Healthy Lifestyle Behaviors Are Major Predictors of Mental Wellbeing During COVID-19 Pandemic Confinement: A Study on Adult Arabs in Higher Educational Institutions

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Abstract

Background: In previous times, infectious diseases affected the quality of human life during home confinement. This study investigated the influence of home confinement during the COVID-19 pandemic outbreak on lifestyle, mental wellbeing, nutritional status, and sleeping pattern.

Method: An online multicategory questionnaire was distributed to collect Demographical information and combined the following tools: Food Frequency Questionnaire (FFQ), International Physical Activity Questionnaire (IPAQ), WHO-5 wellbeing score, and Pittsburgh Sleep Quality Index (PSQI). A snowball none-discriminate sampling procedure was followed to collect data from people attending or working at higher institution had covering the period between Mar/00/2020 and Apr/24/2020. A total of 1723 completed responses (917 Males 37.4 ±13.4 yrs. old and (806 Females 32.2 ± 11.5 yrs. old) were collected.

Results: Female participants had significantly lower mental health scores as compared to males (53.9% vs 46.1%). on Mental wellbeing score was better among participants with medium and high Physical Activity Levels ($p < 0.00$). Additionally, mental wellbeing score was significantly improved by dietary quality and sleeping score ($p < 0.001$). However, physical activity was by far the major determinants of mental health score.

Conclusion: Factors such as PA, Diet, sleeping patterns were associated with mental wellbeing during COVID-19 confinement among Arab participants.

Introduction

In the past few centuries, the health status of people was affected by the presence of chronic and infectious diseases. Major epidemics occurred and reports indicate that infectious diseases such as cholera, plague, yellow fever are back,[1]. Recently, new ones have emerged such as Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS), Zika, and now the new coronavirus known as Coronavirus Disease 2019 (Covid-19). [2, 3]

In December, 2019, Wuhan city, the capital of Hubei province in China, became the center of an outbreak of pneumonia of unknown cause.[4] Since then, the disease has spread quickly over the globe and World Health Organization (WHO) announced it as a global pandemic.[5] By the end of May 2020, globally about 6 Million people were reported to be infected and with death reaching about 370,000. Data changes rapidly and might not reflect some cases still being reported (Covid-19 Alert, 2020).

It seems that the persistence of bad news received every day about the COVID-19, which causes an increasing number of deaths, economic collapses, an increase in the unemployed, losses of major international companies, travel bans, daily home confinement, etc. has become a concern for people all over the world and might impact their mental wellbeing. Although governments have highlighted the spread of the disease and the ability of health ministries to restraint its spread and treat patients, they

have neglected the negative impact on the mental wellbeing across the globe. For example, suicides increased in some countries which might indicate mental wellbeing disorders associated with the COVID-19 pandemic. Moreover, there is an urgent need for timely attention to mental health care, social support / work programs, as well as an optimal treatment for mental disorders. It is also imperative to pay attention to other factors of lifestyle that can enhance mental wellbeing. [6, 7]

The recommended procedures to prevent the spread of the disease so far focused on social distancing (minimum of 1.5-meter) and home confinement. These were imposed by several governments and were reported to be “very effective” for people who stand still indoors or outdoors. [8] However, home confinement, up to curfew in some incidents is of concern since it may affect physical activity and eating behaviors as well as mental wellbeing.

The impact of COVID-19 transformed social life as we know it. Most Arab countries have taken extreme measures to prevent the spread of the disease and to protect its people following the Chinese approach of aggressive isolation measures, which led to a progressive reduction of cases [9, 10]. Thus, academic institutions were closed as early as March 13th and shifted to online activities. Curfew was enforced, few cities were isolated and access to workplaces, Gyms, etc. was prohibited. Grocery stores (convenience stores), Bakery shops and medical facilities were the only available services people can walk-visit during limited hours of the day and only for limited age-groups. These measures favor sedentary lifestyle due to low mobility and consequently may impact cardiovascular and mental health integrities.

The American Heart Association, [11] indicated that “Prevention is the key to limiting the spread of coronavirus and as more people work remotely or reduce their public exposure, it is important to maintain healthy habits at home”. Physical activity includes all forms of skeletal muscles-driven movement that encompasses activities of different levels of intensity. Physical activities include leisure time activities such as walking, hiking, gardening, cycling and dancing. Although, competitive sports have been prevented from continuing to play, playing and cleaning the house and carrying heavy shopping continued as a compensatory physical activity. Many are very restricted in movement through the pandemic of COVID-19, it is extremely important for people of all ages and abilities to be as active as possible. Short break from long sitting by doing physical movements for 3-5 minutes every one hour has significant impact on health.[12] Walking or stretching exercises would help relieving muscle fatigue, mental tension and improve blood circulation and overall physical wellness. [12]

Prior to this pandemic and associated confinement, mankind health was already jeopardized due to the sedentary lifestyle the hypokinetic-triggered diseases. The lifestyle modifications may become a serious threat affecting many daily activities and lifestyle alterations for people of all ages. Benefits of physical activities in this emerging condition is expected to exceed the known benefits to improve mental status and help people to cope with the new stay-home status quo and social-life withdrawal. It has been reported that moderate regular physical activity can enhance the immune response [13], also reports provide evidence that moderate regular physical activity is inversely related to the occurrence of upper respiratory tract infections(URTI), which are usually caused by viral agents. [14]

Home confinement and curfew forced most people to work or study at home, a practice that is thought to compromises the routine physical activity by increasing the sitting time. Most people are thought to spend a long periods of stay in front of the screen, whether it is to check the news on the phone, or join Zoom with the family, or watch the interesting Netflix, or spend additional hours staring at a computer while working from home, and this can mean increasing social spacing in the family because of the long stay in front of the screen. Such behaviors would be expected to decrease.

Non-Exercise Activity Thermogenesis (NEAT) and thus total energy expenditure, which may have long term implication on body weight, and life expectancy [15] . Moreover, home confinement may alter eating behaviors resulting from broadness and access to food. Thus, a proper nutrition become of vital importance to support immune system and improve energy balance, in order to reduce the risk of developing chronic and infectious diseases. [16]

Staying stuck at home, especially if it has low levels of natural light, may reduce light-based signals for wakefulness and sleep, which are necessary for our daily rhythm (circadian). Especially since many do not work or have their weekly working hours reduced due to COVID-19, the majority of them may be tempted to sleep every morning. It can make sleeping more than seven to eight hours a night and waking up on time more difficult, This in turn leads to drowsiness, irritation, insomnia and lack of focus throughout the day. [17, 18] . Sleep is important for physical health and the effective functioning of the immune system. It promotes emotional wellness and mental health and helps to overcome stress, depression and anxiety. Millions of people have suffered from insomnia before the coronavirus, but with the epidemic a host of new challenges are producing even for people who have never had trouble sleeping before. Excessive stay in front of the screen, especially in the late evening, can have a detrimental effect on sleep. This is probably because of the blue light from the screens that affects the natural production of melatonin, a hormone the body makes to help us sleep.[19, 20, 21]

Finally, Mental wellbeing is an important issue in our daily life and may change from day to day. Each person has a different potential to cope with stress and can be affected by several factors. Among these factors can be regular physical activity, good sleep and good food. As the WHO indicates in defining health that it is not only free of disease, but rather a state of physical, mental, spiritual and social integration .Therefore, the purpose of this study was to determine to what extend that the lifestyles' behavior includes Physical activity, sleep, and diet contributed to mental wellbeing during the COVID 19 pandemic confinement. Consequently, we hypothesized that good physical activity, good diet quality, and good sleep would be linked with better mental wellbeing.

Subjects And Methods

Study Design and Participants Recruitment

A cross-sectional comparable design using a snowball nondiscriminatory sampling procedure was followed in this study. An online Arabic questionnaire was sent to universities in the Middle Eastern region. The questionnaire was designed to collect demographic, dietary, physical activity, sleep, and well-

being information. Briefly, participants were invited to the study via email, WhatsApp, Facebook etc…, were informed about the study objectives, and interested subjects completed the questionnaire (about 10 min) and submit it online. The questionnaire did not obtain information (name, email, date of birth) that could be used to identify the person; therefore, participant's identity remained completely anonymous. No compensation was offered to the participants who completed the questionnaire. Ethical approval conforming to the Declaration of Helsinki was obtained from the Human Research Ethics Committees of University of Jordan and the Hashemite University. All participants provided an online informed consent. The study questionnaire was tested in a pilot of 63 participants who completed the survey in two occasions separated by a period of time ranging from one to two weeks to test for external reliability and clarity of survey. The data from the pilot group was not included in the final analysis.

In general, self-reported information from 1807 participants were obtained from 17th until 24th of April 2020 and participants were mainly students, staff or faculty members of varied universities. Records with incomplete and none rational information (data outside the 95% confidence interval) were excluded. Therefore, only information obtained from 1723 participants were included for analysis in this study.

Demographics, Mental Well-Being, Dietary Behavior, Physical Activity, and Sleep Data

Participants completed a questionnaire composed of multiple scales validated and adopted to be used in Arabic population. The questionnaire sub-scales included the Demographic and Cultural Information (DCI), The World Health Organization-Five Well-Being Index (WHO-5) [21], Food Frequency Questionnaire (FFQ) [22], Pittsburg Sleep Quality Index (PSQI) [23], and Short-Form International Physical Activity Questionnaire (IPAQ) [24]. Data on demographics (age, gender, weight, etc …) was gathered through a self-completed DCI. Body Mass Index (BMI) was calculated from the self-reported weight (kg) and height (cm). The BMI values were used to classify participants into underweight, normal, overweight, or obese [25]. Mental well-being was assessed with the use of the WHO-5 index. The WHO-5 index consisted of five items, which were scored as previously described [21]. Scores from the WHO-5 items were summed up to generate a total score with a maximum of 25 points. Participants with a WHO-5 total scores of >13 were recognized as having good well-being [21].

Dietary behavior was assessed using a qualitative FFQ. The FFQ included eleven questions, which provided information about frequency of consumption of healthy and less healthy dietary components over the last week. The items asking about healthy dietary behavior included how often you consumed breakfast; how often you consumed vegetables; how often you consumed fruits; how often you consumed dairy; how often you consumed herbs; and how often you consumed healthy nuts. Whereas, the items related to the less healthy dietary behavior included how often you consumed preserved food; how often you consumed sweetened beverages; how often you consumed fried food; how often you consumed sweets; and how often you consumed energy drinks. Healthy dietary behavior items were rated on a scale of 0 to 4, the better the score the more frequents the consumption of that food per week. Less healthy dietary behavior items, in which low frequency and consumption is desirable, were reverse scored with lower consumption receiving a better score. Scores from the individual items were added up to

generate a total dietary score with a maximum of 44 points. The dietary score for each participant was categorized into good (>median) or poor (<median) dietary quality.

Quality of sleep was assessed with the use of PSQI. The PSQI scale includes nineteen questions. Data from the nineteen questions were used to generate seven components. The components were scored individually on a scale of 0 to 3 as previously described [23]. The scores from the seven components were summed up to generate a total score with a maximum of 21 points. Participants with a total PSQI score of <5 were identified as having good sleep quality.

Physical activity (PA) level for each participant was assessed with the use of data obtained from the completed short form IPAQ. The short form IPAQ consists of seven items that provide information about walking, moderate physical activity, and vigorous physical activity conveyed as metabolic equivalent (MET) minutes per week. In addition, the instrument provides information about sitting time. Using a previously published scoring protocol [24], the MET minutes per week was used for categorization of participants into low PA, moderate PA, or high PA.

Statistical Analysis

All analyses were conducted with the use of SPSS Statistics version 23 (IBM, Chicago, IL, USA). Data from continuous variables are presented as means (standard deviation). Data from categorical variables are presented as percentages. Significant differences were elucidated with the use of independent samples t-test, and one-way ANOVA (followed by Tukey's post-hoc test) for the continuous variables and for the categorical variables the Chi-Square test was used. A two stage hierarchical multiple regression was performed to assess the association of well-being (dependent variable) with dietary quality, sleep quality and physical activity after controlling for the influence of age, gender, BMI, and health status. Statistical significance was set as p-value<0.05.

Results

The demographic characteristics of the 1723 participants (806 Female, 917 Male) who completed this study questionnaire are presented in Table 1. Overall, 82.5% (n = 1422) of participants were non obese, and the majority of the participants were living in urban areas (83.3%). In addition, female participants were significantly younger than male participants (P<0.0001). The prevalence of obesity and overweight were significantly higher in males in comparison with females (both P<0.0001). The prevalence of regular smoking and chronic diseases were significantly higher in males in comparison with females (both P<0.0001). Education, physical activity, and good mental wellbeing were significantly higher in males in comparison with females (all P<0.0001).

Table 1. Participants' characteristics according to gender

Variable	Total	Male	Female
	n (%)	n (%)	n (%)
Participants	1723 (100)	917 (53.2)	806 (46.8)
Body Mass Index			
Mean ± SD	25.8 ± 4.5	26.7 ± 4.2	24.7 ± 4.6
Underweight	58 (3.4)	14 (1.5)	44 (5.5)
Normal	778 (45.2)	338 (36.9)	440 (54.6)
Overweight	586 (34.0)	373 (40.7)	213 (26.4)
Obese	301 (17.5)	192 (20.9)	109 (13.5)
Age Group (years)			
Mean ± SD	34.9 ± 12.8	37.4 ± 13.4	32.2 ± 11.5
18-23	468 (27.2)	187 (20.4)	281 (34.9)
24-33	397 (23.0)	209 (22.8)	188 (23.3)
34-44	437 (25.4)	231 (25.2)	206 (25.6)
45 or more	421 (24.4)	290 (31.6)	131 (16.3)
Education Level			
School	340 (19.7)	156 (17.0)	184 (22.8)
Bachelor/College	941 (54.6)	488 (53.2)	453 (56.2)
Master/Doctorate	442 (25.7)	273 (29.8)	169 (21.0)
Housing			
Urban	1436 (83.3)	758 (82.7)	678 (84.1)
Rural	287 (16.7)	159 (17.3)	128 (15.9)
Smoking			
No	1249 (72.5)	574 (62.6)	675 (83.7)
Yes	474 (27.5)	343 (37.4)	131 (16.3)
Chronic Disease			
No	1252 (72.7)	598 (65.2)	654 (81.1)
Yes	471 (27.3)	319 (34.8)	152 (18.9)
Health Status			

Poor/Fair	169 (9.8)	85 (9.3)	84 (10.4)
Good	471 (27.3)	255 (27.8)	216 (26.8)
Very-good/Excellent	1083 (62.9)	577 (62.9)	506 (62.8)
Marital Status			
Single	711 (41.3)	332 (36.2)	379 (47.0)
Married	947 (55.0)	549 (59.9)	398 (49.4)
Divorced	65 (3.8)	36 (3.9)	29 (3.6)

SD: Standard Deviation

Table 2 reports the association of the level of mental wellbeing with lifestyle variables and with some demographic variables. Overall, 67.4% of participants showed good level of mental wellbeing. Male participants were more likely to have good mental wellbeing in comparison with female participants ($p<0.0001$). In general, participants with good mental wellbeing were more likely to have good sleep ($p<0.0001$), higher self-reported health ($p<0.0001$), higher level of physical activity ($p<0.0001$), higher level of education ($p = 0.037$), and good diet ($p<0.0001$).However, level of mental health was not significantly associated with: weight, age, geographic locale, smoking, and/or marital status.

Table 2. Assessment of mental wellbeing according to lifestyle variables and selected demographic variables

Variable	Mental Wellbeing Status		Chi-Square	
	No (<13)	Yes (≥13)	2	P value
	n (%)	n (%)		
Participants	562 (32.6)	1161 (67.4)		
Gender				
Female	303 (53.9)	503 (43.3)	17.058	<0.0001
Male	259 (46.1)	658 (56.7)		
Body Mass Index				
Underweight	23 (4.1)	35 (3.0)	2.812	0.422
Normal	253 (45.0)	525 (45.2)		
Overweight	181 (32.2)	405 (34.9)		
Obese	105 (18.7)	196 (16.9)		
Age Group (years)				
18-23	166 (29.5)	302 (26.0)	3.391	0.335
24-33	119 (21.2)	278 (23.9)		
34-44	137 (24.4)	300 (25.8)		
45 or more	140 (24.9)	281 (24.2)		
Education Level				
School	112 (19.9)	228 (19.6)	6.577	0.037
Bachelor/College	327 (58.2)	614 (52.9)		
Master/Doctorate	123 (21.9)	319 (27.5)		
Housing				
Urban	477 (84.9)	959 (82.6)	1.411	0.235
Rural	85 (15.1)	202 (17.4)		
Smoking				
No	395 (70.3)	854 (73.6)	2.034	0.154
Yes	167 (29.7)	307 (26.4)		
Health Status				
Poor/Fair	89 (15.8)	80 (6.9)	97.672	<0.0001

Good	211 (37.5)	260 (22.4)		
Very-good/Excellent	262 (46.6)	821 (70.7)		
Marital Status				
Single	230 (40.9)	481 (41.4)	0.074	0.964
Married	310 (55.2)	637 (54.9)		
Divorced	22 (3.9%)	43 (3.7)		
Sleep Status				
Poor	383 (68.1)	353 (30.4)	220.480	<0.0001
Good	179 (31.9)	808 (69.6)		
Physical Activity Status				
Low	540 (96.1)	721 (62.1)	226.105	<0.0001
Moderate	22 (3.9)	253 (21.8)		
High	0 (0.0)	187 (16.1)		
Dietary Status				
Poor	382 (68.0)	558 (48.1)	60.546	<0.0001
Good	180 (32.0)	603 (51.9)		

Mental well-being was categorized according to WHO-5 physical activity (Figure 1.a), (low, moderate and high). Data shows that mental health was improved with physical activity ($F (2, 1722) = 291.595$, $p< 0.001$), thought that of moderate and high categories were quite close.

Similarly, mental health score was found to be higher among participants having good dietary quality (Figure 1.b and better sleep Figure 1.c ($t = -16.413$, $p < 0.001$). Figure 1, a. Showed significant differences of mental health scale as dependent variable by physical activity (low, moderate and high, 12.9 (3.7)[a] , 17.0 (2.8)[b] , 18.2 (2.5)[c] respectively). Figure 1, b. Showed significant differences of mental health scale as dependent variable by dietary quality (poor vs. good, 13.3 (4.1), 15.1 (3.8), respectively). Figure 1, C. Showed significant differences of mental health scale as dependent variable by sleep score (poor vs. good, 12.4 (4.2), 15.5 (3.4), respectively).

We conducted stepwise multiple regression analysis using two models. We assumed two models. In model 1, the first model we entered 4 predictors (: age, BMI, gender, and health status) were used and were found too. All were good predictors of mental health except for BMI ($p< 0.05$). The four predictors explained 9% ($F (4, 1717) = 44.480$, $p< 0.001$) of the variance in mental health scores with health status

accounting for 4.8% followed by gender (3.9%) being the best predictor of mental health. In model 2, In the second step, we entered three additional predictors (: dietary score, sleep score, and physical activity) were included and were found to predict. The added variables explained about 18% of the variance (p< 0.001), in which physical activity was the major determinant at about 10%...

Table 3. Step wise multiple regression to assess predictors of mental health

Model		Unstandardized		Standardized	t	Sig.	95.0% C.I. for B		
		B	S.E.	Beta			Lower	Upper	r
1	(Constant)	37.765	2.754		13.714	.000	32.364	43.166	
	Age (Years)	.066	.033	.052	2.003	.045	.001	.131	.031
	BMI (kg/m2)	-.134	.093	-.037	-1.431	.153	-.317	.050	-.014
	Gender	3.898	.770	.120	5.061	.000	2.387	5.409	.128
	Health Status	4.800	.403	.276	11.905	.000	4.010	5.591	.277
2	(Constant)	2.601	3.163		.822	.411	-3.603	8.805	
	Age (Years)	.047	.031	.037	1.508	.132	-.014	.109	.031
	BMI (kg/m2)	.030	.084	.008	.354	.723	-.135	.195	-.014
	Gender	1.416	.714	.044	1.983	.047	.016	2.817	.128
	Health Status	3.380	.367	.194	9.208	.000	2.660	4.100	.277
	Dietary Score	.478	.066	.165	7.259	.000	.349	.607	.281
	Sleep score	-.330	.053	-.129	-6.233	.000	-.434	-.226	-.167
	Physical Activity	9.568	.623	.348	15.351	.000	8.346	10.791	.427

Discussion

This research project investigated the influence of home confinement during COVID-19 pandemic outbreak on different dimensions of mental wellbeing and lifestyle behavior. The responses obtained from a cluster of the sample included 1063 (67%) from the Levant, from the Arab Gulf 442 (25.7%), from North Africa 119 (6.9%), and the other 99 (5.7%) showed virtuous results during the confinement.

Home confinement and curfew forced most people to work or study at home, a practice that is thought to compromises the routine physical activity by increasing the sitting time. Most people are thought to spend a long periods of stay in front of the screen, whether it is to check the news on the phone, or join Zoom with the family, or watch the interesting Netflix, or spend additional hours staring at a computer while working from home, and this can mean increasing social spacing in the family. In addition to the

alteration of daily practices, confinement was reported to impact mental health. Quarantined people and medical workers during MERS outbreak back in 2005 were reported to experience anxiety symptoms and anger for four to six months after they've been release and, in some cases, a need for psychological support was reported. [26]. Recently, in 2020 and due to COVID19 pandemic outbreak and associated confinement, increased levels of psychological problems such as anxiety, depression and poor sleeping quality were found among Chinese quarantined participants [19, 20, 21]. Furthermore, a recent review concluded that quarantine deteriorate peoples' mental health causing negative psychological effects including post-traumatic stress symptoms [27, 28].

The impact of stress on mental health was reported to be affected by gender [29]. and it is expected in part be related cultural differences. At the family level and due to cultural practices, male would be expected to secure needed food items (e.g. shopping walking outside etc.), while women would be house bounded to prepare foods and other needed. [30]. It is not clear whether such cultural practices were behind the observed differences in mental wellbeing between male and female's participants. This can be explained by the fact that most of the responses came from urban, and many of them live in apartments that do not allow freedom of movement. For example, they can't work in gardens in their houses such as weeding, mowing, cleaning etc. Thought a gender difference was reported to be significant predictor of posttraumatic stress symptoms (PTSS) [29].

To further improve the understanding of the home confinement effect on peoples' health, we investigated the association between physical activity levels, dietary behavior and sleeping quality and the magnitude of the COVID19 pandemic confinement effect on mental wellbeing. Table 3. showed that physical activity was the best predictor of mental health, followed by health status. That is, more physically activity and better health individuals reported the better mental health they expressed. Also, those who reported better diet also reported better mental health. Furthermore, participants with good sleep score were associated with better mental health. Gender was also good predictor of mental health as males reported better mental health. These results provide support to our descriptive results in Figure 1a, b, and c.

In the present study, the relation between physical activity and mental health was determined, especially since this lack of commuting and lockdown were reported to impact physical activity and wellness depending on different interactions and setting [31]. In line with others ([32, 33, 34, 35], mental health was found to be improve with physical activity.

It is well known that active people have always better mood which influenced by the release of certain hormones namely endorphins and serotonin. Although morphine reduces pain sensation, secretion of endorphins leads to feelings of euphoria, modulation of appetite, and enhancement of the immune response.

During high level of physical activity, the body releases endorphins which interact with the receptors in the brain that reduce the perception of pain thus induces relaxation and reduction of stress. [36] Serotonin produces in the intestine to promote healthy digestion, help with sleep and also help with mood

regulation in the brain. [37, 38] Furthermore, it is known that the benefits of regular physical activity go beyond supporting the secretion of serotonin, relieving depression and dealing with stress.

Our findings are consistent with the results of some previous research conducted during the SARS epidemic and recent research in Europe [39, 18]. Not getting enough exposure to sunlight is one theory behind why people experience depression during the short, dark days of fall and winter.[40] A new mouse study has found that continuous exposure to ultraviolet (UV) radiation causes the release of endorphins and vitamin D3 which is essential for bone and musculoskeletal health. [41, 42, 43] A deficiency of similar hormones was associated with depression, the group with low physical activity may have a feeling of guilt and exposing their health to sedentary lifestyle-associated risk. Overall mental wellbeing score (WHO5) was positively influenced by physical activity level, this result concurs with results reported by other recent research reported a negative psycho-emotional effect of COVID-19 home confinement on lifestyle behaviors particularly on physically inactive people [27, 28, 29, 44].

Moreover, our results indicated that mental wellbeing overall score (WHO5) was higher in people who adapted healthy dieting. These findings encourage the use of healthy dieting behaviors to control the psycho-emotional effect of home confinement. The bad nutritional behavior may also be stimulated by emotional eating due to confinement-induced anxiety, stress, and long sitting hours [34, 45].

Additionally, results also indicated that sleeping quality was strongly associated with mental wellbeing ($p < .001$). Having enough sleeping hours and good sleeping quality is very essential in regulating human biology and circadian rhythm which affects hormonal secretion and metabolism. Mood alterations and brain neurological factors that enhance psychological status are expected to function well with a better quality of sleep. Earlier studies have reported a negative impact of home confinement on sleeping quality [18] which is proved to be linked to mental wellbeing conferring our findings. In addition, the diet score in our study showed that those who eat balance good quality of food would enhance the mental wellbeing. This is in agreement with what is already in the literature that having a good balance of "friendly" bacteria in your intestines been linked to adequate serotonin levels [42, 46]

In brief, mental health among our participants was found to be affected by several factors (physical activity, diet and sleep) and thus a further analysis was performed in attempt to identify the magnitude of contribution of each factor. It is clear that, the impact of physical activity (moderate and above) on mental health was by far the highest. This finding is of public health importance for addressing the detrimental impact of confinement on mental health. Therefore, interventions are needed to develop programs that focus on improving physical activity during confinement and such other circumstances in order to attenuate the risk of poor mental health during confinement.

Limitation

Despite being one of the few studies examining the link between physical activity, diet, sleep and mental wellbeing among Arab educational institutions during the Covid 19, this study has some limitations. Given the high number of responses examined, the detailed variables are not explained and limiting our

ability to compare between pre and during confinement among each variable. Given the nature of the cross-sectional comparable design using a snowball nondiscriminatory sampling procedure in this study, causality can't be inferred from this analysis. Moreover, Due to the nature of the surveys, the effects of bias in remembering and social culture cannot be avoided. However, inclusion and exclusion criteria were not defined, it has been treated and explained in the method section.

Conclusion

This As a result of confinement due to Covid-19, individuals who had more physical activity and those who perceived they had better health with good sleeping time adapted mentally better to the stress of confinement. In brief, mental health status during confinement was reported to be better among subjects adopting a healthy life style approach in terms of physical activity, dietary and sleep behaviors. Physical activity was the best predictor of mental health, followed by health status. That is, more physically activity and better health individuals reported the better mental health they expressed. Also, those who reported better diet also reported better mental health. Furthermore, participants with good sleep score were associated with better mental health. Gender was also good predictor of mental health as males reported better mental health. Also, males and those who had good diet regime were better in adapting mentally to confinement.

Declarations

Ethics approval and consent to participate

Ethical approval conforming to the Declaration of Helsinki was obtained from the Human Research Ethics Committees of University of Jordan and Hashemite University. All participants provided an online informed consent and a copy of the IRB will be provided as supplemental material and upon request.

Consent for publication

All panel members and coauthors of this research project reviewed the manuscript and consented to coauthoring it.

Availability of data and materials

Online Collected data are saved in one excel file and prepared for further analysis and are available for reasonable request as a supplementary information file.

Competing interests

The authors declare that they have no competing interests

So far, no funding is provided by any entity to support this research project and all authors and expert panel received no personal compensation for these roles.

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Research team applied for governmental funding through the ministry of higher education in Jordan. The Committee of the Fund in the Ministry of Higher Education and Scientific Research just announced for Supporting Scientific Research and Innovation to support five research directed at dealing with the Corona virus in Jordan, out of (58) fifty-eight research submitted to the fund from researchers distributed on Twenty Jordanian public and private universities, The Fund's various scientific and academic committees have studied it and selected the most appropriate ones.

The ministry added that this research was distributed by two researches in the humanities, social and economic sciences sector. However, Due to coronavirus confinement, official paperwork is not available up to the submission date. We will provide the confirmation as soon as it is available and upon your request.

Authors' Contributions

Hashem A. Kilani: was responsible for the study project, implementation of the study and writing. Mo'ath F. Bataineh conducted the data statistical analyses, interpretation, and writing methodology. Ali Al-Nawayseh helped in writing discussion and introduction. Maher M. Abu-Hilal helped in writing the results. Omar Obeid edited the manuscript. The conceptual model draft was developed by all authors participated in the Expert Panel meetings done via Zoom platform. All authors collected and cleaned the data, approved the paper, commented and performed the literature research and approved the final version of this submission.

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Figures

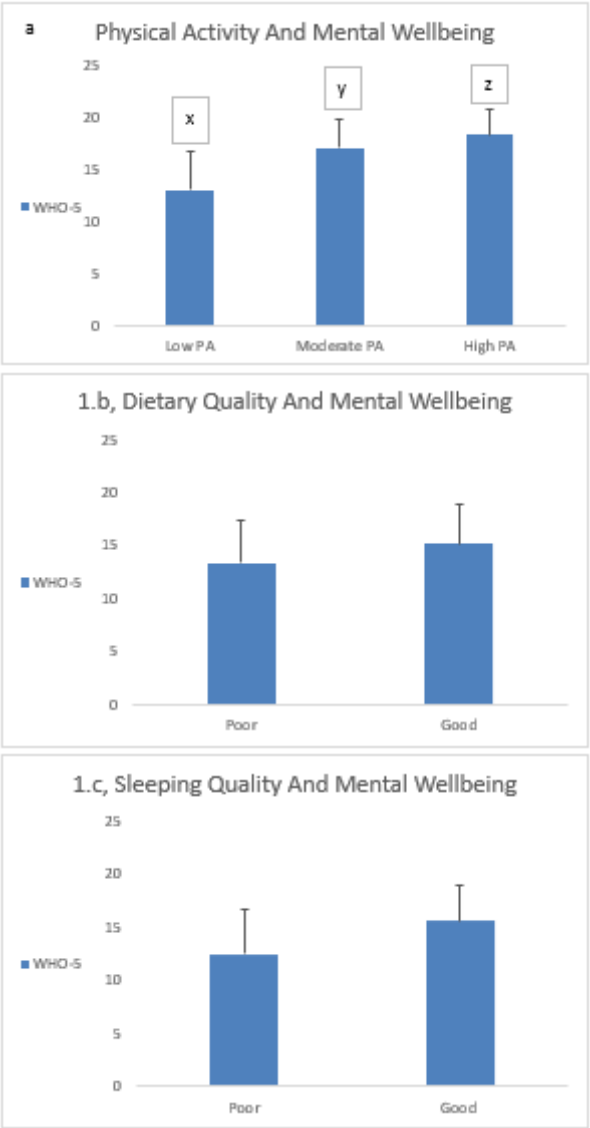

Figure 1

a. Mental health score of participants with varied levels of physical activity (low, moderate and high). Bars with different letters are significantly different using one-way analysis of variance (ANOVA) b. Mental health score of participants with poor or good dietary quality score. a 0.001 using T-test) c. Mental health score of participants with poor or good sleeping quality score.