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Original article

Healthy nutritional behavior during COVID-19 lockdown: A cross-sectional study

Hayder Al-Domi*, Anfal AL-Dalaeen, Sara AL-Rosan, Nour Batarseh, Hala Nawaiseh

Department of Food Technology and Nutrition, School of Agriculture, The University of Jordan, Amman 11492, Jordan

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SUMMARY

Background: Ongoing outbreak of the novel coronavirus infectious disease 2019 (COVID- 19) constitutes a major global pandemic health care system challenge. Shortly following the disease outbreak, like SARS-CoV virus, all affected countries are implementing various preventive and control measures to mitigate the spread of the disease. Optimizing public health system during COVID-19 pandemic requires not only advanced medical and biological sciences knowledge, but also all human sciences related to social, as well as nutritional behavior, and lifestyle practices.

Aim: To investigate the effect of COVID-19- quarantine on healthy nutritional behavior and lifestyle practices among Jordanian population.

Methods: A cross-sectional study among Jordanian population was conducted using an online questionnaire between March and April 2020. Participants were kindly requested to answer a standardized and validated structured questionnaire. Demographic information (age, gender, place of residence, and occupation), anthropometric data (reported weight and height); nutritional behavior information (number of meals per day, snakes, water intake), and physical activity behavior were requested.

Results: A total of 4473 respondents were included in the study; obese ($n = 1135$), normal body weight ($n = 1561$), and underweight ($n = 116$). During COVID-19 quarantine, a significant increase in body weight (12.9% underweight, 28.5% normal body weight, 36.4% overweight' and 41.1% of obese ($p < 0.001$) was reported. Moreover, the number of snacks between meals ($p < 0.001$), number of main meals ($p < 0.001$), and the smoking rate was also increased significantly; however, there was no significant difference regarding physical activity among various weight status groups ($p < 0.05$).

Conclusions: In this study, we have provided evidence, for the first time, that there were significant negative changes in healthy nutritional behavior among Jordanians during COVID-19 quarantine who encountered significantly increased body weight, appetite, and smoking. Hence, future larger cross-sectional studies are warranted.

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1. Introduction

The world is currently experiencing an unprecedented pandemic of the novel acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1]. Globally, more the 96.2 million individuals were diagnosed with coronavirus disease 2019 (COVID-19), which continues to spread rapidly across the world. In December 2019, COVID-19 infection began in Wuhan, Hubei, China [2], which started with an animal-to-human infection. The direct cause of death is generally due to ensuing severe atypical pneumonia [2]. As such, COVID-19 has been declared a pandemic by the World Health Organization (WHO) in February 2020 [3].

To prevent or at least ameliorate the sweeping spread of COVID-19, populations throughout the world have been under extended quarantine as a strategy to prevent the spread of the disease, which then also reduces the impact on medical resources [4]. Since the quarantine is associated with the interruption of the life and work routine [5], it could result in boredom [6], which could be associated with increased intake of higher quantities of macronutrients; fats, carbohydrates, and proteins; each of which has a distinctive set of properties that impact health, but all are a source of energy. Surplus intake of macronutrients are regarded as potentially problematic that could contribute to disordered eating [7]. Continuous television watching or reading about the pandemic

* Corresponding author.
E-mail addresses: h.aldomi@ju.edu.jo (H. Al-Domi), anfal.moafaq@hotmail.com (A. AL-Dalaeen), saraalrosan@hotmail.com (S. AL-Rosan), batarseh.n@yahoo.com (N. Batarseh), ha.nawaiseh@ju.edu.jo (H. Nawaiseh).

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without a break during the extended quarantine could be also stressful [8]. As such, stress drives people toward hedonic overeating, mostly consuming more sugary and salty food "comfort foods" [9].

This desire to consume higher amounts of specific foods, defined as food craving, is a multidimensional concept including emotional eating (intense desire to eat), behavioral (seeking food), cognitive (thoughts about food), and physiological (salivation) processes [10]. Healthy nutrition is crucial for good health, whereas unhealthy nutritional behavior and sedentary behavior are associated with a significant risk of developing overweight or obesity [11]. The pro-subclinical pro-inflammatory state caused by obesity is often complicated by serious comorbidities, including, but not limited to diabesity, cardiovascular diseases, and pulmonary diseases [12] that have been demonstrated to increase the risk of serious complications of COVID-19 [13].

Increased intake of macronutrients during quarantine could also be accompanied by micronutrient deficiency associated with increased body weight [14], which is associated with an impaired immune response; this could be responsible for heightened susceptibility to infections [15]. Thus, during this time of quarantine, it is pivotal to maintain healthy nutrition behavior and undertake adequate physical activity [8].

The Jordanian government announced a lockdown on 17 March 2020, which was later turned into a strictly-enforced curfew that was described as one of the world's strictest measures Jordan Ministry of Health (2021). As of January 24, 2021, the accumulative positive cases were 319, 519, the incidence rate was 5.8 per 100,000 population, and the daily death rate was 1.6 per 100,000 population. It is conceived that due to the quarantine-related situational stress-eating, healthy nutrition should become a national priority.

The objective of this study, therefore, was to objective to establish national base-line data on the effect of quarantine on nutritional behavior, physical activity among Jordanian residents using a formulated online survey. A comparison of lifestyle and nutritional behavior during the lockdown was also undertaken to allow a better understanding of the impact of COVID-19-induced confinement policies on lifestyle practices among the Jordanians as well as to examine the potential risks of nutritional inadequacies.

2. Material and method

A population-based cross-sectional study was conducted between March and April 2020. The study was conducted using an online self-administered questionnaire distributed through social networking sites (SNS), mainly Facebook. The decision was made because it is the most used SNS in Jordan. As of January 2020, a minimum of 6.78 million Jordanians have internet access, which accounted for 67% of the entire ten million Jordanian population [16]; of the more than six million Jordanians have a Facebook account (57.3% men, and 42.7% women) [17]. Worth noting that two of the largest mobile service providers in Jordan offer free access to Facebook, especially during the COVID-19 quarantine. According to the Inclusive Internet Index of 2019, a slight gender gap exists in internet and mobile phone access in Jordan [16].

The target population was Jordanian adults aged more than 18 years. Participants were invited to participate in this online survey using snowball sampling methods to guarantee a large-scale distribution and recruitment of participants [18].

To assess the content validity, the questionnaire was revised by a Panel of Academics of Nutrition, and Nutrition Epidemiologist and Arabic literature, and their respected comments were taken into consideration. Then, the questionnaire was formatted into Google forms, an internet-based software commonly used for data collection. Google forms were preferred for their convenience, efficiency, and high popularity especially in the current scenario where people in Jordan were under quarantine. After adding the questionnaire into Google forms, a link was generated and randomly distributed using social media networking sites such as Facebook and by phone on WhatsApp groups.

Before distribution, the initial version was further reviewed by experts and was piloted on 30 participants for clarity and language. All the feedback about the survey was positive and no changes were suggested and, subsequently, all piloted cases were included in the data analysis. The study was approved by the Institutional Review Board, the Deanship of Scientific Research, the University of Jordan (IRB Number: 639-2020-19).

A multicomponent, self-administrated online survey was designed using Google document forms in Arabic. This survey contained questions on dietary and lifestyle practices during the COVID-19 confinement. The online survey included 20 questions and was divided into four sections: (1) consent form, (2) socio-demographic background (7 questions; gender, age, marital status, education level, employment status, whether they were working or studying from home during the lockdown, weight change, perceived health status), (3) sources of information (2 questions; where do they obtain health and nutrition-related information), (4) eating habits (8 questions; meal type, meal frequency, eating breakfast, skipping meals, reasons for skipping meals, water intake, and food frequency of specific foods), and (5) physical activity practices (4 questions; exerce frequency, household chores frequency, computer time for work or study, and screen time for entertainment). After participants start answering the questions, no question could be left blank except for the income. Thus, the entire form should be filled up before submitting the survey through the server to the researchers.

2.1. Statistical analysis

Data were analyzed using the graduate pack SPSS 23.0 for windows 2010. Data are represented as number and percentage in parentheses (%) for categorical variables, Data are presented as means ± standard deviation (SD) and as frequency distributions. All p values of less than .05 were considered statistically significant.

3. Result

A total of 4473 participants were included in this study. Only 35 individuals refused to sign a consent form, and 50 individuals were not able to complete the survey. Volunteers from various levels of government-mandated confinement at-home accepted to fill up the survey. The sample distribution was representative of the population distribution in Jordan. With the highest number of participants in the Middle region ($n = 2178$, 49.6%), and Northern region ($n = 1632$, 37.2%).

Table 1 shows that there was a significant difference between underweight, normal weight, overweight, and obese male and female participants ($p \leq 0.05$). Most of the normal weight group were bachelor degree holders (55.6%). 36.2% of overweight and 30.3% obese individuals continued working during COVID-19 as compared to 42.7% normal-weight counterparts.

Table 2 represents the occurrence of chronic diseases and their association to the body mass index, the majority of participants had no chronic diseases (76.6%) such as diabetes mellitus (96.2%), hypertension (94.0%), cardiovascular diseases (97.9%), respiratory diseases (96.5%) and kidney diseases (99.5%, $p < 0.166$) in normal weight and. 77.5% of the overweight group had chronic diseases such as diabetes mellitus (96.4) and cardiovascular disease (97.9%, $p < 0.015$).

Table 1
Participants' general characteristics, education, and occupation.

Variable[a]		*n* (%)	Underweight *n* (%)	Normal weight *n* (%)	Overweight *n* (%)	Obese *n* (%)	*P*-Value
Gender	Male	1302 (29.7)	20 (17.2)	401 (25.7)	523 (33.2)	358 (31.5)	.001
	Female	3086 (70.3)	96 (82.8)	1160 (74.3)	1053 (66.8)	777 (68.5)	
Marital Status	Single	1504 (34.3)	91 (78.4)	754 (48.3)	422 (26.8)	237 (20.9)	.001
	Married	2729 (62.2)	23 (19.8)	762 (48.8)	1097 (69.6)	847 (74.6)	
	Divorced or Widow	155 (3.5)	2 (1.7)	45 (2.9)	57 (3.6)	51 (4.5)	
Residence	North region	1632 (37.2)	38 (32.8)	471 (30.2)	618 (39.2)	505 (44.5)	.001
	Middle region	2178 (49.6)	60 (51.7)	863 (55.3)	765 (48.5)	490 (43.2)	
	South region	578 (13.2)	18 (15.5)	227 (14.5)	193 (12.2)	140 (12.3)	
Education	Primary and middle School	206 (4.7)	15 (12.9)	64 (4.1)	61 (3.9)	66 (5.8)	.001
	Secondary School	743 (16.9)	23 (19.8)	197 (12.6)	277 (17.6)	246 (21.7)	
	Diploma	575 (13.1)	12 (10.3)	171 (11.0)	220 (14.0)	172 (15.2)	
	Bachelor	2195 (50.0)	60 (51.7)	868 (55.6)	761 (48.3)	506 (44.6)	
	Graduate Studies	669 (15.2)	6 (5.2)	261 (16.7)	257 (16.3)	145 (12.8)	
Occupation	Student	673 (15.3)	58 (50.0)	371 (23.8)	168 (10.7)	76 (6.7)	.001
	Housewife	924 (21.1)	9 (7.8)	255 (16.3)	342 (21.7)	318 (28.0)	
	Employee	1503 (34.3)	15 (12.9)	498 (31.9)	584 (37.1)	406 (35.8)	
	Retired	207 (4.7)	1 (.9)	34 (2.2)	93 (5.9)	79 (7.0)	
	Unemployed	461 (10.5)	17 (14.7)	184 (11.8)	165 (10.5)	95 (8.4)	
	Government Worker	234 (5.3)	8 (6.9)	89 (5.7)	75 (4.8)	62 (5.5)	
	Own business	244 (5.6)	4 (3.4)	75 (4.8)	100 (6.3)	65 (5.7)	
	Other	142 (3.2)	4 (3.4)	55 (3.5)	49 (3.1)	34 (3.0)	
Income (Jordan Dinar)	<200	438 (10.0)	23 (19.8	150 (9.6)	129 (8.2)	136 (12.0)	.001
	200–500	1980 (45.1)	49 (42.2)	654 (41.9)	728 (46.2)	549 (48.4)	
	>500-1000	1207 (27.5)	27 (23.3)	446 (28.6)	453 (28.7)	281 (24.8)	
	>1000-1500	402 (9.2)	10 (8.6)	175 (11.2)	130 (8.2)	87 (7.7)	
	>1500	361 (8.2)	7 (6.0)	136 (8.7)	136 (8.6)	82 (7.2)	
Continue. Working During quarantine	Yes	1643 (37.7)	62 (53.5)	667 (42.7)	570 (36.2)	344 (30.3)	.001
	No,	1653 (37.4)	33 (28.4)	564 (36.1)	608 (38.6)	448 (39.5)	
	Do not work	330 (24.9)	21 (18.1)	330 (21.1)	398 (25.3)	343 (30.2)	

[a] Data are presented as frequency (%)and is considered statistically significant at $p < 0.05$.

Table 2
Occurrence of Chronic Diseases among various weight groups during COVID-19 quarantine.

Variable[a]		(*n*%)	Under weight *n* (%)	Normal weight *n* (%)	Overweight *n* (%)	Obese *n* (%)	*p*-Value
Chronic diseases	No	3362 (76.6)	97 (83.6)	1319 (84.5)	1222 (77.5)	724 (63.8)	.001
	Yes	1026 (23.4)	19 (16.4)	242 (15.5)	354 (22.5)	411 (36.2)	
Diabetes Mellitus	No	4222 (96.2)	115 (99.1)	1532 (98.1)	1520 (96.4)	1055 (93.0)	.001
	Yes	166 (3.8)	1 (.9)	29 (1.9)	56 (3.6)	80 (7.0)	
Hypertension	No	4123 (94.0)	114 (98.3)	1539 (98.6)	1489 (94.5)	981 (86.4)	.001
	Yes	265 (6.0)	2 (1.7)	22 (1.4)	87 (5.5)	154 (13.6)	
Thyroid Dysfunction	No	4178 (95.2)	115 (99.1)	1519 (97.3)	1511 (95.9)	1033 (91.0)	.001
	Yes	210 (4.8)	1 (.9)	42 (2.7)	65 (4.1)	102 (9.0)	
Cardiovascular diseases	No	4294 (97.9)	116 (100.0)	1536 (98.4)	1543 (97.9)	1099 (96.8)	.015
	Yes	94 (2.1)	0 (.0)	25 (1.6)	33 (2.1)	36 (3.2)	
Respiratory Diseases	No	4236 (96.5)	108 (93.1)	1512 (96.9)	1530 (97.1)	1086 (95.7)	.038
	Yes	152 (3.5)	8 (6.9)	49 (3.1)	46 (2.9)	49 (4.3)	
Kidney Diseases	No	4366 (99.5)	115 (99.1)	1555 (99.6)	1571 (99.7)	1125 (99.1)	.166
	Yes	22 (.5)	1 (.9)	6 (.4)	5 (.3)	10 (.9)	
Liver Diseases	No	4377 (99.7)	116 (100.0)	1558 (99.8)	1572 (99.7)	1131 (99.6)	.807
	Yes	11 (.3)	0 (.0)	3 (.2)	4 (.3)	4 (.4)	
Medical nutrition effect	Do not have Chronic Diseases	3362 (76.6)	97 (83.6)	1319 (84.5)	1222 (77.5)	724 (63.8)	.000
	No	681 (15.5)	15 (12.9)	184 (11.8)	230 (14.6)	252 (22.2)	
	Yes	345 (7.9)	4 (3.4)	58 (3.7)	124 (7.9)	159 (14.0)	
Medical effect	Do not have Chronic Disease	3362 (76.6)	97 (83.6)	1319 (84.5)	1222 (77.6)	724 (63.8)	.000
	No	862 (19.6)	12 (10.3)	207 (13.3)	306 (19.4)	337 (29.7)	
	Yes	163 (3.7)	7 (6.0)	35 (2.2)	47 (3.0)	74 (6.5)	

[a] Data are presented as frequency (%)and is considered statistically significant at $p < 0.05$.

Table 3 shows dietary intake, smoking habit, and their association with body mass index during COVID-19 quarantine. During Covid quarantine, there was a significant increase in the bodyweight of the overweight (36.4%), and obese participants (41.1%) as compared to normal body weight counterparts (28.5%, $p < 0.05$). Moreover, there was a significant rise in the percentage of participants who consumed breakfast, lunch, and dinner regardless of the bodyweight status group. There was a significant increase in the appetite of overweight (44.4%), and of obese (50.2%) as compared to normal weight counterparts (40.4%, $p < 0.05$).

4. Discussion

This study was undertaken to assess the effect of the COVID-19 quarantine on healthy habits related to nutritional behavior, dietary patterns, and sedentary behavior among the Jordanian population during the COVID-19 pandemic. To the best of our knowledge, this study could be among the first in Jordan to investigate the impact of COVID-19 on ceratin nutritional behavior aspects. Our findings revealed a significant variation of eating patterns and lifestyle factors that were affected by the quarantine.

Table 3
Dietary intake, smoking habit, among weight groups during COVID-19 quarantine.

Variable[a]		(*n* %)	Underweight ***n*(%)**	Normal weight ***n*(%)**	Overweight ***n*(%)**	Obese ***n*(%)**	*p*-Value
Smoking	No	3132 (71.4)	92 (79.3)	1130 (72.4)	1070 (67.9)	826 (72.8)	.002
	Yes	1256 (28.6)	24 (20.7)	431 (27.6)	506 (32.1)	309 (27.2)	
Increased Smoking	Non-smoker	3132 (71.4)	92 (79.3)	1132 (72.5)	1073 (68.1)	835 (73.6)	.001
	No	674 (15.4)	17 (14.7)	237 (15.2)	278 (17.6)	142 (12.5)	
	Yes	582 (13.3)	7 (6.0)	192 (12.3)	225 (14.3)	158 (13.9)	
Change in body weight	No changes	2214 (50.5)	82 (70.7%)	892 (57.1)	758 (48.1)	482 (42.5%)	.001
	Increase	1500 (34.2)	15 (12.9%)	445 (28.5)	573 (36.4)	467 (41.1%)	
	Decrease	674 (15.4)	16.4 (16.4)	224 (14.3)	245 (15.5)	186 (16.4)	
Increase number Breakfast	No	1344 (30.6)	51 (44.0)	507 (32.5)	469 (29.8)	317 (27.9)	.001
	Yes	3044 (69.4)	65 (56.0)	1054 (67.5)	1107 (70.2)	818 (72.1)	
Increase number Launch	No	449 (10.2)	14 (12.1)	157 (10.1)	163 (10.3)	115 (10.1)	.916
	Yes	3939 (89.8)	102 (87.9)	1404 (89.9)	1413 (89.7)	1020 (89.9)	
Increase number Dinner	No	2018 (46.0)	46 (39.7)	687 (44.0)	757 (48.0)	528 (46.5)	.068
	Yes	2370 (54.0)	70 (60.3)	874 (56.0)	819 (52.0)	607 (53.5)	
Increase Appetite	No	1405 (32.0)	36 (31.0)	538 (34.5)	505 (32.0)	326 (8.7)	.001
	Yes	1946 (44.3)	47 (40.5)	630 (40.4)	699 (44.4)	570 (50.2)	
	Maybe	1037 (23.6)	33 (28.4)	393 (25.2)	372 (23.6)	239 (21.1)	
Food intake or supplements containing antioxidants	No	1436 (32.7)	41 (35.3)	508 (32.5)	511 (32.4)	376 (33.1)	.038
	Yes	2019 (46.0)	41 (35.3)	702 (45.0)	762 (48.4)	514 (45.3)	
	Maybe	933 (21.3)	34 (29.3)	351 (22.5)	303 (19.2)	245 (21.6)	
Number of snacks	<3	2638 (60.1)	69 (59.5)	935 (59.9)	938 (59.5)	696 (61.3)	.808
	≤3	1750 (39.9)	47 (40.5)	626 (40.1)	638 (40.5)	439 (38.7)	
Water intake	>8 cups	3009 (68.6)	102 (87.9)	1129 (72.3)	1045 (66.3)	733 (64.6)	.001
	≤8 cups	1379 (31.4)	14 (12.1)	432 (27.7)	531 (33.7)	402 (35.4)	
Change in physical activity	Yes	2984 (68.0)	38 (32.8)	527 (33.8)	501 (31.8%)	338 (29.8)	.183
	No	1404 (32.0)	78 (67.2)	1034 (66.2)	1075 (68.2	797 (70.2)	
Physical Activity Levels	Inactive	1700 (38.7)	62 (53.4)	573 (36.7)	614 (39.0)	451 (39.7)	.000
	Moderate	1743 (39.7)	40 (34.5)	618 (39.6)	606 (38.5)	479 (42.2)	
	High	945 (21.5)	14 (12.1)	370 (23.7)	356 (22.6)	205 (18.1)	

[a] Data are presented as frequency (%)and is considered statistically significant at $p < 0.05$.

This online survey was conducted in March 2020, and the data was collected from all 12 governorates of Jordan, which are in one of three regions: the North, Central, and Southern region. The majority of the study participants were females, which could be attributed to the fact that females who participate are more involved in online surveys, mostly whenever related to their interests. Generally, they have a positive attitude toward online operations, and they provide more accurate and consistent responses [18,19].

Our findings showed that the 26–40 years age of the participants was the dominant age group; provided that according to the Jordan statistical book (2016), 62% of the Jordanian population aged between 15 and 64 years old. As such, it is highly anticipated that this age group is more familiar with technology and online surveys compared to older individuals [20].; Furthermore, this survey was conducted during the second academic semester (2020) where the majority of the college students were highly engaged in online learning during COVID-19 quarantine and therefore, this could explain the limited participation (26.7%) of the young adults (18–26 years old).

As mentioned before, our findings showed that participants who are employed and hold a bachelor degree or a higher were either overweight or obese with the highest percentage reported among females, provided that 70% of the participants were females); similarly, the highest percentage of overweight (39.2%) and obese (44.5%; $p < 0.05$ was among participants in the Northern region. This is consistent with an earlier report which found that the percentage of obese women in Northern Jordan constituted 53.1% of the population sample compared to men (28.1%) who were obese and their. Furthermore, we found that there were significant differences between obesity and its comorbidities, particularly type 2 diabetes, hypertension, and other cardiovascular diseases ($p \leq 0.001$), which is consistent with a report indicating that there was a strong association with obesity in chronic morbidities, especially diabetes, hypertension, and other cardiovascular diseases, $p \leq 0.001$) [19].

More than 45% of the participants had a low monthly income between (200–500 JD); of them, about a half were either overweight or obese. The income issue plays an essential role in the nutritional behavior of Jordanians; it affects directly the economic access to foods [20]. Quarantine has imposed more stress on Jordanian families as many of them lost their income. It has been reported that while Mafraq, Karak, and Tafileh governorates are the highest incidence of poverty, Amman, Madaba, and Irbid governorates are the lowest. Jordanians who have higher income adopt better healthy nutritional behaviors, whereas individuals living in rural areas and have low income are less likely to adopt healthy promotion behavior [21].

During the COVID-19 locked down, our findings showed a significant change in the Jordanian nutritional behavior as well as and lifestyle practices. It has been known that Jordan is one of the highest counties globally in the smoking rate. According to the world health organization, 66% of Jordanian men and more than 17% of women are smokers [5], and the smoking rate is the highest among poor individuals (monthly income 100–250 JD) followed by individuals with a monthly income up to 500 JD [22]. Nutritional behavior is likely to change due to reduced availability of goods, limited access to food caused by restricted store opening hours, and a switch to unhealthy food [23].

In 2020, findings on the quarantine in Italy found that COVID-19 generates intense stress and challenge on individuals who smoke [22]. Dual users of cigarette, e-cigarette, and exclusive cigarette smokers reported that their daily consumption has slightly decreased while exclusive cigarette smokers and exclusive e-cigarette users changed purchasing products. This result is generally is consistent with our findings; a minimum of 46% of the participating smokers reported an increase in tobacco smoking. On the other hand, it has been demonstrated individuals who

smoke more than ten cigarettes per day have decreased by .5% cigarettes per day.

Findings of this study revealed that lunch was the main meal during the quarantine, increased appetite, and the intake of foods or supplements containing antioxidants has increased during the quarantine. Home-cooked meals, eating five portions of fruits and vegetables, whole grains, drinking enough water, avoiding added sugar and salt is recommended, and taking multi-vitamins for short periods during this epidemic could be beneficial [11]. Nonetheless, the sense of hunger and satiety changed for more than half of the population participants during COVID-19 causing weight gain [8].

Physical activity is one of the most critical determinants of health, specifically for Jordanian patients with common cardiovascular diseases [23]. However, there was a significant weakness in applying this concept to Jordanian patients, especially by health sector workers [24]. In 2018, Hayder et al. discussed the importance of physical activity in reducing overweight and obesity issues from early stages. Their research showed that Jordanian girls who have normal body weight were more physically active and maintain regular excises than boys (49%, 26.5%; respectively, $p < 0.01$), and school children who spent around 30 min/day exercising have a decreased risk of overweight by .5-fold [25].

The decrease in physical activity is associated with a lower metabolic rate and energy expenditure that poses health issues and an economic burden [26], while regular physical activity has positive effects on the immune system and prevents low-grade inflammatory response [27]. During the COVID-19 lockdown, negative impacts on psychological health and exercise motivation were globally noticed [28]. Like other countries, sedentary behavior was dominant in Jordan during the lockdown, and this significantly affected the physical activity as almost 70% of Jordanian who reported changes in their physical activity, and 39% of overweight and obese reported inactive state.

Adequate water intake is essential, reflects good nutritional behavior, and suboptimal hydration before weeks of infection with COVID-19 rises angiotensin-converting enzyme 2 receptors lung, which causes epithelial cells injury, leakage of fluid into the airway space and therefore, it could increase the risk of COVID-19-related mortality [29]. Daily total water intakes less than 1.8 L/day (7.2 cups) may start a neuroendocrine defense for water in the body that influence the risk of dysfunctional metabolism [30]. Generally, 69% of Jordanians reported drinking less than eight cups of water per day during the lockdown, precisely 64% of obese people who are considered a high-risk group for metabolic disorders.

5. Conclusion

Due to the COVID-19 quarantine-related stress-eating, changes in the nutritional behavior should constitute a priority at this time. Many people probably encountered an increase in their appetite, and many breakfasts and dinner meals were consumed. Water intake was reported below the recommended in all weight groups, and inactive physical behavior was dominant, specifically among overweight and obese during the quarantine. Strategies to promote healthy nutritional behavior, positive lifestyle practices, and enhancing physical activity should be developed and implemented. Further large-scale population-based studies are warranted to investigate the long-term effect of this pandemic on various aspects of nutritional behavior.

Author contribution

Hayder Al-Domi: Conceived the research idea, and overall scientific management participated in the manuscript preparation.

Anfal AL-Dalaeen: Conceived the research idea, data collection, and manuscript preparation.

Sara AL-Rosan: Conceived the research idea, data collection, and analysis of data.

Nour Batarseh: Data collection, and the manuscript preparation.

Hala Nawaiseh: Conceived the research idea, and data collection.

Declaration of competing interest

The authors declare no conflict of interest.

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References

[1] Zu ZY, Jiang M Di, Xu PP, Chen W, Ni QQ, Lu GM, et al. Coronavirus disease 2019 (COVID-19): a perspective from China. Radiology 2020;296(2):E15–25. https://doi.org/10.1148/radiol.2020200490.
[2] Zhou Y, Chen Z, Wu X, Tian Z, Cheng L, Ye L. The outbreak evaluation of COVID-19 in wuhan district of China. Healthcare 2020;9(61). https://doi.org/10.3390/healthcare9010061.
[3] Sohrabi C, Alsafi Z, O'Neill N, Khan M, Kerwan A, Al-Jabir A, et al. World Health Organization declares global emergency: a review of the 2019 novel coronavirus (COVID-19). Int J Surg 2020;76:71–6. https://doi.org/10.1016/j.ijsu.2020.02.034.
[4] Burke KE, Kochar B, Allegretti JR, Winter RW, Lochhead P, Khalili H, et al. Immunosuppressive therapy and risk of COVID-19 infection in patients with inflammatory bowel diseases. Inflamm Bowel Dis 2020;27(2):155–61. https://doi.org/10.1093/ibd/izaa278.
[5] World Health Organization. Considerations for quarantine of individuals in the context of containment for coronavirus disease (COVID-19). WHO; 2020. https://apps.who.int/iris/handle/10665/331497.
[6] Jiménez-Pavón D, Carbonell-Baeza A, Lavie CJ. Physical exercise as therapy to fight against the mental and physical consequences of COVID-19 quarantine: special focus in older people. Prog Cardiovasc Dis 2020;63(3):386–8. https://doi.org/10.1016/j.pcad.2020.03.009.
[7] Moynihan AB, van Tilburg WAP, Igou ER, Wisman A, Donnelly AE, Mulcaire JB. Eaten up by boredom: consuming food to escape awareness of the bored self. Front Psychol 2015:369. https://doi.org/10.3389/fpsyg.2015.00369.
[8] Di Renzo L, Gualtieri P, Pivari F, Soldati L, Attinà A, Cinelli G, et al. Eating habits and lifestyle changes during COVID-19 lockdown: an Italian survey. J Transl Med 2020;18:299. https://doi.org/10.1186/s12967-020-02399-5.
[9] Yılmaz C, Gökmen V. Neuroactive compounds in foods: Occurrence, mechanism and potential health effects. Food Res Int 2020;128:108744. https://doi.org/10.1016/j.foodres.2019.108744.
[10] Rodríguez-Martín BC, Meule A. Food craving: new contributions on its assessment, moderators, and consequences. Front Psychol 2015;6:21. https://doi.org/10.3389/fpsyg.2015.00021.
[11] Jayawardena R, Sooriyaarachchi P, Chourdakis M, Jeewandara C, Ranasinghe P. Enhancing immunity in viral infections, with special emphasis on COVID-19: A review. Diabetes Metab Syndr: Clin Res Rev 2020;14(4):367–82. https://doi.org/10.1016/j.dsx.2020.04.015.
[12] Hanson C, Rutten EP, Wouters EFM, Rennard S. Influence of diet and obesity on COPD development and outcomes. Int J Chron Obstruct Pulmon Dis. 2014;9:723–33. https://doi.org/10.2147/COPD.S50111.
[13] Wu C, Chen X, Cai Y, Xia J, Zhou X, Xu S, et al. Risk factors associated with acute respiratory distress syndrome and death in patients with coronavirus disease 2019 pneumonia in wuhan, China. JAMA Intern Med 2020;180(7):934–43. https://doi.org/10.1001/jamainternmed.2020.0994.
[14] García OP, Long KZ, Rosado JL. Impact of micronutrient deficiencies on obesity. Nutr Rev 2009;67(10):559–72. https://doi.org/10.1111/j.1753-4887.2009.00228.x.
[15] Thurnham DI. Micronutrients and immune function: some recent developments. J Clin Pathol 1997;50(11):887–91. https://doi.org/10.1136/jcp.50.11.887.
[16] Malkawi SH, Almhdawi K, Jaber AF, Alqatarneh NS. COVID-19 quarantine-related mental health symptoms and their correlates among mothers: a cross sectional study. Matern Child Health J 2020:1–11. https://doi.org/10.1007/s10995-020-03034-x.
[17] Alzougool B. Facebook addiction among ordinary users in Jordan. Proc. 5th Eur. Conf. Soc. Media, ECSM 2018 2018:1–8. http://academicbookshop.com.
[18] Liu CH, Zhang E, Wong GTF, Hyun S, Chris Hahm H ". Factors associated with depression, anxiety, and PTSD symptomatology during the COVID-19 pandemic: clinical implications for U.S. young adult mental health. Psychiatr Res 2020;290:113172. https://doi.org/10.1016/j.psychres.2020.113172.

[19] Ajlouni K, Khader Y, Batieha A, Jaddou H, El-Khateeb M. An alarmingly high and increasing prevalence of obesity in Jordan. Epidemiol Health 2020;42: e2020040. https://doi.org/10.4178/epih.e2020040.
[20] Shamieh O, Richardson K, Abdel-Razeq H, Harding R, Sullivan R, Mansour A. COVID-19—impact on DNR orders in the largest cancer center in Jordan. J Pain Symptom Manag 2020;60(2):e87–9. https://doi.org/10.1016/j.jpainsymman.2020.04.023.
[21] Jordan Department of Statistics. Economic. DoS 2020. http://dosweb.dos.gov.jo/economic/.
[22] Caponnetto P, Caponnetto P, Caponnetto P, Inguscio L, Saitta C, Maglia M, et al. Smoking behavior and psychological dynamics during covid-19 social distancing and stay-at-home policies: A survey. Heal Psychol Res 2020;8(1): 9124. https://doi.org/10.4081/HPR.2020.9124.
[23] Alsaleh E, Windle R, Blake H. Behavioural intervention to increase physical activity in adults with coronary heart disease in Jordan. BMC Publ Health 2016;16:643. https://doi.org/10.1186/s12889-016-3313-5.
[24] Obeidat NA, Habashneh MA, Shihab RA, Hawari FI. Are Jordanian primary healthcare practitioners fulfilling their potential in cancer prevention and community health? Findings from a cross-sectional survey. BMJ Open 2017;7(4):e015269. https://doi.org/10.1136/bmjopen-2016-015269.
[25] Al-Domi HA, Faqih A, Jaradat Z, AL-Dalaeen A, Jaradat S, Amarneh B. Physical activity, sedentary behaviors and dietary patterns as risk factors of obesity among jordanian schoolchildren. Diabetes Metab Syndr 2019;13(1):189–94. https://doi.org/10.1016/j.dsx.2018.08.033.
[26] Al-Dalaeen AM, Al-Domi HA. Factors associated with obesity among school children in Amman, Jordan. Malays J Nutr 2017;23:211–8.
[27] Phansopkar PA, Naqvi WM, Sahu AI. COVID-19 pandemic- A curse to the physical well-being of every individual in lock-down. J Evol Med Dent Sci 2020;9(35):2561–6. https://doi.org/10.14260/jemds/2020/556.
[28] Erion JR, Wosiski-Kuhn M, Dey A, Hao S, Davis CL, Pollock NK, et al. Obesity elicits interleukin 1-mediated deficits in hippocampal synaptic plasticity. J Neurosci 2014;34:2618–31. https://doi.org/10.1523/JNEUROSCI.4200-13.2014.
[29] Stookey JD, Allu PKR, Chabas D, Pearce D, Lang F. Hypotheses about sub-optimal hydration in the weeks before coronavirus disease (COVID-19) as a risk factor for dying from COVID-19. Med Hypotheses 2020;144:10237. https://doi.org/10.1016/j.mehy.2020.110237.
[30] Armstrong LE, Johnson EC. Water intake, water balance, and the elusive daily water requirement. Nutrients 2018;10(12):1928. https://doi.org/10.3390/nu10121928.