

Dietary and lifestyle changes among Pakistani adults during COVID-19 pandemic: A nationwide cross-sectional analysis

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ABSTRACT

Introduction: During the pandemic, sedentary behaviors, anxiety, and boredom caused by confinement at home could affect lifestyle patterns, degrade diet quality, and promote overconsumption. This cross-sectional study aimed to identify the impact of lockdowns on lifestyle behaviors among Pakistan's population and changes in the nutritional and eating patterns. **Materials and Methods:** This is an online, questionnaire-based, cross-sectional study. The study collected demographic information, dietary habits, and lifestyle patterns. Descriptive and summary statistics were used to describe data, and Chi-square or Fisher's exact tests were used for associations. **Results:** Most respondents were females (82.1%) aged 18–29 years (98.1%). 90.3% of them were students. 16.0% were overweight pre-pandemic, which increased to 20.0% during the pandemic. The majority ate more during the pandemic ($P < 0.001$). 47.9% reported a physical activity duration of 0.5–2 h pre-pandemic, and 50.6% reported decreased physical activity during the pandemic, with increased food intake ($P = 0.007$). Screen time was < 4 h for most (48.8%) participants pre-pandemic, and the majority (89.7%) of respondents reported an increased screen time during the pandemic, associated with a higher food intake (47.9%, $P = 0.029$). **Conclusion:** The pandemic has negatively impacted lifestyles and diets, including a significant decrease in physical activity, increased food intake, and increased screen time.

Keywords: COVID-19, diet, exercise, lifestyle, population

Introduction

The coronavirus disease-19 (COVID-19) outbreak was labeled as a pandemic by the World Health Organization (WHO) on March

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11, 2020.^[1] As of September 9, 2021, 221,388,047 confirmed COVID-19 cases have been reported, with 4,579,173 global deaths. In Pakistan, the total case number and deaths are reported as 1,179,305 and 26,175, respectively.^[2] The COVID-19 pandemic has taken a massive toll on the physical and psychological health of the community. The associated restrictions with the pandemic have led to sudden lifestyle changes in social distancing and home isolation.

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Daily sitting time has increased from 5 to 8 h per day during the pandemic restrictions.^[3] Sedentary behaviors, anxiety, and boredom caused by home confinement could influence eating habits, change lifestyle patterns, reduce diet quality, and promote overconsumption.^[4] A poor diet can have detrimental effects on the immune system and could influence disease susceptibility. Gut microbial composition and adequate maintenance of micronutrients such as iron, zinc, and vitamins A, E, B6, and B12, are essential for a healthy immune system.^[5] Poor nutrition and lifestyle practices can also result in poor psychological health, depression, and further medical complications, particularly for patients with co-morbidities.^[6]

The disruption in the work routine caused by the quarantine may lead to boredom, which is linked to increased food intake.^[7] The negative news on conventional and social media on COVID-19 can be stressful. Stress causes people to overeat, especially sugar-rich “comfort foods,” also known as “food craving.”^[8,9] Overeating can lead to a chronic state of inflammation, potentially increasing the risk for more severe COVID-19 complications. The consumption of processed carbohydrates with a high glycemic index is associated with an increased risk of developing obesity and cardiovascular diseases.^[10,11]

There exists a link between sleep patterns and obesity. The proposed mechanism is an increased secretion of pro-inflammatory cytokines from visceral adipose tissue, contributing to a shift in the sleep–wake pattern.^[12,13] Decreased physical activity is linked to obesity and hunger disorders.^[14] People with morbid obesity (Body mass index (BMI) 40 kg/m²) are more likely to develop complications from COVID-19.^[15] Obesity leads to lower expiratory reserve volume, functional capacity, and respiratory compliance. Reduced diaphragmatic excursion in patients with excessive central fat compromises pulmonary function in the supine position, making breathing more difficult.^[16]

Physical activity is closely associated with work activities, daily commute, and sports participation, which have all been affected to curb the spread of infection. A study conducted in France concluded that the lockdown period in France was related to a decrease in the nutritional quality of diet, which could be partly explained by changes in food choice motives.^[17] A study conducted in Mumbai, India, revealed reduced consumption of fruits and vegetables and increased intake of snacks during the lockdown period.^[18] Physical tiredness, emotional exhaustion, irritation, and tension were reported by a considerably more percentage of participants in a study conducted in the United Arab Emirates (UAE) during the pandemic compared to pre-pandemic ($P < 0.001$). During the pandemic, 60.8% reported sleep problems.^[19]

To the best of our knowledge, there is no study examining the effects of the COVID-19 pandemic on lifestyles and dietary habits in Pakistan. Therefore, the current study is focused on recognizing dietary changes and patterns, and their coalition

with socio-demographic factors, BMI, and lifestyle behavior changes which would prompt primary care physicians to take necessary measures for public health awareness and promote healthy lifestyle habits among the masses.

Materials and Methods

Study participants and survey design

This is a cross-sectional study carried out among the general population of Pakistan during the lockdown period of the pandemic between July 19, 2021 and August 20, 2021. Informed consent was obtained from all participants in the study before data collection. The sample size was calculated using the open-EPI sample size calculator. The estimated sample size obtained was 385 with a 95% confidence level and 80% power. The questionnaire was developed via SurveyMonkey and distributed via online social media platforms, including Facebook, WhatsApp, and emails. The questionnaire was translated in Urdu, i.e., the national language of Pakistan, and available in English. It was simple, concise, and took approximately 5 min to complete. Before its administration, the questionnaire was reviewed by local experts for its validity, reliability, and also tested via a pilot survey. The inclusion criteria for participation were the following: (1) being a Pakistani residing in any of four provinces such as Sindh, Punjab, Balochistan, and Khyber Pakhtunkhwa, (2) having age of 18 years or more, and (3) having internet access. The exclusion criteria were respondents aged less than 18 years, pregnant and breastfeeding females, and refusal to provide informed consent.

Instruments

The questionnaire consisted of three sections; the first section addressed the participants’ demographic data, including age in years, gender, level of education, occupation, and marital status. The participants were also asked to report any changes in their BMI before and during the pandemic (i.e., increased, decreased, or stayed the same).

Dietary questionnaire

The second section assessed the dietary changes of the participants before and during the pandemic with food items listed as follows: vegetables, fruits, whole grain, low-fat meat, eggs, pulses, fish, processed meat, salty snacks, fast food, confectionery items, sweetened spreads, commercial pastries, ice-cream, pudding, home-made pastry, sweetened/carbonated beverages, water, tea/coffee, and home-made food. The participants were asked to report the consumption of these food items using frequency choices stated as consumed/ate less, consumed/ate more, or stayed same (no change). The respondents were also asked if they faced any issues with the availability of food during the pandemic.

Lifestyle questionnaire

The third section included lifestyle components such as self-reported sleep patterns, smoking, physical activity, and screen time during the COVID-19 pandemic.

Ethical considerations

The Research Ethics Committee of the Dow University Hospital approved this study. Consent was obtained from the study participants before study commencement.

Statistical analysis

The study was analyzed using the Statistical Package for Social Sciences (SPSS), version 25.0, Armonk, NY: IBM Corporation (USA). The descriptive analysis of each quantitative variable was presented as frequency (numbers) and percentages, further using categorical variables analysis via Chi-square or Fisher's exact test to observe the association among dietary habits. Statistical significance was considered if $P < 0.05$ (two-tailed).

Results

Socio-demographic characteristics of participants

A total of 512 respondents were recruited for analysis. However, 28 incomplete responses were removed from the final analysis. Hence, a total of 486 responses were included. The majority were females (82.1%) aged between 18 and 29 years (98.1%). Most respondents had higher secondary education (49.8%), 42.2% were graduates, and 90.3% were students. 97.7% were unmarried, 53.5% belonged to the state of Punjab, and 24.9% had co-morbidities. 64.9% of respondents reported normal weight before the pandemic, which decreased to 61.5% of respondents during the pandemic. Another 16.0% reported being overweight before the pandemic, which increased to 20.0% respondents during the pandemic [Table 1 and Figure 1].

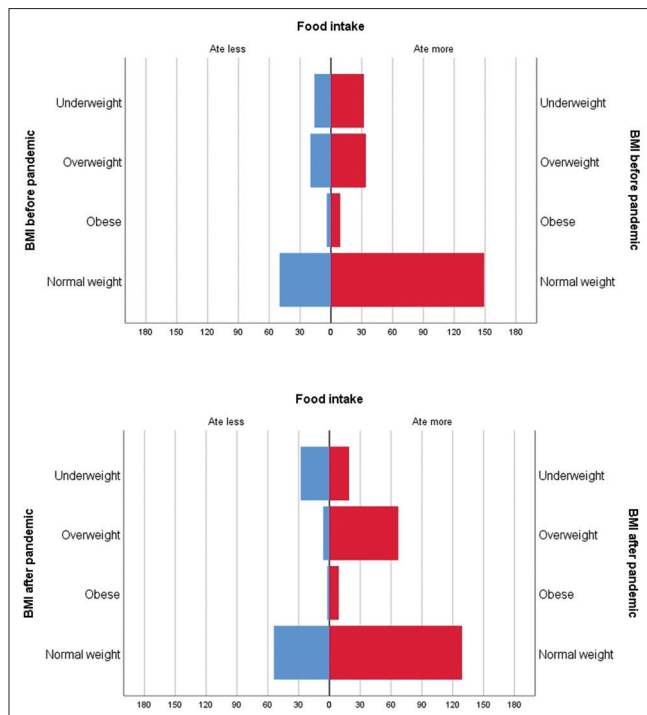


Figure 1: Association of BMI pre- and post-pandemic with dietary change

Dietary changes during the COVID-19 pandemic

The majority of respondents reported decreased food availability during the pandemic (78.8%). The unhealthy pattern of dietary intake was characterized by an increased uptake of tea/coffee reported in 54.5% of participants, fast food (33.5%), ice-cream (29.2%), salty snack (28.4%), processed meat (18.1%), confectionery items (14.8%), sweetened spreads (20.0%), commercial pastries (19.5%), sweetened/carbonated beverages (12.1%), pudding (12.1%), and home-made pastry (18.1%), as well as a decreased consumption of vegetables (15.4%), fruits (15.2%), eggs (20.2%), pulses (11.5%), fish (36.2%), water (48.1%), whole grain (13.0%), low-fat meat (20.2%), and home-made food in 17.9% of the respondents [Table 2].

Lifestyle changes during the COVID-19 pandemic and its association with dietary patterns

47.9% reported a physical activity duration of 0.5–2 h pre-pandemic, and 50.6% reported having decreased physical

Table 1: Socio-demographic characteristic of the respondents

| Variable | Characteristics | Frequency |
|--------------------------|---------------------|------------|
| Age | 18-29 years | 477 (98.1) |
| | 30-39 years | 7 (1.4) |
| | 40-59 years | 1 (0.2) |
| | >60 years | 1 (0.2) |
| Gender | Male | 87 (17.9) |
| | Female | 399 (82.1) |
| Education | Primary/Secondary | 21 (4.3) |
| | Higher Secondary | 242 (49.8) |
| | Graduate | 205 (42.2) |
| | Postgraduate | 18 (3.7) |
| Occupation | Unemployed | 15 (3.1) |
| | Employed | 12 (2.5) |
| Marital status | Students | 439 (90.3) |
| | Healthcare worker | 20 (4.1) |
| | Single | 475 (97.7) |
| Monthly household income | Married/Widowed | 11 (2.3) |
| | <20,000 PKR | 43 (8.8) |
| Region | 21,000-50,000 PKR | 98 (20.2) |
| | 51,000-100,000 PKR | 117 (24.1) |
| | 101,000-200,000 PKR | 119 (24.5) |
| | >200,000 PKR | 109 (22.4) |
| BMI before pandemic | Sindh | 144 (29.6) |
| | Punjab | 260 (53.5) |
| | Khyber Pakhtunkhwa | 74 (15.2) |
| | Balochistan | 8 (1.6) |
| BMI after pandemic | Normal weight | 315 (64.9) |
| | Obese | 20 (4.1) |
| | Overweight | 78 (16.0) |
| BMI during pandemic | Underweight | 73 (15.0) |
| | Normal weight | 299 (61.5) |
| | Obese | 17 (3.5) |
| | Overweight | 97 (20.0) |
| | Underweight | 73 (15.0) |

PKR=Pakistani rupee

Table 2: Dietary changes during the COVID-19 pandemic

| Food items | Dietary pattern | Frequency n (%) |
|---------------------------------|-----------------|-----------------|
| Vegetables | Decreased | 75 (15.4) |
| | Increased | 104 (21.4) |
| | No changes | 307 (63.2) |
| Fruits | Decreased | 74 (15.2) |
| | Increased | 204 (42.0) |
| | No changes | 208 (42.8) |
| Whole grain | Decreased | 63 (13.0) |
| | Increased | 108 (22.2) |
| | No changes | 315 (64.8) |
| Low-fat meat | Decreased | 98 (20.2) |
| | Increased | 50 (10.3) |
| | No changes | 338 (69.5) |
| Eggs | Decreased | 98 (20.2) |
| | Increased | 146 (30.0) |
| | No changes | 242 (49.8) |
| Pulses | Decreased | 56 (11.5) |
| | Increased | 109 (22.4) |
| | No changes | 321 (66.0) |
| Fish | Decreased | 176 (36.2) |
| | Increased | 68 (14.0) |
| | No changes | 242 (49.8) |
| Processed meat | Decreased | 141 (29.0) |
| | Increased | 88 (18.1) |
| | No changes | 257 (52.9) |
| Salty snacks | Decreased | 148 (30.5) |
| | Increased | 138 (28.4) |
| | No changes | 200 (41.2) |
| Fast food | Decreased | 170 (35.0) |
| | Increased | 163 (33.5) |
| | No changes | 153 (31.5) |
| Confectionery items | Decreased | 143 (29.4) |
| | Increased | 72 (14.8) |
| | No changes | 271 (55.8) |
| Sweetened spreads | Decreased | 170 (35.0) |
| | Increased | 97 (20.0) |
| | No changes | 219 (45.1) |
| Commercial pastries | Decreased | 167 (34.4) |
| | Increased | 95 (19.5) |
| | No changes | 224 (46.1) |
| Ice-cream | Decreased | 153 (31.5) |
| | Increased | 142 (29.2) |
| | No changes | 191 (39.3) |
| Pudding | Decreased | 202 (41.6) |
| | Increased | 59 (12.1) |
| | No changes | 225 (46.3) |
| Home-made pastry | Decreased | 175 (36.0) |
| | Increased | 88 (18.1) |
| | No changes | 223 (45.9) |
| Sweetened/ carbonated beverages | Decreased | 167 (34.4) |
| | Increased | 59 (12.1) |
| | No changes | 260 (53.5) |
| Water | Decreased | 234 (48.1) |
| | Increased | 11 (2.3) |
| | No changes | 241 (49.6) |

Contd...

Table 2: Contd...

| Food items | Dietary pattern | Frequency n (%) |
|-----------------------------------|-----------------|-----------------|
| Tea/coffee | Decreased | 56 (11.5) |
| | Increased | 265 (54.5) |
| | No changes | 165 (34.0) |
| Home food | Decreased | 87 (17.9) |
| | Increased | 195 (40.1) |
| | No changes | 204 (42.0) |
| Food availability during pandemic | Yes | 103 (21.2) |
| | No | 383 (78.8) |

activity during the pandemic, among which most had increased food intake ($P = 0.007$) [Figure 2]. 5.6% were smokers. There was no significant change in the smoking pattern during the pandemic. 59.5% of individuals reported a sleep duration of 6–8 h pre-pandemic. Most of the participants reported increased sleep duration during the pandemic, among which the majority (49.8%) had a higher food intake ($P = 0.015$) [Figure 3]. Screen time was <4 h for most (48.8%) participants pre-pandemic, and the majority (89.7%) of respondents reported an increased screen time during the pandemic, among which a large proportion (47.9%) had higher food intake ($P = 0.029$) as demonstrated in Table 3 and Figure 4.

Discussion

The COVID-19 pandemic has caused considerable disruption in daily activities globally. The physical training routine at gyms has been affected.^[20,21] The main goal of this survey is to determine the effects of the pandemic and home confinement and the correlations between lifestyle changes and dietary patterns. Despite recommendations that home confinement should not prevent people from being physically active, most people had decreased physical activity coupled with an increase in food intake.^[22] The findings of this survey are in line with global data indicating that the current COVID-19 home confinement has significantly impacted lifestyle, including sports participation and physical activity engagement.^[23,24] This could partly be due to the numerous restrictions placed during the pandemic, which demotivated people to exercise and strive to remain physically fit. Despite the increased availability of physical activity guidance and lessons on social media, the current findings indicate that individuals have not maintained their typical level of pre-pandemic activity.

The majority of the respondents reported an increase in sleeping duration (59.5%) and screen time (89.7%) during the pandemic. These findings support the fact that time spent on physical activity, sports, and walking before the pandemic was now spent resting and watching television or using handheld devices during the pandemic, which is in line with global data.^[3,4]

The number of overweight patients in our study increased from the pre-pandemic level with a change in eating patterns. This is in line with prior studies, which imply an unhealthy pattern of food

Table 3: Lifestyle changes and their association with dietary patterns during the COVID-19 pandemic

| Variable | Characteristics | Frequency Total (%) | Dietary patterns | | | P |
|-------------------------------------|-----------------|------------------------|------------------|------------------|-------------------|--------------------|
| | | | Ate less (n=90) | Ate more (n=224) | No change (n=172) | |
| Food availability during pandemic | Yes | 103 (21.2) | 24 (23.3) | 46 (44.7) | 33 (32.0) | 0.352 ^b |
| | No | 383 (78.8) | 66 (17.2) | 178 (46.5) | 139 (36.3) | |
| Physical activity before pandemic | 0.5-2 h | 233 (47.9) | 36 (15.5) | 110 (47.2) | 87 (37.3) | 0.460 ^b |
| | >2 h | 85 (17.5) | 16 (18.8) | 38 (44.7) | 31 (36.5) | |
| | <0.5 h | 168 (34.6) | 38 (22.6) | 76 (45.2) | 54 (32.2) | |
| Physical activity after pandemic | Decreased | 246 (50.6) | 47 (19.1) | 125 (50.8) | 74 (30.1) | 0.007 ^b |
| | Increased | 82 (16.9) | 22 (26.8) | 33 (40.2) | 27 (32.9) | |
| | No changes | 158 (32.5) | 21 (13.3) | 66 (41.8) | 71 (44.9) | |
| Smoking | Yes | 27 (5.6) | 3 (11.1) | 18 (66.7) | 6 (22.2) | 0.087 ^b |
| | No | 459 (94.4) | 87 (19.0) | 206 (44.9) | 166 (36.2) | |
| Smoking pattern during pandemic | Decreased | 13 (2.7) | 2 (15.4) | 7 (53.8) | 4 (30.8) | 0.581 ^a |
| | Increased | 11 (2.3) | 2 (18.2) | 7 (63.6) | 2 (18.2) | |
| | No changes | 3 (0.6) | 1 (33.3) | 1 (33.3) | 1 (33.3) | |
| Sleep duration before pandemic | <6 h | 100 (20.6) | 22 (22.0) | 49 (49.0) | 29 (29.0) | 0.283 ^b |
| | >8 h | 97 (20.0) | 22 (22.7) | 39 (40.2) | 36 (37.1) | |
| | 6-8 h | 289 (59.5) | 46 (15.9) | 136 (47.1) | 107 (37.0) | |
| Sleep pattern during pandemic | Decreased | 74 (15.2) | 19 (25.7) | 34 (45.9) | 21 (28.4) | 0.015 ^b |
| | Increased | 289 (59.5) | 52 (18.0) | 144 (49.8) | 93 (32.2) | |
| | No changes | 123 (25.3) | 19 (15.4) | 46 (37.4) | 58 (47.2) | |
| Screen time before pandemic | <4 h | 237 (48.8) | 44 (18.6) | 110 (46.4) | 83 (35.0) | 0.832 ^b |
| | >8 h | 52 (10.7) | 10 (19.2) | 27 (51.9) | 15 (28.8) | |
| | 4-8 h | 197 (40.5) | 36 (18.3) | 87 (44.2) | 74 (37.6) | |
| Screen time pattern during pandemic | Decreased | 10 (2.1) | 2 (20.0) | 5 (50.0) | 3 (30.0) | 0.029 ^a |
| | Increased | 436 (89.7) | 81 (18.6) | 209 (47.9) | 146 (33.5) | |
| | No changes | 40 (8.2) | 7 (17.5) | 10 (25.0) | 23 (57.5) | |

n=number of subjects, ^aFisher's exact test, ^bChi-square test

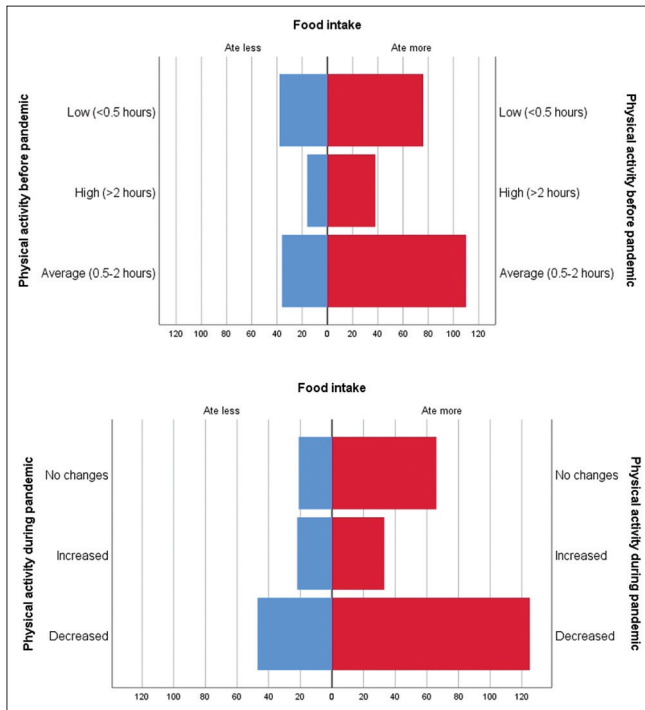


Figure 2: Association of physical activity pre- and post-pandemic with dietary change

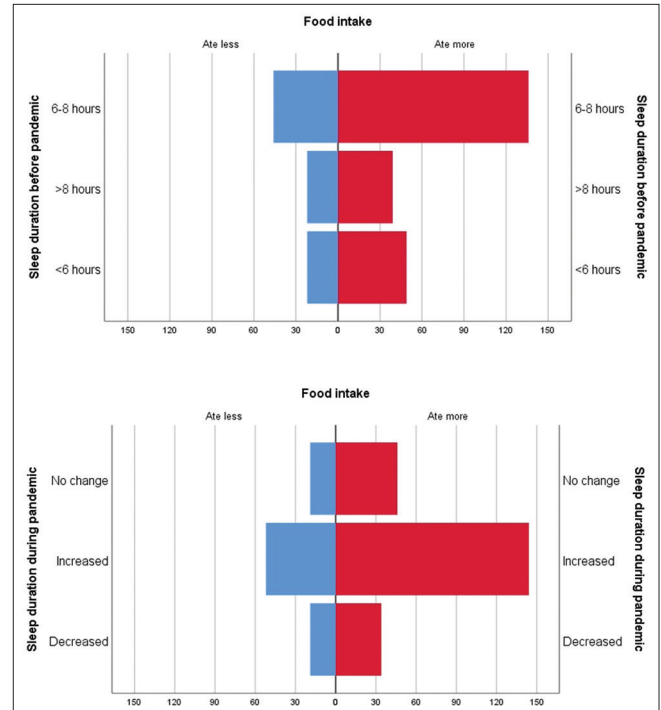


Figure 3: Association of sleep duration pre- and post-pandemic with dietary change

intake (kind of food, eating out of control, snacks in between meals, and the number of main meals) during the pandemic.^[4]

The increased accessibility of food at home could be a factor in this change. Data suggests a pattern of persistent overeating

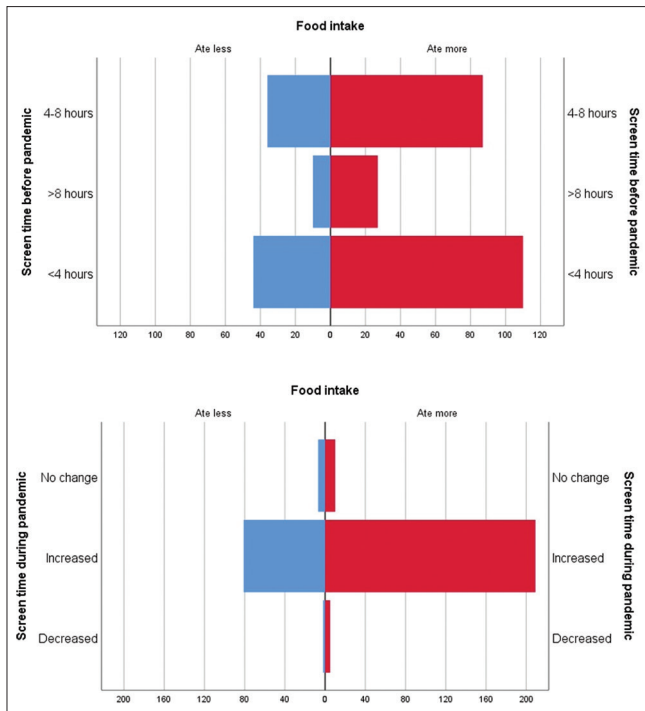


Figure 4: Association of screen time pre- and post-pandemic with dietary change

when a substantial quantity of food is available despite a reported decrease in hunger and increased satiety.^[25] As a result, dietary restraint should be advocated during self-quarantine. Dietary restraint is described as the desire to limit food consumption to maintain body weight and form, and it has been found to predict long-term weight loss.^[26]

One fascinating result from this survey is that food availability has been hampered during the epidemic while food intake has grown. During quarantine, increased eating in reaction to sight and scent could be a component of impulsivity and disinhibition of the psychological variables. Impulsivity has been related to binge eating because it is a rapid reaction to an external stimulus without regard for negative consequences.^[27] Eating out of worry or boredom,^[28] a drop in motivation to participate in physical activity or maintain healthy eating,^[29] or an increase in mood-driven eating,^[28] could all explain the detrimental changes in the majority of eating behaviors.

In the COVID-19 pandemic, home fitness, utilization of online fitness content, and smart applications might be the solutions for being active.^[30] Many have relied on these innovative mobile applications to design and record home workouts, from high-intensity training to yoga and food tracking apps and online food delivery options to ensure a balanced food intake.^[21] Current physical activity recommendations advise the general population to aim at performing at least 150–300 min of moderate or 75–150 min of vigorous physical activity a week (or a combination of these) and muscle-strengthening activities at least twice a week. Regular moderate physical activity has amplified health

benefits for people of all ages, sexes, races, health conditions, and shapes, as shown in reduced morbidity and mortality rates, increased quality of life, and independence in old age.^[31] Assistive technologies such as applications, streaming services, and social media can provide alternative motivation during home confinement. Meal planning and managing food composition and caloric numbers with web-based solutions such as mhealth and nutrition applications may be the way forward.^[23,28] With respect to primary care physicians, recent studies have highlighted the challenges of obesity and unhealthy lifestyle practices during and beyond the pandemic, and the role of primary care physicians in incorporating healthy lifestyles by promoting awareness and supporting ideas of those healthy practices.^[32,33]

Our survey is not without limitations. Due to social distance requirements, the current study had to be conducted online and completely self-reported and may be limited by social desirability bias. The study also has a weakness in terms of subject recruitment and convenience sampling. It could be argued that the sample is not representative of the population because the questionnaire was shared and distributed via social media. Authors acknowledge this limitation, but still, the current study reveals unique information about an unprecedented occurrence in world history. Furthermore, the authors recognize that the data gathered can be spliced and analyzed in various ways. However, to retain the research's integrity, the authors tried to stay focused on the primary research question: What changes in lifestyle and diet are produced by the present pandemic? Future studies can divide the population by race, nutrition type (non-vegetarian, vegetarian, and veganism), nutritional condition, types of co-morbidities present, among others.

Conclusion

The findings of this study demonstrate that the pandemic has had numerous adverse effects on people's lifestyles and diets. People are more sensitive to various medical complications due to the significant decline in physical activity and sports and increased food intake and screen time. A disturbed sleep schedule with increased sleeping hours and weight and BMI indicate a health crisis during the pandemic.

Take home messages

Our study reported the changing dietary patterns during the pandemic with respect to the food availability reported by the participants. Certain unhealthy lifestyle changes causing sedentary habits were also reported, although they might be non-causally associated with the increasing BMI of our population during the pandemic. Primary care physicians have a role to play in preventing the unhealthy lifestyles by promoting awareness and supporting healthy practices including physical activity and a balanced diet.

Ethical approval statement

Ethical approval was taken in this study from the institutional review board of Dow University Hospital, and consent to participants was taken from all respondents.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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