

# Comparison of the general dietary habits and lifestyle between before and during COVID-19 among the Saudi adult's population in Riyadh

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## Research Article

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# Abstract

**Background:** The Covid-19 pandemic led to lockdowns in several parts of the world, causing sudden lifestyle and dietary habits changed, through social distancing and isolation at home. This study aimed to compare the general dietary habits and lifestyle between before and during COVID-19 among the Saudi adult population in Riyadh.

**Methods:** It was a cross-sectional study, targeting the Riyadh population, from 16 May 2020 to 16 June 2020. The study comprised a structured questionnaire packet that inquired demographic information examples include:(age, gender, place of residence, and health status); dietary habits information (daily intake of certain foods, food frequency, number of meals/day, and number of times drinking the tea and coffee); lifestyle habits information (physical activity, sleep quality, time that spend using the internet, social media and electronic devices for fun daily and stresses) using Google form. A total of 1,193 participants have been included in the study aged over 18 years.

**Results:** During the COVID-19 period, a significant increase in the number of meals eaten daily, the number of times of fruits and vegetable intake, the number of sweets, cakes, and biscuits, the number of hours of sleep per day, the time using the internet and social media were observed more than at in the before COVID-19 pandemic period. However, the number of running exercise or physical activity was significantly reduced.

**Conclusion:** In this study, the dietary and lifestyle habits have changed among the Saudis during the COVID-19 period. Future large-scale similar studies should be undertaken to confirm the results of the study.

## Background

Coronaviruses (CoVs) infect many species of animals, including humans, causing systemic infections of pneumonia and upper/lower respiratory, intestine, liver, and nervous system [1, 2]. In late December 2019, a novel Coronavirus Disease 2019 (COVID-19) elicited by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) emerged in Wuhan, China and was identified as a pandemic by the World Health Organization (WHO) on March 11, 2020 [3]. SARS-CoV-2 is an enveloped viruses and containing a non-segmented single-stranded, positive-sense RNA that belongs of genus *Betacoronavirus*, family *Coronaviridae*, and order *Nidovirales* [4]. The viral genome is about 27–32 kb in length, which encodes for both structural and non-structural proteins [5]. SARS-CoV-2 is highly similar to SARS-CoV-1, which emerged in Guangdong (southern China) in late of 2002 [6, 7] and Middle East respiratory syndrome coronavirus (MERS-CoV) which was started in Saudi Arabia during September 2012, and spread to the neighboring countries [8]. Signs and symptoms of COVID-include respiratory symptoms, fever, dry cough, headache, dizziness, general weakness, shortness of breath and breathing difficulties that could worsen leading to pneumonia, and death [9]. Older people are at highest risk from COVID-19 as a result of systemic diseases such as diabetes, lung disease etc. coupled with weak immunity [10].

Even though the exact mechanisms of transmission of SARS-CoV-2 are presently uncertain, it is clear now that SARS-CoV-2 can be transmitted by human-to-human despite the majority of the early cases. Infection is also acquired by inhalation of these droplets or touching surfaces contaminated by them and then touching the nose, mouth and eyes [11]. Within a short period, and due to the number of countries reporting cases, the WHO declared the COVID-19 outbreak as a pandemic [12], until of Jun 16th 2020, the virus affected more than 205 countries with more than 6,5 million confirmed cases of COVID-19. Of these, more than 400,000 had lost their lives globally [13]. Although the case fatality rate of COVID-19 (estimated at 2–3%) is lower than those of severe acute respiratory syndrome (SARS) (approximately 10%) and MERS (approximately 40%), the pandemic associated with COVID-19 has been far more severe. In Saudi Arabia, within 3 months of outbreak, despite a bunch of restriction rules, the virus spread to most regions of the Saudi Arabia and infected more than 200,000 individuals with more than 2000 deaths [14].

To date, global public health bodies and governments have ignited strategies and issued advisories on various handwashing and hygiene guidelines such as handwashing and hand antiseptis, wearing a face mask [15] and social distancing strategies [16]. Some countries have adopted partial/complete curfew, and travel restrictions to prevent COVID-19 spread. In Saudi Arabia, rapid spread of the virus with the high fatality rates has left the world scrambling to bring the pandemic under control, at the beginning of March 2020, the Saudi Government early decided for more stringent containment measures and issued a curfew and imposed a strong financial penalty on lawbreakers, curfew in specific hours and most of the major cities have 24 hours' curfew and also stopped religious gathering in orders to prevent the spread of virus [17, 18].

Good nutrition is an important implication in host defense against COVID-19 [19]. Various dietary patterns have been linked to the risk of inflammatory conditions [20] and respiratory disease [21]. Fruit and vegetable intakes have been investigated for potential benefits in association with respiratory and inflammatory conditions due to their nutrient profile consisting of antioxidants, vitamins, minerals [22, 23]. All of this caused a sudden change including lifestyle and dietary habits through social distancing and isolation at home, with social and economic. This study aimed to compare the general dietary habits and lifestyle between before and during COVID-19 among the Saudi adult's population in Riyadh.

## Methods

### Study design and population

A cross sectional survey conducted among the general population of Riyadh, from 16 May 2020 to 16 June 2020, data were collected online, via questionnaire, using Google form. Given the high internet usage among people in the Saudi Arabia, a link to the survey was distributed to respondents, via Twitter, WhatsApp and Instagram. According to the latest Saudi Arabia census, Riyadh has a population around 4.21 million [24]. To achieve the study objectives and sufficient statistical power, sample size was calculated using sample size calculator [25], which was 1,193 participants, using a margin of error of  $\pm$

4%, a confidence level of 99%, a 50% response distribution. Ethical approval was obtained from the Ethics Committee of the College of Science Research Center of King Saud University, Riyadh, Saudi Arabia.

### **Eating habits and lifestyle changes in COVID 19 period (EHLC-COVID19) questionnaire**

EHLC-COVID19 questionnaire was specially built in Arabic language. On the first page of the questionnaire, respondents were clearly informed about the background and the purpose of the study. EHLC-COVID19 questionnaire consists of three primary sections that inquired, the first section was about demographic information (age, gender, place of residence, current employment, education and health status); The second assessed participants' dietary habits that included 12 questions about (daily intake of certain foods, food frequency, number of meals/day and number of times drinking the tea and coffee); The final section of the questionnaire assessed the lifestyle habits. This section consisted of five questions related to practices and behavior, including (physical activity, sleep quality, time that spend using the internet, social media and electronic devices for fun daily and stresses). Once completed, each questionnaire was transmitted to the Google platform and the final database was downloaded as a Microsoft Excel sheet.

### **Statistical analyses**

Data were analyzed using Statics Package for Social Science (SPSS) version 22 (SPSS Inc. Chicago, IL, USA). Categorical data were presented as frequencies and percentages (%). Continuous data were presented as mean  $\pm$  standard deviation (SD) for normal variables and non-Gaussian variables were presented as median. Independent Sample T-test, and The Chi-Square independence test was used to indicate differences as all variables are nominal. Results were significant for  $P$  value $<0.05$ .

## **Results**

### **Participants**

On the 16th of Jun 2020, the web-survey was stopped, and the collected data were analysed. A total of 1,100 participants completed the questionnaire. The participants (7) that live outside of Riyadh city Saudi Arabia were excluded, so, the final sample consisted of 1,093 participants aged over than 18 years. According to gender distribution, the female respondents represent (76.9%) of the population. The majority of the participants (71.5%) were married, (69.9%) of those had university education. The majority of the participants (67.1%) without diseases and the percentage of those a had different disease (32.9%). The most important diseases were respiratory problems, cholesterol, blood pressure, thyroid and diabetes as shown in Table 1.

**Table 1.** Characteristics of the study participants.

Variable	Category	N	%	Variable	Category	F	%
Gender	Male	252	23.1	Social status	Unmarried	268	24.5
	Female	841	76.9		Married	782	71.5
Age	18 - 20	131	12.0	Education	Separated	43	4.0
	21 -30	197	18.0		Secondary and lower	211	19.3
	31 -40	273	25.0		University	764	69.9
	41- 50	351	32.1	Postgraduate	118	10.8	
	51 - 60	120	11.0	Occupation	Student	176	16.1
	More than 61	21	1.9		Employed	560	51.2
					Retired	118	10.8
				Unemployed	239	21.9	
Health status:							
You have diseases	No	733	67.1	Osteoporosis	11	1.0	
	Yes	360	32.9	Thyroid	30	2.7	
The type of disease	Diabetes	23	2.1	Diabetes & pressure	10	0.9	
	Blood pressure	33	3.0	Diabetes & cholesterol	11	1.0	
	Respiratory problems	47	4.3	Diabetes, pressure and cholesterol	10	0.9	
	Digestive problems	22	2.0				
	Cholesterol	36	3.3				
Take prescription medications	No	746	68.3				
	Yes	347	31.7				

Note: Data presented as mean  $\pm$  Standard Deviations and number (%).

### Dietary habits and lifestyle changes during COVID-19 pandemic:

With regards to dietary habits, a significantly reduced intake of breakfast was observed during COVID-19 pandemic than that in the before COVID-19 pandemic ( $P=0.000$ ). There was a significant increase in the number of meals eaten daily (more 5 meals) during COVID-19 pandemic than that in the before COVID-19 pandemic ( $P=0.000$ ). The family members ate the meal together were significantly elevated during COVID-19 pandemic more than before COVID-19 pandemic ( $P=0.000$ ). However, the number of times of eat in restaurants or home delivery were significantly reduced during COVID-19 pandemic in comparison to before COVID-19 pandemic ( $P=0.000$ ). A significantly increase in the number of times of fruits and vegetables intake (3-4/day) was showed during COVID-19 pandemic than that in the before COVID-19 pandemic ( $P=0.000$ ), there was also a clear increase in the number of sweets, cakes and biscuits intake (twice/day and 3-4/day) during COVID-19 pandemic than that in the before COVID-19 pandemic ( $P=0.000$ ) as shown in Table 2.

With regards to lifestyle changes during the COVID-19 pandemic, a significantly decrease in the number of running exercise or physical activity (1-2/week and 3-4/week) than that in the before COVID-19 pandemic ( $P=0.000$ ). However, the number of hours of sleep per day were significantly elevated during COVID-19 more than before COVID-19 pandemic ( $P=0.000$ ). A significantly increase the time using the internet, social media and electronic devices for fun daily was noted during COVID-19 pandemic as compared to before COVID-19 pandemic ( $P=0.000$ ), there was also a clear increase in the feeling anxious, afraid and depressed during COVID-19 pandemic more than at in the before COVID-19 pandemic ( $P=0.000$ ) as shown in Table 3.

**Table 2.** The impact of the COVID-19 pandemic on dietary habits.

Variable	Category	Pre- COVID- 19	%	During COVID- 19	%	<i>P</i> value
Do you have breakfast?	No	141	12.9	199	18.2	0.000**
	Yes	660	60.4	573	52.4	
The number of meals eaten daily	Sometimes	292	26.7	321	29.4	0.000**
	1-2 meals	527	48.2	473	43.3	
	3-4 meals	535	48.9	534	48.9	
	More 5 meals	31	2.8	86	7.9	
The family members ate the meal together	Don't	12	1.1	19	1.7	0.000**
	Rarely	112	10.2	41	3.8	
	Sometimes	496	45.4	303	27.7	
	Always	473	43.3	730	66.8	
The number of times you eat in restaurants or home delivery	Don't	98	9.0	794	72.6	0.000**
	1-2 times/week	595	54.4	206	18.8	
	3-4 times / week	243	22.2	24	2.2	
	More than 4 times/week	72	6.6	15	1.4	
	Once/month	61	5.6	47	4.3	
	Twice/month	24	2.2	7	0.6	
The number of times you eat fresh or cooked fruits and vegetables	Don't	84	7.7	77	7.0	0.000**
	1-2 /week	197	18.0	145	13.3	
	3-4 / week	72	6.6	78	7.1	
	3-4 / day	108	9.9	205	18.8	
	1-2 / day	632	57.8	588	53.8	
The number of times you eat meat	Don't	71	6.5	68	6.2	0.969
	1-2 / week	265	24.2	269	24.6	
	3-4 / week	329	30.1	321	29.4	
	1-2 / day	428	39.2	435	39.8	
The number of times to eat sweets, cakes and biscuits	Don't	148	13.5	54	4.9	0.000**
	1-2 /week	30	2.7	19	1.7	
	Once /day	602	55.1	509	46.6	
	Twice/day	220	20.1	397	36.3	
	3-4 /day	93	8.5	114	10.4	
The number of times to eat nuts	Don't	429	39.2	185	16.9	0.074
	1-2 /week	17	1.6	18	1.6	
	Once /day	449	41.1	491	44.9	
	Twice/day	36	3.3	144	13.2	
	3-4 /day	162	14.8	255	23.3	
The number of times drinking the tea	Don't	299	27.4	271	24.8	0.075
	1-2 /week	18	1.6	20	1.8	
	Once /day	464	42.5	442	40.4	
	Twice/day	266	24.3	323	29.6	
	3-4 /day	46	4.2	37	3.4	
The number of times drinking the coffee	Don't	131	12.0	123	11.3	0.225
	1-2 /week	11	1.0	9	0.8	
	Once /day	497	45.5	470	43.0	
	Twice/day	424	38.8	471	43.1	
	3-4 /day	30	2.7	20	1.8	

**Table 3.** The impact of the COVID-19 pandemic on lifestyle.

Variable	Category	Pre- COVID- 19	%	During COVID- 19	%	<i>P</i> value
The number of running exercise or physical activity	Don't	258	23.6	279	25.5	0.000**
	1-2/week	435	39.8	364	33.3	
	3-4/week	169	15.5	149	13.6	
	5-6/week	49	4.5	82	7.5	
The number of hours of sleep per day	Daily	182	16.7	219	20.0	0.000**
	4-6 hours	573	52.4	325	29.7	
	7-9 hours	480	43.9	611	55.9	
	10-12 hours	37	3.4	141	12.9	
	More than 12 hours	3	0.3	16	1.5	
How much time do you spend using the internet, social media and electronic devices for fun daily	1-3 hours	426	39.0	163	14.9	0.000**
	4-6 hours	474	43.4	377	34.5	
	7-9 hours	119	10.9	353	32.3	
	More than 10 hours	74	6.8	200	18.3	
Do you follow a diet to lose weight	Yes	884	80.9	877	80.2	0.705
	No	209	19.1	216	19.8	
Feeling anxious, afraid and depressed.	Don't	364	33.3	271	24.8	0.000**
	Rarely	366	33.5	264	24.2	
	Sometimes	319	29.2	431	39.4	
	Always	44	4.0	127	11.6	

Note: Data presented as number (%). \*\*Significant at  $P < 0.01$

## Discussion



This cross-sectional study was aimed to compare the general dietary habits and lifestyle between before and during COVID-19 among the Saudi adult's population in Riyadh. To our knowledge, this is the first study to investigate the immediate impact of the COVID-19 pandemic on dietary and lifestyle patterns among the Saudi adult's population in Riyadh. The web-survey was conducted from 16 May 2020, to 16 June 2020 [17, 18]. The total number of assessed cases in Saudi Arabia was more than 200,000 individuals with more than 2000 deaths, the virus spread to most regions of the Saudi Arabia, mostly in Riyadh, Jeddah, Makkah, Al Madinah and Dammam [14].

Eating habits may be substantially changed due COVID-19 pandemic, the results of the current study showed that increase in the number of meals eaten daily (more 5 meals) and the number of times of fruits and vegetables intake (3–4/day) during COVID-19 pandemic than that in the before COVID-19 pandemic. These observations, in parallel with previous study, suggest that 15% of Italian population increased their consumption of fresh fruit and vegetables, especially in the North and Center of Italy during COVID-19 pandemic [26]. Similarly, a recent study reported that 21.2% of Italian population upped their consumption of fresh fruit and vegetable. Considering the current pandemic of COVID-19 has no effective preventive and curative medicine is available, healthy eating habits are crucial and elective micronutrient supplementations (e.g. vitamins, trace elements, nutraceuticals and probiotics) may be beneficial in nutritionally especially for vulnerable populations, such as the elderly [27]. Another recent study also reported that healthy foods is reduced susceptibility to and long-term complications from COVID-19 [19]. Fruit and vegetable intakes may be important modifiable risk factors for the development, progression and management of obstructive lung diseases such as asthma and chronic obstructive pulmonary disease [28]. Furthermore, various previous studies have associated low intake of fruits and vegetables with chronic diseases such as chronic obstructive pulmonary diseases respiratory problems [29–31]. Fruits and vegetables support the immune system are likely to be in excess of intakes that can easily be achieved through diet alone. This is the case for vitamins C, D and E and zinc and selenium [32], which contributes to immune defense by supporting various cellular functions of both the innate (non-specific) and acquired (specific) immunity immune system [33–35]. Vitamin C is an essential dietary component which unable to synthesize vitamin C endogenously due to loss of a key enzyme in the biosynthetic pathway [36]. Fruits (mainly oranges) (51 %) and fruiting vegetables (mainly tomato and sweet pepper) (20 %) for vitamin C; vegetable oils (sunflower and olive) (40 %), non-citrus fruits (10 %), and nuts and seeds (8 %) for vitamin E [37]. Furthermore, most dietary pro-vitamin A comes from leafy green vegetables, orange and yellow vegetables, tomato products, fruits, and some vegetable oils [38]. However, high zinc fruits include avocados, blackberries, pomegranates, raspberries, guavas, cantaloupes, apricots, peaches, kiwifruit, and blueberries [39].

Lifestyle may be substantially changed due to COVID-19 pandemic, in the present study, to COVID-19 pandemic greatly reduced the amount of running exercise or physical, increased in the number of hours of sleep per day, the number of hours of sleep per day, the time using the internet and social media and electronic devices for fun daily. The staying at home (which includes digital-education, smart working, limitation of outdoors and in-gym physical activity) and stockpiling food, due to the restriction in grocery shopping may cause increase of body weight. There is evidence to support that low fitness and physical

activity, excess body weight [40]. Another previous study compared interventions consisting of diet alone, physical activity alone, and the combination of diet plus physical activity. The results of this study demonstrated that following the initial 6-month intervention period revealed weight decrease of 9.1, 2.1, and 10.4%, respectively [41]. An early study also suggested that subjects reporting exercise of higher intensities were less likely to gain weight than those reporting low intensity exercises [42]. Another previous study demonstrated that the physical activity of 45min/day on 5 days/week over a 16-month period in overweight and obese adult resulted in revealed weight losses of 5.2 kg vs. a 0.5 decrease observed in non-physical-activity control men, when dietary intake is unchanged [43].

A limitation of our data was represented by a self-reported questionnaire, which may lead to the actual misreporting of data. Another limitation is the skewing in the geographical distribution of participants, which were from the Riyadh. Our data need to be confirmed and investigated in future larger population studies.

## **Conclusion**

In conclusion, in this study, the dietary and lifestyle habits have changed among the Saudi during the COVID-19 period. Future large-scale similar studies should be undertaken to confirm the results of the study.

## **Abbreviations**

COVID-19: Coronavirus Disease 2019; WHO: world health organization; MERS-CoV: Middle East respiratory syndrome coronavirus; SARS: severe acute respiratory syndrome coronavirus.

## **Declarations**

### **Acknowledgment**

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### **Authors' contributions**

### **Availability of data and materials**

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request

### **Ethics approval and consent to participate**

Ethical approval was obtained from the Ethics Committee of the College of Science Research Center of King Saud University, Riyadh, Saudi Arabia

## Consent for publication

Not applicable.

## Competing interests

The author declare that they have no competing interests.

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