Introduction

World Health Organization (WHO) declared new coronavirus outbreak a public health emergency of international concern.[1] The virus has already directly impacted almost all countries and has been reported on all the continents across the globe. As of September 7, 2020, the WHO reported 29,925,969 confirmed cases of COVID-19 globally, with 942,076 deaths.[2] In the early phase of the pandemic, conflicting statements on the sources of infection and the likelihood of human-to-human transmission possibly aggravated the continued flare-up of the infection among the general public. The effect of globalization on world travel and communication may have facilitated the ease of the virus spread from China to other parts of the world within a short time. This resulted in severe and widespread morbidities and deaths that could have been prevented. A lack of proper understanding of the risks of transmission and the unavailability of specific treatment for the virus forced China to put the affected cities and provinces in lockdown and implement travel bans that later proved effective in containing the spread.[3] Many countries followed suit by taking strict measures, including enforcing the wearing of face masks and gloves, encouraging people to work from home to avoid contact with other people, and limiting the travel between provinces.[4] The restrictions blocked the flow of goods and services.

Objectives: Physical activity appears to be essential to maintain health during the COVID-19 pandemic, specifically for those at high risk, because of its advantages mentally as well as physically. This study determines weight control behaviors among the Saudi population during the COVID-19 pandemic. Methods: The study was a cross-sectional survey of Saudis aged 18–60 and residents in the country during the lockdown period. The study sample was 384 people obtained from the Leslie formula for sample size calculations. The population covered all Saudi regions. Results: A total of 397 people responded to the survey. Among these people, 196 (49.4%) were male and 201 (50.6%) were female. The majority of them were urban residents (288; 72.5%). One hundred seventy-five (44.1%) had engaged in healthy behavior for weight control during the COVID-19. Factors that significantly affected these healthy behaviors were gender, employment, and educational level (P value <0.05). During pandemic, certain activities and behaviors were affected (P value < 0.05), including smoking (36; 9.1%), exercising (255; 64.2%), dieting for weight loss (98; 24.7%), dieting for weight maintenance (102; 25.7%), regular dieting before COVID-19 (112; 28.2%), and maintaining exercise after pandemic (194; 48.9%). Other significantly affected healthy behaviors were decreasing food intake (301; 75.8%; P value 0.01) and eating less meat (200; 50.4%; P value 0.00). Conclusions: Healthy behavior for weight control during the COVID-19 pandemic was reported by less than half of the study population. Minority (15.6%) engaged in at least one unhealthy or extreme weight loss practice. Healthy behavior was significantly influenced by gender, employment, and educational level.

Keywords: COVID-19, healthy behavior, physical activities, Saudi Arabia, weight control

Abstract

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Various health authorities and the WHO advised the public for strict restrictions and preventive measures. This lifestyle can also lead to increased risk or potential worsening of chronic health conditions, especially among pre-existing conditions. A reduction in physical activity and resting energy expenditure accompanied by increased calorie intake could increase these risks. Long-term inactivity, generally associated with excessive calorie intake, is the major contributor to being overweight, followed by increased systemic inflammation.

Regrettably, due to public health orders, recommendations to stay at home, school and park closures, and self-isolation by high-risk groups, many groups could not maintain regular physical activity patterns. Evidence is emerging that obesity-related conditions appear to complicate the impact of the virus. Research on Chinese patients with COVID-19 has recognized a few hazardous components of extreme COVID-19, including age, cardiomyopathy, and obesity-related problems such as diabetes mellitus type 2 and hypertension. Obesity has been mentioned as one of the main factors for developing severe morbidity and high mortality, which means that obesity is a high-grade risk factor for severe COVID-19.

Obesity-related conditions thus seem to worsen the effect of COVID-19. Saudi Arabia had recorded more than 300,000 COVID-19 cases and more than 4000 deaths. The country was under lockdown for about 5 months. Many people struggled with weight control during the lockdown because restrictions on the movement led to less physical activity and a sedentary lifestyle. Many studies have reported health problems associated with the lockdown elsewhere. This study determines weight control behaviors among the Saudi population during the COVID-19 pandemic.

Material and Methods

Saudi Arabia is the country with the most giant landmass in the gulf region. Its population of 33,413,660 is also the largest among the gulf coast countries. The country recorded success in controlling the COVID-19 pandemic by instituting robust interventions such as the early closure of the country’s borders, restrictions on the pilgrimage, and movement restrictions across the nation. The universal use of face masks, social distancing, control of crowds, early testing, quarantine, and contact tracing effectively curtailed the spread of the virus. Most of the population was in lockdown for 5 months.

This study used a cross-sectional survey that enrolled only Saudis between the ages of 18 and 60 who were residents in the country during the lockdown period. The study sample was 384 people obtained from the Leslie formula for sample-size calculations. Participants covered all regions of the Kingdom, covering rural and urban areas.

We used an adapted questionnaire—the modified international medical activity questionnaire—for data collection. The questionnaire was electronically mailed to respondents. The first section of the questionnaire determined the respondents’ socioeconomic data, existing comorbidities, and participants’ weight before and after the COVID-19 pandemic. The second section captured information about healthy lifestyles and specific weight control practices during the COVID-19 pandemic. Data were collected using Google Forms and downloaded to SPSS v22 for analysis. Analysis was made using SPSS, where variables were presented in frequency tables and percentages. Categorical variables were tested for associations using Chi-square tests. Associations between variables were considered significant where $P$ values were less than 0.05.

The IRB number UBCOM/H-06-BH-087 (05/21) was from the University of Bisha, Saudi Arabia. Additionally, consent was obtained from the respondents before the questionnaire was mailed to them. The approval Date October 26th 2020.

Results

This study addressed weight control behaviors among the Saudi population during the COVID-19 pandemic lockdown. A total of 397 people responded to the survey. Among these people, 196 (49.4%) were male and 201 (50.6%) were female. The majority of them were urban residents (288; 72.5%), married (114; 28.7%), and employed (353; 88.9%), and almost all of them received regular education. One hundred seventy-five of the respondents (44.1%) engaged in healthy behaviors for weight control during the COVID-19 pandemic, while most of them were involved in unhealthy behaviors (222; 55.9%). Factors that significantly affected healthy behaviors for weight control were gender, employment, and educational level ($P$ value <0.05).

Those infected by COVID-19 intended to diet to lose or maintain weight in the next few weeks had a history of dieting for weight loss or had participated in an organized weight loss program. Significant associations revealed positive behaviors for weight control ($P$ value 0.05; see Table 1).

Some of the study population changed their practices during the COVID-19 pandemic. Activities and behaviors that were significantly affected ($P$ value <0.05) were smoking (36; 9.1%), exercising (255; 64.2%), dieting for weight loss (98; 24.7%), dieting for weight maintenance (102; 25.7%), regular dieting before the COVID-19 pandemic (112; 28.2), and maintaining exercise after the pandemic (194; 48.9%). Sixty-two participants (15.6%) engaged in at least one unhealthy or extreme weight loss practice with no significant association with healthy behaviors during the COVID-19 pandemic ($P$ value 0.97; see Table 2).

The population engaged in specific weight control practices during the COVID-19 pandemic. Specific activities were practiced by both the male and female populations in rural and urban areas of Saudi Arabia. Those who increased their exercise during the COVID-19 pandemic (194; 48.9%) significantly affected their healthy behavior (100; 25.2%) and $P$ value (0.01).

Other practices that significantly affected healthy behavior are decreased food intake (301; 75.8%; $P$ value 0.01) and eating less...
meat (200; 50.4%; P value 0.00). About 246 participants (62%) decreased their fat intake, 234 (58.9%) reduced their calorie consumption, 267 (67.3%) increased their consumption of fruits and vegetables, 274 (69%) changed the type of food that they consume, 206 (51.9%) cut out sweets and junk food, and 172 (43.3%) stopped snacking.

A range of practical nutritional activities represented nutritional modalities: 227 (57.2%) skipped meals, 194 (48.9%) ate less bread and potatoes, and 214 (53.9%) fasted (for at least 24 h).

Some of the population behaved differently to control their weight during the pandemic. In total, 59 (14.8%) respondents took appetite suppressants, 64 (16.1%) took liquid diet supplements, 47 (11.8%) took diet pills, 56 (14.1%) took laxatives, 29 (7.3%) took diuretics, and 24 (6%) vomited after eating [see Table 3].

### Discussion

Weight control behaviors are very important in general and were a particular concern for the large population of Saudi Arabia during the COVID-19 pandemic. During the lockdown, it was...
During the COVID-19 pandemic, the Saudi population practiced a variety of healthy nutritional behaviors, such as decreasing their food or calorie intake, eating less meat or fat, increasing their consumption of fruits and vegetables, changing the type of food they eat, and cutting out snacking, sweets, or junk food. This was possibly due to the psychological effects of the lockdown and sedentary lifestyles during this period. The media and the health authority implemented health promotion programs to address this. While part of the Saudi population behaved differently to maintain their weight during the pandemic, many nutritional modalities were adopted, including skipping meals and consuming fewer carbohydrates and fast food. Some took appetite suppressants, liquid diet supplements, diet pills, laxatives, or diuretics. The findings correlated well with previous results.

The action taken by most countries to make people stay at home and limit their movement has vast economic and social consequences, especially on these populations’ health. Staying home has the unintended adverse effect of reducing physical activity. Prolonged homestays have led to increased sedentary behaviors, such as spending excessive amounts of time sitting, reclining, or lying down. This issue is addressed through health promotion programs in communities, primary healthcare, and social media. According to the health system in Saudi Arabia, most chronic diseases, including obesity, managed in primary health care centers under the responsibility of the primary care physicians.

This study provided important insights into weight control behaviors in the Saudi population. Healthy practices are essential at all times, with special considerations in COVID-19 times. However, recent literature has highlighted the relationship between the COVID-19 pandemic and the potential weight giant.

**Conclusion**

Healthy behavior for weight control during the COVID-19 pandemic was reported by less than half of the study population.
A minority of participants (15.6%) engaged in at least one unhealthy or extreme weight loss practice. Healthy behaviors were significantly influenced by gender, employment, and educational level.

**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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Nil.

### Table 3: Distribution of the Saudi population according to specific weight control practices implemented during the COVID-19 pandemic

| Weight control practices | Behavior | Total (No./%) | P   |
|--------------------------|----------|---------------|-----|
|                          | Healthy (No./%) | Unhealthy (No./%) |     |
| Increased exercise      | Yes      | 100 (25.2)    | 94 (23.7) | 194 (48.9) | 0.01 |
|                         | No       | 75 (18.9)     | 128 (32.2) | 203 (51.1) |
| Decreased fat intake    | Yes      | 117 (29.5)    | 129 (32.5) | 246 (62)   | 0.07 |
|                         | No       | 58 (14.6)     | 93 (23.4)  | 151 (38)   |
| Decreased amount of food| Yes      | 143 (36)      | 158 (39.8) | 301 (75.8) | 0.01 |
|                         | No       | 32 (8.1)      | 64 (16.1)  | 96 (24.2)  |
| Reduced calories        | Yes      | 118 (29.7)    | 116 (29.2) | 234 (58.9) | 0.09 |
|                         | No       | 57 (14.4)     | 106 (26.7) | 163 (41.1) |
| Increased fruit and vegetable intake | Yes | 126 (31.7) | 141 (35.5) | 267 (67.3) | 0.07 |
|                         | No       | 49 (12.3)     | 81 (20.4)  | 130 (32.7) |
| Changed type of food    | Yes      | 127 (32)      | 147 (37)   | 274 (69)   | 0.17 |
|                         | No       | 48 (12)       | 75 (19)    | 123 (31)   |
| Cut out sweets and junk food | Yes | 92 (23.2) | 114 (28.7) | 206 (51.9) | 0.80 |
|                         | No       | 83 (20.9)     | 108 (27.2) | 191 (48.1) |
| Cut out snacking        | Yes      | 85 (21.4)     | 87 (21.9)  | 172 (43.3) | 0.06 |
|                         | No       | 90 (22.7)     | 135 (34)   | 225 (56.7) |
| Ate less meat           | Yes      | 101 (25.4)    | 92 (23.2)  | 200 (50.4) | 0.00 |
|                         | No       | 67 (16.9)     | 130 (32.7) | 197 (49.6) |
| Skipped meals           | Yes      | 99 (24.9)     | 128 (32.2) | 227 (57.2) | 0.51 |
|                         | No       | 76 (19.1)     | 94 (23.7)  | 170 (42.8) |
| Ate less bread and potatoes | Yes | 78 (19.6) | 116 (29.2) | 194 (48.9) | 0.22 |
|                         | No       | 97 (24.4)     | 106 (26.7) | 203 (51.1) |
| Fasted (for at least 24 h) | Yes | 93 (23.4) | 121 (30.5) | 214 (53.9) | 0.78 |
|                         | No       | 82 (20.7)     | 101 (25.4) | 183 (46.1) |
| Took appetite suppressants | Yes | 29 (7.3) | 30 (7.6) | 59 (14.8) | 0.39 |
|                         | No       | 146 (36.7)    | 192 (49.9) | 338 (84.2) |
| Took liquid diet supplements | Yes | 35 (8.8) | 29 (7.3) | 64 (16.1) | 0.62 |
|                         | No       | 140 (35.3)    | 193 (48.6) | 333 (83.9) |
| Took diet pills         | Yes      | 22 (5.5)      | 25 (6.3)   | 47 (11.8)  | 0.27 |
|                         | No       | 153 (38.5)    | 197 (49.6) | 350 (88.2) |
| Took laxatives          | Yes      | 26 (6.5)      | 30 (7.6)   | 56 (14.1)  | 0.27 |
|                         | No       | 149 (37.5)    | 192 (48.4) | 341 (85.9) |
| Took diuretics          | Yes      | 14 (3.5)      | 15 (3.8)   | 29 (7.3)   | 0.54 |
|                         | No       | 161 (40.6)    | 207 (52.1) | 368 (92.7) |
| Vomited after eating    | Yes      | 10 (2.5)      | 14 (3.5)   | 24 (6)     | 0.80 |
|                         | No       | 165 (41.6)    | 208 (52.4) | 373 (94)   |

**Conflicts of interest**

There are no conflicts of interest.

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