

Does COVID-19 change dietary habits and lifestyle behaviours in Kuwait?

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Abstract:

Aim: This study was designed to understand the changes in dietary and lifestyle behaviours that are major determinants of health during the COVID-19 outbreak. **Methods:** A cross-sectional study was conducted through an online questionnaire using a convenience sample of 415 adults living in Kuwait (age range 18-73 years). **Results:** The overall prevalence of being overweight and obesity among participants was 37.2% and 33.1% respectively. The study identified significant changes in the dietary habits and lifestyle behaviours of participants during COVID-19. In general, there was an increase in the percentage of participants that consumed four or more meals a day, skipped breakfast, and engaged in frequent late night snacking. Moreover, there was a drastic decrease in the frequency of fast food consumption and an increase in the percentage of participants who had their main meal freshly made. Furthermore, there was a great reduction in physical activity and an increase in the amount of screen time and sedentary behaviours. A notable increase was detected in day-time sleep and a decrease in night-time sleep among participants. **Conclusion:** This study indicates that due to the increased prevalence of habits conducive to increased rates of being overweight and obesity during the COVID-19 outbreak, there is a high likelihood that the pandemic will further exacerbate the already widespread problem of obesity and being overweight in Kuwait.

Keywords: dietary habits, lifestyle, COVID-19, Kuwait

Introduction

The World Health Organization (WHO) has declared the COVID-19 outbreak a pandemic, since it is spreading rapidly worldwide. It has affected more than 200 countries around the world [1]. COVID-19 attacks the human respiratory system and can cause mild to severe illness [2]. Evidence from several studies has shown that the elderly and people with underlying medical conditions, such as cardiovascular diseases, hypertension, diabetes and cancer, are at a higher risk of death as a result of contracting COVID-19 [3-6]. In addition, it can cause severe complications among people with obesity related conditions [7]. A Chinese study found that among Chinese adults, obesity caused a threefold increase in the likelihood of having a severe case of COVID-19 [8, 9].

It has been reported that Kuwait is one of the countries with the highest rates of obesity, estimated to be around 50% [10]. It has been suggested that the prevalence of this risk factor in Kuwait is due to nutrition transition and a lack of physical activity among the population [11-16].

COVID-19 is a new disease that spreads very easily and sustainably between people. There is insufficient information concerning the risk factors that can lead to severe illness and there is no vaccine or specific treatment to prevent or cure the disease. Therefore, WHO recommendations have focused on avoiding contracting the virus through the practice of good hygiene, social distancing and only leaving the house when necessary [17].

In line with international action and in order to counter the spread of COVID-19, Kuwait imposed a nationwide curfew on March 22nd 2020 from 5:00pm until 4:00am until further notice. People were also encouraged to eat a healthy and balanced diet, be physically active and maintain a healthy lifestyle to support their immune system during these difficult times. The result has been stress induced by the disruption of daily routine, along with fear and anxiety regarding the spread of the disease and its consequences for people's finances, work, family and personal matters.

The relationship between stress and emotional eating is well established. Previous studies have shown an association between stress and the amount of food consumed [18-21]. It has been shown that people under stress crave more high fat and high sugar foods, since the body under stress requires more energy to function [22]. In addition, the body increases storage of abdominal fat [23]. According to Geliebter and Aversa [24], emotional eating is related to

higher weight status. Furthermore, Tomiyama [25] has reported that stress can lead to sleep disturbance, which increases the risk of developing obesity.

Since obesity is a serious concern in Kuwait, there is a need to understand the impact of the COVID-19 outbreak on dietary habits and lifestyle. Therefore, this study aims to investigate the effects of the COVID-19 outbreak on eating habits and other health-related behaviours among adults in Kuwait.

Methods

Design and data collection

A cross-sectional study was developed and conducted in Kuwait during the COVID-19 outbreak between March and April 2020. A web-based survey tool (SurveyMonkey®)[26] was used among a convenience sample to investigate changes to their dietary habits and lifestyle during this period. Participants were recruited via online advertisements on social media; an invitation letter was launched on Twitter, Facebook and Instagram, with a link to the questionnaire and a request to circulate the survey broadly to adults. Study information was provided at the start of the survey. It was anonymous and voluntarily to apply. Respondents who were at least 18 years of age and above living in Kuwait could participate in the study. Respondents who were less than 18 years or not living in Kuwait were excluded. The study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving participants were conducted after obtaining agreement.

Questionnaire

The questionnaire was developed by the primary investigators following a review of related literature [16, 27, 28]. It was evaluated and assessed by a number of experts and specific modifications were made where needed. In addition, the questionnaire was piloted as a paper version among (n=10) participants to check clarity and the suitability of wording, as well as the average time needed for its completion. The questionnaire was then amended to address all comments and converted into a web-based survey to increase response rates and reduce participant burden.

The questionnaire was divided into three parts. The first part used 8 questions to gather data about socio-demographic characteristics, including date of birth, sex, nationality, marital status, and education level. Moreover, the respondents were asked for their height, weight, and their weight perception. The second part consisted of 30 questions and investigated dietary

patterns and habits. Participants were asked about their usual meal patterns, food preparation and grocery shopping responsibilities, frequency of consumption of selected foods and food groups, and frequency of consumption of selected beverages and water. The final part of the questionnaire asked about physical activity and lifestyle. It consisted of 9 questions aimed at investigating participants' physical activity level, smoking status, and sleeping habits. Sleeping time (including naps) on a typical day were reported. Sleep duration was then categorised into three levels: <7 hours, 7-9 hours, or >9 hours. These categories were based on the sleep duration recommendations for adults (18 to 64 years) of the National Sleep Foundation [29]. The participants were also asked whether they perceived that their eating habits had changed or not since the start of the curfew instigated by the COVID-19 outbreak, and whether or not they believed the curfew would lead to weight gain. All questions were asked in pairs, to assess the same habits before and during the outbreak/curfew.

Anthropometry

Height and weight information obtained in the questionnaire was all self-reported by the respondents. Body mass index (BMI) was then calculated as the ratio of weight in kilograms to height in meters squared. Weight status was classified according to WHO [30] categories as follows: underweight (BMI < 18.5), normal weight (BMI between 18.5- 24.9), overweight (BMI between 25-29.9), and obese (BMI \geq 30).

Statistical analysis

Data was statistically analysed using Statistical Package for the Social Sciences, version 23 [31]. The cut-off point for statistical significance was p value \leq 0.05. Descriptive statistics (means and standard deviations, or frequencies) were calculated for all variables. Variables were checked for normality by inspection and by using the Shapiro-Wilk. A chi-square (χ^2) statistical test was conducted to examine the significant differences for categorical variables. A nonparametric test Wilcoxon signed rank test was conducted to compare differences in dietary habits before and during COVID-19. The effect size Cohen's d was determined by dividing the z value by the square root of N, where N= total number of cases (N=830) $r=Z/\sqrt{N}$ using Excel [32]. Cohen [32] criteria were used to consider the effect size: .1 = small effect, .3 = medium effect, and .5 = large effect.

Results

Participants' characteristics and weight status based on BMI category

The socio-demographic characteristics of the study participants are presented in Table 1 and self-reported anthropometric measurements and body mass indexes in Table 2. In total, 415 adults participated in this descriptive cross-sectional study with a mean age of 38.47 ± 12.73 years, of which 130 were males (31.3%) and 285 (68.7%) females. The majority of the sample was Kuwaiti (90.6%). With regards to marital status, a majority of the sample were married (56.6%), followed by single (31.8%), divorced (10.4%), and widowed (1.2%). In terms of education, 53.3% had earned a bachelor's degree, and 14.5% and 23.1% of participants held a diploma or postgraduate qualification respectively.

Table 1 Socio-demographic characteristics of the study participants

Demographic characteristics of the study		All N (%)	Male N (%)	Female N (%)	<i>P</i> value
		N=415 (100)	N=130 (31.3)	N=285 (68.7)	
Age (years) mean±SD (minimum-maximum)		38.47±12.73 18-73	42.52±12.27 18-70	36.62±12.53 18-73	0.000
Nationality	Kuwaiti	376 (90.6)	111 (85.4)	265 (93)	0.013
	Non Kuwaiti	39 (9.4)	19 (14.6)	20 (7)	
Marital status	Single	132 (31.8)	27 (20.8)	105 (36.8)	0.002
	Married	235 (56.6)	90 (69.2)	145 (50.9)	
	Divorced	43 (10.4)	13 (10)	30 (10.5)	
	Widow	5 (1.2)	0	5 (1.8)	
Education level	Less than high school	4 (1)	1(0.8)	3 (1.1)	0.386
	High school	30 (7.2)	11 (8.5)	19 (6.7)	
	Special courses	4 (1)	0	4 (1.4)	
	Diploma	60 (14.5)	24 (18.5)	36 (12.6)	
	Bachelor	221 (53.3)	63 (48.5)	158 (55.4)	
	Postgraduate	96 (23.1)	31 (23.8)	65 (22.8)	

Table 2 Body mass index and perception of body shape

Body composition		All N (%)	Male N (%)	Female N (%)	P value
		N=415 (100)	N=130 (31.3)	N=285 (68.7)	
Height (cm) mean±SD (minimum-maximum)		164.38±9.37 (142-190)	174.95±6.34 (155-190)	159.54±5.92 (142-178)	0.000
Weight (kg) mean±SD (minimum-maximum)		77.40±20.60 (35-180)	92.65±19.77 (57-150)	70.42±16.90 (35-180)	0.000
BMI (minimum-maximum)		28.52±6.74 (15.77-74.22)	30.36±6.40 (19.39-57.60)	27.68±6.734 (15.77-74.22)	0.000
Calculated BMI	Underweight	7 (1.7)	0	7 (2.5)	0.000
	Normal	116 (28)	20 (15.4)	96 (33.8)	
	Overweight	154 (37.2)	48 (36.9)	106 (37.3)	
	Obese	137 (33.1)	62 (47.7)	75 (26.4)	
Self-perceived value	Underweight	13 (3.1)	3 (2.3)	10 (2.5)	0.223
	Normal	135 (32.5)	34 (26.2)	101 (35.4)	
	Overweight	207 (49.4)	73 (56.2)	134 (47)	
	Obese	60 (14.5)	20 (15.4)	40 (14)	
Habitual routine change		All N (%)	Male N (%)	Female N (%)	P value
Yes		170 (41)	43 (33.1)	129 (45.3)	
No		76 (18.3)	30 (23.1)	46 (16.1)	0.046
Maybe		167 (40.2)	57 (43.8)	110 (38.6)	
COVID 19 period may cause obesity or gain weight		All N (%)	Male N (%)	Female N (%)	P value
Yes		217 (52.3)	72 (55.4)	147 (51.6)	
No		119 (28.7)	35 (26.9)	84 (29.5)	0.770
I don't know		77 (18.6)	23 (17.7)	54 (18.9)	

The average height and weight reported by study participants were 164.38±9.37cm and 77.40±20.60 kg respectively (male 174.95 ± 6.34 cm, female 159.54 ± 5.92 cm, $p=0.000$). The average BMI was 28.52 ± 6.741 kg/m², which is indicative of the overweight category according to the definition of the WHO (male 30.36 ± 6.40 kg/m², female 27.68 ± 6.73 kg/m², $p=0.000$). The prevalence of being overweight was observed in both male (36.9%) and female (37.3%) participants. Obesity was more common among males compared to females (47.7% vs. 26.4% respectively). This was in contrast to being underweight, where only 2.5% of females fell into this category. With regards to self-perceived values, no significant difference was found between genders ($p=0.223$). About 26.2% of males and 35.4% of females perceived themselves as having a normal weight. Over half of males (56.2%) and 47% of females perceived themselves as being overweight. Moreover, only 15.4% of male subjects and 14% of females assumed that they were obese. Significant difference was observed between actual and perceived BMI ($p=0.000$). Overall, within the sample there were significantly less people

who perceived themselves as being obese than were obese in actuality, and more people who perceived themselves as being overweight than were overweight in actuality.

Dietary habits of the participants before and during COVID-19

Table 3 shows significant differences between meals patterns, snacking and food preparation habits before and during COVID-19 ($p=0.000$). More than half the participants consumed four or more meals a day before the COVID-19 pandemic. This further increased during the pandemic from 55.5% to 61.7%. Both before and during COVID-19, the majority of people considered their main meal to be lunch (67.2% and 57.3% respectively). However, the percentage of people who considered their main meal to be dinner more than doubled during COVID-19 (24.6%), compared to 11.8% before. With regards to meal skipping, both before and during COVID-19, breakfast was picked as the most commonly skipped meal among participants (38.8% and 41.7% respectively). Although this percentage increased, there was no significant difference ($p=0.376$). The snack between breakfast and lunch came as a close second as the most commonly skipped meal, with 32.3% of participants skipping it before and 25.8% after. Furthermore, during COVID-19 there was a marked increase in the percentage of participants who skipped lunch ($p=0.000$, $r=0.000$), increasing from 8.9% to 13.7%. The frequency of late night snacking was significantly different before and during COVID-19 ($p=0.000$, $r=0.285$). There was a general increase in the frequency of late night snacking among participants during COVID-19, with most considering themselves to engage in late night snacking either usually (31.8%) or occasionally (32.8%), as opposed to before the pandemic where most chose rarely (32.5%) or occasionally (33.7%).

Table 3 Meal patterns

Meal pattern	Multiple-choice responses	Before N (%)	During N (%)	P value	Cohen's d
How many times a day do you eat?	One time a day	5 (1.2)	4 (1)	0.000	0.174
	Two times a day	56 (13.5)	43 (10.4)		
	Three times a day	124 (29.9)	112 (27)		
	Four times a day or more	230 (55.5)	256 (61.7)		
What meal would you consider to be your main meal?	Breakfast	78 (18.8)	58 (14)	0.000	0.125
	Lunch	279 (67.2)	238 (57.3)		
	Dinner	49 (11.8)	102 (24.6)		
	Others	9 (2.2)	17 (4.1)		
Skipping meal	Breakfast	161 (38.8)	173 (41.7)	0.376	0.000
	Snack between breakfast and lunch	134 (32.3)	107 (25.8)	0.113	
	Lunch	37 (8.9)	57 (13.7)	0.000	
	Snack between lunch and dinner	120 (28.9)	52 (12.5)	0.290	
	Dinner	119 (28.7)	84 (20.2)	0.484	
	None	15 (3.6)	23 (5.5)	0.372	
How likely are you to have a late night snack or meal? (past 10 pm)	Never	89 (21.4)	65 (15.7)	0.000	0.285
	Rarely	135 (32.5)	82 (19.8)		
	Occasionally	140 (33.7)	136 (32.8)		
	Usually	51 (12.3)	132 (31.8)		
How is your main meal prepared?	Freshly made	306 (73.7)	386 (93)	0.000	0.189
	Restaurant	61 (14.7)	9 (2.2)		
	Microwave	37 (8.9)	19 (4.6)		
	Others	11 (2.7)	1 (.2)		
Number of times a week you consume fast food	None	116 (28)	341 (82.2)	0.000	0.456
	1-2 times per week	205 (49.4)	57 (13.7)		
	3-4 times per week	72 (17.3)	9 (2.2)		
	5 or more times per week	22 (5.3)	8 (1.9)		
Who prepares and cooks in your family	By myself	86 (20.7)	133 (32)	0.000	0.232

	Husband	1 (.2)	2 (.5)		
	Wife	59 (14.2)	70 (16.9)		
	Father	0	1 (.2)		
	Mother	82 (19.8)	74 (17.8)		
	Grand parents	9 (2.2)	6 (1.4)		
	Housekeeper	169 (40.7)	120 (28.9)		
	Others	9 (2.2)	9 (2.2)		
Do you eat when you feel stressed, unhappy, angry or bored?	Never	100 (24.1)	98 (23.6)	0.005	0.097
	Rarely	103 (24.8)	87 (21)		
	Occasionally	149 (35.9)	143 (34.5)		
	Usually	63 (15.2)	87 (21)		
Who shop for food at your home?	By myself	53 (12.8)	53 (12.8)	0.368	0.031
	Husband or father	114 (27.5)	145 (34.9)		
	Wife or mother	99 (23.9)	70 (16.9)		
	Husband and wife or father and mother	116 (28)	86 (20.7)		
	Housekeeper	17 (4.1)	23 (5.5)		
	Online shopping	16 (3.9)	38 (9.2)		

There was a significant difference in meal preparation before and during COVID-19 ($p=0.000$, $r=0.232$). The vast majority of participants, both before and after the pandemic, had their main meal freshly made. However, during the pandemic there was a significant increase in the percentage of participants who had their main meal freshly made, increasing from 73.7% to 93%. Furthermore, the percentage of people who had their main meal from restaurants also noticeably reduced (from 14.7% before COVID-19 to 2.2% during COVID-19). There was a decrease in the frequency of fast food consumption during COVID-19 in all mentioned consumption frequencies, with the vast majority (82.2%) consuming no fast food meals. Furthermore, fast food was significantly ($p=0.000$, $r=0.456$) less consumed, in the frequency of 1-2 times per week after COVID-19 (13.7%) compared with 49.4% before. In terms of food preparation practices, there was an increase in the percentage of participants who cooked for themselves and wives who cooked during COVID-19, accompanied by a reduction in the percentage of participants who relied on a housekeeper for cooking during COVID-19, decreasing from 40.7% to 28.9%. With regards to stress eating, it was noticed that the

percentage of participants who described themselves as usually engaging in stress eating increased from 15.2% before COVID-19 to 21% during COVID-19.

In terms of family grocery shopping, results indicated significant statistical differences before and during COVID-19 ($p=0.000$, $r=0.031$). There was an increase in the percentage of husbands or fathers that did the grocery shopping during the pandemic from 27.5% to 34.9%, and a reduction in the percentage of wives or mothers that did the grocery shopping from 23.9% to 16.9%, and of husbands and wives or fathers and mothers from 28% to 20.7%. Among the participants, husbands or fathers were found to be the main person to grocery shop for the family during COVID-19. In addition, the percentage of online grocery shopping increased from 3.9% before COVID-19 to 9.2% during COVID-19.

Food group patterns

Table 4 shows the results of questions related to the food group patterns of the participants before and during COVID-19. There was an overall statistically significant decrease in the frequency of consumption of red meat during COVID-19 compared to before ($p=0.000$, $r=0.136$). Nearly half of the participants, both before and during COVID-19, consumed red meat 1-2 times per week (49.4% and 47.5% respectively), with only a slight decrease during. Furthermore, there was a slight increase in the percentage of participants who did not consume red meat during COVID-19 (from 7.7% to 10.1%) and those who consumed it less than once a week (from 17.3% to 20.7%).

Table 4 Food groups pattern

Food groups pattern	Multiple-choice responses	Before N (%)	During N (%)	<i>P</i> <i>value</i>	Cohen's <i>d</i>
Red meat	Never	32 (7.7)	42 (10.1)	0.000	0.136
	Less than one per week	72 (17.3)	86 (20.7)		
	1-2 times per week	205 (49.4)	197 (47.5)		
	3-4 times per week	94 (22.7)	75 (18.1)		
	5-6 times per week	5 (1.2)	9 (2.2)		
	7 or more times per week	3 (.7)	2 (.5)		
	I don't know	4 (1)	4 (1)		
Chicken	Never	15 (3.6)	20 (4.8)	0.005	0.097
	Less than one per week	18 (4.3)	27 (6.5)		
	1-2 times per week	149 (35.9)	143 (34.5)		
	3-4 times per week	172 (41.4)	164 (39.5)		
	5-6 times per week	44 (10.6)	47 (11.3)		
	7 or more times per week	13 (3.1)	11 (2.7)		
	I don't know	4 (1)	3 (.7)		
Fish and sea food	Never	44 (10.6)	110 (26.5)	0.000	0.326
	Less than one per week	131 (31.6)	137 (33)		
	1-2 times per week	195 (47)	143 (34.5)		
	3-4 times per week	36 (8.7)	18 (4.3)		
	5-6 times per week	1 (.2)	1 (.2)		
	7 or more times per week	2 (.5)	1 (.2)		
	I don't know	6 (1.4)	5 (1.2)		
Processed meat	Never	284 (68.4)	288 (69.4)	0.345	0.033
	Less than one per week	74 (17.8)	67 (16.1)		
	1-2 times per week	38 (9.2)	29 (7)		
	3-4 times per week	13 (3.1)	21 (5.1)		
	5-6 times per week	2 (.5)	4 (1)		
	7 or more times per week	0	1 (.2)		
	I don't know	4 (1)	5 (1.2)		
Canned fish	Never	219 (52.8)	241 (58.1)	0.843	0.007
	Less than one per week	132 (31.8)	99 (23.9)		
	1-2 times per week	46 (11.1)	48 (11.6)		
	3-4 times per week	10 (2.4)	15 (3.6)		
	5-6 times per week	1 (.2)	3 (.7)		
	7 or more times per week	0	1 (.2)		
	I don't know	7 (1.7)	8 (1.9)		
Fruits	Never	33 (8)	38 (9.2)	0.598	0.018
	Less than once per day	129 (31.1)	121 (29.2)		
	1 serving per day	157 (37.8)	147 (35.4)		
	2 serving per day	62 (14.9)	76 (18.3)		
	3 serving per day	17 (4.1)	18 (4.3)		
	4 or more serving per day	9 (2.2)	7 (1.7)		
	I don't know	8 (1.9)	8 (1.9)		
Vegetables	Never	29 (7)	34 (8.2)	0.459	0.026
	Less than once per day	93 (22.4)	96 (23.1)		
	1 serving per day	151 (36.4)	140 (33.7)		
	2 serving per day	85 (20.5)	89 (21.4)		
	3 serving per day	32 (7.7)	38 (9.2)		
	4 or more serving per day	17 (4.1)	9 (2.2)		

	I don't know	8 (1.9)	9 (2.2)		
Bread group	White	178 (42.9)	199 (48)	0.112	0.055
	Brown / Brown seeds	183 (44.1)	164 (39.5)		
	Whole wheat	39 (9.4)	40 (9.6)		
	None	5 (1.2)	5 (1.2)		
	Others	10 (2.4)	7 (1.7)		
Milk group	Never	97 (23.4)	99 (23.9)	0.213	0.043
	Whole milk	124 (29.9)	128 (30.8)		
	Semi skimmed	99 (23.9)	103 (24.8)		
	Skimmed	56 (13.5)	47 (11.3)		
	Soya milk	4 (1)	5 (1.2)		
	Almond milk	21 (5.1)	15 (3.6)		
	Others (rice, goat milk)	11 (2.7)	13 (3.1)		
	I don't know	3 (.7)	5 (1.2)		
Fat type	Never	19 (4.6)	13 (3.1)	0.072	0.063
	Butter	21 (5.1)	19 (4.6)		
	Vegetables oil	234 (56.4)	241 (58.1)		
	Olive oil	109 (26.3)	107 (25.8)		
	Ghee/ lard	7 (1.7)	8 (1.9)		
	Others	9 (2.2)	10 (2.4)		
	I don't know	16 (3.9)	17 (4.1)		
Favourite snacks	Biscuit	69 (16.6)	95 (22.9)	1.000	0.000
	Crisps	126 (30.4)	131 (31.6)		
	Chocolate	179 (43.1)	186 (44.9)		
	Nuts	132 (31.8)	139 (33.5)		
	Vegetables & fruits	115 (27.7)	131 (31.6)		
	Others	8 (1.7)	6 (1.2)		

With regards to chicken consumption, there was an overall statistically significant decrease in the frequency of consumption during COVID-19 compared to before ($p=0.005$, $r=0.097$). Nearly half of the participants, both before and during COVID-19, consumed chicken 3-4 times per week (41.4% and 39.5% respectively). The consumption of chicken 1-2 times per week came as a close second for the most common consumption frequency of chicken, again showing only a slight decrease during COVID-19 (35.9% to 34.5%). Furthermore, there was a slight increase in the percentage of participants who did not consume chicken during COVID-19 (from 3.6% to 4.8%) and those who consumed it less than once a week (from 4.3% to 6.5%). In addition, there was an overall significant reduction in the frequency of consumption of fish and seafood during COVID-19 compared to before ($p=0.000$, $r=0.326$). The most commonly reported frequency both before and during COVID-19 for the consumption of fish and seafood was 1-2 times per week (47% and 34.5% respectively), with a sizeable decrease during. Furthermore, there was a great increase (more than double) in the percentage of participants

who reported that they did not eat any fish or seafood during COVID-19 (from 10.6% to 26.5%).

In reference to the consumption of processed meat, canned fish, fruits and vegetables, and the type of bread, milk, cooking fat and snacks most often consumed, no significant differences were found before and during the pandemic. More than half of the participants never consumed canned fish (52.8%, 58.1%) and the majority never consumed processed meat (68.4%, 69.4%) before and during COVID-19 ($p=0.843$, $r=0.007$ and $p=0.345$, $r=0.033$ respectively). With regards to fruit consumption, the most commonly reported frequency was 1 serving per day both before and during COVID-19 (37.8% and 35.4% respectively). The second most commonly reported frequency was less than one serving per day (31.1% and 29.2% respectively, $p=0.598$, $r=0.018$). In terms of vegetable consumption, the most commonly reported frequency was 1 serving per day both before and during COVID-19 (36.4% and 33.7% respectively). The second most commonly reported frequency was less than one serving per day (22.4% and 23.1% respectively, $p=0.459$, $r=0.026$). It can be seen from the data in Table 4 that most participants did not meet the USDA minimum recommended daily intake of fruits and vegetables of 5 servings a day (2 servings of fruits and 3 servings of vegetables). A total of 76.9% and 73.8% of participants did not meet the fruit consumption recommendation both before and during COVID-19 respectively. Moreover, about 86% of participants did not meet the vegetable consumption recommendation both before and during the pandemic.

Brown/brown seeded bread was the most frequently consumed type of bread before COVID-19 (44.1%), followed closely by white bread (42.9%). On the other hand, white bread was the most frequently consumed type of bread by participants during COVID-19 (48%), followed by brown/brown seeded bread (39.5%). Only 9.4% and 9.6% consumed whole wheat bread before and during COVID-19 respectively. No significant difference was detected ($p=0.112$, $r=0.055$). With regards to the type of milk consumed, whole milk was the most frequently consumed milk (29.9%, 30.8%), followed by semi-skimmed milk (23.9%, 24.8%), before and during COVID-19 respectively. No significant difference was detected ($p=0.213$, $r=0.043$). Furthermore, vegetable oil was the most frequently used fat for cooking (56.4%, 58.1%), followed by olive oil (26.3%, 25.8%), before and during COVID-19 ($p=0.072$, $r=0.063$).

With regards to favourite snacks, the most commonly reported snacks by the participants were chocolate (43.1%, 44.9%) followed by nuts (31.8%, 33.5%) and crisps (30.4%, 31.6%) before and during COVID-19 respectively. It was also noticed that during the pandemic the percentage

of participants who chose fruits and vegetables as their favourite snack was 31.6%, making it equal to those who chose crisps as their favourite snack. No significant difference was found for favourite snack types before and during the pandemic.

Drink patterns

The three most commonly consumed drinks among the participants before the pandemic were American coffee followed by water and black tea, consumed by 77%, 75% and 72% of participants respectively. During the pandemic the three most commonly consumed drinks were water followed by black tea and American coffee, consumed by 77%, 73% and 68% of participants respectively, Figure 1. The most commonly reported frequencies of water consumption both before and during the pandemic were 1-2 cups (32%, 35.9%), 3-4 cups (24.3%, 21.2%) and 5-6 cups (18.3%, 20.2%) per day, in descending order. Furthermore, 20% of participants before and 19% during the pandemic reported consuming less than 1 cup of water per day, Figure 2. It is worth noting that almost two-thirds of the participants (63.4% and 64.3% respectively) reported not consuming fizzy drinks before or during COVID-19. No significant difference was detected ($p=0.977$, $r=0.001$). In terms of energy drinks, both before and during the pandemic, the majority of participants (89.2% and 92%) reported not consuming energy drinks. In general, significant differences were identified between the two groups ($p=0.003$, $r=0.101$).

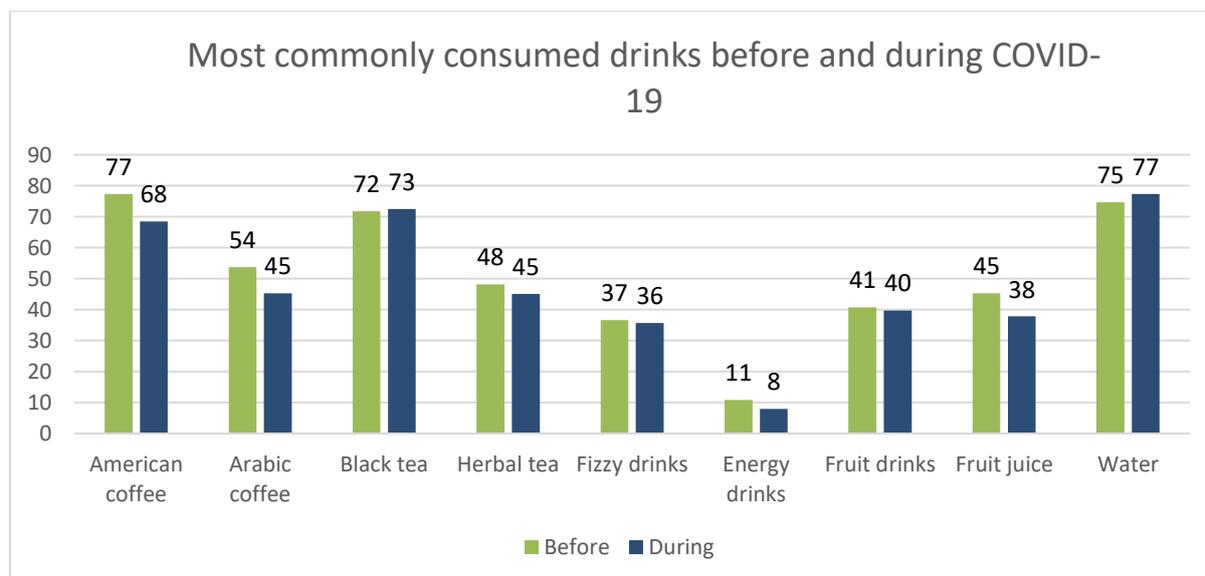


Figure 1 Most commonly consumed drinks

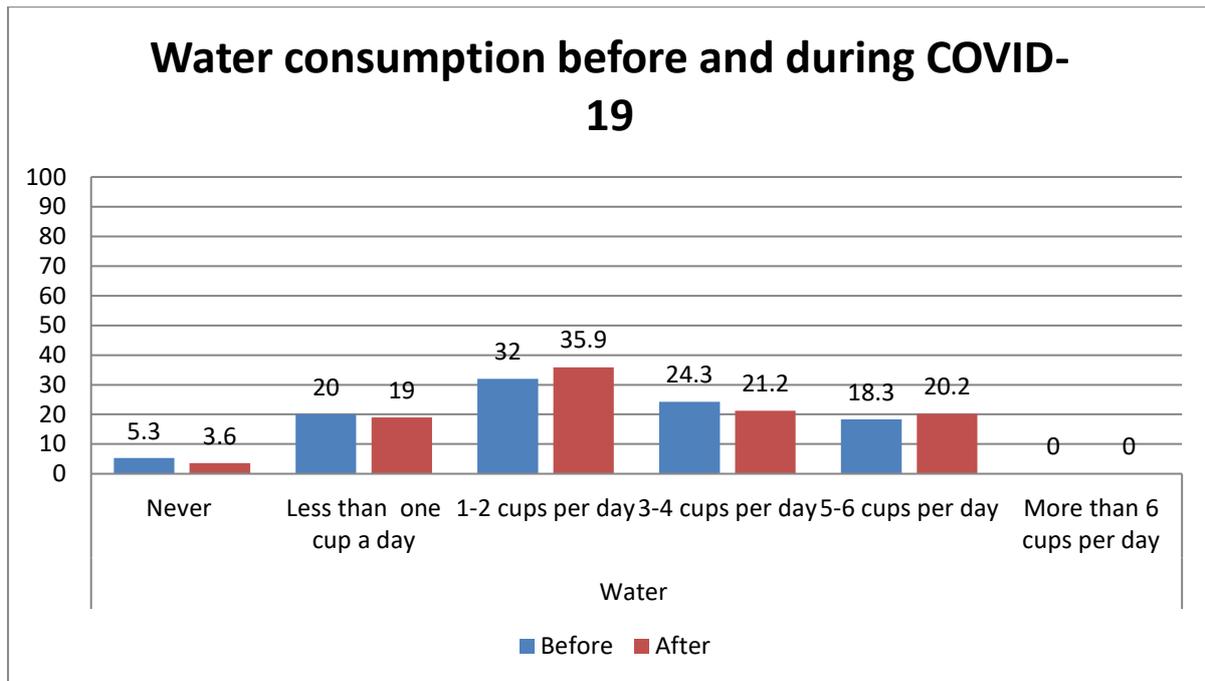


Figure 2 Water consumption

Physical activity, smoking and sleeping habits

The overall prevalence of smoking was low among study participants. Only 19.8% reported that they were current smokers. The prevalence of smoking among males and females was statistically different ($p=0.000$); smoking was more common among males (40.8%) compared to females (10.2%).

The prevalence of physical activity and sedentary behaviours before and during COVID-19 is presented in Table 5. In general, it was noticed that during the pandemic there was a remarkable reduction in the prevalence of physical activity and an increase in the amount of time spent on sedentary behaviours, such as spending time on computers and smartphones or watching television, compared to before the pandemic.

Table 5 Physical activity, smoking and sleeping habit

Physical activity	Multiple-choice responses		Before N (%)	During N (%)	P value	Cohen's d		
Practicing a physical activity	Never		84 (20.2)	164 (39.5)	0.000	0.222		
	Only in some seasons		78 (18.8)	43 (10.4)				
	Sometimes		167 (40.2)	147 (35.4)				
	Always		86 (20.7)	61 (14.7)				
Hours practicing PA per week	Less than one hour/ none		203 (48.9)	257 (61.9)	0.000	0.211		
	1-2 hours		84 (20.2)	75 (18.1)				
	3-4 hours		61 (14.7)	49 (11.8)				
	More than 4 hours a week		67 (16.1)	34 (8.2)				
Free time activity spend	Walking		87 (21)	48 (11.6)	0.000	0.166		
	TV, music, computer, reading		230 (55.4)	339 (81.7)				
	Sports		37 (8.9)	19 (4.6)				
	Shopping		61 (14.7)	9 (2.2)				
Hours spend on computer/mobile/TV	1-2 hours per day		126 (30.4)	50 (12)	0.000	0.430		
	3-4 hours per day		138 (33.3)	79 (19)				
	5-6 hours per day		84 (20.2)	105 (25.3)				
	More than 6 hours per day		67 (16.1)	181 (43.6)				
Smoking habit questions	Multiple-choice responses	N (%)	Male	Female	P value			
Do you smoke?	Yes	82 (19.8)	53 (40.8)	29 (10.2)	0.000			
	No	333 (80.2)	77 (59.2)	256 (89.8)				
Sleeping time habit	Before N (%)		During N (%)			P value	Cohen's d	
Night sleep (n=401)	268 (66.3)		119 (29.7)			0.000	0.395	
Day sleep (n=404)	136 (33.7)		282 (70.3)					
Sleeping amount (n=404)	Before N (%)			During N (%)			P value	Cohen's d
	< 7 hours	7-9 hours	>9 hours	< 7 hours	7-9 hours	>9 hours	0.000	0.264
	166 (41.1)	200 (49.5)	38 (9.4)	87 (21.7)	233 (58.1)	81 (20.2)		

In terms of physical activity, significant differences were found before and during the pandemic ($p=0.000$, $r=0.222$). There was an increase in the percentage of people who never practice physical activity from 20.2% before the pandemic to 39.5% during, and a reduction in the percentage of people who always practice physical activity from 20.7% before the pandemic to 14.7% during.

The most commonly reported number of hours spent practicing physical activity per week among the participants both before and during COVID-19 was less than one hour or none. Furthermore, there was a great increase in the percentage of participants who reported less than one hour or no hours spent on physical activity per week during COVID-19, increasing from 48.9% before to 61.9% during ($p=0.000$, $r=0.211$). Both before and during COVID-19, the majority of participants reported their main leisure activities to be watching television, listening to music, spending time on the computer or reading (55.4% and 81.7% respectively). The least commonly chosen leisure activity among the participants both before and during the pandemic was sports (8.9% and 4.6% of participants respectively). Significant differences were found between the types of leisure activities before and during COVID-19 ($p=0.000$, $r=0.166$). Furthermore, there was a great increase in the percentage of participants who reported spending more than 6 hours per day on the computer, smartphone or television during COVID-19, increasing from 16.1% before to 43.6% during ($p=0.000$, $r=0.430$).

With regards to sleeping habits, results indicated significant statistical differences before and during COVID-19 ($p=0.000$, $r=0.395$). During COVID-19, there was a decrease in the percentage of participants who slept during the night (66.3% before to 29.7% during) and a marked increase in the percentage of participants who slept during the day (33.7% before to 70.3% during). In addition, results showed significant differences in the recommended amount of sleep before and during pandemic ($p=0.000$, $r=0.264$). Both before and during COVID-19, around half of the participants (49.5% and 58.1% respectively) reported meeting the recommended sleeping hours of 7-9 hours. However, there was a notable increase during COVID-19 in the percentage of participants who reported spending more than 9 hours sleeping (from 9.4% before to 20.2% during) and a great decrease in the percentage of participants who reported spending less than 7 hours sleeping (from 41.1% to 21.7%).

Figure 3 shows participants' views regarding the effect of COVID-19 on their dietary habits, lifestyle and weight. A total of 41% of those who took part in the study said that their dietary habits and lifestyle behaviours changed during this period. More than half of the participants (52.3%) said they would gain weight due to the COVID-19 outbreak.

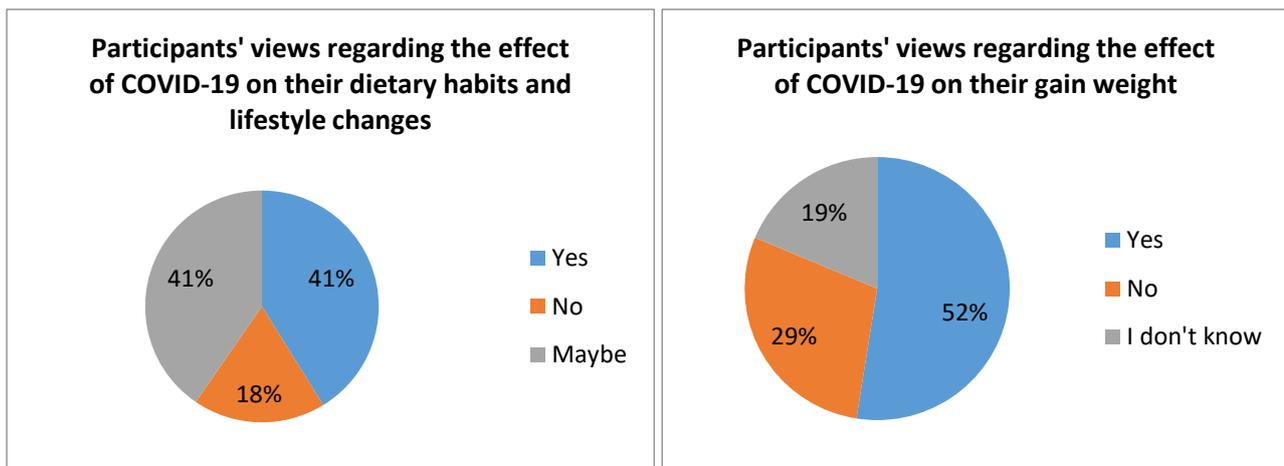


Figure 3 Participants' views regarding the effect of COVID-19 on their dietary habits, lifestyle and weight

Discussion

This study, for the first time, produces novel information about dietary habits and lifestyle behavior in Kuwait during the period of COVID-19. The findings indicate some changes in daily life due to the pandemic, including changes in eating practices, physical activity, smoking and sleeping habits. These changes, which have often been unfavorable, may be conducive to increased rates of being overweight and obesity, especially if the current situation persists for a longer period time. Obesity is associated with an increased risk of developing many serious health conditions, including cardiovascular disease, chronic respiratory disease, diabetes and cancer. People with these conditions or who suffer from obesity are at higher risk of severe COVID-19 related illness and death [6, 33]. Among the convenience sample of 415 participants, 291 (70.3%) were either obese or overweight. This finding is close to that reported in a survey of risk factors for chronic non-communicable disease, the EMAN study (77.0%) [14], and that reported by the Kuwait nutrition surveillance system (79.76%) [15]. Data from several studies suggests that the high prevalence of being overweight and obesity in Kuwait is due to nutrition transition and a lack of physical activity [11-16], which is confirmed in the current study.

Maintaining a healthy and balanced diet and being physically active are important and recommended in these difficult times to support the immune system [34-36]. To have a balanced diet it is necessary to consume a variety of foods across and within all food groups. Therefore, it is important to avoid skipping meals, particularly breakfast. A research review found that skipping breakfast may lead to a reduction in diet quality [37]. Moreover, regular intake of breakfast decreases the risk of obesity and chronic problems [38]. Nevertheless, unhealthy meal patterns were detected in this study, such as skipping breakfast and late night snacking. Both behaviours are likely associated with being overweight and obesity [39, 40]. Consistent with the literature [41-44], this research found skipping breakfast was common among participants. Possible explanations for this behavior include a lack of time, intentionally skipping breakfast to cut calories and a lack of appetite [43]. However, other possible explanations for skipping breakfast during COVID-19 include staying up late, which leads to late night snacking, and oversleeping during the day, as shown in the results. These findings reflect those of Okada et al. [40], which was a study among 19,687 Japanese women that found a significant association between a late dinner or bedtime snack and skipping breakfast, as well as an association of this behavior with being overweight and obesity. Despite the recommendation to reduce one's intake of fats, sugar and salt during COVID-19 [34] and avoid irregular snacking [36], chocolate, nuts and crisps were reported to be the most commonly consumed snacks, and these are loaded with sugar, fat and salt. These results may be explained by the fact that feelings of boredom and stress (likely heightened due to quarantine, as shown in the results) lead to higher consumption of energy-dense foods that are high in sugar and fat [25, 45]. Similar findings were also reported by Muscogiuri et al. [46], who found that many people over-eat sugary and salty comfort foods for snacking due to stress induced by quarantine and that this habit may increase the risk of developing obesity.

Furthermore, it is recommended that people should eat plenty of fruits and vegetables because of their benefits to health and the immune system, especially during the pandemic [34] since they are rich in micronutrients [47] and dietary fiber [48]. However, the results of this study show that more than 70% of the participants did not reach the minimum portions of fruits and vegetables recommended by the USDA of 5 portions a day [49]. This result is in line with findings from other studies that reported a low consumption of fruits and vegetables among Kuwaiti adults [50] such as the EMAN study [14] and the Kuwait Nutrition Surveillance System [15]. These results are likely related to a lack of awareness of the current recommendation for the consumption of fruits and vegetables (unpublished data). A finding

from two cross-sectional questionnaire studies among the UK's population found an association between low knowledge of details of the 5-a-day recommendation and low consumption of fruits and vegetables [51]. In addition, another possible explanation is a predisposition towards energy-dense foods that are high in sugar and fat for snacking, as shown in the results. Moreover, the limited availability of fruits and vegetables and restricted food store opening hours due to quarantine during the pandemic could have caused a reduction in the consumption of fruits and vegetables.

The results of this study indicate a rise in home cooking during COVID-19. Participants started cooking more themselves (or their wives and mothers did so), resulting in reduced reliance on a housekeeper for cooking purposes. These results match those observed by an American study [52] that found about half of the participants reported they were cooking and baking more during the pandemic. Furthermore, the study detected a significant reduction in the frequency of fast food consumption. It seems possible that this rise in home cooking is related to attempts to occupy the increased free time resulting from quarantine. Another explanation is that people wanted to eat healthier in reaction to the spread of COVID-19 and thus resorted to home cooking more frequently. Finally, it could be related to the reduced consumption of fast foods as a result of fears regarding the transmission of COVID-19, whether it be from unhygienic practices at restaurants or from the delivery driver. However, it is difficult to conclude that people ate more healthily during the pandemic just because they reported consuming more home cooked meals, especially if unhealthy foods were still in circulation.

In accordance with the FAO recommendation for maintaining a healthy diet during COVID-19, it is important to stay hydrated and the best choice of fluid is water [34]. The results of this study showed that the most commonly consumed drinks during the pandemic among the participants were water, black tea and American coffee. Surprisingly, only a minority of respondents consumed energy drinks. This finding is contrary to what was previously reported by Zenith International [53], that Kuwait is one of the top seven countries consuming energy drinks. A possible explanation for this might be that energy drinks are popular among teenagers and young adults [54] who were not very well represented in the test sample (the average age of participants being 38.5 years).

It has been suggested that to enhance the immune system it is important to be physically active, get enough sleep and quit smoking [33]. In the present study, a noticeable reduction was found in the prevalence of physical activity during COVID-19, while time spent on sedentary

behaviours increased, similar to the findings of Ammar et al. [55]. This is most likely due to social distancing measures and the need for open spaces for people to be physically active [56].

Based on the results, more than half of the participants met the recommended sleeping hours during the pandemic. However, 70% of the participants slept during the day time instead of night time. This result may be explained by the fact that quarantine may cause stress, which results in sleep disturbances and abnormal sleep patterns, or because of changes in daily routine. This may negatively affect the immune system [57]. Moreover, it may increase food intake and increase the risk of developing obesity [46].

The prevalence of smoking was low among study participants. Smoking was more common among males than females. According to the WHO [33], smokers are more vulnerable to COVID-19 since smoking weakens the body's defenses, especially against respiratory illness.

Limitations of the study

It is acknowledged that the current study has some limitations. Firstly, all measurements, including height and weight, physical activity, dietary, smoking and sleeping habits, were self-reported. The poor informative status may increase information bias. Secondly, diet was only measured using questions that relied on daily or weekly frequency consumption; measuring of serving size was neglected. Moreover, the consumption substances that are specific dietary risk factors, such as fat, sodium and sugar, were not collected. Thirdly, although the study questionnaire was developed after a comprehensive review of literature, the tool was new and this could add to the limitations. Furthermore, as a convenience sample was used in this study, the number of individuals who agreed to take part in the study could be one of the limitations.

Conclusion

This study concludes that due to the increased prevalence of habits conducive to increased rates of being overweight and obesity during the COVID-19 outbreak, there is a high likelihood that the pandemic will further exacerbate the already widespread problem of obesity and being overweight in Kuwait, especially if the current situation persists for a longer period time. Poor dietary habits together with an unhealthy lifestyle can cause serious health problems. It is therefore important that the government considers the need for nutrition education programs in Kuwait, especially school-based nutrition education, since eating patterns are established early in life and school education is a reliable means to reach a wide range of individuals.

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