |
| Carrying light loads | 135 | 114 | 30.00& | 0.11 |

BL: Before lockdown, DL: During lockdown

Dietary behavior

Food consumption and meal patterns (58.55% vs. 47.95%, $P = 0.01$) were also more unhealthy (78.60% vs. 87.94%, $P = 0.01$) during complete lockdown with only the consumption of late-night snack decreasing significantly. About 90% of the people were binge eating, while 76.23% were having snacks between meals and 48.43% intend to eat

too much of foods tempting them which were found to be unhealthy.

Late night snack

The recorded response shows that late-night snack consumption had decreased significantly and the healthiness aspect of it had increased significantly ($P = 0.01$ [S]), meaning, the late-night snack consumed by the participants were healthy and included fruits, vegetables, legumes, nuts, and whole grains. Responses to Question 1 recorded before and during complete lockdown are presented in Table 7 and Graph 1.

Binge eating

It was found that 90% of the people were binge eating. Responses to Question 2 recorded before and during complete lockdown are presented in Graph 2.

Snacks between meals

It was found that 76.23% had snacks between meals. Responses to Question 3 recorded before and during complete lockdown are presented in Graph 3.

Tempting food

This data were compared with their age and gender and the responses are recorded in Table 8 and Table 9. It was found that people less than or equal to the age of 40 were more tempted to eat chocolates, cakes, ice creams, and pizza and 51.57% of the participants intend not to eat too much of the foods that they find tempting while 48.43% of them intend to eat too much of the tempting foods.

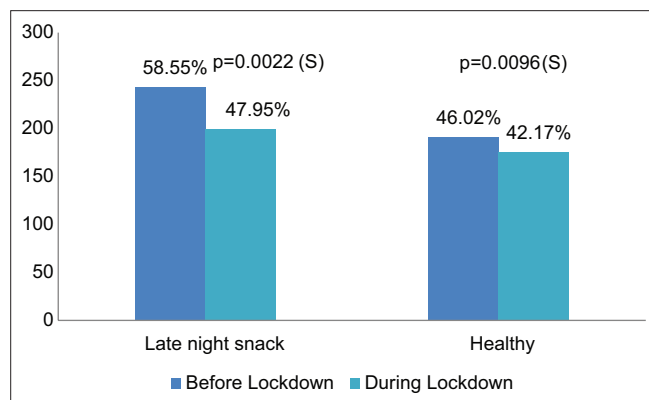
Sleep hours and stress

Sleep hours

Comparison of the sleep hours of the participants before and during complete lockdown shows that: 5–6 h sleep (38.07% vs. 14.46%), 6–8 h (51.57% vs. 49.40%), 8–10 h (9.16% vs. 29.88%), >10 h (1.20% vs. 6.26%), meaning sleep hours had increased significantly during complete lockdown ($P = 0.01$ [S]) which is shown in Graph 4.

Stress

Data show that the stress factor of the participants had decreased significantly during complete lockdown (14.94%, $P = 0.01$).



Graph 1: Responses to Question 1 recorded before and during complete lockdown

DISCUSSION

The 2019 novel coronavirus (2019-nCoV) or the acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the current public health crisis threatening the world^[14] was officially declared as a public emergency of international concern by WHO.^[15] The COVID-19 pandemic had enforced several restrictions which were necessary to abate the spread of the

Table 4: Responses to walking daily questionnaire recorded before and during complete lockdown

| | BL | DL | Percentage | P |
|--|-----|-----|------------|-------|
| Walk daily | 230 | 178 | 49.16 | 0.01 |
| Feeling stressed | 150 | 88 | 28.67 | <0.01 |
| Trainer to monitor and guide during exercise | 27 | 11 | 4.58 | <0.01 |

BL: Before lockdown, DL: During lockdown

Table 5: Responses recorded before and during complete lockdown

| Time of the day | Exercise BL | Exercise DL | Percentage | P |
|-----------------|-------------|-------------|------------|-------|
| Morning | 250 | 169 | 50.48 | <0.01 |
| Afternoon | 7 | 11 | 2.17 | 0.34 |
| Evening | 103 | 109 | 25.54 | 0.63 |
| Night | 19 | 24 | 5.18 | 0.43 |

BL: Before lockdown, DL: During lockdown

Table 6: Responses to the physical fitness trainer question recorded before and during complete lockdown

| Trainer | Yes | No | Percentage |
|---------|-----|-----|------------|
| BL | 27 | 388 | 6.51 |
| DL | 11 | 404 | 2.65 |

BL: Before lockdown, DL: During lockdown

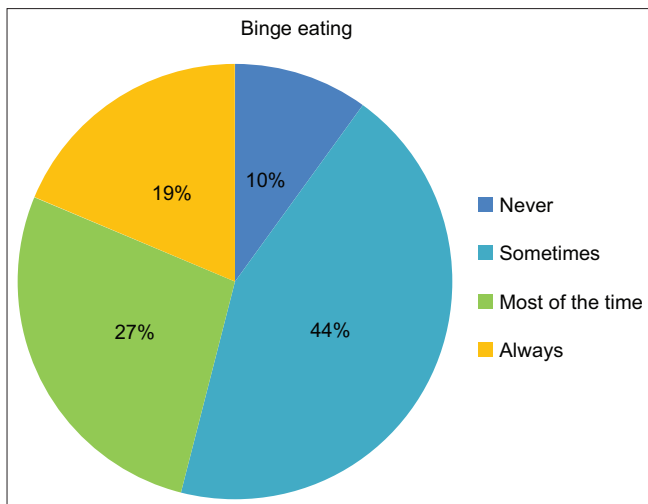
Table 7: Responses to Question 1

| | Exercise BL | Exercise DL | Percentage | P |
|------------------|-------------|-------------|------------|------|
| Late night snack | 243 | 199 | 53.25 | 0.01 |
| Healthy | 191 | 175 | 44.10 | 0.01 |

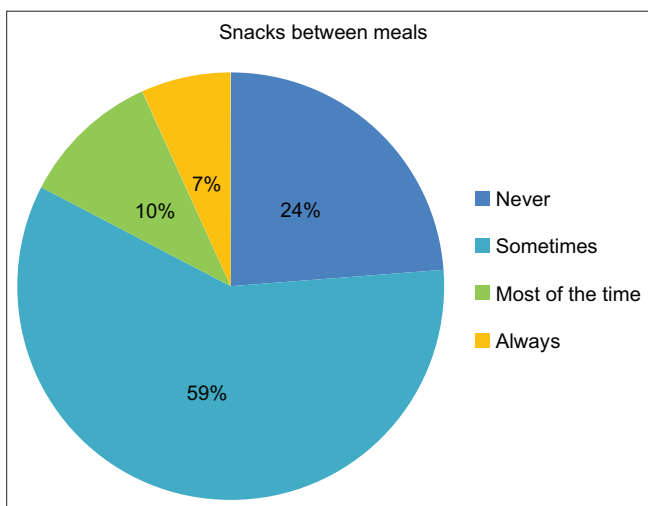
BL: Before lockdown, DL: During lockdown

Table 8: Tempting foods compared with the age of the participants

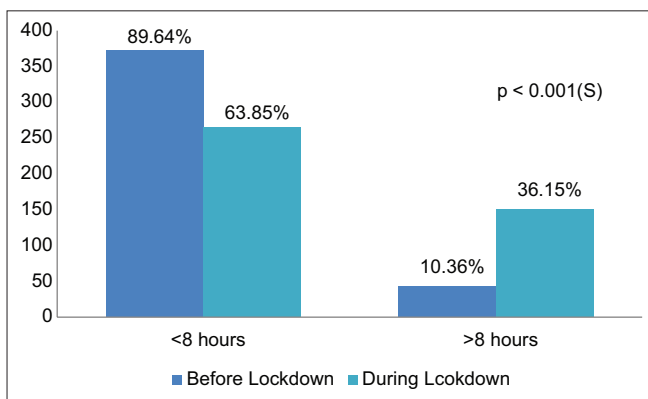
| Tempting foods | Age | | Percentage | P |
|----------------|-----|-----|------------|-------|
| | ≤40 | >40 | | |
| Chocolate | 46 | 6 | 23.32 | <0.01 |
| Cake | 35 | 8 | 19.28 | 0.01 |
| Ice cream | 41 | 11 | 23.32 | 0.01 |
| Pastries | 14 | 4 | 8.07 | 0.12 |
| Pizza | 25 | 2 | 12.12 | 0.00 |
| Fried foods | 52 | 21 | 32.74 | 0.09 |
| Popcorn | 14 | 6 | 8.97 | 0.48 |
| Others | 28 | 28 | 25.11 | 0.04 |



Graph 2: Responses to Question 2 recorded before and during complete lockdown



Graph 3: Responses to Question 3 recorded before and during complete lockdown



Graph 4: Comparison of the sleep hours of the participants before and during complete lockdown

virus but the blow of these limitations on health behaviors and lifestyles remain under defined. Hence, we carried out a pilot

Table 9: Tempting foods compared with the gender of the participants

| Tempting foods | Male | Female | Percentage | P |
|----------------|------|--------|------------|------|
| Chocolate | 24 | 26 | 22.42 | 0.77 |
| Cake | 20 | 23 | 19.28 | 0.12 |
| Ice cream | 23 | 29 | 23.32 | 0.02 |
| Pastries | 7 | 7 | 6.28 | 0.93 |
| Pizza | 7 | 20 | 12.12 | 0.01 |
| Fried foods | 43 | 30 | 32.74 | 0.01 |
| Popcorn | 5 | 15 | 8.97 | 0.01 |
| Others | 36 | 20 | 25.11 | 0.01 |

study to evaluate the behavioral and lifestyle consequences of complete lockdown during the pandemic.

Failure to achieve the minimum recommended physical activity– 150 min for moderate exercise or 75 min of vigorous exercise per week is considered as one of the most common contributors of poor health.^[16] Despite WHO recommendations on physical activity, it was found that the COVID-19 complete lockdown had a negative impact on all intensity exercise levels, vigorous exercise (64.34% vs. 41.20%, $P \leq 0.01$), moderate exercise (95.67% vs. 84.57%, $P \leq 0.01$) and walking (55.42% vs. 42.89%, $P = 0.0003$) which indicates that the remarkable number of people were physically inactive and all forms of exercise were reduced. There was a significant decrease in weight lifting, swimming, and running probably due to closure of gyms, swimming pools and restriction of usage of roads due to which cycling and jogging had also decreased. Exercising regularly has a number of benefits which were mentioned earlier.^[5] It also helps in preventing the onset of heart failure and provides salutary.^[17] Hence, physical inactivity can lead to an increase in disease and mortality risks.^[18]

Dietary behavior is crucial as it influences our lifestyle and physical fitness. Food consumption and meal patterns (58.55% vs. 47.95%, $P = 0.0022$) were also more unhealthy (78.60% vs. 87.94%, $P = 0.0096$) during complete lockdown with only the consumption of late-night snack decreasing significantly. It was found that 90% of the people were binge eating, while 76.23% were having snacks between meals and 48.43% intend to eat too much of foods tempting them which were found to be unhealthy. The negative changes in eating behavior can be associated with mood-driven eating or eating out of anxiety or boredom.^[19] Overeating can cause obesity and severe obesity has medical, emotional and economic consequences.^[6,7] Unhealthy food along with physical inactivity and sedentary lifestyle can lead to obesity, which in turn can cause mortality.^[20]

Our study shows that despite WHO guidance^[11] physical activity had decreased and eating behaviors had become more unhealthy, with the only exception of late-night snack decreasing significantly. This may be because the sleeping hours of participants had increased significantly. The amount of sleep depends on various factors, especially age. Adults need about 7–9 h of sleep.^[21] Sleep is essential for good health and

wellbeing throughout our life.^[22] Heart failure and obesity are linked to sleep disorders.^[21] Lack of sleep is a risk factor for heart diseases like smoking and lack of exercise.^[23] According to the WHO an average of 8 h of sleep is necessary for active functioning.

Self-quarantine during the complete lockdown, though crucial to safeguard public health, has certain disadvantages. Our survey shows that exercise and nutritional behaviors get affected during a complete lockdown. This will help to develop interventions which would potentially alleviate these negative lifestyle and nutrition behaviors to maintain healthy lifestyle habits during the current new normal state. The WHO has advised that taking a break from sitting, by doing 3–4 min of light-intensity exercises such as walking or stretching will help improve physical health and that regular physical activity profits both the body and mind by (i) reducing increased blood pressure, (ii) helping handle weight gain and (iii) decreasing the danger of heart disease-all conditions that can increase susceptibility to COVID-19.^[24] Food and Agriculture Organization of the United Nations (FAO)^[25] has called on everyone to fortify their immune system with a healthy and conscious diet by following these 7 healthy eating tips (i) strengthening the immune system through a proper diet, (ii) Not just buying nonperishable food, (iii) To plan our purchases, (iv) Not to throw over leftovers, (v) To drink plenty of water, (vi) Making the most of your budget and (vii) Cooking with kids^[25] to maintain a healthy lifestyle during the current new normal state.

The usage of electronic gadgets and the Internet has increased drastically over the recent decade^[26] especially during the lockdown stage. Obsessive usage of electronic gadgets and Internet causes sleep disturbances at night among adolescents^[27] which may lead to anxiety and depression. Sleep deprivation also causes obesity.^[28] Hence increasing awareness on physical inactivity and obesity and encouraging exercise and maintenance of proper diet through social media across the internet can help cross boundaries and establish healthier habits. This can be done with the help of numerous apps that help in monitoring our fitness activities^[29] and diet plans.^[30] This is one of the effective ways in which people can maintain their fitness during the new normal state.

Strengths and limitations

The advantages of this study are the following: First, it was conducted during a complete lockdown, hence it could be more representative of habits which were prevalent. Second, this is the only such data available currently.

Third, our study helps to provide evidence to confirm that unhealthy practices were prevalent during complete lockdown. We presume that our study would help to establish measures which are focused on the local population to overcome such difficulties

Finally, this analysis would underscore the need for larger trials to evaluate exercise and nutritional behaviors.

However, our study has several limitations – Firstly, it is a pilot study. Secondly, it was conducted in the form of a questionnaire and has its inherent disadvantages (the interpretation and understanding of each questions by the study subjects varies and the question of desirability bias exists where the subjects showed a masked approach). Thirdly, the sample size of this study is small as it could be conducted only with those who could come out of their houses during the complete lockdown. Finally, the study was not multicentric.

However, our study will be unique in that, till date, it is the only form of evidence available in our country.

CONCLUSION AND FUTURE PERSPECTIVE

While self-quarantine and isolation during complete lockdown are crucial to safeguard public health, the results of this analysis indicate that physical activity had decreased significantly and eating behaviors were unhealthy which are grievous to the wellbeing of the public. Our survey will help to develop interventions which would potentially alleviate these negative lifestyle and nutrition behaviors during the current new normal state.

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Conflicts of interest

There are no conflicts of interest.

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