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GENDER DIFFERENCES IN HEALTH BEHAVIORS AND ASSOCIATION WITH MENTAL WELLBEING DURING THE INITIAL COVID-19 PANDEMIC LOCKDOWN IN ARAB COUNTRIES

by
ADNAN OMAR EL KADRI

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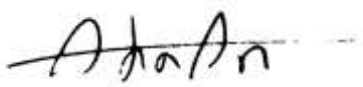

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ABSTRACT
OF THE THESIS OF

Adnan Omar El Kadri for Master of Science
Major: Epidemiology

Title: Gender Differences in Health Behaviors and Association with Mental Wellbeing During the Initial Covid-19 Pandemic Lockdown in Arab Countries

Background and Objective: The COVID-19 pandemic lockdown has been shown to be associated with poor lifestyle behaviors and poor mental wellbeing. It is suggested that females have shouldered most of the burden widening the gender inequity gap in the Arab region. The objective of this study is to examine differences between males and females with respect to their lifestyle behaviors (mainly physical activity, sleep and diet) and to explore gender differences in the association between those lifestyle behaviors and mental wellbeing.

Methods: This is a secondary data analyses of a cross-sectional study that recruited 2754 adults from 12 Arab countries via email and various social media platforms using snowball nondiscriminatory sampling. The questionnaire collected data on lifestyle factors using the following tools: Food Frequency Questionnaire (FFQ), International Physical Activity questionnaire (IPAQ), WHO-5 wellbeing score, and Pittsburgh Sleep Quality Index (PSQI). Binary logistic regression with gender as the main exploratory variable was run to estimate the association between gender and lifestyle factors, and further examine the association between lifestyle factors and mental wellbeing; separate models were run for males and females followed by interaction analysis to test if the gender differences are statistically significant.

Results: After controlling for sociodemographics, males had higher odds of being current smokers vs. non-smokers (p-value<0.0001) and higher odds of being moderately or intensely physically active (vs. not) (p-value<0.0001). Females had higher odds of having being in the above median dietary split (p-value<0.0001). Sleep did not vary by gender. Lifestyle factors that were associated with mental wellbeing include: smoking, sleep, physical activity and diet. The magnitude of the associations did not vary by gender, except for association between high (vs. low) level physical activity and mental wellbeing which was statistically significantly [p-value: 0.002] higher for males [OR: 9.07, 95%CI: (5.81; 14.16)] than females [OR: 4.15, 95%CI: (4.34; 6.33)].

Conclusion: Our study revealed that there are significant differences between males and females in lifestyle factors, with no significant gender differences in the association between mental wellbeing and lifestyle factors, except in high levels of physical

activity. Healthy lifestyle factors were similarly associated with good mental wellbeing in males and females suggesting that future interventions could aim to improve lifestyle behaviors which would in turn aid in promoting good mental wellbeing in both genders.

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CHAPTER I

INTRODUCTION

On 11 March 2020, the World Health Organization declared the COVID-19 pandemic (World Health Organization, 2020), and to this date, populations globally have been grappling with the virus and its physical and mental health repercussions. Suicide rates have risen in a multitude of countries (Roger & Yena, 2020). Sleep quality, dietary behaviors, physical activity, sedentary habits have all been negatively affected, in addition to people's general mental wellbeing (Pieh & O´Rourke et al, 2020). Quality of relationships has also been reportedly negatively affected, and poor relationship quality has been linked to worse mental health (Pieh & O´Rourke et al, 2020).

Public health interventions were initially followed to contain the spread of the pandemic and reducing cases and resulting mortalities. Several Arab countries adopted severe public health measures to contain the epidemic (Kilani et al, 2020). Lebanon, for example, initially followed extreme measures such as school closures, workplace closures, and travel bans (Khoury et al, 2020), with its high Government Response Stringency Index of 85 out of a possible 100 (Khoury et al, 2020).

While lockdowns were successful at reducing transmission rates across several countries (Alfano & Ercolano, 2020), they indirectly contributed to the deterioration in other health-related outcomes (Doraiswamy et al, 2021). Studies have shown a strong association between lockdown and decreased physical activity (Chouchou et al, 2021; Jontez et al, 2021; Sadarangani et al, 2021; Radwan et al, 2021; Cheikh Ismail et al, 2020), worse sleep quality (Kolokotroni et al, 2021; Chouchou et al, 2021; Radwan et

al, 2021), unhealthy eating habits (Jontez et al, 2021; Radwan et al, 2021; Cheikh Ismail et al, 2020), increased sitting time and smoking intensity (Kolokotroni et al, 2021) as well as longer screen time (Sadarangani et al, 2021).

Besides lifestyle factors, lockdown has been implicated in reduced mental wellbeing in two main ways: (1) increased stress (Kolokotroni et al, 2021; Doraiswamy, 2021; Cheikh Ismail et al, 2021), anxiety (Chouchou et al, 2021; Pieh et al, 2020; Jacques-Aviñó et al, 2020), depression (Yamamoto et al, 2020; Pieh et al, 2020; Jacques-Aviñó et al, 2020), deteriorating mood (Pesce & Sanna, 2020) induced by the virus and aggravated by reduced social interactions and worsened financial and employment status (Yamamoto et al, 2020); and (2) deteriorating mental wellbeing associated with the change in all aforementioned lifestyle factors (Kilani et al, 2020). Deteriorating mental wellbeing was associated with decreased physical activity (Chouchou et al, 2021; Kilani et al, 2020; Radwan et al, 2021), poor sleep (Chouchou et al, 2021; Kilani et al, 2020; Yamamota et al, 2020) and dietary quality (Kilani et al, 2020; Bennett et al, 2021) during lockdown.

A. Gender Differences

Though all segments of the population have been impacted, there has been a recent focus on understanding the differential impact of the pandemic (and lockdown) on males and females. Sleep quality was more effected in females compared to males (Liu et al, 2020; Radwan et al, 2021; Xue & McMunn, 2021; Salfi et al, 2020). Additionally, more females reported reduced physical activity during lockdown (Radwan et al, 2021). A working paper by Alon and colleagues concluded that the pandemic (and lockdown) may have had a stronger employment impact on women who

had to carry most of the burden and increased responsibilities during lockdown such as housework and childcare (Alon et al., 2020).

Many studies (Pesce & Sanna, 2020; Pieh et al, 2020; Jacques-Aviñó, 2020; Cheikh Ismail et al, 2021; Rania & Coppola, 2021; Salfi et al, 2020, Kilani et al, 2020) have additionally reported worsened mental wellbeing during lockdown only among females. Liu and colleagues (2020) showed that posttraumatic stress symptoms were more pronounced in females during lockdown (Liu et al, 2020). The literature has consistently shown that a higher percentage of women lost their employment or had to alter or reduce their paid work hours compared to men and had to contribute longer hours to domestic work and childcare compared to men during the lockdown (Deshpande, 2020; Andrew et al, 2020; Xue & McMunn, 2021; Yerkes et al, 2020). It was found that increased levels of psychological distress in women was associated with prolonged duration of housework and childcare during lockdown (Xue & McMunn, 2021). A study showed that women were more concerned about childcare while men were more concerned about paid work and the economy (Czymara et al, 2020). The study suggested that the pandemic affected women more than men in that women had reduced paid work in addition to the potential longer-term consequences in gender inequality.

B. Significance and Gap

Pre-pandemic, the gender inequality was common in the Arab world which scored considerably lower (0.856) than the world average (0.941) on the Gender Development index (ESCWA 2020). It has been suggested by a recent policy brief that gender inequities or inequalities in the Arab world may have been possibly exacerbated

during the pandemic (ESCWA, 2020). Abdou (2020) confirms the preexisting gender inequalities in the Arab region with a wider gender inequality in Arab labor markets during the pandemic.

Besides gender inequity, the Arab world has also been recently characterized as having a relatively weak research culture and few publications on mental health (Maalouf et al, 2019). Very few studies have tackled the impact of Covid-19 within Arab populations, and the limited literature has focused on direct infections and physical health comorbidities such as cancer (Al-Shamsi et al, 2021), or people's perceptions and experiences (Essam & Abdo, 2020). A recent study on 1723 people attending or working at higher institutions in several Arab countries found that lower physical activity, unhealthy dietary behavior and poor sleep quality during lockdown were all associated with worse mental wellbeing (Kilani et al., 2020). While this study has shed light on the importance of maintaining a healthy lifestyle (mainly healthy sleep, diet and physical activity) during lockdown for better mental health, it did not investigate the possible differential impact of lockdown on male vs. female participants. To our knowledge, no study from the Arab world has investigated gender differences in lifestyle factors during lockdown, or quite importantly the differential impact of such behaviors on mental wellbeing of males and females.

C. Research Aims

The aims of the present study are therefore to: (1) examine gender differences in various lifestyle factors (e.g., physical activity, dietary behavior and sleep patterns during lockdown) and reported health status (e.g., chronic diseases and perceived health); and to (2) examine gender differences in the association between the above-

mentioned lifestyle factors and practices on the mental wellbeing of Arab males and females during lockdown.

CHAPTER II

METHODS

A. Study Design and Recruitment

This study involves secondary data analysis. The original study followed a cross-sectional comparable design using snowball nondiscriminatory sampling. The initial published paper (Kilani et al, 2020) had recruited a sample of 1723 from 18 countries across the Arab world. The final sample being used for the present study includes 2754 adults recruited from 12 Arab countries including Bahrain (n=8), Iraq (n=169), Jordan (n=1088), Saudi Arabia (n=280), Kuwait (n=357), Lebanon (n=43), Oman (n=146), Palestine (n=360), Qatar (n=55), Syria (n=8), United Arab Emirates (n=222) and Yemen (n=18).

Arab adults ages between 18 and 65 who were home confined during lockdown were recruited electronically. The link to the questionnaire was spread electronically through email and common social media platforms such as Facebook and Twitter. Participants provided online informed consent before completing the survey. The survey was constructed in Arabic using Google forms, and gathered data pertaining to demographics, lifestyle factors including dietary behaviors, physical activity, and sleep, and finally mental wellbeing. Details on the original study are published elsewhere (Kilani et al, 2020).

B. Concepts and Measures

1. Demographics

A section was included that asked about Demographic and Cultural Information (DCI) The DCI section was used to collect data on demographics (age, gender, education level, marital status, country, region, housing and occupation). Participants were asked about their age in years which was reported and recorded as a continuous variable. Gender was asked as a binary question as being female or male. Education level was asked as completed education level or currently enrolled educational level. Participants were requested to input the country they are currently living in as well as the name of the village or the city they are currently living in. Additionally, participants were requested to choose one of the following choices for their residence area 'village, city or capital'. Based on the country of residence participants were then classified as living in the Gulf or living in the Levant. The questionnaire included a list of occupations from which the participants were asked to choose in which job they are currently employed. Marital status was asked with four potential choices 'single, married, divorced or widowed'; in this study we merged 'divorced and widowed' into one category labeled 'ever married'.

2. Mental Wellbeing

The validated Arabic version of the World Health Organization-Five Well-Being Index (WHO-5) was used to assess mental wellbeing (Sibai et al, 2009). (). The Arabic validated version was used. The WHO-5 consists of five items measured on a 6-point Likert scale, starting from 5 (all of the time) to 0 (at no time); the total score is calculated by adding the responses of the 5 items. Scores from the items was summed

up to generate a total score ranging between 0 and 25; a WHO-5 total score of greater than 13 is recognized as having good mental wellbeing (Sibai et al, 2009; Schaefer et al, 2017). The internal consistency reliability estimate for the WHO-5 in this sample as measured by Cronbach's Alpha was 0.79

3. Reported Health Status and BMI

Participants were asked to rate their perceived health as one of the following: poor, fair, good, very good or excellent. Participants were additionally asked about the presence of chronic disease as a binary yes or no question. Body Mass Index (BMI) was calculated from the self-reported weight (kg) and height (cm). The BMI values were used to classify participants (Weir & Jan, 2020) into underweight (BMI under 18.5 kg/m^2), normal (BMI greater than or equal to 18.5 to 24.9 kg/m^2), overweight (BMI greater than or equal to 25 to 29.9 kg/m^2), or obese categories (BMI greater than or equal to 30 kg/m^2).

4. Lifestyle Factors

a. Dietary Behavior

The Arabic validated version of the Food Frequency Questionnaire (FFQ) was used to assess dietary behavior (Gundy, 1996). The FFQ includes 11 questions, which provide information on the frequency of consumption of healthy and unhealthy dietary components during the past week. Healthy dietary behavior was assessed by asking respondents about their consumption of healthy food items such as fruits and vegetables and frequency of having breakfast through the past week during lockdown. Unhealthy dietary behavior was assessed by the consumption of unhealthy food items such as

sweetened beverages and fried foods. Healthy dietary behavior items were rated on a scale of 0 to 4, while unhealthy behavior items were reverse scored from to 4 to 0. Scores from the individual items were added with the resulting total dietary score having a highest possible score of 44. A higher total score implies healthier dietary behavior. Total dietary scores were classified according to the median split of the dietary score (Kilani et al, 2020). An above median score was classified as high and a below median score was classified as low (Kilani et al, 2020). The internal consistency reliability estimate for the FFQ in this sample as measured by Cronbach Alpha was 0.64.

b. Sleeping Patterns

The Arabic validated version of the Pittsburg Sleep Quality Index (PSQI) was used to assess quality of sleep (Alomari et al, 2011). The PSQI scale includes 19 questions from which seven components were produced. Each component was scored separately on a scale of 0 to 3. The sum of the seven components' scores was used to produce a final score with a top score of 21 points, with lower scores signifying better sleep quality. Participants with a total PSQI score of less than 5 were identified as having good sleep quality (Alomari et al, 2011). The internal consistency reliability estimate for the PSQI in this sample as measured by Cronbach Alpha was 0.74.

c. Smoking and Physical activity

Participants were asked about their current smoking status, whether they are currently smokers or nonsmokers.

The Arabic validated version of the International Physical Activity Questionnaire (IPAQ) short form was used to assess the physical activity level for each participant (Al-Hazzaa & Musaiger, 2010). The short form IPAQ consists of seven items that ask about frequency and duration of walking, moderate physical activity, and vigorous physical activity characterized according to metabolic equivalents (MET) minutes per week. Moreover, IPAQ inquiries about sitting time. The MET minutes per week were used to categorize participants' physical activity into high, moderate, or low. 1500 MET minutes a week from high intensity activity on at least 3 days, or 3000 MET minutes a week from any physical activity 7 or more days was categorized as high. 600 MET minutes a week from any physical activity on at least 5 days, or 3 or more days of vigorous intensity activity, or walking of at least 30 minutes per day was categorized as moderate. Not meeting any of the criteria for either high or moderate levels of physical activity was categorized as low (Forde, 2020). The internal consistency reliability estimate for the IPAQ short form in this sample as measured by Cronbach Alpha was 0.54.

C. Data Analysis

Exploratory data analysis was conducted to describe the distribution of the variables. Frequencies and proportions (or mean/standard deviation) of the lifestyle factors were generated for the total sample as well as males and females, separately. Below is described in details the analyses run per each research objective.

1. Objective 1: To examine gender differences in various lifestyle factors including physical activity, dietary behavior and sleep patterns during lockdown

Bivariate analysis with gender as the main explanatory variable was conducted. Depending on whether the outcome measure is continuous or categorical, independent sample t-test or Pearson Chi-square were respectively used to explore the differences in lifestyle factors between males and females. Bivariate binary logistic regression analyses were conducted to compare the odds of each of the measures in males vs. females; unadjusted and adjusted ORs (controlling for age, education, marital status, occupation, residence area and region) were presented.

2. Objective 2: Examine gender differences in the association between the above-mentioned lifestyle factors and practices on the mental wellbeing of Arab males and females during lockdown

Unadjusted analyses estimated the association between each lifestyle factor and mental wellbeing in the total sample and in males and females separately. For this analysis, mental wellbeing was the main outcome and each of the lifestyle factors was considered an independent variable; adjusted analyses controlled for sociodemographic variables including sex, age, marital status, education, occupation, region and residence area. To further examine whether the male-female differences were statistically significant, additional models were run including an interaction term between gender and the lifestyle factor. All analyses were conducted using Stata-IC 13 (Stata Statistical Software: Release 13. College Station, TX: StataCorp LP 2013).

CHAPTER III

RESULTS

Table 1. Gender and its association with other sociodemographics

	Total Sample %(N)	Female % (N)	Male % (N)	P-value (Chi2)	Crude OR (95%CI) (male vs. female)	P-value (logistic regression crude model)	Adjusted* OR (95%CI) (male vs. female)	P-value (logistic regression adjusted model)
Age(years)§ **	32.81 ± 11.76	30.58 ± 10.48	35.29 ± 12.63	<0.0001	1.04 (1.03; 1.04)	<0.0001	1.05 (1.04; 1.06)	<0.0001
Education§				<0.0001		<0.0001		<0.0001
School	2.49 (81)	2.91 (43)	2.91 (38)		1.00		1.00	
Highschool	13.65 (376)	15.18 (220)	11.95 (156)		0.802 (0.495; 1.299)		1.37 (0.78; 2.41)	
Community	8.17 (225)	10.42 (151)	5.67 (74)		0.555 (0.331; 0.930)		0.65 (0.36; 1.18)	
Bachelor	55.12 (1518)	55.62 (806)	54.56 (712)		0.999 (0.639; 1.564)		1.40 (0.83; 2.38)	
Graduate	20.12 (554)	15.80 (229)	20.12 (554)		1.606 (1.006; 2.564)		1.40 (0.79; 2.47)	
Country				<0.0001				
Bahrain	0.29 (8)	0.28 (4)	0.31 (4)					
Iraq	6.14 (169)	3.31 (48)	9.27 (121)					
Jordan	39.51 (1088)	38.99 (565)	40.08 (523)					
KSA	10.17 (280)	11.04 (160)	9.20 (120)					
Kuwait	12.96 (357)	15.04 (218)	10.65 (139)					
Lebanon	1.56 (43)	1.45 (21)	1.69 (22)					
Oman	5.30 (146)	5.52 (80)	5.06 (66)					
Palestine	13.07 (360)	14.07 (184)	13.49 (176)					
Qatar	2.00 (55)	1.59 (23)	2.45 (32)					
Syria	0.29 (8)	0.41 (6)	0.15 (2)					
UAE	8.06 (222)	8.90 (129)	7.13 (93)					
Yemen	0.65 (18)	0.76 (11)	0.54 (7)					
Region				0.331		0.3308		<0.0001
Levant	54.43 (1499)	53.55 (776)	55.40 (723)		1.00		1.00	
Gulf	45.57 (1255)	46.45 (673)	44.60 (582)		0.928 (0.799; 1.079)		0.86 (0.72; 1.03)	
Residence Area§				<0.0001		<0.0001		<0.0001
Village	14.78 (407)	13.32 (193)	16.40 (407)		1.00		1.00	

City	67.61 (1862)	66.32 (961)	69.04 (901)		0.846 (0.682; 1.048)		0.70 (0.55; 0.88)	
Capital	17.61 (485)	20.36 (295)	14.56 (190)		0.581 (0.445; 0.758)		0.53 (0.39; 0.71)	
Residence§				0.023				<0.0001
Rural	14.78 (407)	13.32 (193)	16.40 (407)		1.00	0.0231	1.00	
Urban	85.22 (2347)	86.68 (1256)	83.60 (1091)		0.783 (0.635; 0.967)		0.66 (0.52; 0.83)	
Occupation§				<0.0001		<0.0001		<0.0001
Unemployed/ Housewife	13.14 (362)	18.29 (265)	7.47 (97)		1.00		1.00	
Teacher	8.39 (231)	7.32 (106)	9.85 (125)		3.22 (2.27; 4.56)		2.80 (1.95; 4.05)	
Student	24.07 (663)	30.02 (435)	17.47 (228)		1.43 (1.08; 1.899)		2.14 (1.53; 2.99)	
Professor	7.59 (209)	5.59 (81)	9.81 (128)		4.32 (3.00; 6.20)		2.78 (1.79; 4.32)	
Health/Medicine	3.34 (92)	3.93 (57)	2.68 (35)		1.68 (1.04; 2.71)		1.54 (0.93; 2.57)	
Office	27.80 (683)	21.67 (314)	28.28 (369)		3.21 (2.43; 4.24)		3.63 (2.69; 4.91)	
Engineer/Field	3.49 (96)	1.79 (26)	5.36 (70)		7.36 (4.43; 12.21)		8.24 (4.79; 14.15)	
Economy	5.34 (147)	2.45 (50)	7.43 (97)		5.30 (3.51; 8.01)		5.97 (3.87; 9.19)	
Athlete/Coach	3.39 (176)	3.86 (56)	9.20 (120)		5.85 (3.95; 8.68)		7.44 (4.91; 11.28)	
Unemployed/ Pandemic	3.45 (95)	4.07 (59)	2.76 (36)		1.67 (1.04; 2.68)		2.41 (1.46, 3.99)	
Marital Status§				<0.0001		<0.0001		<0.0001
Single	46.26 (1274)	50.66 (734)	41.38 (540)		1.00		1.00	
Married	50.04 (1378)	44.58 (646)	56.09 (732)		1.54 (1.32; 1.796)		0.69 (0.55; 0.88)	
Ever married	3.70 (102)	4.76 (69)	2.53 (33)		0.650 (0.423; 0.999)		0.31 (0.19; 0.51)	

*OR adjusted for Age, education, marital status, occupation, Residence area and region

** Mean ± standard deviation provided for age. T-test used to test for association

§ statistically significant at alpha=0.05

A. Associations Between Demographics, Health Variables, Lifestyle Factors and Gender

1. Sociodemographics by Gender

Table 1 presents the distribution of the sociodemographics of the 1449 females and 1305 males (N=2754) who participated in the study. Male participants were statistically significantly older (35.29 ± 12.63) than female participants (30.58 ± 10.48) ($p<0.0001$). A higher percentage of female participants completed community college (10.42% vs. 5.62%), whereas slightly more males (20.12% vs. 15.80%) completed graduate studies (p-value<0.0001). After controlling for other sociodemographics education did not vary significantly statistically by gender. The majority (85.22%) of participants were living in cities; a slightly higher percentage (though statistically significant, p-value: 0.023) of females (87%) than males (84%) reported living in the city (Table 1). The association between occupation and gender was statistically significant (p-value<0.0001). After controlling for other sociodemographics male participants had higher odds than female participants in having any listed occupation (vs. not working) except for working in the medical field which showed no statistically significant difference [OR: 1.54, 95%CI: (0.93; 2.57)]. The association between marital status and gender was statistically significant (p-value<0.0001): the percentage of single and ever married females (50.66% and 4.76%) was higher (41.38% and 2.53% in males, respectively) while more males were married (56.09% in males vs. 44.58% in females) at the time of the study.

Table 2. Gender and its association with mental wellbeing, reported health and lifestyle factors including sleep, physical activity, and dietary behavior

Lifestyle Factor	Total Sample %(N)	Female % (N)	Male %(N)	P-value (Chi2)	Crude OR (95%CI) (male vs. female)	P-value (logistic regression crude model)	Adjusted* OR (95%CI) (male vs. female)	P-value (logistic regression adjusted model)
BMI, Health variables and Mental Wellbeing								
BMI During Lockdown§				<0.0001		<0.0001		<0.0001
Underweight	4.32 (119)	6.32 (92)	2.07 (27)		1.00		1.00	
Normal	42.58 (1180)	50.24 (728)	34.64 (425)		2.12 (1.36; 3.30)		1.68(1.05; 2.67)	
Overweight	34.02 (937)	27.88 (404)	40.84 (533)		4.495 (2.872; 7.036)		3.10 (1.92; 5.00)	
Obese	18.81 (518)	15.53 (225)	22.45 (293)		4.437 (2.793; 7.049)		3.23 (1.96; 5.34)	
Perceived Health[1]				0.723		0.7225		<0.0001
Poor	0.84 (23)	0.76 (11)	0.92 (12)		1.00		1.00	
Fair	6.64 (183)	7.11 (103)	6.13 (80)		0.712 (0.299; 1.697)		0.55 (0.21; 1.40)	
Good	23.82 (656)	23.19 (336)	24.52 (320)		0.873 (0.380; 2.01)		0.71 (0.29; 1.74)	
Very Good	42.01 (1157)	42.58 (617)	41.38 (540)		0.802 (0.351; 1.833)		0.68 (0.28; 1.66)	
Excellent	28.69 (735)	26.36 (382)	27.05 (353)		0.847 (0.369; 1.944)		0.81 (0.33; 1.99)	
Disease (Chronic)§[2]				<0.0001		<0.0001		<0.0001
No	79.16 (2180)	84.89 (1230)	72.80 (950)		1.00		1.00	
Yes	20.84 (574)	15.11 (219)	27.20 (355)		2.099 (1.738; 2.534)		1.85 (1.49; 2.30)	
Mental Wellbeing§[3]				<0.0001		0.0002		<0.0001
Poor	40.78 (1123)	44.10 (639)	37.09 (484)		1.00		1.00	
Good (>13)	59.22 (1631)	55.90 (810)	62.91 (821)		1.34 (1.149; 1.559)		1.29 (1.09; 1.52)	
Lifestyle Factors								
Smoker§				<0.0001		<0.0001		<0.0001

No	72.15 (1987)	85.30	57.55 (751)		1.00		1.00	
Yes	27.85 (767)	(1236)	42.45 (554)		4.281 (3.568; 5.136)		4.82 (3.94; 5.90)	
		14.70 (213)						
Sleep§[4]				0.002		0.0021		<0.0001
Poor	60.57 (1668)	63.29 (917)	57.55 (751)		1.00		1.00	
Good	39.43 (1086)	36.71 (532)	42.45 (554)		1.27 (1.091; 1.482)		1.09 (0.92; 1.29)	
Physical				<0.0001		<0.0001		<0.0001
Activity§[5]	50.51 (1391)	57.56 (834)	42.68 (557)		1.00		1.00	
Low	33.19 (914)	29.26 (424)	37.55 (490)		1.73 (1.46; 2.05)		1.76 (1.46; 2.11)	
Moderate	16.30 (449)	13.18 (191)	19.77 (258)		2.02 (1.63; 2.51)		2.20 (1.74; 2.80)	
High								
Median split of dietary score§[6]				0.278		0.2784		<0.0001
Low	51.82 (1427)	52.80 (765)	50.73 (662)		1.00		1.00	
High	1327 (48.18)	47.20 (684)	48.18 (643)		1.08 (0.94; 1.26)		0.77(0.65; 0.91)	

1. Participants were asked to rate their health on a scale from poor to excellent.
2. Participants were asked if they had any chronic conditions.
3. Mental Wellbeing was measured using the WHO-5, participants with a score of greater than 13 were classified as having good mental wellbeing.
4. Sleep was measured using PSQI, participants with a total PSQI score of less than 5 were identified as having good sleep quality.
5. Physical activity was measured using short form IPAQ, physical activity level was categorized based on metabolic equivalents minutes per week.
6. Dietary behavior was measured using a qualitative FFQ, median = 26

*OR adjusted for Age, education, marital status, occupation, Residence area and region

§ statistically significant at alpha=0.05

2. Health Variables and Mental Wellbeing by Gender

Table 2 presents the distribution of the health-related measures and mental wellbeing by gender. A higher percentage of males (63.29%) than females (43.41%) were screened as being overweight and obese (p-value <0.0001). The prevalence of chronic diseases (27.20% vs. 15.11%, p-value <0.0001) and good mental wellbeing (62.91% vs. 55.90%, p-value <0.0001) were statistically significantly higher in males than females. No observed difference between males and females in perceived health (p-value: 0.723).

3. Lifestyle Factors by Gender

Table 2 shows the distribution and associations between gender and lifestyle factors. The prevalence of smoking was statistically significantly higher in males than females (42.45% vs. 14.70%, p-value <0.0001). A higher proportion of males (42.45%) had good sleep compared to females (36.17% p-value=0.0021). Males also had higher levels of high and moderate levels of physical activity compared to females (p-value <0.0001). The percentage of males and females who reported above the median dietary score did not differ significantly statistically (p-value=0.278).

After controlling for sociodemographics (age, education, marital status, occupation, residence area and region), some of the associations changed. Sleep no longer differed significantly statistically between males and females [OR: 1.09, 95%CI: (0.92; 1.29)] and odds of having an above median dietary score was lower in males compared to females [OR: 0.77. 95%CI: (0.65; 0.91)].

Table 3. Predictors of mental wellbeing (sociodemographic, health and lifestyle factors) in the total sample N=2754.

Variable	Poor Mental Wellbeing %(N)	Mental Wellbeing Good (>13) %(N)	P-value (Chi2)	Crude OR (95%CI)	P-value (logistic regression crude model)	Adjusted* OR (95%CI)	P-value (logistic regression adjusted model)
Sociodemographics							
Age (years) **	32.52 ± 12.08	33.00 ± 11.58	0.2914	1.003 (0.997; 1.01)	0.2908	1.00 (0.99; 1.01)	<0.0001
Education			0.125		0.1232		<0.0001
School	38.27 (31)	61.73 (50)		1.00		1.00	
Highschool	38.83 (146)	61.17 (230)		0.98 (0.596; 1.60)		1.08 (0.64; 1.81)	
Community	42.22 (95)	57.78 (130)		0.85 (0.504; 1.43)		0.94 (0.54; 1.61)	
Bachelor	42.69 (648)	57.31 (870)		0.83 (0.525; 1.32)		0.95 (0.58; 1.54)	
Graduate	36.64 (203)	63.22 (351)		1.07 (0.66; 1.73)		1.32 (0.77; 2.25)	
Region§			<0.000		0.0002		<0.0001
Levant	43.96 (659)	56.04 (840)	1	1.00		1.00	
Gulf	36.97 (464)	63.03 (791)		1.34 (1.15; 1.56)		1.45 (1.22; 1.72)	
Residence Area§			0.013		0.0120		<0.0001
Village	34.40 (140)	65.60 (2.67)		1.00		1.00	
City	41.46 (772)	58.54 (1090)		0.74 (0.59; 0.92)		0.69 (0.55; 0.87)	
Capital	43.51 (211)	56.49 (274)		0.68 (0.52; 0.89)		0.59 (0.44; 0.79)	
Residence§			0.005		0.042		<0.0001
Rural	34.40 (140)	65.60 (267)		1.00		1.00	
Urban	41.88 (938)	58.12 (1364)		0.73 (0.58; 0.91)		0.67 (0.53; 0.84)	
Occupation§			0.043		0.0437		<0.0001
Unemployed/	41.71 (151)	58.29 (211)		1.00		1.00	

Housewife	44.16 (102)	55.84 (129)		0.91 (0.65; 1.26)		0.81 (0.57; 1.14)
Teacher	43.29 (287)	56.71 (376)		0.94 (0.72; 1.21)		0.88 (0.65; 1.19)
Student Professor	41.15 (86)	58.85 (123)		1.02 (0.72; 1.44)		0.70 (0.46; 1.07)
Health/Medicine	44.57 (41)	55.43 (51)		0.89 (0.56; 1.41)		0.90 (0.56; 1.44)
Office	36.60 (250)	63.40 (433)		1.24 (0.96; 1.61)		1.06 (0.81; 1.40)
Engineer/Field	35.42 (34)	64.58 (62)		1.30 (0.82; 2.08)		1.19 (0.73; 1.94)
Economy	40.82 (60)	59.18 (87)		1.04 (0.70; 1.53)		1.00 (0.67; 1.49)
Athlete/Coach	35.23 (62)	64.77 (114)		1.32 (0.91; 1.91)		1.24 (0.84; 1.83)
Unemployed/ Pandemic	52.63 (50)	47.37 (45)		0.64 (0.41; 1.01)		0.60 (0.38; 0.95)
Marital Status			0.866		0.8861	<0.0001
Single	41.29 (526)	58.71 (748)		1.00		1.00
Married	40.28 (555)	59.72 (823)		1.04 (0.89; 1.22)		0.90 (0.72; 1.13)
Ever Married	41.18 (42)	58.82 (60)		1.00 (0.67; 1.51)		0.95 (0.61; 1.49)
Health variables						
BMI			0.337		0.3390	<0.0001
Underweight	46.22 (55)	53.78 (64)		1.00		1.00
Normal	40.93 (483)	59.07 (697)		1.24 (0.85; 1.81)		1.21 (0.82; 1.79)
Overweight	38.95 (365)	61.05 (572)		1.35 (0.92; 1.98)		1.18 (0.78; 1.77)
Obese	42.47 (220)	57.53 (298)		1.16 (0.78; 1.74)		1.00 (0.65; 1.54)
Perceived Health§			<0.000		<0.0001	<0.0001
Poor	65.22 (15)	34.78 (8)	1	1.00		1.00
Fair	64.48 (118)	35.52 (65)		1.03 (0.42; 2.57)		1.06 (0.42; 2.68)
Good	51.52 (338)	48.48 (318)		1.76 (0.74; 4.22)		1.84 (0.76; 4.47)
Very Good	38.38 (444)	61.62 (713)		3.01 (1.27; 7.16)		3.19 (1.32; 7.72)
Excellent	28.30 (208)	71.70 (527)		4.75 (1.98; 11.37)		5.01 (2.06; 12.21)
Disease (chronic)§			<0.000		0.0004	<0.0001
No	39.08 (852)	60.92 (1328)	1	1.00		1.00
Yes	47.21 (271)	52.79 (303)		0.72 (0.596; 0.86)		0.63 (0.51; 0.77)
Lifestyle Factors						

Smoker§			0.023		0.0235		<0.0001
No	39.46 (784)	60.54 (1203)		1.00		1.00	
Yes	44.20 (339)	55.80 (428)		0.82 (0.695; 0.974)		0.76 (0.63; 0.91)	
Sleep§			<0.000		<0.0001		<0.0001
Poor	51.20 (854)	48.80 (814)	1	1.00		1.00	
Good	24.77 (269)	75.23 (817)		3.19 (2.69; 3.78)		3.29 (2.76; 3.92)	
Physical Activity§	51.40 (715)						
Low	36.87 (337)	48.60 (676)	<0.000	1.00	<0.0001		<0.0001
Moderate	15.81 (71)	63.13 (577)	1	1.81 (1.53; 2.15)		1.00	
High		84.19 (378)		5.63 (4.28; 7.41)		1.87 (1.56; 2.23)	
						6.14 (4.62; 8.15)	
Median split of dietary score§			<0.000 1		<0.0001		<0.0001
Low	59.35 (990)	40.65 (678)		1.00		1.00	
High	40.24 (437)	59.76 (649)		1.61 (1.38; 1.87)		1.73 (1.46; 2.04)	

*OR adjusted for Gender, Age, education, marital status, occupation, residence area and region.
** Mean ± standard deviation provided for age
§statistically significant at alpha=0.05

Table 4. Predictors of mental wellbeing (sociodemographic, health and lifestyle factors) in males n=1305 and females n=1449 separately

	Female							Male						
Variable	Poor Mental Wellbeing %(N)	Mental Wellbeing Good (>13) %(N)	P-value (Chi2)	Crude OR (95%CI)	P-value (logistic regressi-on crude model)	Adjusted* OR (95%CI)	P-value (logistic regressi-on adjusted model)	Poor Mental Wellbeing %(N)	Mental Wellbeing Good (>13) %(N)	P-value (Chi2)	Crude OR (95%CI)	P-value (logistic regression crude model)	Adjusted* OR (95%CI)	P-value (logistic regression adjusted model)
Sociodemographics														
Age (Years) **	29.82 ± 10.51	31.17 ± 10.43	0.0147	1.01 (1.002; 1.023)	0.0144	1.01 (0.99; 1.02)	0.0193	36.09 ± 13.05	34.81 ± 12.35	0.0773	0.99 (0.98; 1.00)	0.0778	0.99 (0.98; 1.01)	0.0007
Education			0.038		0.0367		0.0193			0.149		0.1351		0.0007
School	39.53 (17)	60.47 (26)		1.00		1.00		36.84 (14)	63.16 (24)		1.00		1.00	
Highschool	43.18 (95)	56.82 (125)		0.86 (0.44; 1.68)		0.92 (0.46; 1.83)		32.69 (51)	67.31 (105)		1.20 (0.57; 2.52)		1.41 (0.62; 3.21)	
Community	50.33 (76)	49.67 (75)		0.65 (0.32; 1.29)		0.60 (0.29; 1.22)		25.68 (19)	74.32 (55)		1.69 (0.72; 3.91)		2.13 (0.86; 5.27)	
Bachelor	45.78 (369)	54.22 (437)		0.77 (0.41; 1.45)		0.82 (0.43; 1.58)		39.19 (279)	60.81 (433)		0.91 (0.46; 1.78)		1.23 (0.58; 2.61)	
Graduate	35.81 (82)	64.19 (147)		1.17 (0.60; 2.29)		1.22 (0.58; 2.53)		37.23 (121)	62.77 (204)		0.98 (0.49; 1.97)		1.67 (0.74; 3.78)	
Region §			0.001		0.0011		0.0193			0.04		0.0393		0.0007
Levant	48.07 (373)	51.93 (403)		1.00		1.00		39.56 (286)	60.44 (437)		1.00		1.00	
Gulf	39.52 (226)	60.48 (407)		1.42 (1.15; 1.75)		1.38(1.09; 1.74)		34.02 (198)	65.91 (384)		1.27 (1.01; 1.59)		1.53 (1.18; 1.98)	
Residence Area§			0.446		0.4439		0.0193			0.022		0.0204		0.0007
Village	39.90 (77)	60.10 (116)		1.00		1.00		29.44 (63)	70.56 (151)		1.00		1.00	
City	44.85 (431)	55.15 (530)		0.82 (0.596;1.11)		0.73 (0.52; 1.01)		37.85 (341)	62.15 (560)		0.69 (0.50; 0.95)		0.65 (0.46; 0.91)	
Capital	44.41 (639)	55.59 (295)		0.83 (0.575; 1.2)		0.73 (0.45; 0.99)		42.11 (80)	57.89 (110)		0.57 (0.38; 0.87)		0.51 (0.33; 0.79)	
Residence§			0.207		0.2050					0.011		0.0102		0.0008
Rural	39.90 (77)	60.10 (116)		1.00		1.00	0.0146	29.44 (63)	70.56 (151)		1.00		1.00	
Urban	44.75 (562)	55.25 (694)		0.82 (0.60; 1.12)		0.71 (0.52; 0.98)		38.59 (421)	61.91 (821)		0.66 (0.48; 0.91)		0.62 (0.44; 0.87)	

Occupation §			0.193		0.1908		0.0193			0.046		0.0507		0.0007
Unemployed/ Housewife	43.02 (114)	56.98(151)		1.00		1.00		38.14 (37)	61.86 (60)		1.00		1.00	
Teacher	48.11 (51)	51.89 (55)		0.81 (0.52; 1.28)		0.76 (0.48; 1.22)		40.80 (51)	59.20 (74)		0.89 (0.52; 1.54)		0.90 (0.51; 1.59)	
Student	47.59 (207)	52.41 (228)		0.83 (0.61; 1.13)		0.90 (0.62; 1.32)		35.09 (80)	64.91 (148)		1.14 (0.70; 1.87)		0.99 (0.57; 1.71)	
Professor	39.51 (32)	60.49 (49)		1.16 (0.70; 1.92)		0.69 (0.37; 1.32)		42.19 (54)	57.81 (74)		0.85 (0.49; 1.45)		0.74 (0.39; 1.37)	
Health/Medicine	52.63 (30)	47.37 (27)		0.68 (0.38; 1.21)		0.70 (0.39; 1.27)		31.43 (11)	68.57 (24)		1.35 (0.59; 3.06)		1.48 (0.64; 3.44)	
Office	37.58 (118)	62.42 (196)		1.25 (0.90; 1.75)		1.13 (0.80; 1.61)		35.77 (132)	64.23 (237)		1.11 (0.69; 1.75)		1.08 (0.66; 1.77)	
Engineer/Field	53.85 (14)	46.15 (12)		0.65 (0.29; 1.45)		0.64 (0.28; 1.47)		28.57 (20)	71.43 (50)		1.54 (0.80; 2.99)		1.74 (0.85; 3.54)	
Economy	40.00 (20)	60.00 (30)		1.13 (0.61; 2.10)		1.22 (0.65; 2.29)		41.24 (40)	58.76 (57)		0.89 (0.49; 1.56)		0.91 (0.50; 1.66)	
Athlete/Coach	44.64 (25)	55.36 (31)		0.94 (0.52; 1.67)		1.06 (0.58; 1.94)		30.83 (37)	69.17 (83)		1.38 (0.79; 2.43)		1.39 (0.77; 2.49)	
Unemployed/ Pandemic	47.46 (28)	52.54 (31)		0.84 (0.47; 1.47)		0.82 (0.46; 1.47)		61.11 (22)	38.89 (14)		0.39 (0.18; 0.86)		0.41 (0.18; 0.93)	
Marital Status			0.281		0.2803		0.0193			0.292		0.2906		
Single	46.05 (338)	53.95 (396)		1.00		1.00		34.81 (188)	65.19 (352)		1.00		1.00	0.0007
Married	41.80 (270)	58.20 (376)		1.19 (0.96; 1.47)		0.98 (0.73; 1.32)		38.93 (285)	61.07 (447)		0.84 (0.66; 1.06)		0.78 (0.53; 1.15)	
Ever Married	44.93 (31)	55.07 (38)		1.05 (0.64; 1.72)		0.86 (0.49; 1.50)		33.33 (11)	66.67 (22)		1.07 (0.51; 2.25)		1.09 (0.48; 2.46)	
Health variables														
BMI			0.687		0.6882		0.0171			0.795		0.7963		0.0017
Underweight	47.83 (44)	52.17 (48)		1.00		1.00		40.74 (11)	59.26 (16)		1.00		1.00	
Normal	43.54 (317)	56.46 (411)		1.19 (0.77; 1.84)		1.10 (0.70; 1.72)		36.73 (166)	63.27 (286)		1.18 (0.54; 2.61)		1.43 (0.63; 3.23)	
Overweight	42.82 (173)	57.18 (231)		1.22 (0.78; 1.93)		0.98 (0.61; 1.59)		36.02 (192)	63.98 (341)		1.22 (0.56; 2.68)		1.56 (0.69; 3.56)	
Obese	46.67 (105)	53.33 (120)		1.05 (0.64; 1.70)		0.76 (0.45; 1.30)		39.09 (484)	60.75 (178)		1.06 (0.48; 2.37)		1.38 (0.60; 3.21)	
Perceived Health§			<0.001		<0.001		<0.001			<0.001		<0.001		<0.0001
Poor	72.73 (8)	27.27 (3)		1.00		1.00		58.33 (7)	41.67 (5)		1.00		1.00	
Fair	66.99 (69)	33.01 (34)		1.31 (0.33; 5.27)		1.26 (0.30; 5.24)		61.23 (49)	38.75 (31)		0.89 (0.26; 3.04)		0.94 (0.26; 3.36)	
Good	52.98 (178)	47.02 (158)		2.37 (0.62; 9.08)		2.40 (0.60; 9.50)		50.00 (160)	50.00 (160)		1.4 (0.44; 4.50)		1.45 (0.43; 4.86)	
Very Good	43.11 (266)	56.89 (351)		3.52 (0.92; 13.39)		3.79 (0.97; 14.90)		32.96 (96)	67.04 (362)		2.85 (0.89; 9.10)		2.97 (0.89; 9.90)	
Excellent	30.89 (118)	69.11 (264)		5.97 (1.56; 22.89)		6.52 (1.64; 25.85)		25.50 (90)	74.50 (263)		4.09 (1.27; 13.21)		4.10 (1.22; 13.79)	
(chronic)§			0.092		0.0924		0.0054			<0.001		0.0001		<0.0001
No	43.17 (531)	56.86 (699)		1.00		1.00		33.79 (321)	66.21 (629)		1.00		1.00	
Yes	49.32 (108)	50.68 (111)		0.78 (0.59; 1.04)		0.68 (0.50; 0.93)		45.92 (484)	54.08 (192)		0.60 (0.47; 077)		0.57 (0.43; 0.75)	
Lifestyle Factors														
Smoker§			0.051		0.0515		0.0192			0.002		0.0021		0.0001
No	43.04 (532)	56.96 (704)		1.00		1.00		33.56 (252)	66.44 (499)		1.00		1.00	
Yes	50.23 (107)	49.77 (106)		0.75 (0.56, 1.002)		0.83 (0.61; 1.13)		41.88 (232)	58.12 (322)		0.70 (0.56; 0.88)		0.70 (0.55; 0.89)	
Sleep§			<0.001		<0.001		<0.001			<0.001		<0.001		<0.0001
Poor	54.63 (501)	45.37 (416)		1.00		1.00		47.00 (353)	53.00 (398)		1.00		1.00	
Good	25.94 (138)	74.06 (394)		3.44 (2.72; 4.34)		3.72 (2.91; 4.78)		23.65 (131)	76.35 (423)		2.86 (2.25; 3.65)		2.95 (2.29; 3.80)	

Physical Activity§	51.68 (431)	48.32 (403)	<0.001	1.00	<0.0001	1.00	<0.0001	50.99 (284)	49.01 (273)	<0.001	1.00	<0.0001	1.00	<0.0001
Low	38.68 (164)	61.32 (260)		1.696 (1.35; 2.15)		1.93 (1.51; 2.48)		35.31 (173)	64.69 (317)		1.91 (1.49; 2.44)		1.90 (1.47; 2.45)	
Moderate	23.04 (44)	76.96 (147)		3.57 (2.48; 5.14)		4.34 (2.97; 6.33)		10.47 (27)	89.53 (231)		8.90 (5.78; 13.71)		9.07 (5.81; 14.16)	
High														
Median split of dietary score§			<0.001		<0.0001		<0.0001			<0.001		<0.0001		<0.0001
Low	49.41 (378)	50.59 (387)		1.00		1.00		42.60 (282)	57.40 (380)		1.00		1.00	
High	38.16 (261)	61.84 (423)		1.58 (1.28; 1.95)		1.69 (1.34; 2.12)		31.42 (202)	68.58 (441)		1.62 (1.29; 2.03)		1.86 (1.44; 2.38)	

*OR adjusted for Gender, Age, education, marital status, occupation, residence area and region.

** Mean ± standard deviation provided for age

§ statistically significant at alpha=0.05

B. Associations Between Demographics, Health Variables, Lifestyle Factors and Mental Wellbeing: Exploring Potential Gender Differences

Table 3 shows the association between lifestyle factors and mental wellbeing in the total sample; Table 4 shows those associations and in males and females separately. Adjusted findings are described below.

1. Sociodemographics and Mental Wellbeing

Age and education were not associated with mental wellbeing. Participants living in the Gulf (vs. Levant) had higher odds of good mental wellbeing [OR: 1.45, 95%CI: (1.23; 1.72)], true in males [OR: 1.32, 95%CI: (1.05; 1.67)] and females [OR: 1.42, 95%CI: (1.10; 1.82)]. Compared to participants living in villages, participants living in cities had lower odds of good mental wellbeing [OR: 0.69, 95%CI: (0.55; 0.87)]; similarly compared to participants living in villages participants living in a capital had lower odds of good mental wellbeing OR: 0.59, 95%CI: (0.44; 0.79)]. Those associations held in males [city OR: 0.65, 95%CI: (0.46; 0.91); capital OR: 0.51, 95%CI: (0.33; 0.791)] with borderline statistical significance in females [city OR: 0.73, 95%CI: (0.52; 0.1.01); capital OR: 0.73, 95%CI: (0.45; 0.99)]. Compared to participants living in rural areas participants living in urban areas had lower odds of good mental wellbeing in the total sample [OR: 0.73 95%CI: (0.58; 0.91)] and in males [OR: 0.66, 95%CI: (0.48; 0.91)] and females [OR: 0.71, 95%CI: (0.52; 0.98)]. Occupation was associated with mental wellbeing in the total sample and in males but not females. Participants who were recently unemployed due to the pandemic (vs. participants who were unemployed or not working prior to the pandemic) had lower odds of good mental wellbeing, true in the total sample [OR: 0.60, 95% CI: (0.38;

0.90)] and males [OR: 0.41, 95%CI: (0.18; 0.93)] but not females OR: 0.82, 95%CI: (0.46; 1.47)].

2. Health, BMI and Mental Wellbeing

BMI was not associated with mental wellbeing. Compared to those who have not reported any chronic disease, participants who reported the presence of any chronic disease had lower odds of good mental wellbeing in the total sample [OR: 0.63, 95%CI: (0.51; 0.77)] as well as in the male [OR: 0.57, 95%CI: (0.43; 0.75)] and female population [OR: 0.68, 95%CI: (0.50; 0.93)]. Participants also reported their perceived health status. Those who reported that it was 'very good' compared to 'poor' had higher odds of good mental wellbeing [OR:3.19, 95%CI: (1.32; 7.72)]; the association held only in the total sample but not females [OR:3.79, 95%CI: (0.97; 14.90)] or males [OR:2.97, 95%CI: (0.89; 9.90)]. Participants who perceived their health as 'excellent' compared to 'poor' also had higher odds of good mental wellbeing [OR: 5.01, 95%CI: (2.06; 12.21)]; this was true for females [OR: 6.52, 95%CI: (1.64; 25.58)] and males [OR: 4.10, 95%CI: (1.22; 13.79)].

3. Lifestyle Factors and Mental Wellbeing

Compared to nonsmokers, smokers had lower odds of good mental wellbeing in the total sample [OR: 0.76, 95%CI: (0.63; 0.91)] and in males [OR: 0.70, 95%CI: (0.55; 0.89)] but not females [OR: 0.83, 95%CI: (0.61; 1.13)].

Compared to participants with bad sleep, participants with good sleep had higher odds of good mental wellbeing in the total sample [OR: 3.29, 95%CI: (2.76; 3.92)]and in both males and females although the association was slightly stronger in females

[OR: 3.72, 95%CI: (2.92; 4.78)] than males (OR: 2.95, 95%CI: (2.29; 3.80) the difference was not statistically significant.

Physical activity was also statistically significantly associated with mental wellbeing (p-value<0.0001). Participants with moderate physical activity levels had higher odds of good mental wellbeing compared to participants with low levels of physical activity in the total sample [OR: 1.87, 95%CI: (1.56; 2.23)] as well as in both females [OR: 1.93, 95%CI: (1.51; 2.48)] and in males [OR: 1.90, 95%CI: (1.47; 2.45)]. Participants with high levels of physical activity had higher odds of good mental wellbeing compared to participants with low levels of physical activity in the total sample [OR: 6.14, 95%CI: (4.62; 8.15)], and the association was statistically significantly stronger [OR=2.44, 95%CI: (1.38; 4.32), p-value = 0.002] in males [OR: 9.07, 95%CI: (5.81; 14.16)] compared to females [OR: 4.15, 95%CI: (4.34; 6.33)].

Compared to participants with a below median dietary score, participants with an above median dietary score had higher odds of good mental wellbeing [OR 1.73, 95%CI: (1.46; 2.04)]; the association held in females [OR 1.69, 95%CI: (1.34; 2.12)] and males [OR 1.86, 95%CI: (1.44; 2.38)].

CHAPTER IV

DISCUSSIONS

To our knowledge, this is the first study to examine potential gender differences in lifestyle factors in the Arab region, and explore the differential gender impact of such behaviors on mental wellbeing. This study highlighted clear gender differences in lifestyle factors, mainly physical activity and dietary behavior during lockdown. While lifestyle factors were related to mental wellbeing, the study noted no significant gender differences in the observed associations, except for high levels of physical activity which was more strongly related to wellbeing in male than female participants. In what follows, we discuss the main findings vis-à-vis the published literature.

More males were overweight and obese in our study, which is established in the published literature (Vijayalakshmi et al, 2017). The percentage who reported having chronic disease was greater in males, which is not in line with most of the literature that reports a typically higher percentage in females (Boersma et al, 2020; Marengoni et al, 2008; Kuri-Morales et al, Sakib et al, 2019), but similar to what was found in an earlier study from the Arab world (Kilani et al; 2020). This discrepancy may be the result of the method used to inquire about chronic disease, as a binary question rather than providing a list of chronic conditions or asking participants about which chronic diseases they suffer from; this may have introduced information bias and jeopardized the validity of the results.

Our findings on gender differences in lifestyle factors for the most part corroborated published evidence. The percentage of smokers was higher in our male sample as in other studies (Higgins et at, 2015). However, the present study collected

and reported only basic information pertaining to smoking. Inquiring more about the patterns of smoking, such as asking about type of tobacco product consumed and intensity and frequency of smoking would be useful in understanding gender differences in smoking habits. Contrary to the current literature reporting that females had worse sleep during lockdown compared to males (Liu et al, 2020; Radwan et al, 2021; Xue & McMunn, 2021; Salfi et al, 2020) the results of our study suggest that sleep quality did not vary significantly statistically by gender. Females in our study reported less physical activity as seen by a recent study (Radwan et al, 2021). Similar to other studies that evaluated mental wellbeing during lockdown(Pesce & Sanna, 2020; Pieh et al, 2020; Jacques-Aviñó, 2020; Cheikh Ismail et al, 2021; Rania & Coppola, 2021; Salfi et al, 2020, Kilani et al, 2020), our study found less women with good mental wellbeing. The Eastern Mediterranean region had identified a wide gender gap in mental health prior to the pandemic (GBD 2015 Eastern Mediterranean Region Mental Health Collaborators, 2018) with mental disorders being significantly more prevalent amongst females, especially depressive disorders (GBD 2015 Eastern Mediterranean Region Mental Health Collaborators, 2018). Females in our study had higher odds of being in the above median split of the dietary score, suggesting that females had healthier diets; the published evidence is mixed as some studies suggest that females had healthier diets (Doraiswamy et al, 2021) while others found that females had less healthy diets (Radwan et al, 2020).

Our study explored the potential differential impact of lifestyle changes on mental wellbeing in males and females, and findings generally point to the absence of any statistically significant gender differences. Educational level of the participants was not related to their mental wellbeing, in line with a recent study by Shuwiekh and

colleagues (2020), which reported no relation between education and mental wellbeing during lockdown in the Arab region. Participants living in the Gulf, however, exhibited higher odds of good mental wellbeing compared to those living in the Levant; this could be due to several reasons that need further investigation, including the possibility that Gulf countries, being wealthier, could have better resources (World Economic Outlook Database, 2020); studies have also shown that individuals with higher incomes showed better mental health, especially during the pandemic (Pieh et al, 2020).

The higher observed odds of good mental wellbeing among participants living in villages (vs. urban settings), particularly among males could be due to a multitude of factors. The study was conducted during the first phases of the lockdown, and so it is possible that the threat of the virus spread may have been delayed to reach the rural areas. Additionally, there is weaker or delayed implementation of restrictions in villages generally. This may have allowed for daily life/routine and social interactions to carry on at least in the initial phases of lockdown, which in turn aided in improving mental wellbeing or leaving it unchanged. Studies have shown that housing situation and setting during the time of the confinement has an impact on mental wellbeing (Pesce & Sanna, 2020). Being surrounded with open green spaces and having larger homes was positively associated with better mental wellbeing, as shown by (Amerio et al. 2020).

The link between unemployment and mental wellbeing was present in males but not females, in line with published studies suggesting that males are more effected by employment/unemployment and financial situation (Czymara et al, 2020; Xue & McMunn, 2021; Pesce & Sanna, 2020) than females. This could also be due the culture/traditional gender roles in the Arab region where the male is perceived as the main breadwinner or provider, putting more pressure on males who have lost their job.

Sleep was associated with mental wellbeing in males and females. Sleep was consistently shown in the literature to be associated with mental wellbeing during the lockdown (Chouchou et al, 2021; Kilani et al, 2020; Yamamota et al, 2020). Good sleep is crucial in modulating hormonal secretion and metabolism (Kilani et al, 2020). Biological activities which improve psychological status usually function better with good sleep quality (Kilani et al, 2020).

Physical activity, both moderate and high levels, was associated with good mental wellbeing in both males and females in line with findings by Nakagawa and colleagues (2020) that suggested that one or two sessions of moderate to high intensity activity for as little as ten minutes per session showed better results for cognitive functions and enhance mood and mental health. The association between high level physical activity and mental wellbeing was stronger in males. Possible explanations could include males participating in more intense activities, which could in turn result in a stronger biological and neurological response (Nakagawa et at, 2020). Males and females could also have different perceptions of what is moderate vs. high intensity physical activity. Finally, males produce on average ten to twelve times more testosterone than females (Weiss et al, 1983), which has been shown to improve mood and physical health by (Zitzmann, 2020). Physical activity and a healthy lifestyle (high intensity activity, sleep and a healthy diet), have been shown to improve testosterone levels in males (Kumagai et al, 2016). While this is also true in females, the magnitude is much smaller (Weiss et al, 1983).

Healthy eating, indicated by an above median dietary score, was associated with mental wellbeing in males and females, in line with published literature (Kilani et al, 2020; Bennett et al, 2021). High calorie and unhealthy meals are associated with high

blood sugar, inflammation and gut microbiome which play a role in negatively affecting mental wellbeing (Firth et al, 2020).

Gender differences in our population were only applicable during the lockdown period, with no possible way to observe changes that happened as a result of the lockdown. This study results have shown that some of the lifestyle factors, namely smoking and physical activity, were more common among males while females exhibited higher odds of having an above median dietary score. Still, a higher proportion of males showed good mental wellbeing. This suggests that the higher proportion of good mental wellbeing among males could be, at least in part, driven by their higher levels of physical activity. It could be also that the gender differences in mental wellbeing are not entirely explained by lifestyle factors.

A. Limitations and Offsetting Strengths

The findings should be interpreted in light of some limitations and offsetting strengths. This study is the first study to examine gender differences in lifestyle factors and their potentially differential impact on mental wellbeing on a relatively large sample of 2754 adults recruited from various Arab countries. Data was self-reported reducing social desirability bias, and Arabic-validated scales were administered decreasing information bias. Nonetheless, this study still has some limitations. Given the cross-sectional nature of the study, it is not possible to infer causality or establish temporality; thus the association between wellbeing and various lifestyle factors may be non-causal or bi-directional. The data was collected during lockdown with no previously established baseline that would allow us to examine whether there were any changes due to the lockdown. The other limitation is that data was collected during the

second half of April 2020, which is only a few weeks following the start of lockdown, a period that might not be long enough to observe any significant changes in behavior in males or females or both. Data was unbalanced across countries, especially that approximately 40% of the sample is from Jordan. Still, there is no statistically significant difference in the distribution of male and female participants living in the Gulf vs. Levant (p-value: 0.331). The non-probability sampling technique inevitably introduced selection bias; participants are most likely educated individuals with active emails or social media accounts and have access to internet connection. The Arabian Gulf countries have some of the highest internet penetration rates in the world (Arab Barometer, 2020), with the countries of the levant having relatively high levels of internet penetration and both showing no to modest gender gaps in internet penetration (Arab Barometer, 2020). Additionally, the vast majority of the Gulf countries are urbanized with few rural areas. As for the levant there are very modest differences in internet penetration between urban and rural setting (Arab Barometer, 2020). Lebanon for example has an urban penetration rate of 88% and a rural one of 91% (Arab Barometer, 2020). Given this information, it is highly likely that nondifferential selection bias was introduced in our study. The study was not powered during design to investigate gender differences which may explain the non-change in estimates between the total sample and sample of males and females despite the non-statistical significance within gender groups, (i.e. association between sleep and mental wellbeing in males and females vs. total sample).

B. Implications

It is possible that a future lockdown will be imposed as winter and fall seasons approach through which an increase in cases is expected (Moriyama et al, 2020), the delta variant spreading (Alexander et al, 2021), and decreased vaccine immunity over time (Thomas et al, 2021). In preparation results from this study could be used to influence future research, practice or policy.

1. Research

In anticipation to the potential future lockdown, future research could collect baseline data and attempt to measure impact of lockdown, to better inform initiatives during lockdown aimed at addressing lifestyle factors and mental wellbeing. Future research could also observe the relation between gender and mental wellbeing in light of other behaviors, such as technology use and media consumption or childcare and domestic work contribution among other potential associations, with a recent study reporting that increased levels of psychological distress in women was associated with prolonged duration of housework and childcare during lockdown (Xue & McMunn, 2021).

2. Practice

Results from this study could be used to influence or strengthen preparedness for potential future crisis. The relation between lifestyle behaviors and mental wellbeing in both genders clearly indicates the need to ensure evidence-based initiatives that would encourage healthy lifestyle behaviors to improve mental wellbeing, and those with mental health problems to avoid adopting an unhealthy lifestyle. One of the strongest

associations observed in this study was between mental wellbeing and physical activity, which should be a basis for encouraging individuals, during and outside lockdown, to be physically active for better mental health. This could be through encouraging people to practice some form physical activity in their homes or allowing them to go out for some physical activity in the outdoors where risk of virus spread is low. Our results also showed relatively high levels of poor mental wellbeing during lockdown. Appropriate interventions and infrastructure could be invested in, such as mental and psychological health facilities and tele-mental health services, as the region is generally lacking in this aspect, which would facilitate in promoting better mental wellbeing during the time of lockdown. The results of this study suggest that for the most part lifestyle factors are similarly associated with mental wellbeing in both genders. Interventions should be implemented for both genders, with a focus on improving lifestyle behaviors during lockdown.

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