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IMPACT OF COVID-19 QUARANTINE ON LIFE STYLE CHANGES, IN THE WESTERN SAUDI ARABIA: A CROSS-SECTIONAL STUDY

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ABSTRACT

Since the World Health Organization announced the Corona Pandemic in March 2020, the world has faced many challenges and fundamental lifestyle changes. This study aims to identify lifestyle changes such as diet, marketing habits, daily activities, and sleep patterns in the western region of Saudi Arabia (SA) during the COVID-19 quarantine period. Besides, this work aims to investigate the relationship between lifestyle changes and weight changes. A retrospective cross-sectional study conducted in the western region, SA during the COVID -19 quarantine between May 2020 and January 2021. The descriptive research approach was adopted using a questionnaire. Subjects who met the admission requirements and completed the questionnaire was 539. The majority of participants' ages 35-44 years, they were mainly women (73.3%). The percentage of those who work from home (online) was 31.2%. Most respondents rely on home-cooked food during the quarantine period (84 %), and the proportion of people eating out at restaurants is declining. About half of the participants reported emotional eating (54 %), and the majority preferred sweets. 42.4% of participants did not store additional food or worry about food insecurity. 44 % of participants revealed weight gain. There were strong correlation between increased weight in the study participants and emotional eating ($p < 0.001$), physical exercise ($p < 0.001$), and the number of fast-food consumed per week ($p < 0.05$). This work showed that weight gain in people during the lockout period could be attributed to the reduction in exercise and physical activity and the increased in emotional eating.

Keywords: COVID -19 quarantine, Lifestyle changes, Body weight, Saudi Arabia.

INTRODUCTION

Coronavirus ailment has been a general health crisis of international worry since January 2020 (WHO, 2020 a). The food sector had faced diverse challenges throughout the pandemic. Food sustainability, security, and safety are strongly affected dimensions of food systems during the COVID-19 quarantine. The COVID-19 has obligatory the Saudi government to impose hygiene restrictions to prevent or reduce infection (Galanakis *et al.*, 2020). Also, there were national lockdown measures, and public gathering places as shopping malls and restaurants were closed (Ruiz-Roso *et al.*, 2020). In April 2020, the Saudi government obligatory a total curfew that allowed people to leave their homes only at a limited time (Obeid *et al.*, 2020). Besides, the negative consequence of quarantine, also called self-quarantine, on health and socioeconomic status (Vieira *et al.*, 2020), also anxiety, stress, boredom, depression, limited physical activity, emotional eating, and sleep disorders have been documented during quarantine (Bhutani & Cooper, 2020; Sidor & Rzymiski, 2020; Bakhsh *et al.*, 2021).

Nutritional status has been severely changed during the quarantine and the pandemic (Scarmozzino & Visioli, 2020; Sidor & Rzymiski, 2020). Research proved the association between boredom and changing dietary lifestyle habits through higher eating of high energy, fat, carbohydrate, and protein foods and unhealthy eating behavior, and weight changes (Alzahrani *et al.*, 2020; Muscogiuri *et al.*, 2020). Moreover, stress has a direct impact on dietary habits. In social isolation, people are put under psychological stress, which makes them overeat in response to emotional triggers (Reyes-Olavarria *et al.*, 2020; He *et al.*, 2021). The COVID-19 lockdown influences lifestyle habits by increasing consumption of foods, excessive food storage, and decreasing physical activity (Di Renzo *et al.*, 2020; Park *et al.*, 2020). Additionally, staying for a long time at home, especially with distance learning and working online, increases the use of screen-based time activities that impact bad eating habits (Pokhrel & Chhetri, 2021).

Galli *et al.* (2020) demonstrated that the COVID-19 quarantine imposed unique lifestyle resulted in a circadian misalignment, which can induce eating behaviors changes and body weight gain, in reaction to mental stress, sedentary lifestyle, spending more time at home, and improve visual and olfactory stimulation to eat. Circadian rhythms counterpart most biological processes as hormonal secretion, metabolism, and gastrointestinal functions (Patton & Hastings, 2018). Besides, peoples' lifestyles were changed during self-quarantine, shopping for fresh groceries became complicated. Storage of food products due to fear of shortages of certain food products might happen, causing disruptions in the food chain around the country (Calder *et al.*, 2020; Jansen *et al.*, 2020; Parmet & Sinha, 2020). These changes produce adaptive and compensatory responses that could last for months and even for generations, thus requiring more attention to restore the dysregulated metabolic processes (Maggini *et al.*, 2018).

In addition, there was a significant decline in physical activity in populations during quarantine relative to WHO recommendation for healthy adults (150 min. of moderate activity weekly or 75 min. of strongly activity weekly) (WHO, 2020 b). Recently Bakhsh *et al.* (2021) documented that COVID-19 harmed physical activity which was related to significant weight gain.

Limited information is available on the effect of quarantine on life modification and its impact on body weight in the western region, Saudi Arabia. Therefore, the current study aimed to determine lifestyle changes, including eating behaviors, marketing habits, daily activities, and sleep behavior in the western region, Saudi Arabia, during the COVID-19 quarantine time. Also, to explore the relationship between modification on lifestyle and the variations in body weight.

MATERIALS AND METHODS

Study Design and Sample Size

This study is a retrospective cross-sectional study. It was conducted in Saudi Arabia from May 2020 to January 2021. The least number of subjects involved in this questionnaire was 384 individuals to reach a 5% margin of error and a 95% confidence limit. Seven hundred forty-eight subjects filled the survey, but only 539 members met the inclusion requirements the total number of members who met the inclusion requirements was 539.

Inclusion and Exclusion Criteria

All participants should be Saudi citizens from the western region, both gender, educated, and over 15. Any samples which not meet the inclusion criteria were excluded from this study.



Data Collection

The descriptive research approach was adopted using an electronic questionnaire, which was translated into Arabic. The Google form questionnaire's link was sent to the participants *via* social networks. Every participant should only send one reply. Replies of participants were double-checked to emphasize that no reply was duplicated.

The questionnaire includes four types of questions. The first section comprises demographic and social characteristics of the study population such as age, gender, education level, social status, number of children, health status, and work status. The second section assesses nutritional habits and bodyweight variation of the study population during the COVID-19 pandemic, such as the amount of water consumed, number of meals, reasons for skipping some daily meals, types of meals, reasons for not eating in restaurants, number of fast-food meals, emotional eating, types of food most common in persons experienced emotional eating, and body weight variation during the COVID-19 pandemic. The third section inquires marketing habits of the study population during the COVID-19 pandemic such as storing extra amounts of food, online food shopping, sterilization of the purchased foods, and changing in meat purchase habits. Finally, the fourth section examines daily activities and sleep habits of the study population during the COVID-19 pandemic, such as hours of work or study per day, the number of doing house cleaning per week, days of physical exercise per week, hours of daily entertainment, hours of sleep per day, sleep quality, experience anxiety as a result of the pandemic, and energy level during the day. Survey validity was checked beforehand. The survey was given to five faculty staff, King Abdulaziz University, who were asked to rate each item on a 5-point Likert scale ranging from 1 to 5 (1=strongly important, 2 = important, 3 = neither important nor not important, 4= not important, and 5 = strongly not important). There was an excellent item-content validity index.

Statistical Calculations

The acquired results were descriptively analyzed. Frequency (percentages and/or counts) is used to represent the replies. A chi-squared test was used for data analysis. Prism® was used to perform statistical analysis on the results (version 8.4.0, GraphPad Software Inc., La Jolla, CA, USA). The significance level was settled as $P \leq 0.05$.

RESULTS AND DISCUSSION

Demographic and Social Characteristics of the Participants

This study included 539 participants aged from 15 years to more than 55 years; most of them (39%) lie between 35-44 years, while only 7.1% of them aged between 55 years and more. Most of the participants were females (73.3%) compared to 26.7% males. Most of the participants were university-educated (59.2%), 73.8 % of them were married, most of them had 3 or more children (48.4%). The majority of the participants were healthy (74 %), and the percentage of those who work from home (online) was 31.2%, while 34.7% of the participants were those who go to workplaces (**Table 1**).

Nutritional Habits and Bodyweight Variation of the Participants during the COVID-19 Pandemic



From the data obtained, 56.2% of the participants consumed 1-4 glasses of water daily, 27.5% consumed 5-7 glasses, and only 16.3% consumed 8 or more glasses. Nearly half of the participants (50.8%) consume 1-2 meals per day, while 46.4% eat 3-4 meals. Approximately 88.1% of the individuals skipped some daily meals on a regular or irregular basis. The following were the main reasons for skipping some meals: lack of time (37.3%), weight loss (24.3%), loss of appetite (18.7%), a drop in daily food consumption (16.7%), and fasting (3%) are all factors. According to the findings, 84% of the participants rely on home-cooked meals, while the percentage of people who eat out has dropped to 14.3%. Outside of the home, there is a wide range of dining options, including restaurants (9.3%), fast food (4.5%), and restaurants serving healthy meals (0.5%). The lack of consumption of restaurants food at 27.1% of the participants is due to their desire to focus on healthy food that raises immunity. While 22.5% justified their lack of eating in restaurants for fear of pollution, 17.6% were due to the low nutritional value, and the high price was the justification for 32.8% of the participants. The percentage of people who consume fast food has declined, with 13.2% saying they don't eat fast food at all and 63.3% saying they eat it once or twice a week. Emotional ingestion was found in 54% of the participants, with 44.3% percent preferring sugars, 28.1% chips and biscuits, 13.7% pastries, and 13.9% nuts. During the pandemic's quarantine period, 44% of participants reported a rise in body weight. In 38% of the participants, bodyweight stayed unchanged, while just 18% lost weight (**Table 2**).

Table 1. Demographic and social information of the participants (n=539)

Character	Frequency (%)
Sex	
Male	144 (26.7%)
Female	395 (73.3%)#
Age (year)	
15-24	67 (12.4%)
25-34	121 (22.4%)
35-44	210 (39.0%)#
45-54	103 (19.1%)
> 55	38 (7.1%)
Education level	
Pre-university	140 (26.0%)
University	319 (59.2%)#
Postgraduate	80 (14.8%)
Social status	
Single	114 (21.2%)
Married	398 (73.8%)#
Divorced	19 (3.5%)
Widower	8 (1.5%)
Children number	
0	145 (26.9%)
1-2	133 (24.7%)
3 or more	261 (48.4%)#



Chronic diseases	
No diseases	399 (74.0%)#
Have diseases	140 (26%)
Diabetes	28 (5.2%)
Hypertension	44 (8.2%)
Obesity	45 (8.3%)
Respiratory diseases	23 (4.3%)
Work status	
Work away from the home	187 (34.7%)#
Work from home	168 (31.2%)
Not applicable	184 (34.1%)

Data are expressed as frequency (n). #Marked the prevalent group.

Marketing Habits of the Participants during the COVID-19 Pandemic

The findings revealed that 42.4% of the participants did not store additional food and were not concerned about food insecurity, whereas 34.6% of the participants went to store extra food and buy more than regular for fear of a shortage of food in the markets. Regarding the different ways of shopping during the pandemic, 34.5% of the participants relied on online shopping, while 43% preferred to shop from the markets. 62.9 % of the participants reported that they sanitize purchases before using them. According to the findings, 87.4 % of the participants did not change their meat-eating habits, while just 12.6 % of them planned to cut their meat consumption (Table 3).

Table 2. Nutritional habits and bodyweight variation of the participants during the COVID-19 pandemic

Character	Frequency (%)
Amount of water per day (glass)	
1-4	303 (56.2%)#
5-7	148 (27.5%)
≥ 8	88 (16.3%)
Number of meals per day	
1-2	274 (50.8%)#
3-4	250 (46.4%)
> 5	15 (2.8%)
Skip some meals	
Always	111 (20.6%)
Sometimes	364 (67.5%)#
Never	64 (11.9%)
The reason for skipping some daily meals	
Weight reduction	131 (24.3%)
Lack of time	201 (37.3%)#
Loss of appetite	101 (18.7%)
Reducing the amount of food eaten	90 (16.7%)

Fasting	16 (3.0%)
Type of meals per week	
Home made	453 (84.0%)#
Restaurants made	50 (9.3%)
Frozen (ready to eat)	9 (1.7%)
Fast food	24 (4.5%)
From restaurants dedicated to serving healthy meals	3 (0.5%)
Reason not to eat in restaurants	
Fear of pollution	121 (22.5%)
Rising prices	177 (32.8%)#
Low nutritional value	95 (17.6%)
Concentration on healthy food to post immunity	146 (27.1%)
Number of fast-food meals per week	
0	71 (13.2%)
1-2	341 (63.3%)#
3-4	105 (19.5%)
5 or more	22 (4.0%)
Emotional eating	
Yes	291 (54%)#
No	87 (16.1%)
Sometimes	161 (29.9%)
Types of food most common in persons who experienced emotional eating	
Sugars	200 (44.3%)#
Chips and biscuits	127 (28.1%)
Pastries	62 (13.7%)
Nuts	63 (13.9%)
Bodyweight variation during COVID-19 pandemic	
Constant	205 (38.0%)
Increase	237 (44.0%)#
Decrease	97 (18.0%)

Data are expressed as frequency (n). #Marked the prevalent group.

Table 3. Marketing habits of the participants during the COVID-19 pandemic

Character	Frequency (%)
Storing extra amounts of food	
Yes	187 (34.6%)
No	228 (42.4%)#
Sometimes	124 (23.0%)
Online food shopping	
Yes	186 (34.5%)
No	232 (43.0%)#



Sometimes	121 (22.5%)
Sterilization of the purchased foods	
Yes	339 (62.9%)#
No	65 (12.1%)
Sometimes	135 (25.0%)
Change in meat purchase habits	
Yes	68 (12.6%)
No	471 (87.4%)#

Data are expressed as frequency (n). #Marked the prevalent group.

Daily Activities and Sleep Habits of the Participants During the COVID-19 Pandemic

The findings showed that 51% of the participants work or study for more than five hours per day, 46.6 percent undertake housework regularly, and 49.9% spend one to two hours per day in entertainment. About 36.2% of the participants exercised once to twice a week, 16.5% exercised three to four times a week, and 11.3% exercised daily, while 36% did not exercise at all. According to the findings, 43.6 percent of participants slept 7-9 hours per day, 64.9 percent of participants reported good sleep quality, and 41% did not suffer from anxiety due to the pandemic. As a result, 69.8% of the participants said they have a medium energy level during the day (Table 4).

Correlation between Increased Bodyweight during COVID-19 Pandemic and Emotional Eating, Physical Exercise, and Fast-Food Behavior

The chi-square correlation showed a strong correlation between emotional eating ($p < 0.001$) and increased body weight in the study participants. 44% of the participants reported increased body weight, and 54% exhibited emotional eating (Figure 1).

The chi-square correlation showed a strong correlation between physical exercise ($p < 0.001$) and increased body weight in the study participants. As 44% of the participants reported increased body weight and 36.2% exercised once to twice a week, 36% did not exercise at all (Figure 2).

The chi-square correlation showed a significant correlation between the number of fast-food ($p < 0.05$) and increased body weight in the study participants. As 44% of the participants reported increased body weight and 23.5% eat fast food more than three times per week (Figure 3).

The current study was performed to discover modifications in lifestyle such as nutritional and marketing habits, daily activities, and sleep behavior in a sample collected from the western region, SA, during the COVID-19 quarantine time and explore their relationship with variations in body weight. The results revealed that most of the survey participants relied on home-cooked meals during the lockdown period, with the percentage of those eating out in restaurants declining. The demand for fast food also falls during the lockdown period. These findings are coherent with previous studies, which revealed that people are eating more home-cooked meals and less fast food during the pandemic (Górnicka *et al.*, 2020; Abdulsalam *et al.*, 2021; Ismail *et al.*, 2021). The participants' tendency to prefer home foods could be due to Coronavirus transmission through food, as food may be contaminated by vendors and handlers or through food bags and containers. Families may have changed their eating patterns to include more home-cooked meals and fewer restaurant meals to get healthier food. Households can benefit

from programs that support home-cooked meals by including more healthful foods in their meals (Fertig *et al.*, 2019).

Table 4. Daily activities and sleep habits of the participants during the COVID-19 pandemic

Character	Frequency (%)
Hours of work or study per day	
1-2	127 (23.6%)
3-4	137 (25.4%)
> 5	275 (51.0%)#
Number of doing house cleaning per week	
Daily	251 (46.6%)#
1-3	207 (38.4%)
4-5	20 (3.7%)
Never	61 (11.3%)
Physical exercise per week	
1-2	195 (36.2%)#
3-4	89 (16.5%)
Daily	61 (11.3%)
Never	194 (36.0%)#
Hours of daily entertainment	
< 0.5	86 (16.0%)
1-2	269 (49.9%)#
3-4	135 (25%)
5 or more	49 (9.1%)
Hours of sleep per day	
< 7	281 (52.1%)#
7-9	235 (43.6%)
> 9	23 (4.3%)
Sleep quality	
Excellent	69 (12.8%)
Good	350 (64.9%)#
Bad	120 (22.3%)
Do you experience anxiety as a result of the pandemic?	
Yes	159 (29.5%)
No	221 (41.0%)#
Sometimes	159 (29.5%)
Energy level during the day	
High	98 (18.2%)
Medium	376 (69.8%)#
Low	65 (12.0%)

Data are expressed as frequency (n). #Marked the prevalent group.



Table Analyzed	Data 1
Chi-square	
Chi-square, df	26.60, 2
P value	< 0.0001
P value summary	***
One- or two-sided	NA
Statistically significant? (alpha<0.05)	Yes
Data analyzed	
Number of rows	3
Number of columns	2

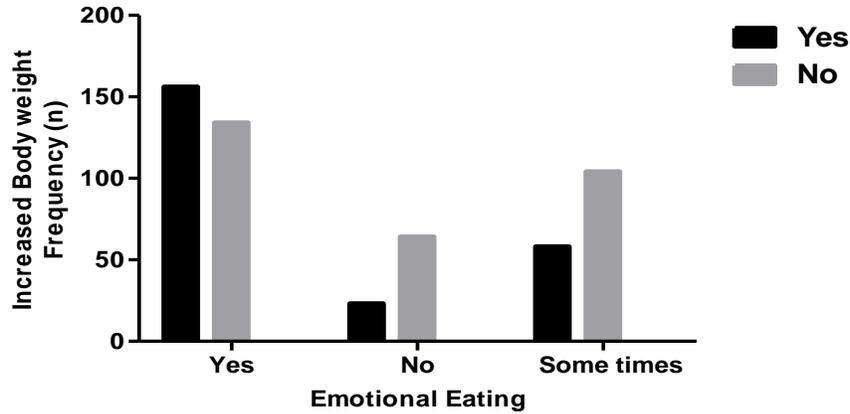


Figure 1. Chi-square correlation between increased body weight during COVID-19 pandemic and emotional eating behavior. Data are expressed as frequency (n).

Table Analyzed	Data 2
Chi-square	
Chi-square, df	22.82, 3
P value	< 0.0001
P value summary	***
One- or two-sided	NA
Statistically significant? (alpha<0.05)	Yes
Data analyzed	
Number of rows	4
Number of columns	2

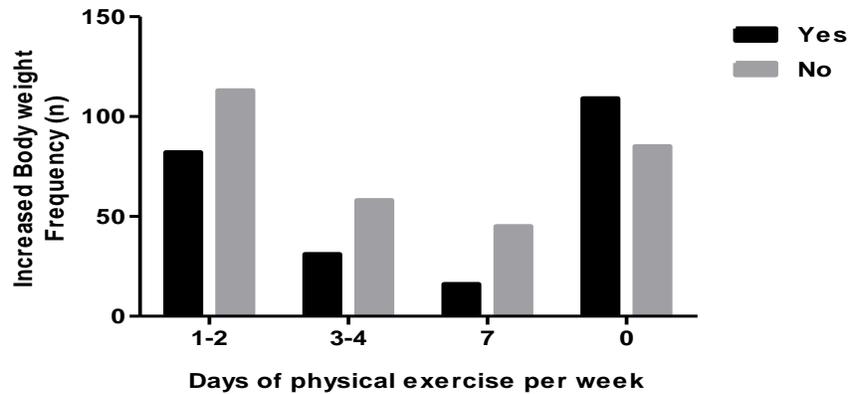


Figure 2. Chi-square correlation between increased body weight during COVID-19 pandemic and physical exercise behavior. Data are expressed as frequency (n).

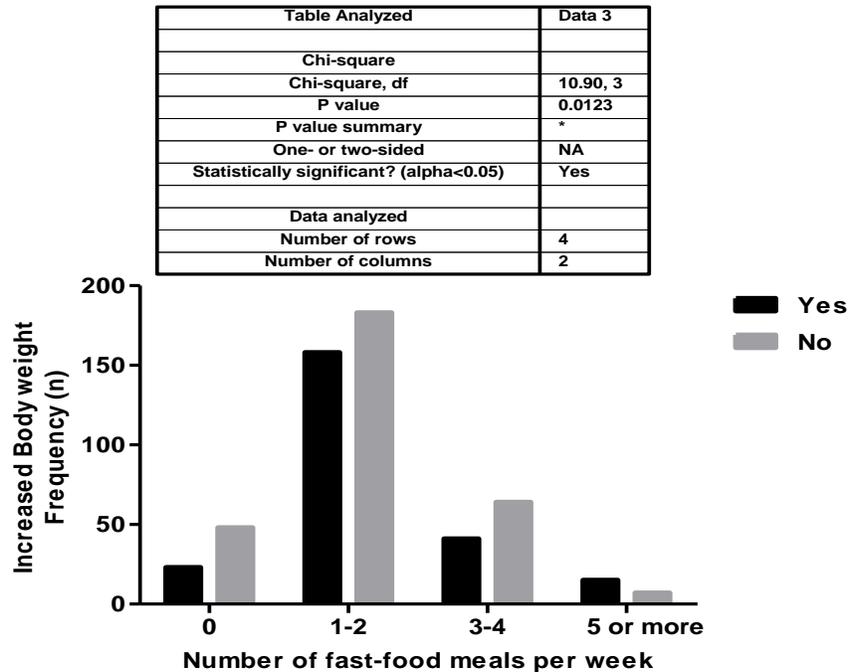


Figure 3. Chi-square correlation between increased body weight during COVID-19 pandemic and number of fast-food meals per week. Data are expressed as frequency (n).



The present study results revealed that emotional ingestion was shown by about half of the participants, with the majority preferring sweets. The findings also showed that nearly the same percentage of participants reported an increase in body weight. There was a strong correlation between emotional eating and increased body weight. Similarly, excessive emotional eating was foretold by 365 Italian subjects during the lockdown period of the COVID-19 pandemic. Furthermore, they reported that a large BMI level was linked to increased emotional eating (Cecchetto *et al.*, 2021).

In addition, a study involving 136 people in the United Kingdom found that when people are depressed, they have much more emotional eating cravings (McAtamney *et al.*, 2021). Emotional eating was characterized as eating food in response to unpleasant emotions (for example, perceived stress) rather than internal hunger indicators (Shen *et al.*, 2020). Sweet, fatty, and salty snack items were consumed in greater quantities by emotional eaters. According to many research, emotional eating has been linked to a higher BMI, stress, and sadness. In most studies, females were more affected by emotional eating, resulting in higher weight gain compared to males (Yau & Potenza 2013).

Stress causes physical and emotional weariness, which causes feeding and dietary habits to be disrupted (Albott *et al.*, 2020; Rodgers *et al.*, 2020; Shah *et al.*, 2020). While acute stress usually inhibits eat desire, chronic stress causes the adrenal glands to secrete cortisol, which stimulates appetite, the incentive to eat, and the ingestion of energy-dense meals which are dense in calories, sweets, and fats (Born *et al.*, 2010; Chao *et al.*, 2017). Several hormones like leptin, ghrelin, and insulin are often impacted by persistent stress, and their quantities have a significant influence on satiety and eating desire and patterns (Yau & Potenza, 2013). Under stressful conditions, consumption of energy and fat-containing meals increases, and stress-induced

cravings for “comfort food” that have large quantities of sugar and/or saturated fat are widespread (Lemmens *et al.*, 2011; van Strien *et al.*, 2019). There is a strong link between stress and the consumption of soft drinks, salty snacks, sweet pastries, and fast meals. Similarly, there has been evidence of a detrimental relationship between stress and consuming fruit and veggies (Errisuriz *et al.*, 2016; Tariq *et al.*, 2019). Recent studies demonstrate that changes in dietary habits and food choices boosted the intake of macaroni, wheat, and frozen foods, while fresh food intake declined during the COVID-19 pandemic (Ashby, 2020; Bracale & Vaccaro, 2020; Di Renzo *et al.*, 2020; Pellegrini *et al.*, 2020).

These findings suggested that in Saudi Arabia, the individuals did not stockpile extra food and were not concerned about food insecurity. In line with these results, there was no panic buying in Qatar because the majority of the participants did not store food (Ben Hassen *et al.*, 2020). The study’s findings also corroborate what was previously published by the Saudi Food & Drug Authority, 2020. According to this international investigation, the developing COVID-19 did not affect food availability or purchasing power in SA. The study was conducted during the global spread of the new Coronavirus pandemic, which forced countries to close, implement home quarantine, and impose social distancing measures, resulting in the closure of restaurants in many countries and causing people all over the world to stockpile basic foods and change how they choose and prepare foods. The survey included 37,714 persons from 38 nations, including 2,788 Saudi Arabians. The researchers came to the following conclusions about the rate of food consumption and food abundance: the unaffected nutritional habits of society in SA, and the lack of any effect on the rate of food storage, particularly meat, bread, flour, eggs, and milk, which confirms the lack of any impact on food abundance, purchasing power, and food storage. These results confirm the efforts made by the government of Saudi Arabia to achieve food security and food abundance during the pandemic.

The findings of this work revealed that the individuals’ weight gain during the lockdown period might have been caused by a reduction in exercise and physical activity. In line with our findings, a Saudi Arabian online survey of 1965 participants from May 11 to June 6, 2020, found that home quarantine had a detrimental impact on physical activity (Alfawaz *et al.*, 2021). In addition, another study found that COVID-19 harmed physical activity, with 52 percent of participants reducing their activity, which was linked to considerable weight gain (Bakhsh *et al.*, 2021). This finding revealed that as in other constrained conditions such as isolation could cause a significant fall in sports participation (Arries & Maposa, 2013; Belavý *et al.*, 2013). Moreover, Al-Musharaf *et al.* (2021) revealed that during the COVID-19 lockdown period a significant proportion of participants gained weight, the risk factors associated with weight gain were stress, sleep hours, and decline in physical activity. In a semi-structured interviews with 41 Saudi adults, most responses were marked by a high awareness about healthy eating. During the lockdown, physical activity declined, causing participants to become more stressed. The COVID-19 lockdown resulted in several changes in eating habits, including increased intake of snacks, sweets, fruits, vegetables, and home-cooked meals (Saaty & Aljadani, 2021). Recently, Alghamdi *et al.*, (2022) reported that during COVID-19 quarantine, university students were under various types of stressors which might have affected their quality and quantity of sleep, and consequently, their quality of life.



CONCLUSION

The current findings revealed that most survey participants relied on home-cooked meals during the COVID-19 lockdown period. People in SA did not stockpile food and were unconcerned about food scarcity. Furthermore, almost half of the participants reported increased body weight gain, and emotional eating, with the majority favoring sweets. Weight gain may have been induced by a reduction in exercise and physical activity and increased emotional eating.

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CONFLICT OF INTEREST: None

FINANCIAL SUPPORT: None

ETHICS STATEMENT: The objectives and procedures of the study were explained to the participants, and informed consent was obtained from all the participants.

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