Lifestyle changes that can increase the risk of cardiovascular disease during the COVID-19 pandemic: a cross-sectional study

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Received: May 2021; Accepted: June 2021; Published: July 1, 2021.
Citation: Mohammed Abdulrahman Alrubaysh et al. Lifestyle changes that can increase the risk of cardiovascular disease during the COVID-19 pandemic: a cross-sectional study. World Family Medicine. 2021; 19(7): 44-53
DOI: 10.5742/MEWFM.2021.94076

Abstract

Objectives: In December 2019, coronavirus disease of 2019 (COVID-19) emerged in Wuhan, China, and in March 2020 the World Health Organization (WHO) declared it a global pandemic. Therefore, many countries including Saudi Arabia enforced lockdowns and quarantine restrictions to help contain the disease. These restrictions lead to changes in lifestyle, diet, and physical activity habits among the world population. This study aimed to assess the lifestyle changes that are considered risk factors of cardiovascular diseases (CVD) among the Saudi population during the COVID-19 lockdown.

Methods: We conducted a cross-sectional study using an online questionnaire on adults over the age of 18 living in Saudi Arabia from January to February 2021.

Results: We collected a total of 2,069 responses of which 64.7% were between 18 – 35 years old and 68.1% were females. During the COVID-19 pandemic, 83% of participants reported having homemade meals. The consumption of meat, fish and seafood, and fat products decreased and the consumption of snacks and beverages increased significantly during the pandemic. The average hours spent on physical activities as well as screen time increased during the pandemic. Moreover, the participants reported changes in sleeping habits and weight gain (43%) during the lockdown. Poor lifestyle habits were associated with increased CVD symptoms.

Conclusion: Dietary and exercise habits among the Saudi population have changed significantly during the COVID-19 pandemic which subsequently resulted in an increase in CVD symptoms.

Key words: COVID-19, pandemic, lifestyle, cardiovascular disease

Introduction

In December 2019, coronavirus disease of 2019 (COVID-19) which originated from Wuhan, China rapidly emerged and spread globally causing mild to severe illness of the respiratory system. The World Health Organization (WHO) officially declared COVID-19 a global pandemic in March 2020(1,2). By September of that year, more than 32.7 million people had been affected by COVID-19 and around 991,000 deaths were reported worldwide(3). The Saudi Ministry of Health reported the first COVID-19 case in the Kingdom of Saudi Arabia in March 2020. Consequently, Saudi Arabia announced a partial lockdown followed by a full lockdown by the end of March(4). Although these restrictions were mandatory to control the spread of COVID-19, they lead to a significant change in lifestyle, diet, and physical activity(5).

Cardiovascular disease (CVD) is still the leading cause of death worldwide. Additionally, those infected with COVID-19 with established CVD usually have a worse prognosis and a higher mortality when compared to a healthy population(6). Although quarantine and restriction measures are a crucial step in the containment of COVID-19 outbreaks, they may lead to lifestyle, diet, and physical activity changes that might potentially increase the incidence of cardiovascular diseases(7,8). This study aimed to assess the changes in dietary and lifestyle habits during the COVID-19 lockdown that could increase the risk of cardiovascular diseases (CVD) among the Saudi population.

Methods

We conducted a cross-sectional study through an online questionnaire from January 2021 to February 2021. The inclusion criteria consisted of all adults ≥18 years old living in Saudi Arabia. Respondents who did not meet the criteria or did not complete the questionnaire were excluded.

An online self-administered questionnaire was used for data collection to determine the changes in lifestyle, eating habits, and physical activity caused by the COVID-19 lockdown that could increase the risk of CVD among the Saudi population. We distributed the survey via social media through an invitation letter and an online link which included a request to circulate the survey broadly to other contacts in Saudi Arabia (snowball sampling).

The questionnaire was composed of closed-ended questions that were divided into 4 sections. The first section consisted of 6 questions about the participants' socio-demographic characteristics. The second section included 16 questions that investigated eating habits and meal patterns. The third section contained 9 questions that assessed physical activity levels, weight changes, and sleeping habits while the fourth section of the questionnaire had 6 questions regarding the participants' past medical, surgical and medication history. The questions were asked in pairs in order to compare habit changes that occurred before and during the pandemic.

A study information sheet and the aim and motivations of the study were provided at the beginning of the survey, followed by a consent form indicating the participants' rights and ability to withdraw at any time without any consequences. Data was collected anonymously and treated with confidentiality. The questionnaire was developed and guided following a review of related literature and revised by two cardiologist consultants.

Statistical Analysis

The data was analyzed using the Statistical Package for the Social Sciences (IBM SPSS version 23). Frequency and percentages were used for description of categorical variables while mean values were used for continuous variables. Chi-square test and t-test were used to compare the differences between variables. A p-value less than 0.05 was considered statistically significant.

Participation was voluntary and informed consent was obtained from all participants. The collected data was kept confidential in compliance with the laws set by the National Committee of Bio and Medical Ethics (NCBE) that operates under King Abdulaziz City for Science & Technology (KACST). The study was approved by the Institutional Review Board of Imam Mohammed Ibn Saud Islamic University.

Results

A total of 2,069 responders completed the questionnaire. The majority of the sample were between 18–35 years old (64.7 %) while 20.7% of the participants were over 46 years of age. The study sample consisted of 1,408 females (68.1%) and 661 males (31.9%) and were mostly of the Saudi nationality (96.5%). More than half of the sample were from the central region (79%), were single (56.2%), and had a university degree (64.7%). Ninety percent of the sample were non-smokers while 8% indicated smoking one pack daily (Table 1).

The majority of our participants (83%) reported that they mostly had homemade meals during the COVID-19 lockdown while 15.3% reported frequently having take-out food. Half of the sample had two meals daily (50.7%) and considered lunch the main meal of the day (50.8%), and 45.2% reported skipping breakfast often. Moreover, 55.9% of participants reported that they sometimes had a late-night snack or meal and 47.2 % indicated that they consumed fast food not more than once per week (Table 2).

Table 1: Socio-demographic characteristics of the study participants			
Demographic characteristics of the study		Count	Column N %
Age	18-35	1338	64.7%
	36-45	303	14.6%
	46-55	291	14.1%
	56-65	126	6.1%
	Older than 65	11	0.5%
Gender	Male	661	31.9%
	Female	1408	68.1%
Nationality	Saudi	1997	96.5%
	Non-Saudi	72	3.5%
Residency	Northern region	53	2.6%
	Southern region	102	4.9%
	Western region	204	9.9%
	Eastern region	76	3.7%
	Central region	1634	79.0%
Marital status	Single	1163	56.2%
	Married	840	40.6%
	Divorced	47	2.3%
	Widow	19	0.9%
Education	Lower than secondary school	53	2.6%
	Secondary school	486	23.5%
	University	1339	64.7%
	Above education (PhD)	191	9.2%
Smoking	Not smoking	1871	90.4%
	Smoking one pack daily	165	8.0%
	Smoking two pack daily	23	1.1%
	Smoking morethan two packs daily	10	0.5%

Table 2: Eating habits and meal patterns during the COVID-19 lockdown			
		N	N %
Your meals are usually	Homemade	1718	83.0%
	From restaurant	317	15.3%
	Frozen, ready to be heated and eaten	34	1.6%
How many times a day do you eat?	One time	180	8.7%
	Two meal	1049	50.7%
	Three meal	699	33.8%
	Four meal	102	4.9%
	More than four meal	39	1.9%
What meal would you consider to be your main meal?	Dinner	582	28.1%
	Lunch	1052	50.8%
	Breakfast	435	21.0%
Which meal could be skipped	Dinner	546	26.4%
	Lunch	510	24.6%
	Breakfast	935	45.2%
	I skipped none of these	78	3.8%
Who usually prepared the food	Mother	1245	60.4%
	Father	79	3.8%
	Sister	552	26.8%
	Wife	440	21.3%
	Husband	58	2.8%
	Housekeeper	746	36.2%
How likely are you to have a late night snack or meal?	Rarely	537	26.0%
	Sometimes	1156	55.9%
	Always	376	18.2%
Number of times a week you consume fast food	Once weekly	977	47.2%
	Twice weekly	487	23.5%
	Three times weekly	322	15.6%
	More than three times weekly	283	13.7%

As described in Table 3, there was a significant decrease in the consumption of meat, fish and seafood, and fat products during the pandemic compared to the pre-COVID-19 period (p-value < 0.05). However, the consumption of chicken, canned meat, fruits, and vegetables markedly increased (p-value < 0.05).

Table 3: Consumption of different food groups before and during the COVID-19 pandemic

Food	Variable	Before the pandemic		During the pandemic		Mean difference†	*p*-value
		N	N%	N	N%		
Meat	Yes	1148	55.5%	1092	52.8%	-0.027	0.000*
	No	921	44.5%	977	47.2%		
Chicken	Yes	1823	88.1%	1867	90.2%	0.021	0.002*
	No	246	11.9%	202	9.8%		
Fish and seafood	Yes	700	33.8%	642	31.0%	-.028	0.001*
	No	66.2%	1427	69.0%	1932		
Canned meat	Yes	137	6.6%	181	8.7%	.021	0.000*
	No	1932	93.4%	1888	91.3%		
Canned fish like tuna	Yes	667	32.2%	695	33.6%	0.013	0.105
	No	1402	67.8%	1374	66.4%		
Fruit	Yes	1198	57.9%	1319	63.8%	0.053	0.000*
	No	871	42.1%	750	36.2%		
Vegetable	Yes	1341	64.8%	1476	71.3%	0.056	0.000*
	No	728	35.2%	593	28.7%		
Baked	Yes	1624	78.5%	1603	77.5%	-0.010	0.280
	No	445	21.5%	466	22.5%		
Dairy product	Yes	1425	68.9%	1425	68.9%	0.000	1.000
	No	644	31.1%	644	31.1%		
Fat products, such as oils, used for cooking	Yes	1001	48.4%	966	46.7%	-0.11	0.017*
	No	1068	51.6%	1103	53.3%		

*Significant at *p*-value less than 0.05
†Difference between score during pandemic and before pandemic where – mean indicates a decrease in usage in pandemic time

Additionally, the consumption patterns of snacks and beverages, such as biscuits, nuts, vegetables, fruits, water, tea, and fresh juices showed a significant increase during the pandemic with the exception of energy drinks which showed a significant decrease compared to the pre-COVID-19 period (p-value < 0.05).

The average hours spent on physical exercise per week markedly increased during the pandemic. Overall, 831 participants (40.2%) did not exercise pre-COVID-19 compared to 758 participants (36.6%) who did not exercise during the pandemic (p-value = 0.001). Despite the increase in physical activity, 1,514 participants (73.2%) reported using electronic devices such as mobile phones for more than 4 hours daily during the pandemic compared to 1,020 participants (49.3%) who used electronic devices for more than 4 hours daily pre-COVID-19 (p-value = 0.000). Only 4.3% spent their spare time with family and friends, while 76.2% had spent their spare time watching television or on social media. Approximately 80% usually slept at night before the pandemic compared to 56.7% who slept at night during the pandemic with a significant increase in the number of participants who slept for more than 8 hours daily (p-value = 0.000). Although the majority of participants did not report insomnia or other sleep disturbances, there was a significant increase in the number of participants who suffered from insomnia during the COVID-19 pandemic (Table 4).

Table 4: Physical activity, sleep, and lifestyle habits before and during the pandemic

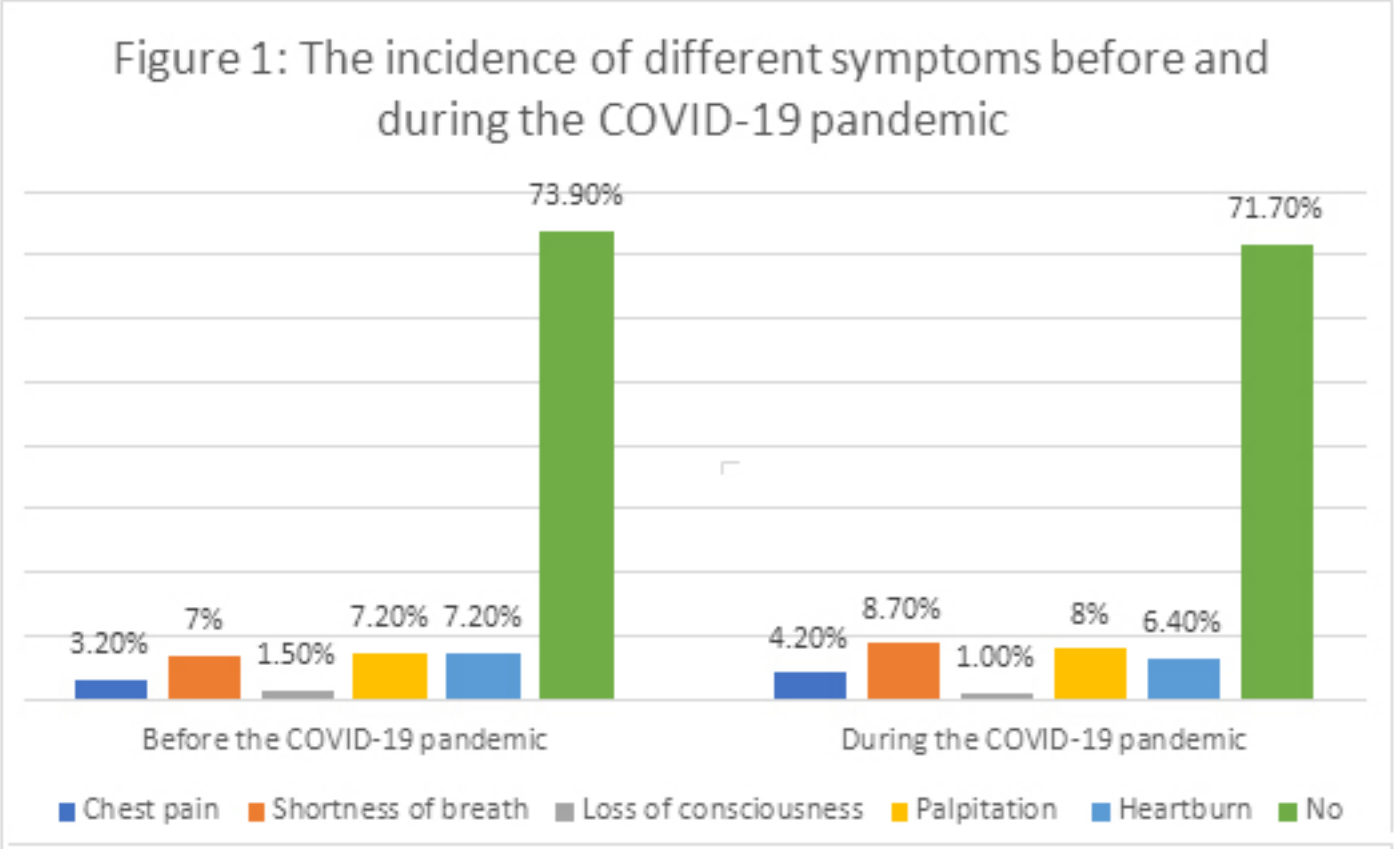
Item	Variable	Before the pandemic		During the pandemic		Mean difference†	*p*-value
		N	N%	N	N%		
Average hours spent practicing physical activities	No exercise	831	40.2%	758	36.6%	0.07	0.001*
	Less than 2 hours/ week	635	30.7%	674	32.6%		
	2-4 hours/ week	369	17.8%	354	17.1%		
	More than 4 hours / week	234	11.3%	283	13.7%		
The average number of hours you spend on devices such as phones and others in the day	Less than 2 hours	313	15.1%	178	8.6%	0.304	0.000*
	2-4 hours	736	35.6%	377	18.2%		
	More than 4 hours	1020	49.3%	1514	73.2%		
You usually spend your spare time	Walking / sport	269	13.0%	345	16.7%	-0.25	0.000*
	Shopping	261	12.6%	60	2.9%		
	TV/ Social media	865	41.8%	1576	76.2%		
	Visiting family and friends	674	32.6%	88	4.3%		
You usually slept in:	Night	1651	79.8%	1173	56.7%	0.23	0.000*
	Morning	418	20.2%	896	43.3%		
Average hours of sleep	Less than 6 hours	556	26.9%	356	17.2%	0.318	0.000*
	6-8 hours	1232	59.5%	972	47.0%		
	More than 8 hours	281	13.6%	741	35.8%		
Were you suffering from insomnia or sleep problems	Yes	565	27.3%	732	35.4%	-0.08	0.000*
	No	1504	72.7%	1337	64.6%		

*Significant at *p*-value less than 0.05
†Difference between scores during and before the pandemic where – mean indicates a decrease in usage in pandemic time

Regarding the COVID-19 lockdown's impact on body weight, 34% of participants reported no weight changes, a quarter reported a weight gain of less than 5 kg, and 18.4% reported weight gain of more than 5 kg. Nearly 23% of our participants reported a decrease in body weight during the pandemic.

Around 92% of participants did not take any medications, 81.1% did not have any medical history of cardiac-related conditions, and 97.7% never had cardiac surgery. The prevalence of cardiac diseases was 2.7% while the prevalence of diabetes mellitus, hypertension and hypercholesterolemia was 6.8%, 7.6%, and 9% respectively. Only 9.7% of the participants reported having an issue dispensing their medication during the pandemic.

Figure 1 shows a list of symptoms some of the participants suffered from before or during the pandemic. Generally, the majority of the participants never experienced any of the symptoms before (73.9%) or during the pandemic (71.7%).



Participants who frequently consumed fatty foods reported symptoms like chest pain, loss of consciousness, and palpitations more than participants who rarely consumed fatty products during the COVID-19 pandemic. There was a significant correlation between shortness of breath and lower levels of physical activity. Additionally, less time on social media was associated with a lower incidence of most symptoms. Weight gain was linked to increased incidence of chest pain, loss of consciousness, heartburn, and palpitations during the pandemic (Table 5).

Table 5: The relation between lifestyle changes during the COVID-19 pandemic and CVD symptoms

Change in life style	Did you suffer from these symptoms during the Corona pandemic?					
	Chest pain	Shortness of breath	Loss of consciousness	Palpitation	Heartburn	No (Control)
	Mean	Mean	Mean	Mean	Mean	Mean
Fat consumption	.02	-.01-	.05	.02	-.04-	-.02-
Increase in physical activity	.02	-.13-	.29	.09	.03	.10
Less time spent on social media	.31	.42	.10	.23	.44	.29
Sleep pattern	.30	.35	.19	.33	.36	.31
Increased weight	2.63	3.05	2.86	3.12	2.92	3.14

Discussion

Adhering to a balanced and healthy diet as well as exercising regularly has a significant role on health maintenance(9). The lockdown and quarantine restrictions which were imposed by many countries to control COVID-19 outbreaks are believed to contribute to poor lifestyle habits which may lead to the development of serious medical conditions such as obesity, diabetes, cardiovascular diseases, and mortality in patients infected with COVID-19(10,11). A study conducted in Korea showed a significant relationship between higher mortality rates in COVID-19 patients and CVD risk factors such as unhealthy eating habits and physical inactivity(12,13). This study assessed the lifestyle changes that can impact cardiovascular health and increase the risk of CVD during the COVID-19 pandemic among the Saudi population. We distributed an online questionnaire and received 2,069 responses from various Saudi regions.

Our study identified multiple changes in eating and physical exercise habits in adults during the COVID-19 lockdown in Saudi Arabia which match the findings of similar studies conducted in Italy and China(14,15). The majority of our sample reported eating homemade food regularly during the lockdown. This is similar to a Saudi study that demonstrated an increase in the consumption of daily home-cooked meals from 35.6% pre-COVID-19 to 85% during the COVID-19 pandemic(16). Two other studies conducted in Italy showed corresponding results(17,18). Skipping breakfast and late-night snacking were the 2 major unhealthy eating habits detected in this study. This is in accordance with findings reported by Husain and Ashkanani(2). Moreover, almost half of our participants (47.2%) indicated that they had a take-out meal once per week during the pandemic as compared to a previous study that reported consumption of take-out meals 1-2 times per week in 17% of participants(16).

In this study, there was a decrease in the consumption of meat, fish and seafood, and fat products but a significant increase in the consumption of chicken, fruits, vegetables, and canned meat during the pandemic. These findings notably differ from previous results reported in the literature which showed a marked increase in the ingestion of fat products and an inability to reach the minimum daily requirement of fruits and vegetables during the pandemic (2). However, our results were consistent with a study conducted on the Spanish population that showed a decrease in the consumption of fat products (96.5% versus 91.7%) and red meats (87.1% versus 82.7%) as well as an increase in the intake of fruits and vegetables(9). A likely hypothesis for the improved intake of fruits and vegetables could be due to the noticeable increase in home cooking and the well-known conception amongst the population that fruits and vegetables can enhance the body's immunity against COVID-19. The decreased consumption of meat and fat products reflects the high level of awareness of the Saudi population about the risks of overindulging in fatty foods and their negative effect on weight. Conversely, the lower intake of fish may be of particular concern, since it may translate to a reduced intake of vital nutrients such as long-chain n-3 polyunsaturated fatty acids and iodine(21).

The present study revealed an increase in the consumption of most snacks and beverages during the COVID-19 pandemic which opposes the recommendation to reduce the intake of fats, sugars, salt, and irregular snacking during the lockdown(22). Our findings support past literature that found that the consumption of unhealthy foods such as potato chips, fried food, red meat, and sugary foods and drinks significantly increased 3 weeks into lockdown(19,20,23). Scarmozzino and Visioli (14) indicated that 50% of Italian participants showed an increase in the consumption of sweet and salty snacks during COVID-19. According to Husain and Ashkanani , this could be a result of boredom, anxiety and stress which may lead to a higher consumption of energy-dense foods including snacks and beverages rich in fats and salt2.Click or tap here to enter text. We assume that the increased consumption of snacks and beverages is due to their wide availability and long shelf life compared to fresh produce which makes them more suitable for storage during a health crisis.

Physical activity and a healthy sleep hygiene are known to improve overall wellbeing and decrease the risk of CVD(24). In this study, our participants reported an increase in both the average hours of physical exercise as well as the average hours spent on electronic devices during the pandemic. This is partially contradictory to previous findings that demonstrated a significant decrease in physical activity during the pandemic but an increase in hours spent on electronic devices similar to our results(2,25). Multiple other studies conducted globally have also shown an increase in screen-time during the lockdown(3,18,26). The increased physical activity in our participants could be explained by the easy accessibility of home workouts through various social media platforms. In line with previous studies, our findings suggested that many participants changed their sleep schedule from night to morning during the COVID-19 pandemic with an increase in the average hours of sleep(2,19,20).

The increased consumption of snacks and beverages found in our study could explain the weight gain reported by 40% of our sample during the COVID-19 pandemic, which agrees with results of other studies conducted in Poland and Northern Italy(27,28). According to literature review, obesity and low physical activity are important modifiable risk factors of CVD (5). In our study, symptoms of CVD were related to a decrease in activity, an increase in fat consumption, an increase in time spent on social media, and poor sleep habits which match the results of several previous studies(2,18,26,27).

This study utilized an online survey, which proved to be an excellent research tool in recruiting a wide sample of participants without direct contact. Additionally, the questionnaire provided an extensive amount of information about dietary and lifestyle changes before and during

the pandemic. However, it is plausible that a number of limitations might have influenced the results obtained. The use of a self-reported questionnaire is subject to social desirability bias as well as recall bias. Although we collected data from various regions of Saudi Arabia, most of the responders were from the central region and were of the female gender which could negatively affect the generalizability of our results.

Conclusion

The present study indicates that the Saudi population experienced major dietary and lifestyle changes during the pandemic which included positive modifications such as the consumption of less fatty food and more fruits and vegetables and an increase in physical activity. However, some negative changes were also detected such as an increase in the frequency of snacking and the use of electronic devices, weight gain, and poor sleep habits. These findings were associated with a significant increase in CVD symptoms. Public awareness programs and further data collection is required to determine the extent of poor lifestyle changes among the Saudi population and their effect on cardiovascular health on a wider region.

Acknowledgement:
We would like to thank Mazen Ayedh Albogami, Faisal Fadel Alshehri, Maha Abdullah Almutairi, Raghad Mohammed Alajlan, Leenah Saad Alazwari, Ayedh Saeed Alqarni, Rahaf Abdulkhaliq Alshehri, Omar Zuhier Alamri, Mohannad Bandar Almutairi, and Layan Mutlaq Aldosari who participated and helped in data collection.

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