AMERICAN UNIVERSITY OF BEIRUT

THE ASSOCIATION BETWEEN LIFESTYLE HABITS AND MENTAL HEALTH DURING THE COVID-19 CONFINEMENT AMONG ADULT ARABS

by
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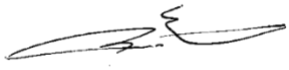

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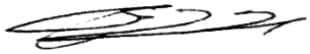

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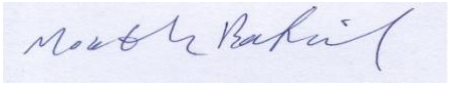

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ABSTRACT
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During the Coronavirus Disease-19 (COVID-19) pandemic, health professionals become highly concerned about individual's physical health and mental wellbeing mainly due to the impact of quarantine. Isolation, and reduced social activities, human connection, and physical interaction can increase mental health complications including depression, anxiety, stress, and varied psychological problems. This study was done to examine the effect of lifestyle factors such as nutritional choices, sleep, and physical activity during the COVID-19 quarantine period among Arab adults living in the Middle Eastern and North Africa (MENA) region.

A cross-sectional design study with a snowball nondiscriminatory sampling procedure was used during the study. The demographic data was collected using an online multicategory questionnaire during the months of March and April 2020, shared with the following tools: Food Frequency Questionnaire (FFQ), International Physical Activity Questionnaire (IPAQ), WHO-5 wellbeing score, and Pittsburgh Sleep Quality Index (PSQI).

A total of 2754 participants from 18 Arab countries completed the questionnaire [1305 males (47.4%) and 1449 females (52.6%)] with an age range of 35.3±12.6 and 30.6±10.5 respectively. Most participants (59.2%) were reported to have a good mental wellbeing status. A significant positive association was found between sleep and mental wellbeing ($p<0.0001$). Additionally, those with the self-reported physical activities and good health status were found to have a better mental wellbeing score ($p<0.0001$). Moreover, participants aged between 32-41 years and those living in rural areas reported a better mental wellbeing score($p<0.05$).

Our results suggest that mental wellbeing is positively related to getting enough sleep and/or engaging in regular physical activity and/or maintaining a good health. Findings from this study may be used to ameliorate the impact of quarantine on mental health.

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ABBREVIATIONS

COVID-19: Coronavirus Disease-19

WHO: World Health Organization

PA: Physical activity

SARS: Severe Acute Respiratory Syndrome

DCI: Demo- graphic and Cultural Information

IPAQ: International Physical Activity

MET: Metabolic equivalents

FFQ: Food frequency questionnaire

OR: Odds ratio

CI: Confidence interval

PSQI: Pittsburg Sleep Quality Index

WHO-5: World Health Organization-Five Well-Being Index

MENA: Middle Eastern and North Africa

CHAPTER I

INTRODUCTION

More than half an era since quarantine became the principal of a multicomponent plan for controlling the outbreaks of several communicable disease, such as the 2003 severe acute respiratory syndrome (SARS) outbreak and the 2009 influenza A(H1N1) pandemic [1]. Increased risk of psychological outcomes was proposed in previous studies following the quarantine measures that were applied in the outbreaks of SARS, Ebola, and H1N1 influenza pandemic [2,3]. During the early stage of the appearance of SARS and other epidemics, numerous psychiatric problems such as depression, panic attack, anxiety, suicidal thoughts, restlessness, and psychotic symptoms were reported [4].

Coronavirus disease 2019 (COVID-19) emerged in early December, 2019, caused by severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2) first started within Wuhan region in China and rapidly spread to Europe and all over the world [5]. After the World Health Organization (WHO) declaring COVID-19 as a global pandemic, different public health interventions were used to control the spread of the virus including traffic restriction, social distancing, home confinement, work and school closures, and centralized quarantine [5,6]. Those interventions being urgently implemented to control the pandemic might possibly cause adverse psychological and social effects especially on those most susceptible, such as frontline medical workers, older adults, and children [7].

During the COVID-19 pandemic, health professionals are very concerned about mental wellbeing. This could be because the death rate recorded for COVID-19 during

its first six months surpassed the total deaths in the first two years of the Ebola epidemic and is close to the anticipated death rates during 18 months of the H1N1 pandemic. In addition to that, the imposed measures during the COVID-19 pandemic drastically surpass quarantine measures previously applied, the pandemic has also led to economic and social global crises; with that being mentioned most people were in a state of mental distress and fear [8]. Isolation and reduced social activities, human connection and physical interaction can increase mental health complications including depression, anxiety, stress, and varied psychological problems [9].

Lifestyle is viewed as a multidimensional construct that encompasses eating habits, physical activity, restful sleep, outdoor activities, substance abuse, and stress management. COVID-19 has been shown to have a great impact on the mentioned lifestyle factors [10]. Dietary modifications, physical activity restrictions, and the impact of increased indoor and screen time are all areas that have been not given enough attention when it comes to their impact on mental health during quarantine [11]. Disturbed sleeping cycle and sleep shortage can result from home confinement due to the loss of daily routines work changes, not enough exposure to sunlight and limited ability to exercise, which could in turn lead to or be associated with the mentioned mental health problems, and vice versa [12, 13, 14]. Disrupted sleep and difficulty falling asleep were shown to have a negative impact on mental health, increasing symptoms of anxiety and depression [15]. With sleep being affected, physical activity another lifestyle factor has been shown to be highly influenced during quarantine, several studies have reported individuals being less active during this period [16]. Mental and physical health are inextricably linked and influenced by one another,

maintaining and increasing physical activity may help to alleviate depression and anxiety symptoms associated with quarantine [17].

Furthermore, eating habits were also been shown to be affected by quarantine, increased food intake and snacking and obesity risk were observed during the pandemic, they could be a result of both the altered psychological status and sleeping disorders [18]. Studies have shown that there was a preference for high-calorie, high sugar, high fat foods, also known as 'comfort foods', specifically amongst obese and overweight individuals during stressful situations. The brain reward system involving opioid, dopamine and endocannabinoid is usually stimulated after the consumption of highly satisfactory foods in response to stress [19, 20]. The obesity risk and mental health problems are both thought to be highly influenced by the quarantine measures applied during the COVID-19 pandemic. To address the association between the mentioned lifestyle factors and mental wellbeing we performed this cross-sectional design study among Arab adults from the Middle Eastern and North Africa (MENA) aged between 18-65 years.

A. Thesis Objectives

This study aims to determine the association between lifestyle behaviors such as physical activity, sleep, and diet followed during quarantine to the mental wellbeing status of individuals during the COVID-19 confinement period in the MENA region. The results will help provide recent and future guidance about lifestyle behaviors that could help improve mental wellbeing status in the MENA region.

CHAPTER II

MATERIALS AND METHODS

A. Study Design

A cross sectional comparable design study with a snowball nondiscriminatory sampling procedure was conducted among adults Arabs in the MENA region among 16 countries, from the gulf and levant regions (Jordan, Lebanon, Palestine, Syria, Bahrain, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates), the North Africa region (Algeria, Egypt, Libya, Morocco, and Tunisia), and from countries outside these regions (Yemen and Sudan). Internal and external reliability of questions in addition to the clarity of questions was established by a pilot test conducted on 63 persons; the pilot test results were not included in analysis.

B. Procedure and Participants

Data for these analyses was retrieved electronically from Arab adults' participants aged 18 to 65 years complying with government guidelines of home confinement and isolation. An online Arabic questionnaire was sent to universities in the MENA region during the months of March and April 2020. The time needed to fill the questionnaire was around 10 minutes. All participants were aware of the general purpose of the study and gave prior informed consent. The participants identity remained anonymous because the questionnaire did not seek personal information (name, email, date of birth). The Human Research Ethics Committees of the University of Jordan and the Hashemite University provided ethical approval conforming to the

Declaration of Helsinki. A total of 2754 self-reported information from participants were obtained.

C. Measures and Scales

Information about demographic, dietary, physical activity, sleep, and mental wellbeing variables was obtained using validated measurement instruments that were included in the online questionnaire. The study questionnaire showed an adequate internal reliability (Cronbach $\alpha > 0.70$) and an external reliability (Intraclass Correlation Coefficient > 0.70) for total and all the individual scales.

Socio- demographic data (age, gender, marital status, health status, education level, smoking status, country, housing, height, weight, occupation, and presence of chronic diseases) were collected through a self- completed DCI [Demo- graphic and Cultural Information] [21].

The Body Mass Index (BMI) was calculated using self-reported weight (kg) and height (cm). Participants were classified as underweight, normal, overweight, or obese based on their BMI [22].

Mental wellbeing was evaluated through the World Health Organization-Five Well-Being Index [WHO-5]. The WHO- 5 entails five items. Five positively worded items are included in the WHO-5 which are : 1) “I have felt cheerful and in good spirits”, 2) “I have felt calm and relaxed”, 3) “I have felt active and vigorous”, 4) “I woke up feeling fresh and rested” and 5) “My daily life has been filled with things that interest me”. Participants are requested to rate how well each of the 5 statements applies

to them when reflecting to the last past two weeks. The validated Arabic version of this questionnaire was used in this study [23,24].

Every item of the five mentioned is scored from 5 (all the time) to 0 (none of the time) [25]. A total score of 25 points maximum was summed up and generated from the item scores. Participants who scored >13 on the WHO-5 total score are considered to have a good mental wellbeing and those who scored <13 are considered to have a poor mental wellbeing [21].

Pittsburg Sleep Quality Index (PSQI) was used to assess the quality of sleep. The PSQI scale consists of 19 questions. Seven components are generated from those questions. The seven components that the tool focuses on are: individual sleep quality, sleep latency, sleep duration, habitual sleep efficiency (the ratio of absolute sleep time to time in bed), sleep conflicts, the use of sleep-promoting medicine (by prescription or over-the-counter), and daytime dysfunction [26]. The validated Arabic version of this questionnaire was used in this study [27]

Each component was scored on a scale of 0 to 3. A total score of maximum 21 points was generated from the sum of the items, lower scores indicated better sleep quality. Participants who were considered to have a good sleep quality are those who had a total PSQI score of <5 [28].

A qualitative Food frequency questionnaire (FFQ) was used to assess dietary behavior. Information about the frequency of healthy and unhealthy food consumption during the last week were retrieved from 11 questions. A scale of 0 to 4 was used to rate healthy dietary behavior; this included the consumption of vegetables, fruits, dairy,

herbs, breakfast and nuts. On the contrary the consumption of preserved foods, sweetened beverages, fried foods, sweets, and energy drinks was considered unhealthy behavior.

The lower the score, the more frequent the unhealthy dietary behavior item has occurred, in the previous week. A maximum score of 44 points was generated from summing up the individual items and the total score was divided using the median split of dietary score into two groups: low and high [29].

The Short-Form International Physical Activity Questionnaire (IPAQ) was used to assess the physical activity level of each participant. IPAQ short form consisted of seven items that gave information about walking, moderate PA, and vigorous PA and they were classified based on metabolic equivalents (MET) minutes per week. The amount of energy expended during physical activity is measured in MET minutes. Information about sitting time was also provided. Participants physical activity was then classified into low, moderate, or high. The validated Arabic form of this questionnaire was used in this study [30]

A high-level amount to at least one hour of moderate intensity activity every day, a moderate level amounts to around half an hour of moderate intensity physical activity on most days of the week and a low-level amount to not meeting the criteria for moderate or high physical activity levels [31].

D. Data analysis

All statistics were conducted using SPSS Statistics version 25 (IBM). Data from continuous variables were presented as means and standard deviations (mean ± SD) whereas those from categorical variables were presented as counts and percentages (%). Chi-Square test ($\chi 2$) for the categorical variables was used to interpret significant differences. Binary logistic regression was used to assess the impact of the gender, dietary score, health status, PA, sleep, chronic disease, housing, smoking, BMI, Marital status, and age on mental wellbeing. The dependent variable was the mental wellbeing status and the independent variables were the BMI, age, gender, education, housing, chronic disease, smoking, sleep, physical activity, health status and marital status. Binary logistic regression was also conducted to test for the association of each dietary variable score (breakfast, fruits, vegetables, nuts, herbs, sweetened drinks, fried and preserved foods, dairy and energy drinks) with the mental wellbeing. The independent variables that showed statistical significance after running each variable alone with the dependent variable (mental wellbeing) to get the crude OR were then combined to get the adjusted OR to test their significance and effect on mental wellbeing.

Statistical significance was set as a p-value<0.05.

CHAPTER III

RESULTS

A. Descriptive results

In total 2754 participants (1449 females, 1305 males) from 18 Arab countries participated in this study. Sociodemographic data are presented in **table 1**. The average age for the participants was 35.3±12.6 and 30.6±10.5 for males and females respectively, in which females were significantly younger ($p<0.001$). Overall, (18.8%) were obese and (34%) were overweight. Self-reported BMI of males was significantly higher than that of females' participants ($p<0.001$) and the majority of participants were educated with a bachelor degree and above (about 70%), about half were married and (85%) were living in urban areas. The reported prevalence of chronic diseases and smoking was significantly higher among male participants, while health status was similar between genders.

Table1. Significance of participants' characteristics based on gender

Variable	Male	Female	Total	P value
	n (%)	n (%)	n (%)	
Participants	1305(47.4)	1449(52.6)	2754(100)	
Body Mass Index (kg/m^2)				
Mean ± SD	27±5.1	25.1±5.2		
Underweight	27(2.1)	92(6.3)	119(4.3)	
Normal	452(34.6)	728(50.2)	1180(42.8)	***p<0.001****
Overweight	533(40.8)	404(27.9)	937(34.0)	
Obese	293(22.5)	225(15.5)	518(18.8)	
Age Group(years)				
Mean ± SD	35.3±12.6	30.6±10.5		
18-22	248(19)	475(32.8).	723(26.3)	
23-31	361(27.7)	380(26.2)	741(26.9)	***p<0.001****
32-41	281(21.5)	351(24.2)	632(22.9)	
>41	415(31.8)	243(16.8)	658(23.9)	
Education Level				

School	38(2.9)	43(3)	81(2.9)	***p<0.001****
High school	156(12)	220(15.2).	376(13.7)	
Community college	74(5.7)	151(10.4)	225(8.2)	
Bachelor	712(54.5)	806(55.6).	1518(55.1)	
Graduate degree	325(24.9)	229(15.8)	554(20.1)	
Housing				***p= 0.023****
Urban	1091(83.6)	1256(86.7)	2347(85.2)	
Rural	214(16.4)	193(13.3)	407(14.8)	
Smoking				***p<0.001****
No	751(57.5)	1236(85.3)	1987(72.1)	
yes	554(42.5)	213(14.7)	767(27.9)	
Chronic Disease				***p <0.001****
No	950(72.8)	1230(84.9)	2180(79.2)	
Yes	355(27.2)	219(15.1)	574(20.8)	
Health Status				*p= 0.723*
Poor/fair	92(7)	114(7.9)	206(7.5)	
Good	320(24.5)	336(23.2)	656(23.8)	
Very good/excellent	893(68.4)	999(68.9)	1892(68.7)	
Marital Status				
Single	540(41.4)	734(50.7)	1274(46.3)	***p<0.001****
Married	732(56.1)	646(44.6)	1378(50)	
Divorced	33(2.5)	59(4.1)	92(3.3)	
Widowed		10(0.7)	10(0.4)	

***significant p value<0.05**

SD[a]: Standard Deviation

B. Mental wellbeing status

The status of mental wellbeing according to different lifestyle variables and selected demographic variables is presented in **table 2**. A total of 1123 (40.8%) participants reported to have a poor mental wellbeing, in which (57%) of females had a poorer mental wellbeing status as compared to males (43%) ($\chi 2=13.9$, $p<0.0001$). Neither BMI nor marital status were found to affect mental wellbeing. Mental wellbeing status was found to be affected by age, in which of younger participants (29.5%) aged between 18-22 years reported a poorer mental being status compared to those in the older age groups (19.7%) aged between 32-41 years ($\chi 2=17.6$, $p<0.001$). The results

suggest that housing (urban vs. rural) has an impact on mental wellbeing status, the number of participants who reported having a poor mental wellbeing status was higher in urban areas (87.5%) compared to rural ones (12.5%) ($\chi2=8.04$, $p=0.005$**).** Additionally, participants who did not suffer from chronic disease (81.4%) reported a better mental wellbeing status compared to those who did suffer from chronic disease (18.6%) ($\chi2=12.436$, $p<0.0001$). Participants who reported that they do not smoke showed that they had a better mental wellbeing status (73.8%) compared to those who did (26.2%) ($\chi2=5.15$, $p<0.05$). Likewise, participants who had a better health status and reported a very good/excellent health status had a better mental wellbeing status compared to those who reported a good or fair health status ($\chi2=110.893$, $p<0.0001$).

In addition to that, some lifestyle factors had an influence on mental wellbeing; for instance, individuals' who engaged in physical activity, ate healthy and had a better sleep quality reported a better mental wellbeing status ($p<0.0001$). Participants who reported low levels of physical activity had a poorer mental wellbeing status (63.7%) than and those who engaged in moderate PA (30%) and high-level PA (6.3%) ($\chi^2 = 186.668$, $p <0.0001$). Those who reported better sleep had a better mental wellbeing status (50.1%) compared to those who reported poor sleep (49.9%) ($\chi2=190.2$, $p<0.0001$). It's important to mention here that 60.6% of participants reported having poor quality of sleep. Additionally, dietary habits were also associated with mental wellbeing status of which participants who had a low dietary score reported a poor mental wellbeing status (58.8%) compared to those who reported high score (41.2%) ($\chi^2 = 36.745$, $p <0.0001$).

Table2. Association of mental wellbeing according to lifestyle variables and selected demographic variables

	Mental wellbeing status			Chi-square P- value
Variable	**Poor (<13)**	**Good (>13)**	**Total**	***χ2*** ***p***
	n (%)	n (%)	n (%)	
Participants	1123(40.8)	1631(59.2)	2754(100)	
Gender				*χ2=13.9*
Female	639(57)	810(49.7)	1449(52.6)	
Male	484(43)	821(50.3)	1305(47.4)	***p<0.0001****
Body Mass Index (kg/m^2)				
Underweight	55(4.9)	64(3.9)	119(4.3)	*χ2=3.376*
Normal	483(43)	697(42.7)	1180(42.8)	
Overweight	365(32.5)	572(35.1)	937(34)	*p =0.337*
Obese	220(19.6)	298(18.3)	518(18.9)	
Age Group(years)				
18-22	331(29.5)	392(24)	723(26.3)	*χ2=17.6*
23-31	292(26)	449(27.5)	741(26.9)	
32-41	221(19.7)	411(25.2)	632(22.9)	***p<0.001****
>41	279(24.8)	379(23.3)	658(23.9)	
Housing				
Urban	983(87.5)	1364(83.6)	2347(85.2)	*χ2=8.04*
Rural	140(12.5)	267(16.4)	407(14.8)	***p=0.005****
Marital Status				
Single	526(46.8)	748(45.9)	1274(46.3)	*χ2=2.3*
Married	555(49.4)	823(50.4)	1378(50.0)	
Divorced	40(3.5)	52(3.2)	92(3.3)	*p=0.504*
Widowed	2(0.3)	8(0.5)	10(0.4)	
Smoking				
No	784(69.8)	1203(73.8)	1987(72.1)	*χ2=5.15*
Yes	339(30.2)	428(26.2)	767(27.9)	***p=0.023****
Chronic Disease				
No	852(75.9)	1328(81.4)	2180(79.2)	$\chi^2 = 12.436$
Yes	271(24.1)	303(18.6)	574(20.8)	***p <0.0001****
Health Status				
Poor/Fair	133(11.9)	73(4.5)	206(7.5)	$\chi^2 = 110.893$
Good	338(30.1)	318(19.5)	656(23.8)	
Very good/ excellent	652(58.0)	1240(76.0)	1892(68.7)	***p <0.0001****
Physical Activity				
Low	715(63.7)	676(41.4)	1391(50.5)	$\chi^2 = 186.668$
Moderate	337(30.0)	577(35.4)	914(33.2)	

High	71(6.3)	378(23.2)	449(16.2)	***p <0.0001****
Sleep Status				
Poor	854(76.0)	814(49.9)	1668(60.6)	*χ2=190.2* ***p<0.0001****
Good	269(24)	817(50.1)	1086 (39.4)	
Dietary Score				
Low	660(58.8)	767(47.0)	1427(51.8)	$\chi^2 = 36.745$
High	463(41.2)	864(53.0)	1327(48.2)	***p <0.0001****

C. Binary logistic regression on the effect of each dietary factor on having a good mental wellbeing status and all factors combined

Logistic regression conducted to test for the impact of dietary factors on the mental wellbeing status is presented in **table 3**. When testing for each variable alone with the mental wellbeing those that showed statistical significance were the consumption of breakfast (3-4 times/week , everyday), fruits (5-7 or more times/week), vegetables, nuts (3-7 or more times/week), herbs, sweetened drinks, fried foods and sweets (3-7 or more times/week), and energy drinks except for (5-6 times/week) ($p<0.05$). Consumption of preserved foods and dairy products showed no significant impact on mental wellbeing ($p>0.05$).

After adjusting for all significant factors, the ones that showed statistical significance on mental wellbeing were consumption of breakfast (daily), vegetables, nuts (5-7 or more times/week), sweetened drinks (7 or more/week), fried foods and sweets (3-7 or more times/week). Participants who consumed breakfast everyday/week had 35.3% higher odds of having a better mental wellbeing status compared to those who did not consume breakfast or consumed it less than 7 times (OR=1.353, p=0.016). Participants who consumed vegetables reported to have a better mental wellbeing, with those who consumed vegetables 1-2 times/ week and 7 or more times/ week reporting the highest rates in which they had 95.6% and 2.5 times higher odds of having a better

mental wellbeing status respectively than those who consumed vegetables 3-6 times/week (OR=1.956,2.468, p<0.05). Participants who reported eating nuts for 5-6 times/week or 7 or more times /week reported to have 59.9% and 59% higher odds of having better mental wellbeing status compared to those who did not consume or consumed nuts less than 5 times/ week (OR=1.599,1.590, p<0.05). Participants who reported drinking sweetened beverages for 7 or more times/ week reported having a better mental wellbeing than those who consumed less than this amount (OR=1.709, p<0.0001). As for the participants who consumed fried foods those who reported having them 3-7 times / week had a better mental wellbeing status than those who had them less than 3 time/week; participants who had them 7 or more times / week had the highest rate of 91.7% higher odds of having a better mental wellbeing status compared to other groups(OR=1.917, p<0.05). Finally, participants who reported having sweets for 3-7 times/ week had a better mental wellbeing than those who did not consume or consumed sweets less than that, with those having them for 7 or more times/week reporting the highest rates with 80.4% higher odds of having a good mental wellbeing than those who had them for less than 3 times/week (OR=1.804, p<0.05).

Table 3. Binary logistic regression on the effect of each dietary factor on having a good mental wellbeing status and all factors combined

		Crude		Adjusted	
		OR (95%CI)	p- value	OR (95%CI)	p-value
Breakfast	None	*Reference*		*Reference*	
	1-2/week	*1.283(0.993,1.657)*	*p=0.057*	1.231(0.942,1.610)	p=0.128
	3-4/week	*1.373(1.053,1.792)*	***p=0.019****	*1.317(0.998,1.740)*	p=0.052
	5-6/week	*1.244(0.927,1.669)*	*p=0.145*	*1.084(0.796,1.476)*	p=0.607

	Everyday	*1.631(1.303,2.041)*	***p<0.0001****	*1.353(1.059,1.728)*	**p=0.016***
Fruits	None	*Reference*		*Reference*	
	1-2/week	*1.256(0.893,1.768)*	p=0.191	*0.889(0.608,1.300)*	*p=0.544*
	3-4/week	*1.397(0.998,1.954)*	p=0.051	*0.931(0.632,1.370)*	*p=0.716*
	5-6/week	1.683(1.176,2.410)	**p=0.004***	*1.063(0.7,1.614)*	*p=0.776*
	7 or more	1.938(1.363,2.755)	**p<0.0001***	*0.998(0.652,1.528)*	*p=0.99*
Vegetables	None	*Reference*		*Reference*	
	1-2/week	*2.280(1.443,3.601)*	**p<0.0001***	*1.956(1.194,3.204)*	***p=0.008****
	3-4/week	*2.181(1.412,3.370)*	**p<0.0001***	*1.780(1.097,2.888)*	***p=0.020****
	5-6/week	*2.329(1.491,3.638)*	**p<0.0001***	*1.861(1.123,3.084)*	***p=0.016****
	7 or more	*3.178(2.053,4.919)*	**p<0.0001***	*2.468(1.491,4.086)*	***p<0.0001****
Nuts	None	*Reference*		*Reference*	
	1-2/week	*1.237(0.990,1.546)*	*p=0.061*	*1.125(0.886,1.428)*	*p=0.333*
	3-4/week	*1.341(1.056,1.703)*	***p= 0.016****	*1.207(0.929,1.569)*	*p=0.159*
	5-6/week	*1.646(1.206,2.245)*	***p=0.002****	*1.599(1.138,2.248)*	***p=0.007****
	7 or more	*1.818(1.269,2.6040*	***p=0.001****	*1.590(1.073,2.356**)*	***p=0.021****
Herbs	None	*Reference*		*Reference*	
	1-2/week	*1.253(1.027,1.528)*	***p=0.026****	*1.084(0.877,1.341)*	*p=0.454*
	3-4/week	*1.358(1.085,1.699)*	***p=0.008****	*1.143(0.900,1.452)*	*p=0.273*
	5-6/week	*1.288(0.971,1.708)*	*p=0.079*	*1.029(0.761,1.391)*	*p=0.853*
	7 or more	*1.439(1.112,1.8610*	***p=0.006****	*1.050(0.793,1.389**)*	*p=0.734*
Sweetened drinks	None	*Reference*		*Reference*	
	1-2/week	*1.200(0.850,1.695)*	p=0.299	*1.130(0.783,1.630)*	*p=0.513*
	3-4/week	*1.494(1.130,1.977)*	**p=0.005***	*1.340(0.987,1.819)*	*p=0.060*
	5-6/week	*1.530(1.183,1.981)*	***p=0.001****	*1.295(0.970,1.729)*	*p=0.080*
	7 or more	*2.216(1.700,2.888)*	**p<0.0001***	*1.709(1.264,2.310)*	***p<0.0001****
Fried food	None	*Reference*		*Reference*	
	1-2/week	*1.419(0.915,2.202)*	*p=0.118*	*1.415(0.892,2.245)*	*p=0.140*
	3-4/week	*1.968(1.334,2.905)*	***p=0.001****	*1.762(1.156,2.683)*	***p=0.008****
	5-6/week	*2.389(1.638,3.483)*	***p<0.0001****	*1.873(1.235,2.840)*	***p=0.003****

	7 or more	*2.846(1.900,4.263)*	***p<0.0001****	*1.917(1.223,3.005)*	***p=0.005****
Sweets	None	*Reference*		*Reference*	
	1-2/week	*1.104(0.839,1.454)*	*p=0.480*	*1.048(0.784,1.400)*	*p=0.753*
	3-4/week	*1.415(1.116,1.792)*	***p= 0.004****	*1.313(1.015,1.699)*	***p=0.038****
	5-6/week	*2.012(1.588,2.550)*	***p<0.0001****	*1.734(1.332,2.258)*	***p<0.0001****
	7 or more	*2.148(1.501,3.075)*	***p<0.0001****	*1.804(1.218,2.673)*	***p=0.003****
Energy drinks	None	*Reference*		*Reference*	
	1-2/week	*1.818(0.568,5.817)*	*p=0.314*	*1.215(0.360,4.094)*	*p=0.754*
	3-4/week	*2.203(0.919,5.282)*	*p=0.077*	*1.363(0.537,3.459)*	*p=0.515*
	5-6/week	*2.347(1.031,5.340)*	***p=0.042****	*1.286(0.532,3.110)*	*p=0.576*
	7 or more	*1.956(0.895,4.277)*	*p=0.093*	*0.899(0.385,2.097**)***	*p=0.805*
Preserved food	None	*Reference*			
	1-2/week	*0.610(0.369,1.009)*	*p=0.054*		
	3-4/week	*0.932(0.605,1.435)*	*p=0.748*		
	5-6/week	*1.094(0.719,1.665)*	*p=0.676*		
	7 or more	*1.145(0.739,1.772)*	*p=0.545*		
Dairy	None	*Reference*			
	1-2/week	*1.054(0.735,1.510)*	*p=0.776*		
	3-4/week	*1.000(0.707,1.414)*	*p=0.998*		
	5-6/week	*1.034(0.722,1.481)*	*p=0.854*		
	7 or more	*0.917(0.647,1.298)*	*p=0.624*		

D. Binary logistic regression on the effect of each lifestyle factor on having a good mental wellbeing and all lifestyle factors combined

Logistic regression conducted to test for the impact of lifestyle factors on the mental wellbeing status is presented in **table 4**. When testing for each variable alone with the mental wellbeing those that showed statistical significance were gender, dietary habits, health status, PA category, sleep, chronic disease, smoking, housing and age (32-

41 years) ($p < 0.0001$). BMI, and marital status showed no significant impact on mental wellbeing ($p>0.05$).

Primary results showed that being a male increases the odds of having a good mental wellbeing compared to females by 33.8% (OR=1.338, $p<0.0001$). With low dietary score being our reference group, our results showed that individuals who were eating healthy and consumed less processed food and less high sugar food had 60.6% higher odds of having a good mental wellbeing compared to those who did not eat healthy and reported a low dietary score (OR=1.606, $p<0.0001$). Moving on to the health status with having poor health status as our reference, results showed that the odds of having a good mental wellbeing was 71.4% and 3.5 times higher for those who had good and very good/excellent health compared to those who reported a poor health status respectively (OR=1.714, 3.465; $p<0.0001$). As for the physical activity, low PA was our reference and results showed that the odds of having a better mental wellbeing was 81.1% and 5.6 times higher for those who engaged in moderate and high PA compared to those who engaged in low PA respectively (OR=1.811, 5.631; $p<0.0001$).

As mentioned, sleep was also shown to be significant, poor sleep score was our reference and results showed that those who reported good sleep status had 3.2 times higher odds of having a good mental wellbeing status compared to those who reported a poor sleep score (OR= 3.186, $p<0.0001$). Chronic disease and smoking also showed significance ($p<0.0001$). Those who did suffer from chronic disease had 28.3 % lower odds of having a good mental wellbeing status than those who did not suffer from any disease (OR=0.717, $p<0.0001$). As for smoking those who smoked had 17.7% lower odds of having a good mental wellbeing compared to those who reported that they are non-smokers (OR=0.823, $p=0.023$).

Housing and age showed statistical significance as well. In which participants who lived in Urban areas had 27.2% lower odds of having a good mental wellbeing compared to those living in rural areas (OR= 0.728 p=0.005). Participants aged between 32-41 years had 57% higher odds of having a good mental wellbeing status compared to those younger than 32 years and older than 41 years with having those aged between 18-22 years as our reference group (OR= 1.570, p<0.0001).

After performing logistic regression for all the significant lifestyle factors combined, gender, dietary habits, chronic disease, smoking, and housing failed to show significance (p>0.05).

Therefore, after combining all lifestyle factors our results showed that the factors that had the greatest impact on mental wellbeing were health status, physical activity, sleep, housing and age.

The odds of having a good mental wellbeing was 60.2% and 2.8 times higher for participants who reported good and very good/excellent health status respectively compared to those who reported poor health status (OR=1.602, 2.766; p=0.008, p<0.0001). As for the physical activity, the odds of having a good mental wellbeing was 55.5% and 5.2 times higher for participants who engaged in moderate and high PA respectively compared to those who engaged in low PA (OR=1.555, 5.170; p<0.0001). Participants who reported good sleep quality had 2.74 higher odds of having a good mental wellbeing status compared to those who reported poor sleep score (OR= 2.742; p<0.0001). Additionally, participants who lived in urban areas had 24.8% lower odds of having a good mental wellbeing than those living in rural ones (OR=0.752, p<0.022). Moving on to our last significant factor which is age, participants aged between 32-41

years had 73.4% higher odds of having a good mental wellbeing compared to those younger than 32 years and older than 41 years (OR=1.734; $p<0.0001$).

Table 4. Logistic regression on the effect of each lifestyle factor on having a good mental wellbeing and all lifestyle factors combined

		Crude		Adjusted	
		OR (95%CI)	p- value	OR (95% CI)	p-value
Gender	Females	*Reference*		*Reference*	
	Males	*1.338(1.148,1.559)*	***p<0.0001****	*1.163(0.968,1.398)*	*p=0.107*
Dietary Score	Low	*Reference*		*Reference*	
	High	*1.606(1.377, 1.872)*	***p<0.0001****	*1.083(0.906,1.294)*	*p=0.381*
Health Status	Poor	*Reference*		*Reference*	
	Good	*1.714(1.24,2.37)*	***P=0.008****	*1.602(1.133,2.264)*	***p<0.0001****
	Very good/excellent	*3.465(2.565,4.681)*	***p<0.0001****	*2.766(1.986,3.852)*	***p<0.0001****
Physical Activity	Low	*Reference*		*Reference*	
	Moderate	*1.811(1.527,2.148)*	***p<0.0001****	*1.555(1.291,1.873)*	***p<0.0001****
	High	*5.631(4.28,7.409)*	***p<0.0001****	*5.170(3.856,6.931)*	***p<0.0001****
Sleep	Poor	*Reference*		*Reference*	
	Good	*3.186(2.694,3.769)*	***p<0.0001****	*2.742(2.293,3.280)*	***p<0.0001****
Chronic Disease	No	*Reference*		*Reference*	
	Yes	*0.717(0.596,0.863)*	***p<0.0001****	*0.967(0.772,1.212)*	*p=0.773*
Smoking	No	*Reference*		*Reference*	
	Yes	*0.823(0.695,0.974)*	***p=0.023****	*0.897(0.735,1.095)*	*p=0.287*
Housing	Rural	*Reference*		*Reference*	
	Urban	*0.728(0.584,0.907)*	***p=0.005****	*0.752(0.589,0.959)*	***p=0.022****
Age	18-22	*Reference*		Reference	
	23-31	*1.298(1.055,1.598)*	*p=0.014*	1.250(0.994,1.571)	*p=0.056*
	32-41	***1.570(1.261,1.956)***	***p<0.0001****	***1.734(1.356,2.217)***	***p<0.0001****
	>41	*1.147(0.927,1.419)*	*p=0.207*	1.264(0.975,1.638)	*p=0.077*
BMI	Underweight	*Reference*			
	Normal	*0.891 (0.533,1.49)*	*p=0.66*		

	Overweight	*1.438(0.854,2.421)*	*p=0.172*		
	Obese	*1.431(0.822,2.491)*	*p= 0.205*		
Marital Status	Single	*Reference*			
	Married	*1.043(0.893,1.218)*	*p=0.596*		
	Divorced	*0.914(0.596,1.401)*	*p=0.680*		
	Widowed	*2.813(0.595,13.299)*	*p=0.192*		

CHAPTER IV

DISCUSSION

To gain insight about the association between mental wellbeing and lifestyle factors during the COVID-19 home confinement period, this cross-sectional study was conducted on Arab adults to test for this association. Based on the results obtained, we could confirm our hypothesis that some lifestyle factors do have an impact on mental wellbeing status during lockdown.

Mass home confinement directives were imposed in all countries of the world. Quarantine was suddenly imposed which caused panic, stress and emotional distress to most people [32, 33]; being exposed to such stressor has put people at higher risk of developing sleep disorders and having a lower immune system [34]. COVID-19 has changed several aspects of life and shifted everything to being online, which forced people to spend more time in front of screens and made it hard for them to leave their house for several months unless it was necessary. This type of sudden lifestyle shift had a great impact on people's mental health, for instance reports from China showed rates of up to 17% for depression [35], 30% for anxiety [36], and 35% trauma-related distress symptoms [37]. Italy almost also had similar rates following the quarantine measures implementation [38]. Additionally, increased suicidal behaviors (suicide attempts, suicidal ideation, and actual suicide) were reported from India and Bangladesh [39, 40].

Mental health is affected by several factors such as individual's freedom, financial stability, and other lifestyle aspects (e.g. physical activity, health status, dietary habits and others) and most of these factors were influenced by COVID-19 [41].

In this study, lifestyle factors such as physical activity, sleep and health status were shown to have a great impact on mental wellbeing. Higher physical activity levels were associated with better mental wellbeing score (WHO-5). Likewise, a study done by Silva et al. to investigate the association between physical activity and mental illness during the COVID-19 pandemic showed that individuals who were training and physically active during coronavirus outbreak had lower levels of anxiety, stress and depression which helped them be in a better mental wellbeing state [42]. Dopamine and endorphins are the chemicals released in the brain when exercising they help give the feeling of happiness associated with physical activity [43]. Besides releasing happy chemicals, exercise helps the brain clear of chemicals that can cause stress and anxiety. People who exercise tend to be happier and less stressed than those who don't. Engaging in regular physical activity was also associated with better emotional control and anger management [43]. Participating in regular moderate to vigorous physical activity is associated with reduced feelings of anxiety, reduced blood pressure, improvements in sleep, some aspects of cognitive function, decrease in depressive symptoms and improved insulin sensitivity. Interestingly, studies show that consistent training habits can be equaled to pharmacological measures for the management of mental illnesses such as depression [44,45].

In addition to that, engaging in physical activity could be highly associated with delaying the development of chronic diseases, such as hypertension and type 2 diabetes [46]. This is worth mentioning because in our study a poor health status was associated with lower mental wellbeing status, thus physical activity being able to improve health status could therefore be associated with improving mental wellbeing as well. Finally, the relationship between physical activity and mental health difficulties seems to be a

two- way relation. As mentioned earlier consistent physical activity was related to a lower chance of depressive symptoms; but in the contrary its almost important to mention that individuals who suffer from symptoms of anxiety and depression may find it hard to regularly workout and reach the recommended levels of physical activity [47].

The results of our study showed that poor sleep quality was also associated with lower mental wellbeing score (WHO-5) and this result was supported by other studies as well. In this study 60.6% of the participants reported poor sleep quality. The development of sleep difficulties in response to major stressful situations such as environmental disasters or wartime has been previously reported [48]. Stressful situations such as those caused by COVID-19 pandemic can cause psychological distress, post-traumatic stress disorder (PTSD) and anxiety symptoms which negatively influence sleep quality [49].

Studies have shown that getting enough sleep helps the brain process emotional information, lack of sleep is associated with difficulty processing positive emotional content. Thus, not getting enough sleep or poor sleep quality can affect mood and emotional reactivity and is associated with higher risk of developing mental health disorders and increasing their severity [50,51]. For example, not getting enough sleep was associated with increasing depression and its symptoms [52], was also shown to trigger anxiety in people who are at risk and increase symptoms for those who already suffer from it [53]. As a result, whether people suffer from mental illness or not, improving sleep quality and finding ways to get enough sleep is critical.

Age was also shown to be significant, in which older participants had a better mental wellbeing than the younger ones; the results obtained were supported by other studies as well. COVID- 19's uncertainties and broad effects did not affect everyone

equally: in March 2021, young people in Belgium, France, and the United States were 30 percent to 80 percent more likely than adults to experience symptoms of depression or anxiety. Young people also reported higher levels of loneliness [54,55]. A study was done to assess the effect of age on the mental wellbeing of individuals during the pandemic, the results showed that younger individuals suffered from higher levels of mental distress compared to adults. The reason behind that was proposed to be due to the decreased social interactions, outdoor activities, disrupted school/college routine and traveling all of which could have an impact on mental wellbeing [56]. In addition, another possibility to explain the current finding that younger people were in a higher mental distress state is that they spend most of their time on social media; high rates of news consumption related to the pandemic was highly associated with increased mental distress levels [57]. As for the older age groups the proposed reason behind them suffering from mental distress was due to the greater emphasis on the necessity for them to take more severe measures to avoid infection, and because they are also more likely to have underlying medical concerns [57]. Further studies are needed to understand the complete relation between age and mental health during the pandemic.

Our study failed to find an association between a healthy diet high in fruits and vegetables and low in processed food to be associated with a better mental health after performing regression.

However, several studies support the fact that our diet could highly impact our mental health. The relation between how food affects mental health is yet not fully established; food intake and quality may affect mental health and mood because certain nutrients such as lipids, amino acids, minerals and vitamins are needed for the normal function and structure of the brain [58,59]. The quality and composition of the diet impacts the

gut microbiota, neurotransmitters and gut hormones affecting people's mood and mental wellbeing as well [60]. A consumption of a diet high in refined carbohydrate and sugars may lead to higher mood alterations and an increase in depression and anxiety symptoms. This could happen due to fluctuations in blood glucose which in turn lead to secretion of counter regulatory hormones such as cortisol, glucagon and adrenaline which cause feelings of irritability and anxiety [61]. In addition to that foods with high glycemic index may be responsible in increasing the body's inflammatory response which in turn is associated with depressive symptoms through connections between mental health and immune activation [62]. Inflammation is also increased after the consumption of foods high in saturated fat and processed food, this increase in inflammation could also affect the blood brain barrier. Mood disorders and other mental health conditions have been highly linked to high inflammation. [63,64]. Its also important to mention here that high fat/sugar foods give a short-term stress relief and mood boosting effect due to the secretion of dopamine. Studies have shown that high fat meals are able to activate the same brain reward centers that taking drug does; the release of happy hormones is what makes people feel good after eating these types of food , and the memory of how it makes people feel after they eat them motivates them to crave them and eat them more to feel happy after [65].

On the contrary, a diet rich in fruits, vegetables, whole grains, good fats and following a Mediterranean diet was shown to decrease inflammation and improve mental wellbeing [66,67].However, further research is needed to understand the complete relation between diet and mental health, it remains crucial to follow a healthy

diet to prevent several types of chronic disease. A poor mental wellbeing status or health may occur due to several causes unrelated to nutrition.

CHAPTER V

CONCLUSION

The lifestyle factors and demographic factors that were highly associated with mental wellbeing during the COVID-19 home confinement period in this study were sleep, physical activity, health status, housing and age. Individuals who engaged in physical activity and had a proper sleep quality and schedule had a higher mental wellbeing score than those who did not. Likewise, individuals who did not have health difficulties scored higher on the mental wellbeing scale than those who did. Finding out what elements can impact mental health and informing people about them is critical so that they can work on implementing them and participating in them more. This way, policies could be developed to guide and comprehend people's mental wellbeing during public emergencies like pandemics, and to help them cope more effectively. Being in a better state of wellbeing is linked to increased productivity, a higher quality of life, and healthier individuals.

CHAPTER VI

STRENGTHS AND LIMITATIONS OF THIS STUDY

To our knowledge not enough studies have been done on the association between lifestyle factors and mental wellbeing among Arab adults during pandemics. Our study is thus strengthened by the fact that it helps give a better understanding of the association between those factors in the Arab region. Another strength of the study is the presence of a large sample size which helped in detecting correlations in addition to being able to collect the data during the critical period of the pandemic and confinement. Adding to that a pilot study was conducted to check for the clarity and reliability of the questionnaire.

A limitation of this study is the inability to compare the results before and after the home confinement. Another limitation is that the study was based on a cross-sectional comparable design study with a snowball nondiscriminatory sampling procedure thus causality can't be inferred, further longitudinal studies are needed to test for that. Furthermore, since it was an online questionnaire it was based on individual recall methods which may also have led to the over or underestimation of some factors.

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