



Impact Of COVID-19 Quarantine On Body Weight And Eating Habits

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Abstract

Since start of pandemic and lockdown imposed by the government people have limited access to fresh food and people spent more time by staying at home. However, staying at home had brought some positive habits among people such as cooking food at home instead of eating junk or fast food. On the other hand, staying home had changes dietary habits of people and cause in gaining more weight during the lockdown. Increase in weight and change in dietary habits have negative effects on health of population. We aimed to investigate the impact of COVID-19 lockdown on body weight and dietary habits of Saudi people. We used survey research design to collect the data from Saudi Arabia. Nature of the study was quantitative and nature of the data collected and used in the study was cross-sectional data. Non-probability convenience sampling technique was used to select the sample size. Total 516 completed responses were received and used in the analysis of the data. SPSS was used for data analysis. Questionnaire adopted in this study consist of three sections, first section contains information about age, gender, chronic disease and height of the respondents, second section included weight and body mass index (BMI) of the respondents before and during pandemic quarantine. Third section consists of eating behavior, dietary habits and health status. Descriptive and inferential statistics were used. In descriptive statistics mean and standard deviation along with percentage were calculated while in order to test hypotheses pair sample t-test and chi-square test were applied. Analysis of results revealed that female participation in the study was high as compared to men. Moreover, majority of the respondents have revealed that they have no chronic disease. Findings of pair sample t-test have revealed that there is significant change in body weight and BMI of females is recorded but there was no significant difference/change in body weight and BMI of male respondents' before and during quarantine. Furthermore, there is significant different found in eating behavior and dietary habit of respondents' during quarantine.

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Key Words: Covid-19, Lockdown, Quarantine, Dietary Habits, Life Style, BMI< Body Weight.

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Introduction

Some unidentified pneumonia cases were identified in December 2019 in Wuhan city in China which was declared as global pandemic by World Health Organization (WHO). A new virus called Sever Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) was held responsible for this pandemic (Alshahrani *et al*, 2022; Al-Daghri *et al*, 2022; Bennett *et al*, 2021; Cheikh *et al*, 2021). This pandemic is also responsible for 6.1 million deaths and has left unprecedented influence globally on health

systems. Coronavirus strains is well known for low respiratory tract severe disease character which include Middle East Respiratory Syndrome (MERS-CoV) and Sever Acute respiratory Syndrome (SARS-CoV) and latest one (SARS-CoV-2). Depression, stress and anxiety are also one of the consequences of lockdown and are associated with health issues including poor life quality, weight gain and poor dietary choices (Tang *et al*, 2021). Studies around the globe have reported the weight gain by individuals during lockdown. Proportion of

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gaining weight in Saudi Arabia is 27.3% while in United States is 22% to 27.5%. In Europe weight gain is 1.5 to 3 kg while in china it is 0.5kg on average (Flanagan *et al*, Jones *et al*, 2021; Nehme *et al*, 2021; Ruano *et al*, 2015; Scott *et al*, 2021). This increase in weight could affect disease burden in future and population health as well. Past studies also investigated the weight gain in risk groups e.g. youth and women during pandemic and lockdown gain more weight usually. In addition diabetes and hypertension have strong relationship with weight gain during lockdown.

On the other hand those with diabetes are more likely to lose weight during pandemic which is mediated by enhancement in glycemic control. Stay at home instructions and lockdown brings new challenges to main healthy lifestyle (Muscogiuri G., Barrea, L. 2020; Golzarand *et al*, 2012). To the best of researcher knowledge scarce and limited empirical evidence are available on weight gain, dietary habits and life quality in Saudi Arabia. Therefore, this study aims to investigate the below mentioned problems.

Lockdown and quarantine imposed against COVID-19 badly affected the life style and dietary habit of Saudis (Al-Daghri *et al*, 2021; Hossein *et al*, 2020; Al-Asmari *et al*, 2021). It brought health as well as nutritional problems. Since start of pandemic and quarantine restrictions, access to fresh food has been limited (Bennet *et al*, 2021; Nelson W, 2020) In addition this lockdown has brought dietary changes not only in Saudi Arabia but globally a significant change has been seen. This change in dietary habits is related with poor life style and weight gain (Al-tawfiq. A., Memish Z. A. 2020; Ben *et al*, 2022; Al-Shahrani *et al*, 2022; Brooks *et al*, 2022). If these habits are sustained for long term it might have serious effects on Saudis' health. (Cheikh *et al*, 2021). Change in diet habits is one of the causes of metabolic syndrome development (Brooks *et al*, 2020). Moreover, change in diet habits is related with weight gain such as increase in number of meals (Kvaavik *et al*, 2005; Sharma *et al*, 2020). snacking after dinner, craving for sugary food, being around relatives and friends social gatherings, and type of food consumed i.e. comfort food, high calories food, sweets, ice-cream, desserts, chocolates (Oppert *et al*, 2006). It is surprising to look at pattern of

energy intake and energy expenditure during pandemic and quarantine. Weight gain is multifactorial and complex it plays important role in developing obesity among those individuals who consume poor diet (Kabir *et al*, 2018). Unhealthy life style and diet habit may lead to circadian misalignment (Gobin *et al*, 2021). Although life expectancy of Saudis' has been increased yet there are several factors which affects health related quality of life (HRQoL) such as diet play crucial role. Limited empirical evidences are available on dietary habits and HRQoL. During quarantine massive impact has been seen on life style such as sedentary behavior, insomnia, sleeping disorder, emotional exhaustion burn out (Chen *et al*, 2020b). There is immense need on training on self-care behavior, counselling and integration of multidimensional approaches to mitigate health issues. Furthermore, guidelines for diet recommended by World Health Organizations (WHO), to have strong immunity, are taking balanced amount of micro and macro nutrients. Thus, stakeholders, professionals and nutritionists involved in healthcare must conduct interventions and raise awareness about self-care. The findings of the existing study would be helpful for health authorities providing health care services to people in Saudi Arabia to effectively handle these services. The consequence of pandemic C-19 on the general population as well as high risk group is area of interest because of pandemic's quarantine has huge impact on human beings globally (Lippi *et al*, 2020; Nguyen *et al*, 2020; Chen *et al*, 2020). Limited empirical evidences are available especially in Saudi Arabia's perspective. Due to C-19 pandemic life style of individuals changes unintentionally because of lockdown and quarantine. Undesirable consequence of quarantine such as eating behavior, dietary habits and weight gain are the most common ones (Caccialanza *et al*, 2020). Weight gain in adulthood is directly proportional to get chronic disease i.e. diabetes or blood pressure, high cholesterol level followed by stress, anxiety, depression and hypertension. Studies conducted in United States, Saudi Arabia, Europe, reported the weight gain during lockdown (Zachary *et al*, 2020; Flangan *et al*, 2021). It was also reported that youth, adults and women tend to gain more weight during pandemic. In addition, changes in



eating behavior during quarantine such as eating more sweets, chocolates, ice cream also affected the life style of Saudi population during lockdown. "Stay at home" instruction by Saudi Government pose new challenges to public to maintain healthy life style. On the other hand impact of quarantine in C-19 has been unclear yet need to be investigated in Saudi Arabia. The regulations used to apply self-quarantine on a national wide scale such as travel bans, closure of leisure places and prohibiting many social activities may affect the public's psychological and physical health (Asrafi *et al*, 2020; Edelson P J 2003; Mcmillan, T M 2018; Zhang Y., Ma Z. F, 2020). This may impact health and quality of life of people undergoing self-quarantine. A recent study from China conducted during CoVID-19 outbreak indicated that individuals with suspected CoVID-19 infection had a higher depression likelihood and lower health-related quality of life than those without. A meta-analysis study revealed that isolated people tended to have poorer anxiety and depression scores, and have lower quality of life compared to non-isolated people. Life quality measurement is an important indicator for health and wellbeing. Therefore, quality of life should be evaluated to determine possible interventions and strategies have to be applied when planning for self-quarantine particularly in a community that has never been through such circumstances (Scott L, Ensaff H, 2022).

Experimental

Materials and Measurements

Study Participants and Design

Nature of this study was quantitative. Nature of the data collected was cross-sectional i.e. data collected at one point of time. First hand primary data was collected using self-administered questionnaire. This current study included those individuals as respondents who were inside the Kingdom and had access to internet during lockdown. Ethical approval was taken prior to data collection from Ethics Committee for Scientific research at Qassim University KSA. Questionnaire was sent online using Google forms link along with consent form to confirm agreement to participate in the study.

Questionnaire/Instrument

Questionnaire adapted has for the current study consisted of three portions/sections. First

section (1) Participants' characteristics and demographic information; (2) evaluation of body weights, and body weight (3) dietary habits and nutritional intake,

Section 1

Demographic information anthropometric data of the respondents was investigated in this section. Information about gender, age, height and chronic disease, was asked from respondents (See Table1).

Section 2

Section 2 consists of body weight and BMI of respondents. Respondents were asked to mention their body weights and BMI before and during pandemic, pair sample t-test were applied for both body weights and BMI (See Table2).

Section 3

In section 3 health status and dietary habits/eating behavior adapted from Saudi Arabia dietary habits questionnaire of respondents was investigated. The dietary habits questionnaire was integrated within the generated online study questionnaire. The dietary habits scores were then used to categories study participants and test their correlations to other study outcomes such as energy and dietary intakes, gender, body weight, body mass index, physical activity level and variables of life quality. (See Table 3 & 4). Chi square tests were applied to see the difference between eating behaviors and health status of respondents before pandemic and during quarantine.

Data Analysis Techniques and Tools

SPSS was used for analysis of data. Descriptive and inferential statistics were used. Descriptive statistics include frequency, percentage, mean and standard deviation while inferential statistics was used to tests hypotheses such as chi square and pair sample t-tests. Pair sample t-test is used when the respondents are same but situations are different. A study code has been generated automatically and assigned to each participant to keep her/his data anonymous. The data was stored into Qassim University's electronic database and could securely be accessed only by the study research team.



Sample size calculation

Based on population-survey studies, the required sample size for this study is 385 participants at 95% confidence level and 5% marginal error.

Results

Table 1 presented demographic characteristics of the respondents. From the analysis of the results, it is revealed that majority of female have participated in the survey 345 (66.9%) followed by male respondents 171 (33.1%). Further analysis of results regarding age and height of respondents Table 1 clearly indicated that average age of respondents is 36.14 with S.D of ± 10.0 and average height in cm of respondents is 163.19 with S.D = ± 9.3 respectively. Majority of respondents have never been diagnosed with chronic disease n = 410 (79.5%), followed by 38 (7.4%) with other chronic disease, 35 patient diagnosed with diabetes and 28 diagnosed with CHD X2 test = 1146.57, $p < 0.01$.

H1a: There is significant difference in the mean scores of male body weight (kg) and BMI (kg/m²) before C-19 and during C-19.

H0: There is no significant difference in the mean scores of male body weight (kg) and BMI (kg/m²) before C-19 and during C-19.

H2a: There is significant difference in the mean scores of female body weight (kg) and BMI (kg/m²) before C-19 and during C-19.

H0: There is no significant difference in the mean scores of female body weight (kg) and BMI (kg/m²) before C-19 and during C-19.

Respondents were also asked about their body weight and body mass index BMI before start of pandemic and during pandemic. Table 2 has presented findings of pair sample t-test. According to Field (2013) paired sample t-test is conducted when sample is same but situation is different. In the above Table 2 on the basis of gender weight of male and female respondents are presented. It is evident that for male respondents mean score of body weight before C-19 is M= 67.86, S.D= ± 19.9 , and during C-19 is M= 67.57 with S.D = ± 19.4 with $p > 0.05$ likewise for BMI (kg/m²) for male respondents before C-19 is M= 27.01 S.D= 7.87 and BMI (kg/m²) after C-19 is M= 26.90, S.D = ± 7.6 $p > 0.05$, alternate hypotheses is not substantiated while null hypotheses is accepted that there is no significant change in weight and BMI for male

respondents before C-19 and during C-19. Similarly female respondents body weight in (kg) before C-19 is M= 87.21 S.D= ± 20.6 , during C-19 is M=88.64, S.D= ± 22.7 $p < 0.05$ is found significant likewise BMI (kg/m²) of female respondents before C-19 was M=29.24, S.D= ± 6.6 during C-19 M= 29.70, S.D= ± 7.2 $p < 0.05$, it indicated that female respondents gained weight and their BMI was also increase during pandemic thus alternate hypotheses for increase in female body weight and BMI during pandemic is accepted while null hypothesis is rejected.

Table 3 has presented findings of chi square analysis on basis of demographic characteristics. It is evident that majority of the respondents has weighing scale at home with n= 266 (51.6%) X2 test = 188.651, $p < 0.01$. Moreover, respondents are also asked about keeping track of their weight and most of the respondents said yes we keep track record of our body weight n= 414 (80.2%) X2 test = 103.849, $p < 0.01$. Furthermore, 265 (51.4%) respondents never diagnosed with obesity or overweight, followed by 152 (29.5%) said yes overweight, 77(14.9%) were diagnosed with obesity and 22 (4.3%) with underweight were diagnosed with X2 test = 257.19, $p < 0.01$. In addition respondents also scored significant on gaining weight during pandemic 188 (36.4%) X2 test = 70.186, $p < 0.01$ on the other hand, 152 (29.5%) claimed that there is no change in body weight during pandemic while 117 (22.7%) respondents claimed that yes we lose weight during pandemic the reason might be these diabetic patient lose weight which is due to mediated by enhancement in glycemic control. Change in eating behavior of respondents before and during pandemic quarantine was investigated. Table 4 results shows findings of pattern of meals and quantity of meals per day taken by respondents. For pattern of meal before pandemic 45 (8.7%) respondents eat homemade food while during pandemic quarantine this number increased to 483 (93.6%), before pandemic 390 (75.6%) eat at restaurant while during pandemic only 22 (4.3%) eat at restaurants or order home delivery. Moreover, 77 (14.9%) eat western or Arab food before pandemic while during quarantine only 11 eat Arab or western food. Before pandemic only 4 (0.8%) respondents eat at healthy food restaurant while during no



respondents eat at restaurant. Regarding quantity of meals per day; 307 (59.5%) respondents claimed to eat 1-2 meals a day during pandemic 231 (44.8%) take 1-2 meals, regarding 3-4 meals before pandemic number of respondents are 202 (39.1%) on the contrary this number has increased to 256 (49.6%) during pandemic, moreover, those who take 5 meals day were 7 (1.4%) during pandemic it has been increased to 29 (5.6%).

Respondents are also inquired about their dietary plans and change in meals 242 (46.9%) respondents said no change X2 test = 79.198, p<0.01, on the contrary 193 (37.5%) has increase the intake of food and 81 (15.7%) respondents during pandemic decrease the intake of food during pandemic. Water consumption per day is also investigated from the respondents. Findings in Table 4 indicates that 223 (43.2%) consume 4 cups of water in a day with X2 test = 57.221, p<0.01 level, followed by 201 (39%) consume 5-7 cups a day while 92 (17.8%) consume more than 8 cups a day.

Effect on appetite or desire to eat more or less during pandemic quarantine is also identified by respondents during survey. Findings indicates that there are 234 (45.3%) claimed no change in appetite with X2 test = 72.640, p<0.01 while 199 (38.6%) said yes increase while 83 (16.1%) said decreased in appetite. Moreover, respondents were investigated about if they were eating more healthy food during quarantine on 4 point likert scale strongly disagrees to strongly agree. 211 (40.9%) agree with this statement X2 test = 127.194, p<0.01 followed by those disagree with this item 163 (31.6%) 101 (19.6%) strongly agree while 41 (7.9%) strongly disagree. Regarding eating more fast food during pandemic quarantine majority 207 (40.1%) disagree followed by strongly disagree i.e. 204 (39.5%) X2 test = 192388, p<0.01. During pandemic eating more food in general 186 (36%) disagree while 175 (33.9%) agree with this item X2 test = 87.457, p<0.01. on the other side it was revealed by respondents that they significantly started eating more snacks during pandemic quarantine 210 (40.7%), X2 test = 90.202, p<0.01 level, 134 disagree with this statement.

Table 1. Age height and Gender of the study sample

Characteristics	N	%
Number of eligible participants		
Male n (%)	171	33.1%
Female n (%)	345	66.9%
Have you ever been diagnosed with a chronic disease?		
No	410	79.5%
Yes, diabetes.	35	6.8%
Yes, CHD.	28	5.4%
Yes, disease related to the digestive system.	0	0.0%
Yes, disease related to kidneys.	5	1.0%
Other chronic diseases	38	7.4%
χ² Test Value	1146.57	
p value	<0.001	
	Mean	S.D
Age	36.14	± 10.0
Height (cm)	163.19	± 9.3

Table 2. Body weight status of the study sample

Variables	Before COVID-19	During COVID-19	p-value
Male:			
- Body Weight (kg)	67.86±19.9	67.57±19.4	>0.05
- BMI(kg/m ²)	27.01±7.87	26.90±7.6	>0.05
Female:			
- Body Weight (kg)	87.21±20.6	88.64±22.7	0.017
- BMI (kg/m ²)	29.24±6.6	29.70±7.2	0.011

Values are means ± standard deviation.

* Paired samples t-test

Table 3. Participants attitudes in relation to Body weight and health status

Variables	Responses (n%)	χ ² Test Value	p-value
Presence of Weighing scale at home			
Yes	266 (51.6)	188.651	<0.001
No	77 (14.9)		
Keep track of body weight			
Yes	414 (80.2)	103.849	<0.001
No	102 (19.8)		
Sometimes			
Have you ever been diagnosed with obesity or underweight?			
No	265 (51.4)	257.19	<0.001
Yes, Overweight	152 (29.5)		
Yes, obesity	77 (14.9)		
Yes, underweight	22 (4.3)		
Effect of quarantine on body weight			
Gaining weight	188 (36.4)	70.186	<0.001
Losing weight	117 (22.7)		
Non change in body weight	152 (29.5)		
weight	59 (11.4)		
Not sure			



Table 4. Effect of Quarantine during Covid-19 on eating behavior

Variables	Before COVID-19			During COVID-19		
	n (%)	χ^2 Test	p-value	n (%)	χ^2 Test Value	p-value
The general pattern of meals						
1. Homemade food	45 (8.7)	724.853	<0.001	483 (93.6)	7.198	<0.001
2. Fast food restaurants	390 (75.6)			22 (4.3)		
3. Arab or Western food restaurants	77 (14.9)			11 (2.1)		
4. Healthy food restaurants	4 (0.8)			0 (0.0)		
How many meals do you eat daily?						
1. 1-2 meals per day	307 (59.5)	269.477	<0.001	231 (44.8)	180.151	<0.001
2. From 3-4 meals a day	202 (39.1)			256 (49.6)		
3. More than 5 meals a day	7 (1.4)			29 (5.6)		
During covid-quarantine: Did the amount of food you eat in general change?						
Yes, increased	-	-	-	193 (37.4)	79.198	<0.001
Yes, decreased	-	-	-	81 (15.7)		
No changes	-	-	-	242 (46.9)		
Daily Water Consumption						
1. Within 4 cups per day	-	-	-	223 (43.2)	57.221	<0.001
2. From 5 to 7 cups a day	-	-	-	201 (39.0)		
3. 8 Cups per day or more	-	-	-	92 (17.8)		
Effect of Covid-quarantine on appetite or desire to eat						
1. Appetite increased	-	-	-	199 (38.6)	72.640	<0.001
2. Appetite decreased	-	-	-	83 (16.1)		
3. No effect on appetite	-	-	-	234 (45.3)		
During covid-quarantine: I ate more healthy food:						
Strongly agree	-	-	-	101 (19.6)	127.194	<0.001
Agree	-	-	-	213 (40.9)		
Disagree	-	-	-	163 (31.6)		
Strongly disagree	-	-	-	41 (7.9)		
During covid-quarantine: I ate more fast foods						
Strongly agree	-	-	-	26 (5.0)	192.988	<0.001
Agree	-	-	-	79 (15.3)		
Disagree	-	-	-	207 (40.1)		
Strongly disagree	-	-	-	204 (39.5)		
During covid-quarantine: I ate more food in general						
Strongly agree	-	-	-	95 (18.4)	87.457	<0.001
Agree	-	-	-	175 (33.9)		
Disagree	-	-	-	186 (36.0)		
Strongly disagree	-	-	-	60 (11.6)		
During covid-quarantine: I ate more snacks						
Strongly agree	-	-	-	112 (21.7)	90.202	<0.001
Agree	-	-	-	210 (40.7)		
Disagree	-	-	-	134 (26.0)		
Strongly disagree	-	-	-	60 (11.6)		

Results and Discussion

The aim of this study was to investigate the impact of Covid-19 on body weight, BMI, life style and Dietary choices (Maffetone P. B., Laursen, P. B. 2020; Calder *et al*, 2020; Ruiz-Rozo *et al*, 2020; Flint *et al*, 2020). Survey approach was used and first hand data was collected from respondents. The nature of the data was cross-sectional. It was found that more females participated in the study. Regarding change in body weight in kg and BMI in kg/m² for male respondents there is no significant mean difference in their weight before and during pandemic but there is significant change in mean difference is recorded for female respondents in their body weight and BMI respectively. The findings of the current study are in line with findings of (Faulkner *et al*, 2021) also conducted study on life style, body weight and dietary choices during pandemic and found the findings of their study supported the findings of the current study. There are multiple factors which contributes significantly

to gain weight such as physical in activity, more screen time, sedentary behavior (Bennet *et al*, 2021; Cardel *et al*, 2020; Osaili *et al*, 2021). During pandemic access to gyms, sports, and recreational places was limited[10]. There is significant relationship between physical inactivity and weight gain (Mazidi *et al*, 2021; Bakhsh *et al*, 2021; Scott *et al*, 2022; Ruano *et al*, 2015). Moreover, staying at home increase the craving for sugary foods which also increase the number of meals per day taken by an individual (Cheikh *et al*, 2021). Change in dietary habits is also one factor of gaining weight. Overeating, snacks, sweets, additional meals also increase the weight of individuals (Gobin *et al*, 2021; Hamzaid *et al*, 2022; Ruano *et al*, 2015; Scott, L, Ensaff, H 2022; Husain W., Ashkanani, F., 2020; Robinson *et al*, 2020). Further analysis of results revealed that in Saudi Arabia more people started taking homemade food during pandemic quarantine as compared to before pandemic majority of people rushed to restaurants for eating. In addition majority of people before pandemic takes 1-2 meals a day but in pandemic quarantine they started 3-4 meals a day which is also a sign of poor dietary choices and gaining weight.

Implications

Overweight, obesity, poor dietary choices and change in life style is main issue of public health and it has financial burden on Ministry of Health in terms of cost (Jimenez *et al*, 2021). As per the World Health Survey in KSA (KSAWHS) percentage of overweight and obesity is 38% and 20% respectively. Approximately there are 34 million population of KSA (Alsahrani *et al*, 2022). It means that there are thirteen million overweight people and 7 million obese populations in the kingdom. This would significantly increase the economic and financial burden on the government of Saudi Arabia.

Conclusions & Future Research Directions

We found in the current study that female tend to gain more weight during pandemic and people in Saudi Arabia started taking more meals a day during pandemic quarantine. This will have negative influence on population health in Saudi Arabia. Proper interventions are crucial and people have to consider these interventions seriously especially those with



higher weights. Future studies can add other factors which can be responsible for gain weight dietary choices and physical activity level.

Author Declaration Statement

Competing Interest

Authors declare there is no conflict of interest

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Authors' Contribution

Author Contributions: H.A.A designed the study; H.A.A and E.M.H constructed the study questionnaire; H.A.A, E.M.H, S.A.A and R.A.A collected data; H.A.A, E.M.H and R.A.A analyzed the data, H.A.A and Y.H.M wrote the first draft of the manuscript. H.A.A E.M.H, S.A.A, Y.H.M and R.A.A have read, revised, corrected, and approved the manuscript. All authors have read and agreed to the published version of the manuscript.

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