Association between eating behavior and quarantine/confinement stressors during the Coronavirus disease 2019 outbreak

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Abstract

Background: Quarantine/confinement is an effective measure to face the Coronavirus disease 2019 (COVID-19). Consequently, in response to this stressful situation, people confined to their homes may change their everyday eating behavior. Therefore, the primary objective of this study is to evaluate the association between quarantine/confinement stressors and eating behavior during the COVID-19 outbreak. The secondary objective is to evaluate the association of quarantine/ confinement stressors and eating behavior amongst two groups of participants selected from the population: individuals attending diet clinics and individuals who are not attending diet clinics.

Method: A cross-sectional web-based online survey carried out between April 3 and 18, 2020, enrolled 407 participants from the Lebanese population. Eating Disorder Examination – Questionnaire (EDE-Q) were used to measure the behavioral features of eating disorders.

Results: More than half of the sample (53.0%) abide to the home quarantine/confinement, 95.4% were living with someone in the quarantine/confinement and 39.6% continued to work from home. Using the lower scores as reference group, higher fear of COVID-19 was found in 182 (44.8%) participants, higher boredom in 200 (49.2%) participants, higher anger in 187 (46.3%) and higher anxiety in 197 (48.5%) participants. A greater fear of COVID-19 (Beta=0.02), higher BMI (Beta=0.05), and physical activity (Beta=1.04) were significantly associated with a higher restraint score. Higher anxiety, higher fear of COVID-19, higher BMI, practicing physical exercise and higher number of adults living in the quarantine/confinement were significantly associated with a higher shape and weight concern.

Conclusion: Our results showed that the fear of COVID-19 was correlated with more restraint eating, weight, and shape concern in the whole sample and more specifically in the dietitian clients group. Public health control measures are needed to define factors of eating disorders during the quarantine/confinement period related to the COVID-19 outbreak.

Plain English Summary

In stressful and fearful situation imposed by the Coronavirus disease 2019 (COVID–19) change in everyday eating behavior could occur. A sample of 407 participants divided into two groups one from the general population and the other selected among people attending dietitian clinics were recruited to study the impact of quarantine and confinement stressors and eating behavior during the COVID–19 outbreak. The quantitative analysis revealed that more than half of the sample abide to the home quarantine/confinement and almost half of them had a higher fear of COVID–19. The latter was associated with higher weight and shape concerns among the total sample and more specifically in the dietitian clients group. Public health control measures are needed to define factors of eating disorders during the quarantine/confinement period related to the COVID–19 outbreak, and promote healthy habits to lower the risk of psychological distress.

Background

Quarantine is a strategy imposed by governments to limit and restrict the circulation of individuals who have potentially been in contact with patients contaminated with a contagious disease present in the population [1]. This restriction of movement occurs during the incubation period of the infectious disease in order to monitor any appearance of the disease's symptoms [1]. The practice of quarantine began as early as the 14th century to protect coastal cities from plague epidemics [1]. It was also used during the influenza pandemic in 1918 and the outbreaks of the severe acute respiratory syndrome (SARS) in 2003 and Ebola in 2014 [2–4]. Also, confinement (lock-down) is imposed on healthy individuals to avoid contact with potentially infected people [5].

Currently, quarantine and confinement are the only known effective measures to face the Coronavirus disease 2019 (COVID–19), a novel Severe acute respiratory syndrome coronavirus 2 (SARS-CoV2) virus-related pneumonia. The first cases of COVID–19 were detected on November 17, in Wuhan, a city in the Hubei province in China, where the outbreak was first identified [6]. COVID–19 contamination can occur from person-to-person contact via droplets or contaminated surfaces [7]. The symptoms of COVID–19 could vary from asymptomatic to mild and severe symptoms (respiratory complications), leading to death [7]. After spreading to several countries, mainly Europe, the World Health Organization (WHO) declared COVID–19 as a pandemic on March 12, 2020, with more than 20,000 confirmed cases and almost 1000 deaths among Europeans [8]. As a result, a third of the world population adopted the lockdown strategy to face the propagation of the virus and limit the catastrophic effect of its contagious spread, in the absence of an effective vaccine.

Confinement imposes a drastic lifestyle change; this prolonged period of physical distancing between individuals and their loved ones increases psychological discomfort and feeling of isolation [9]. Additionally, mass confinement increases anxiety and spreads fear among the population [10]. People in lockdown might be facing psychological rather than physical distress. Boredom, fear of infection, financial issues, and lack of supplies are now serious health factors that may lead to troubled unusual psychological behavior [11]. Thus, this pandemic is strongly impacting the financial and economic status because of the prolonged lockdown[12].

In Lebanon, a developing Middle Eastern country, the first COVID–19 case was detected on February 21, 2020. On March 15, the government announced a public health emergency and a national lockdown. On March 1, 13 cases of COVID–19 were confirmed, and ten days later, the first death due to COVID–19 was recorded. By the end of March, the official numbers reported 446 confirmed cases and 11 deaths. These numbers increased to reach a total of 704 cumulative cases and 24 deaths by April 26, 2020 [13]. Furthermore, the risk of psychological distress seems higher than in other countries, and confinement measures seem to be more difficult to endure. In fact, Lebanon is in a double-edged fight against both COVID–19 and an unprecedented financial crisis that started months prior to the pandemic.

The Lebanese population may be divided into two groups: some are privileged with financial stability and the ability to stock up on food while others are struggling to buy supplies or have lost their jobs. Moreover, the forceful cessation of daily activities (such as attending school or university classes, and working in an office environment, as well as constraining physical activity, for instance, the inability to practice a favorite sport) may all increase anxiety and establish anger [14]. Moreover, stress during this period may also be due to the fear of being infected, as well as the panic generated by the idea of being asymptomatic, unknowingly contaminating vulnerable people [15], sometimes loved ones. These anxious feelings are manifested by the avoidance of contact with family members, neighbors, or any other members of society. People may start to fear going out from home for necessary activities, such as buying groceries, seeking medical treatment for a problem unrelated to COVID–19, or

even getting medications. This restricted mobility leads to the incapacity of accessing desired healthy food, thus disrupting eating habits and affecting dietary intakes. Besides, panic buying of certain food products is generating item shortage that results in the incapacity of affording food preferences.

People confined to their homes may, consequently, attempt to change their everyday eating behavior due to the quarantine/confinement [16]. Humans are generally sociable, and this period of social isolation may put them under pressure psychologically, causing some of them to eat more in quantity or frequency as a mechanism to cope with growing fear and anxiety [16]. Stressful and fearful situations are associated with a variety of behavioral responses, with conflicting coping strategies, such as overeating or under eating [17]. Some individuals tend to overeat in response to emotional triggers, which leads to more concerns and self-evaluation of body weight or shape [18]. During confinement, people tend to eat as they are not aware of their actual body weight and shape; they are rather busy with food, which leads to changes in dieting behaviors, and thus a higher disturbance in body weight [19]. Evidence suggests that the majority of people tend to change their eating behavior when they believe themselves to be stressed. About 80% of people alter their caloric intake by either increasing or decreasing their consumption [20]. Indeed, bored people are likely to eat more than in a controlled state [21]; studies have shown that normal weight and overweight people reported eating more when they are lonely or bored [22].

All these factors, namely, social isolation, fear, anxiety, feelings of loneliness and boredom, have shown to influence eating behavior. Thus, understanding their impact on shape and weight may help predict better outcomes during this critical period. Therefore, the primary objective of this study is to evaluate the association between quarantine and confinement stressors and eating behavior during the COVID-19 outbreak. The secondary objective of this study is to evaluate the association of quarantine/confinement stressors and eating behavior amongst two groups of participants, namely those who are attending diet clinics and individuals who are not attending diet clinics (general population).

Methods

Study design and sampling

A cross-sectional web-based online survey carried out between April 3 and 18, 2020, enrolled 407 participants. Two groups of participants were included in the study: the first group consisted of participants selected from the general population, and the second group consisted of persons randomly selected among people attending dietitian clinics. The latter group are expected to have more weight and eating behaviors related problems.

The questionnaire was distributed via social media (WhatsApp, Facebook, Instagram...), using a snowball technique for the general population group. For clinics attendees, they were randomly selected from the dieticians list; questionnaires were sent by e-mail to targeted participants. The list was retrieved from the Lebanese Academy for Nutrition and Dietetics website [23].

All people over the age of 18 with internet access were eligible. Out of the 1000 persons contacted, 407 responded, resulting in a response rate of 40.7%. The questionnaire required approximately 20 minutes to complete. The anonymity of the participants was guaranteed during the data collection process (de-identification before data entry and analysis).

Procedure

The online survey consisted of a link to an internet-based questionnaire on Google forms with closed-ended questions in English and Arabic. Data from completed forms were imported into a Microsoft Excel spreadsheet and analyzed using the SPSS software, version 25.

Questionnaire

The questionnaire consisted of two parts. The first part assessed the socio-demographic details of the participants (age, gender, marital status, educational level, employment status, region, and current value of monthly income, divided into four levels: no income, low income <1,000 USD, intermediate income 1,000–2,000 USD, and high income >2,000 USD), and their Body Mass Index (BMI).

The BMI was calculated by dividing self-reported weight (in Kg) by height (in m²). Participants were then classified into four categories, according to their BMI: underweight (<18.5 kg/m²), normal (18.5–24.9 kg/m²), overweight (25.0–29.9 kg/m²), and obese (≥30.0 kg/m²) [24]. Due to the quarantine situation, the height and weight were estimated by the person itself.

The second part of the questionnaire consisted of a set of nine questions related to stressors of quarantine and confinement, in addition to various scales:

Quarantine and confinement stressors

Under this category, a set of nine questions defining the stressors of quarantine/confinement were retrieved from previous articles [25, 26]. The questions were about “Closed and prolonged coexistence with the family member”, “Financial difficulty due to quarantine/confinement”, “Difficulty buying the desired foods and products”, “Constant sense of insecurity for oneself and loved ones”, “Physical exercise practice during quarantine/confinement”, and “Lack of physical contact with friends”. Additionally, questions regarding the length of quarantine/confinement in days and the numbers of adults and children living in the same house during quarantine/confinement were also asked.

Current Fear of COVID–19

Ten questions selected from previous studies were used to assess the current fear of COVID–19 in people [27–30]. Examples of the asked questions: “Thinking about COVID–19 makes me feel anxious”, “I feel tense when I think about the threat of COVID–19”, and “I feel quite anxious about the possibility of another outbreak of COVID–19”. All items were measured on a 5-point Likert scale, from 1 (not at all) to 5 (extremely). The total score ranged from 10 to 50. High scores indicated a greater fear of COVID–19 infection. In this study, the Cronbach’s alpha value was 0.917.

By the time our data collection was completed, a study validating a fear of the COVID–19 scale was published [31], and thus could not be used in this paper.

Short Boredom Proneness Scale (SBPS)

The SBPS is a self-report questionnaire consisting of eight items rated on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) [32]. The total score ranged from 8 to 56. Higher scores indicated a greater tendency to boredom [32]. Permission to use the scale for the current article was obtained from the author of the questionnaire (Pr.James Danckert). In this study, the Cronbach's alpha value was 0.912.

Lebanese Anxiety Scale (LAS)

This 10-item self-report scale, recently developed and validated in Lebanon, was created to screen for anxiety [33]. Seven of the items are graded on a 5-point Likert scale (0 = Not present to 4 = very severe) and the remaining three, on 4-point Likert scale (1 = almost never to 4 = almost always) [33]. The total score was obtained by summing all the responses, with higher scores indicating higher anxiety [33]. In this study, the Cronbach's alpha value was 0.884.

Anger subscale of the Buss-Perry Scale

The Buss-Perry Scale is a 29-item questionnaire composed of four factors that measure physical and verbal aggression, anger, and hostility [34]. In this study, the anger subscale (8 items) was used and was graded on a 5-point Likert scale from 1 (extremely uncharacteristic of me) to 5 (extremely characteristic of me) [34]. The total score was calculated by summing all the responses, with higher scores indicating a higher anger score. In this study, the Cronbach's alpha value was 0.865.

Eating Disorder Examination Questionnaire (EDE-Q)

The Eating Disorder Examination-Questionnaire (EDE-Q) is a 28-item self-reported tool measuring the range and severity of behavioral features of eating disorders [35, 36]. It is rated using four subscales and a global score. The four subscales are restraint, eating concern, shape concern, and weight concern, and reflect the severity of eating disorders. All items are scored on a 7-point rating scale (0–6), higher scores indicating greater levels of symptomatology [36]. In this study, the Cronbach's alpha values of the four subscales were as follows: restraint subscale (Cronbach's alpha = 0.835), eating concern (Cronbach's alpha = 0.745), shape concern (Cronbach's alpha = 0.902), and weight concern (Cronbach's alpha = 0.824).

Translation procedure

A forward and backward translation was conducted for all the scales except for the LAS–10 already available in Arabic. One translator was in charge of translating the scales from English to Arabic, and a second one performed the back translation. Discrepancies between the original English version and the translated one were resolved by consensus.

Statistical analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS software version 25). A descriptive analysis was done using the counts and percentages for categorical variables and mean and standard deviation for continuous measures. Pearson correlation analyses were used for continuous variables, and Student t-test and

ANOVA F tests for categorical variables with two or more levels, to assess the association of variables with the continuous scales.

Stepwise linear regressions were conducted, taking the fear of COVID–19 scale, anxiety, anger, and the four EDE subscales as the dependent variables. All variables that showed a $p < 0.1$ in the bivariate analysis were taken as independent variables in the final model. Afterwards, other four stepwise linear regressions taking the EDE subscales as the dependent variable but stratified over the two groups of participants were conducted (stratification analysis). A value of $p < 0.05$ was considered significant. The reliability of the scales was assessed using Cronbach's alpha.

Results

Sample description

The sociodemographic characteristics of the participants are summarized in Table 1. The results showed that the mean age of the participants was 30.59 ± 10.10 years, with 51.3% females. The majority (90.9%) had a university level of education and were single (75.0%). More than half of the participants (56.6%) were employed, reported having a low monthly income (51.4%), resided in Mont Lebanon region (58.6%), and lived in cities (60.1%). The mean BMI of the participants during the quarantine/confinement was 25.08 ± 4.44 Kg/m². Only 10 participants were underweight (2.5%), 218 (53.8%) had normal weight, 124 (30.8%) were overweight, and 52 (12.9%) were obese.

Table 1: Sociodemographic characteristics of the participants (N=407)		
	Frequency	Percentage
Age in years		
Less than 24	130	32.0%
24 – 28	89	21.8%
28 – 35	91	22.4%
Over than 35	97	23.8%
Gender		
Male	198	48.7%
Female	209	51.3%
Marital status		
Single	305	75.0%
Married	102	25.0%
Education level		
University level	370	90.9%
Secondary level and below	37	9.1%
Household monthly income		
No income	127	31.0%
Lower than 1000\$	83	20.4%
1000-2000	118	29.1%
Higher than 2000	79	19.3%
Employment status		
Employed	230	56.6%
Unemployed	177	43.4%
Region of residence		
Mont Lebanon	238	58.6%
Beirut	35	8.6%
North	71	17.5%
South	27	6.8%
Bekaa	36	8.6%
Living place		
Rural	162	39.9%
Urban	245	60.1%
	Mean	SD
BMI (Kg/m²)	25.08	4.44

Quarantine and confinement stressors

Table 2 describes the quarantine/confinement situation and stressors among the participants. The results showed that more than half of the sample (53.0%) abides by the home quarantine/confinement, 95.4% were living with someone in the quarantine/confinement, and 39.6% continued to work from home. The majority of the participants (80.4%) had a closed and prolonged coexistence with the family members, 34.5% were facing financial problems, and 28% experienced difficulties in buying desired foods and products. As for physical activity, 58.9% of the participants indicated that they were exercising during quarantine/confinement. Lack of physical

contact with friends was expressed by 46.5% of the participants, and 42.8% reported a constant sense of insecurity. The mean values of length (in days) of quarantine/confinement, fear of the COVID–19, and Short Boredom Proneness were 26.05 ± 10.69 , 28.49 ± 9.19 , and 24.12 ± 11.79 , respectively. In the absence of cut-off values for fear of the COVID–19 scale, boredom scale, anger subscale, and anxiety scale, the median was considered as a cut-off point. Higher fear of COVID–19 was found in 182 (44.8%) participants, higher boredom in 200 (49.2%) participants, higher anger in 187 (46.3%), and higher anxiety in 197 (48.5%) participants.

Table 2: Description of the quarantine/confinement situation and stressors among the participants (N=407)		
	Frequency	Percentage
Quarantine/confinement stressors		
Closed and prolonged coexistence with the family		
Yes	327	80.4%
No	80	19.6%
Financial difficulty due to the quarantine/confinement		
Yes	140	34.5%
No	267	65.5%
Difficulty buying the desired food and products		
Yes	114	28.0%
No	293	72.0%
Lack of physical contact with friends		
Most of the time	189	46.5%
Some of the time	22	5.4%
Rarely	58	14.4%
Never	137	33.7%
Constant sense of insecurity for themselves and loved ones		
Yes	174	42.8%
No	233	57.2%
Physical exercise practice during quarantine/confinement		
Yes	240	58.9%
No	167	41.1%
	Mean	SD
Fear of COVID-19 scale	28.49	9.19
Short Boredom Proneness scale	24.12	11.79
Length of quarantine/confinement in days	26.05	10.69
Number of adults living in the quarantine/confinement	3.21	1.30
Number of children living in the quarantine/confinement	0.54	0.96

Bivariate analysis: correlates of anxiety and anger

In the total sample, a significantly higher mean anxiety score was found in participants with financial problems, those who had difficulty in buying desired foods, and those who had a constant sense of insecurity for themselves and their loved ones. Moreover, high anxiety was significantly associated with greater fear of COVID–19, higher boredom, and longer duration of quarantine/confinement. Also, a significantly higher mean anger scale was found in participants who had difficulty in buying desired foods, and those who had a constant sense of

insecurity for themselves and their loved ones. Also, higher anger was significantly associated with greater fear of COVID-19, higher boredom, and longer duration of quarantine/confinement (table 3).

Table 3: Bivariate analysis between the association of quarantine/confinement stressors and anxiety and anger scales in the total sample.				
	Anxiety scale (LAS - 10)		Anger scale	
	Mean $\pm$ SD	p - value	Mean $\pm$ SD	p-value
Groups of participants				
Participants from the general population group	14.44 $\pm$ 7.52	0.157	18.83 $\pm$ 5.53	0.468
Dietitian clients group	13.34 $\pm$ 8.02		18.38 $\pm$ 6.56	
Closed and prolonged coexistence with the family				
Yes	14.27 $\pm$ 7.80	0.572	18.78 $\pm$ 5.89	0.556
No	14.85 $\pm$ 8.33		19.23 $\pm$ 6.29	
Financial difficulty due to quarantine/confinement				
Yes	16.69 $\pm$ 8.19	<0.001	19.28 $\pm$ 5.97	0.305
No	13.15 $\pm$ 7.45		18.64 $\pm$ 5.95	
Difficulty buying desired food and products				
Yes	16.48 $\pm$ 8.53	0.001	20.18 $\pm$ 6.30	0.003
No	13.49 $\pm$ 7.44		18.30 $\pm$ 5.73	
Lack of physical contact with friends				
Most of the time	14.79 $\pm$ 8.09	0.331	19.13 $\pm$ 5.62	0.082
Some of the time	13.17 $\pm$ 6.21		21.32 $\pm$ 6.02	
Rarely	15.41 $\pm$ 6.75		18.86 $\pm$ 5.78	
Never	13.54 $\pm$ 8.20		18.03 $\pm$ 6.43	
Constant sense of insecurity for themselves and loved ones				
Yes	17.59 $\pm$ 8.21	<0.001	19.99 $\pm$ 5.88	0.001
No	12.05 $\pm$ 6.77		18.04 $\pm$ 5.89	
Physical exercise practice during quarantine/confinement				
Yes	13.96 $\pm$ 7.58	0.202	18.76 $\pm$ 5.83	0.694
No	14.98 $\pm$ 8.30		19.00 $\pm$ 6.15	
	Correlation coefficient		Correlation coefficient	
Length of quarantine/confinement in days	0.138	0.005	0.123	0.013
Number of adults living in the quarantine/ confinement	0.022	0.651	-0.001	0.991
Number of children living in the quarantine/ confinement	-0.068	0.167	-0.093	0.060
Fear of COVID-19 scale	0.381	<0.001	0.270	<0.001
Short Boredom Proneness scale	0.527	<0.001	0.419	<0.001
p-value marked in bold are significant (Less than 0.05)				

Bivariate analysis: Correlates of eating behaviors

In the total sample, a higher restraint mean score was significantly associated with the practice of physical activity during quarantine/confinement and greater fear of COVID-19. A significantly higher eating concern mean score was found in dietitian clients' group participants, those who have financial problems, those who had difficulty buying desired foods and products, those who had a constant sense of insecurity, and those who practiced physical activity during the quarantine/confinement. Also, higher fear of COVID-19, boredom, anxiety,

and anger were significantly associated with higher eating concern score. A significantly higher shape concern mean score scale was found in dietitian clients' group participants, those who had financial problems, those who had difficulty buying desired foods and products, a constant sense of insecurity, lack of contact with friends, and those who practiced physical activity during quarantine/confinement. Also, higher shape concern was significantly associated with longer duration of quarantine/confinement, a higher number of adults living together in quarantine/confinement, greater fear of COVID–19, and higher boredom, anxiety, and anger. A significantly higher weight concern mean score was found in in dietitian clients' group participants, those who had financial problems, a constant sense of insecurity, lack of contact with friends, and those who practiced physical activity during quarantine/confinement. Also, higher weight concern was significantly associated with longer duration of quarantine/confinement, a higher number of adults living together in quarantine/confinement, fear of COVID–19, boredom, anxiety, and anger (Table 4).

Table 4: Bivariate analysis taking the eating behaviors as the dependent variables in the total sample.								
	EDE restraint subscale		EDE eating concern subscale		EDE shape concern subscale		EDE weight concern subscale	
	M ± SD	p - value	M ± SD	p- value	M ± SD	p- value	M ± SD	p-value
Groups of participants								
Participants from the general population group	1.13 ± 1.42	0.051	0.83 ± 1.12	<0.001	1.45 ± 1.46	<0.001	1.13 ± 1.38	<0.001
Dietitian clients group	1.45 ± 1.74		1.30 ± 1.28		2.09 ± 1.78		1.78 ± 1.62	
Closed and prolonged coexistence with the family								
Yes	1.32 ± 1.59	0.636	1.16 ± 1.31	0.565	1.90 ± 1.75	0.610	1.60 ± 1.70	0.891
No	1.42 ± 1.62		1.26 ± 1.36		2.01 ± 1.78		1.63 ± 1.53	
Financial difficulty due to quarantine/confinement								
Yes	1.54 ± 1.70	0.076	1.44 ± 1.44	0.005	2.25 ±1.98	0.009	1.90 ±1.86	0.015
No	1.23 ± 1.52		1.04 ± 1.23		1.74 ±1.60		1.45 ±1.54	
Difficulty buying desired food								
Yes	1.47 ± 1.84	0.309	1.46 ± 1.55	0.010	2.21 ±1.94	0.042	1.84 ±1.86	0.080
No	1.28 ± 1.48		1.06 ± 1.19		1.80 ±1.66		1.51 ±1.58	
Lack of physical contact with friends								
Most of the time	1.55 ± 1.67	0.058	1.28 ± 1.48	0.058	2.21 ±1.88	0.001*	1.88 ±1.82	<0.001*
Some of the time	1.07 ± 1.42		1.26 ± 1.28		2.24 ±1.53		1.95 ±1.44	
Rarely	1.21 ± 1.57		1.36 ± 1.26		1.86 ±1.57		1.59 ±1.54	
Never	1.11 ± 1.48		0.92 ± 1.02		1.43 ±1.56		1.12 ±1.40	
Constant sense of insecurity for themselves and loved ones								
Yes	1.49 ± 1.67	0.101	1.58 ± 1.60	<0.001	2.39 ±1.99	<0.001	2.01 ±1.93	<0.001
No	1.23 ± 1.53		0.88 ± 0.97		1.58 ±1.47		1.32 ±1.39	
Physical exercise practice during quarantine/confinement								
Yes	1.68 ± 1.70	<0.001	1.31 ± 1.40	0.011	2.06 ±1.76	0.045	1.76 ±1.68	0.021
No	0.84 ± 1.26		0.99 ± 1.16		1.71 ±1.73		1.38 ±1.63	
	Correlation coefficient	p- value	Correlation coefficient	p- value	Correlation coefficient	p- value	Correlation coefficient	p-value
Length of quarantine/confinement in days	0.073	0.142	0.080	0.106	0.109	0.027	0.113	0.023
Number of adults living in the quarantine/confinement	0.069	0.164	0.086	0.083	0.108	0.028	0.106	0.032
Number of children living in the quarantine/confinement	0.013	0.789	0.014	0.773	-0.029	0.556	-0.043	0.387
Fear of COVID-19 scale	0.120	0.015	0.237	<0.001	0.246	<0.001	0.192	<0.001
Short Boredom Proneness scale	0.035	0.484	0.254	<0.001	0.253	<0.001	0.250	<0.001
Anxiety scale	0.064	0.194	0.357	<0.001	0.332	<0.001	0.304	<0.001
Anger scale	0.044	0.373	0.191	<0.001	0.202	<0.001	0.186	<0.001
*Bonferroni post-hoc analysis: Association between lack of physical contact with friends and shape concern subscale: Most of the time vs. some of the time p=1.000, most of the time vs. rarely p=1.000, most of the time vs. never p<0.001, some of the time vs. rarely p=1.000, some of the time vs. never p=0.231, rarely vs. never p=0.773. Association between lack of physical contact with friends and weight concern subscale: Most of the time vs. some of the time p=1.000, most of the time vs. rarely p=1.000, most of the time vs. never p<0.001, some of the time vs. rarely p=1.000, some of the time vs. never p=0.152, rarely vs. never p=0.475. p-value marked in bold are significant (Less than 0.05)								

Multivariable analysis

The results of a first linear regression, taking the fear of COVID-19 score as the dependent variable and the sociodemographic features as independent variables, showed that being married (Beta = 4.03) was significantly associated with a higher fear of COVID-19 score, whereas older age (Beta = -0.22) was significantly associated with a lower fear of COVID-19 score (Table 6, Model 1).

A second linear regression, taking the anxiety scale as the dependent variable showed that a higher anxiety score was significantly associated with a constant sense of insecurity (Beta = 3.07), financial problems (Beta = 1.91), greater fear of COVID-19 (Beta = 0.13), and higher boredom (Beta = 0.27) (Table 6, Model 2).

A third linear regression, taking the anger scale as the dependent variable, showed that a higher anger higher score was significantly associated with greater fear of COVID-19 (Beta = 0.10) and higher boredom (Beta = 0.15). However, older age was significantly associated with a lower anger score (Beta = -0.11) (Table 6, Model 3).

A fourth linear regression, taking the restraint scale as the dependent variable, showed that a higher restraint score was significantly associated with greater fear of COVID-19 (Beta = 0.02), higher BMI (Beta = 0.05), and physical activity (Beta = 1.04) (Table 6, Model 4).

A fifth linear regression, taking the eating concern scale as the dependent variable, showed that a higher eating concern score was significantly associated with female gender (Beta = 0.52), higher anxiety (Beta = 0.04), higher BMI (Beta = 0.06), a constant sense of insecurity (Beta = 0.41), and physical activity (Beta = 0.43) (Table 6, Model 5).

A sixth linear regression, taking the shape concern scale as the dependent variable, showed that higher shape concern score was significantly associated with female gender (Beta = 0.63), higher anxiety (Beta = 0.05), greater fear of COVID-19 (Beta = 0.03), higher BMI (Beta = 0.14), physical activity (Beta = 0.50), and a higher number of adults living together in the quarantine/confinement (Beta = 0.13). However, a lower shape concern score was significantly associated with older age (Beta = -0.02), university education level (Beta = -0.55), and physical contact with friends (Beta = -0.46) (Table 6, Model 6).

A seventh linear regression, taking the weight concern scale as the dependent variable, showed that a higher weight concern score was significantly associated with female gender (Beta = 0.63), higher anxiety (Beta = 0.03), greater fear of COVID-19 (Beta = 0.02), higher BMI (beta = 0.14), higher boredom (Beta = 0.02), physical exercise (Beta = 0.61), and a higher number of adults living together in the quarantine/confinement (Beta = 0.17). However, physical contact with friends was significantly associated with a lower weight concern score (Beta = -0.46) (Table 6, Model 7).

Table 6: Multivariable analysis in the total sample					
Model 1: Linear regression variable taking the 'Fear of COVID-19' as the dependent variable and the sociodemographic characteristics as the independent variables.					
Variable	Unstandardized Beta	Standardized Beta	P	95% Confidence Interval	
Age in years	-0.22	-0.25	<0.001	-0.33	-0.12
Married vs. single*	4.03	0.19	0.001	1.58	6.48
<u>Variables entered in the models:</u> Age, gender, marital status and education level.					
Model 2: Linear regression variable taking the 'Anxiety' as the dependent variable and the quarantine/confinement stressors as the independent variables.					
Variable	Unstandardized Beta	Standardized Beta	P	95% Confidence Interval	
Short Boredom Proneness scale	0.27	0.41	<0.001	0.21	0.32
Constant sense of insecurity for themselves and loved ones	3.07	0.19	<0.001	1.71	4.42
Fear of COVID-19 scale	0.13	0.16	<0.001	0.06	0.21
Financial difficulty due to quarantine/confinement	1.91	0.11	0.004	0.61	3.22
<u>Variables entered in the models:</u> Age, gender, marital status, education level, length of quarantine/confinement in days, fear of COVID-19 scale, short boredom proneness scale, financial difficulty due to the quarantine/confinement, difficulty buying desired food and products and constant sense of insecurity for themselves and loved ones.					
Model 3: Linear regression variable taking the 'Anger scale' as the dependent variable and the quarantine/confinement stressors as the independent variables.					
Variable	Unstandardized Beta	Standardized Beta	P	95% Confidence Interval	
Short Boredom Proneness scale	0.15	0.30	<0.001	0.10	0.19
Age in years	-0.11	-0.19	<0.001	-0.17	-0.06
Fear of COVID-19 scale	0.10	0.15	0.001	0.04	0.16
<u>Variables entered in the models:</u> Age, gender, marital status, education level, length of quarantine/confinement in days, fear of COVID-19 scale, short boredom proneness scale, difficulty buying desired food and products and constant sense of insecurity for themselves and loved ones.					
Model 4: Linear regression variable taking the 'EDE-Restraint subscale' as the dependent variable and the quarantine/confinement stressors, anger and anxiety as the independent variables.					
Variable	Unstandardized Beta	Standardized Beta	P	95% Confidence Interval	
Physical exercise during quarantine/confinement	1.04	0.32	<0.001	0.74	1.35
Fear of COVID-19 scale	0.02	0.16	0.001	0.01	0.04
BMI (kg/m ²)	0.05	0.15	0.002	0.02	0.09
<u>Variables entered in the models:</u> Age, gender, marital status, education level, BMI, fear of COVID-19 scale, short boredom proneness scale, anxiety scale, anger scale, financial difficulty due to the quarantine/confinement and physical exercise during quarantine/confinement.					
Model 5: Linear regression variable taking the 'EDE- Eating Concern subscale' as the dependent variable and the quarantine/confinement stressors, anger and anxiety as the independent variables.					
Variable	Unstandardized Beta	Standardized Beta	P	95% Confidence Interval	
Anxiety	0.04	0.28	<0.001	0.03	0.06
Gender (male* vs. female)	0.52	0.21	<0.001	0.30	0.74
BMI (kg/m ²)	0.06	0.25	<0.001	0.04	0.09
Physical exercise during quarantine/confinement	0.43	0.17	<0.001	0.20	0.65

Constant sense of insecurity for oneself and loved ones	0.41	0.16	0.001	0.18	0.65
<u>Variables entered in the models:</u> Age, gender, marital status, education level, BMI, fear of COVID-19 scale, short boredom proneness scale, anxiety scale, anger scale, constant sense of insecurity for themselves and loved ones, financial difficulty due to the quarantine/confinement and physical exercise during quarantine/confinement.					
Model 6: Linear regression variable taking the ‘EDE- Shape Concern subscale’ as the dependent variable and the quarantine/confinement stressors, anger and anxiety as the independent variables.					
Variable	Unstandardized Beta	Standardized Beta	P	95% Confidence Interval	
Anxiety	0.05	0.23	<0.001	0.03	0.07
BMI (kg/m ²)	0.14	0.39	<0.001	0.11	0.18
Gender (male* vs. female)	0.63	0.19	<0.001	0.35	0.91
Fear of COVID-19 scale	0.03	0.20	<0.001	0.02	0.05
Age	-0.02	-0.16	0.001	-0.04	-0.01
Physical exercise during quarantine/confinement	0.50	0.15	0.001	0.21	0.79
Presence of physical contact with friends	-0.46	-0.13	0.002	-0.76	-0.16
Number of adults living in the quarantine/confinement	0.13	0.10	0.019	0.02	0.23
University education level	-0.55	-0.09	0.046	-1.08	-0.01
<u>Variables entered in the models:</u> Age, gender, marital status, education level, BMI, length of quarantine/confinement in days, number of adults living in the quarantine/confinement, fear of COVID-19 scale, short boredom proneness scale, anxiety scale, anger scale, constant sense of insecurity for themselves and loved ones, financial difficulty due to the quarantine/confinement, difficulty buying the desired food and products, presence of physical contact with friends and physical exercise during quarantine/confinement.					
Model 7: Linear regression variable taking the ‘EDE- Weight Concern subscale’ as the dependent variable and the quarantine/confinement stressors, anger and anxiety as the independent variables.					
Variable	Unstandardized Beta	Standardized Beta	P	95% Confidence Interval	
Anxiety	0.03	0.19	<0.001	0.01	0.05
BMI (Kg/m ²)	0.14	0.41	<0.001	0.11	0.17
Gender (male* vs. female)	0.63	0.20	<0.001	0.37	0.89
Physical exercise during quarantine/confinement	0.61	0.19	<0.001	0.35	0.88
Short Boredom Proneness scale	0.02	0.15	0.002	0.008	0.03
Number of adults living in the quarantine/confinement	0.17	0.15	<0.001	0.07	0.27
Presence of physical contact with friends	-0.46	-0.14	0.001	-0.73	-0.19
Fear of COVID-19 scale	0.02	0.12	0.008	0.005	0.03
<u>Variables entered in the models:</u> Age, gender, marital status, education level, BMI, length of quarantine/confinement in days, number of adults living in the quarantine/confinement, fear of COVID-19 scale, short boredom proneness scale, anxiety scale, anger scale, constant sense of insecurity for themselves and loved ones, financial difficulty due to the quarantine/confinement, difficulty buying the desired food and products, presence of physical contact with friends and physical exercise during quarantine/confinement.					
*Reference group					

Stratification over the two group of participants

A stratification analysis was performed over the two groups of participants: the first group selected from the general population and the second group selected from dietitian clients.

The first linear regression analysis in which the restraint subscale was taken as the dependent variable, showed that being a female (Beta = 0.42) was significantly associated with higher restraint score in participants selected from the general population group. Higher fear of COVID-19 (Beta = 0.06) was significantly associated with higher restraint score, whereas higher boredom (Beta = -0.03) was significantly associated with lower restraint score in the dietitian clients group. Higher physical activity was significantly associated with higher restraint score in both groups (Table 7, model 1).

A second linear regression analysis in which the shape concern subscale was taken as the dependent variable, showed that higher anxiety (Beta = 0.05) was significantly associated with higher shape concern score, whereas a presence of physical contact with friends (Beta = -0.86) and university education level (Beta = -0.81) were significantly associated with lower shape concern score in participants selected from the general population group. Higher fear of COVID-19 (Beta = 0.06), higher boredom (Beta = 0.03), higher number of adults living in the quarantine (Beta = 0.26), higher BMI (Beta = 0.09) and higher physical activity (Beta = 0.68) were significantly associated with higher shape concern score in the dietitian clients group. Being a female was significantly associated with higher shape concern score in both groups (Table 7, model 2).

A third linear regression analysis in which the weight concern subscale was taken as the dependent variable, showed that a presence of physical contact with a friend (Beta = -0.71) was significantly associated with lower weight concern score in participants selected from the general population group. Higher fear of covid-19 (Beta = 0.05) and higher number of adults living in the quarantine (Beta = 0.27) were significantly associated with higher weight concern score in the dietitian clients group. Being a female, higher physical activity, higher boredom and higher BMI were significantly associated with higher weight concern score in both groups (Table 7, model 3).

A four linear regression analysis in which the eating concern subscale was taken as the dependent variable, showed that being a female (Beta = 0.69) and higher BMI (Beta = 0.08) were significantly associated with higher eating concern score in participants selected from the general population group. Higher fear of COVID-19 (Beta = 0.03), higher physical activity (Beta = 0.76) and constant sense of insecurity for themselves and loved ones (Beta = 0.57) were significantly associated with higher eating concern score in the dietitian clients group. Higher anxiety (Beta = 0.02) was significantly associated with higher eating concern score in both groups (Table 7, model 4).

Table 7: Stratification over the two groups of participants.								
Model 1: Linear regression taking the “restraint subscale” as the dependent variable								
	Group selected from the general population (N=228 (56.3%))				Group selected from the dietitian clients (N=177 (43.7%))			
Predictor factors	Beta	95 % CI		p-value	Beta	95 % CI		p-value
Physical exercise during quarantine/confinement	0.736	0.354	1.118	<0.001	1.394	0.903	1.886	<0.001
Gender (Male* vs. female)	0.421	0.013	0.829	0.043	0.210	0.373	-0.254	0.674
Fear of COVID-19 scale	.006	-.018	.030	.615	0.062	0.036	0.087	<0.001
Short Boredom Proneness scale	.005	-.016	.026	.637	-0.038	-0.062	-0.015	0.001
Model 2: Linear regression taking the “shape concern subscale” as the dependent variable								
Anxiety scale	0.057	0.034	0.081	<0.001	0.025	-0.008	0.058	0.136
Presence of physical contact with friends	-0.863	-1.254	-0.472	<0.001	0.165	-0.295	0.625	0.479
Number of adults living in the quarantine/confinement	0.115	-0.037	0.266	0.137	0.265	0.102	0.427	0.002
Fear of COVID-19 scale	0.006	-0.018	0.029	0.648	0.068	0.044	0.092	<0.001
Short Boredom Proneness scale	0.013	-0.007	0.033	0.215	0.037	0.017	0.058	<0.001
Gender (Male* vs. female)	0.558	0.162	0.955	0.006	0.569	0.122	1.015	0.013
Education level (university vs. secondary and lower*)	-0.817	-1.628	-0.006	0.048	-0.123	-0.935	0.689	0.765
Physical exercise during quarantine/confinement	0.382	-0.005	0.769	0.053	0.681	0.228	1.135	0.003
BMI (Kg/m ²)	0.084	-0.017	0.185	0.101	0.097	0.031	0.162	0.004
Model 3: Linear regression taking the “weight concern subscale” as the dependent variable.								
Presence of physical contact with friends	-0.716	-1.094	-0.338	<0.001	0.018	-0.405	0.440	0.934
Gender (Male* vs. female)	0.609	0.232	0.986	0.002	0.525	0.102	0.949	0.015
Physical exercise during quarantine/confinement	0.435	0.085	0.786	0.015	0.853	0.436	1.270	<0.001
Fear of COVID-19 scale	-0.009	-0.031	0.014	0.454	0.051	0.026	0.076	<0.001
Short Boredom Proneness scale	0.021	0.002	0.040	0.031	0.027	0.006	0.047	0.013
Number of adults living in the quarantine/confinement	0.112	-0.032	0.256	0.126	0.274	0.120	0.428	0.001
BMI (Kg/m ²)	0.115	0.019	0.211	0.019	0.118	0.058	0.178	<0.001
Model 4: Linear regression taking the “eating concern subscale” as the dependent variable								
Anxiety scale	0.035	0.011	0.059	0.005	0.026	0.001	0.051	0.042
Gender (Male* vs. female)	0.694	0.387	1.002	<0.001	0.272	-0.069	0.613	0.117
Constant sense of insecurity for oneself and loved ones	0.211	-0.114	0.536	0.202	0.579	0.191	0.967	0.004
Physical exercise during quarantine/confinement	0.208	-0.093	0.509	0.174	0.767	0.419	1.114	<0.001
Fear of COVID-19 scale	-0.003	-0.021	0.016	0.760	0.033	0.013	0.054	0.002

BMI (Kg/m ²)	0.087	0.007	0.166	0.032	0.012	-0.037	0.061	0.641
Note: values marked in bold were significant								

Discussion

To our knowledge, this is the first study to examine the effect of quarantine/confinement stressors due to COVID-19 on behavioral eating disorders among 407 Lebanese participants from all the Lebanese regions. Our results showed that 44.8% of participants had a higher fear of COVID-19, 48.5% had anxiety, and more than half (53%) of the sample were abiding by home quarantine/confinement. A recent study in Wuhan (510 participants) and Shanghai (501 participants) found a moderate to severe anxiety related to the COVID-19 disease [37]. Another research conducted among 1210 participants from 194 cities in China revealed moderate to severe anxiety symptoms in 28.8%, while 8.1% had moderate to severe stress during the first phase of the COVID-19 outbreak, and most of the respondents abided by home quarantine/confinement (84.7%) [38]. Fear and anxiety during the worldwide pandemic, where cities and even entire countries were locked down, might be overwhelming and stressful for people and cause strong and high distress emotions.

A multivariable analysis evaluated quarantine and confinement stressors associated with eating disorders and showed that greater fear of COVID-19 and boredom were associated with higher anxiety and anger. Additionally, greater fear of COVID-19 and higher anxiety and BMI were related to higher body shape and weight concern.

Fear of COVID-19

Fear of COVID-19 was observed more in married than unmarried people, consistent with other studies; this is probably due to their responsibility toward their family and their great concern for the wellbeing of the family [25, 27, 39]. Our results also showed that higher age was associated with a lower fear of COVID-19. This is in line with previous studies showing that older adults were more likely to have less fear throughout the Severe Acute Respiratory Syndrome (SARS) outbreak and experienced reduced negative emotions as they had different types of coping strategies [40]. Indeed, fear of becoming infected and falling ill decreases with age [41].

Anxiety and Anger

Greater fear of COVID-19 and higher boredom were positively correlated with higher anxiety and anger, consistent with several previous studies showing that anger and anxiety were associated with the fear of getting a disease [27, 42, 43] and boredom [44–46].

Financial problems were positively correlated with anxiety, as also reported in a study revealing that a decrease in income was associated with increased anxiety [47].

Moreover, older age was negatively correlated with anger, in agreement with other studies [48]. Indeed, getting older is associated with a decrease in anger and anxiety and an increase in acceptance and emotional wellbeing [48–50].

Eating behaviors

Greater fear of COVID-19 and higher BMI were significantly associated with higher eating restraint, consistent with results from previous studies showing that dietary restriction is linked to lower psychological health and higher anxiety [51–54]. The stressful situation imposed by the COVID-19 outbreak and the subsequent quarantine affects emotional status, resulting in loss of control and changes in eating behavior [55].

Our findings revealed that anxiety and higher fear of COVID-19 increase body shape and weight concerns, in agreement with previous results showing that anxiety and fear co-occur with eating disorders [56–59]. A person with feelings of intense distress might experience severe disturbances in eating behavior, such as an extremely reduced food intake or extreme overeating, which consequently could increase body weight and shape concerns [60].

Our study also showed that higher boredom was related to more weight concerns. Indeed, boredom is a great predictor of eating behavior, independently of other negative emotions [21, 22]. Many people around the world, forced to stay at home and feeling empty, may turn to food as a coping strategy to relieve boredom, stress, and anxiety brought on by fear of the COVID-19 outbreak.

Also, weight and shape concerns increased with the number of individuals in the quarantine/confinement. A higher number of people living together often drives up the demand for food, typically contributing to disrupted eating patterns, which in turn affects the nutritional status.

Also, in our study, higher BMI was related to higher eating, weight, and shape concerns. Similarly, other studies had found that higher BMI is a great predictor of weight and shape concern [61–64].

During stressful times, people might have misperceptions of their weight due to various factors, primarily psychological, such as fear of the virus, anxiety, and extreme stress [65]. Weight misperception, particularly among overweight and obese persons, is related to changes in eating attitudes [66].

The practice of physical activity was related to higher weight and shape concern, similarly to findings of previous research [62, 67–69]. Remaining physically active while staying at home for a prolonged period can pose a significant challenge to the mental and physical health of individuals. Excessive exercise could result in an extreme way to reduce calories and maintain or lose body weight in an attempt to enhance and keep the ideal body shape or weight [70].

When looking at the association between quarantine/confinement stressors and eating behaviors among the dietitian clients group and participants selected from the population group, the results revealed that higher fear of COVID-19 score and higher boredom was associated with higher disturbed eating behavior in the dietitian clients group. At a time of extreme isolation, being trapped indoors and adapting new routines imposed by the coronavirus pandemic, people had difficulty to control their weight due to shortage of food supplies, closure of gyms and the constant proximity to food while stuck at home [26]. These hard times could be even more challenging for those trying to manage their weight [26]. Many people find it difficult to control their weight as they tend to fall back on comfort food to help them cope with the stress of COVID-19 lockdown and social isolation [71]. Turning back to comfort eating is a possible response to the negative emotions associated with stress, fear and boredom [71]. During a time when people are most emotionally vulnerable they tend to lose their ability to control their eating resulting in excessive self-evaluation and worrying about weight gain and weight management

issues [72]. The difference among dietitian clients and non-dietitian clients regarding quarantine/confinement stressors and weight and shape concern should be more clarified in future studies. Also, higher BMI was associated with higher weight and shape concern among the dietitian clients group compared to non-dieticians clients. In fact, different studies showed that overweight/obese participants reported the greatest weight concern [61, 73]. The main difference among these two groups is that dietitian clients admit their body dissatisfaction, their loss of control and their negative mood while others live in state of denial and so they have lower scores of weight and shape concern [74].

Regarding the relation between sociodemographic variables and weight and shape concerns, our results showed that being a female was related to higher body concerns while older age was related to lower body concern. Similar results showed that women were preoccupied with body shape and weight [75–77], always aiming at an ideal slim body and optimal size and shape of the body [78]. Women whose bodies do not conform to the current fashionable images of female beauty may have higher concerns and distress about their bodies as they are vulnerable to societal pressures that contribute to unhealthy eating attitudes [79]. Studies also revealed that eating disorders tended to decrease with older age [64, 80, 81]. Preoccupation with weight and shape is mostly seen among younger people, exposed to higher sociocultural pressures [82]. Physical appearance loses importance with age, while the functionality of the body and health gain in value [83].

Limitations

Although our results are consistent with those of previous research, our study has several limitations. The first is its cross-sectional questionnaire-based design; a longitudinal study would assess better the associations of the quarantine/confinement on eating disorders. Second, the sample may not be representative of the entire population of quarantined/confined people since the actual number of respondents is relatively low. An information bias could exist since the information was self-reported by the participants. A selection bias is also likely since the majority of the respondents were well educated with computer literacy and Internet access, which suggests that the less educated people and those unable to access the internet were not assessed. Furthermore, a self-selection bias may have occurred as people with any eating disorder were more motivated to enroll than other participants. The instrument used to assess the current fear of COVID–19 was derived from several surveys and is not yet validated in the Lebanese context. This study did not include a matched control group of persons who were not quarantined/confined that would have allowed the assessment of possible eating disorder by the community at large as an effect of the COVID–19. Residual confounding bias is also possible, since there could be factors related to eating behaviors that were not measured in this study.

Conclusion

Although quarantine/confinement is essential to reduce the spread of the disease, it generates different negative psychological impacts like fear of infection, anxiety, anger, and boredom. Our results showed that the fear of COVID–19 was correlated with more eating restraint, weight, and shape concern in the whole sample, but more specifically in the dietitian clients group. Public health control measures are needed to define factors of eating disorders during the quarantine/confinement period related to the COVID–19 outbreak, and promote healthy habits to lower the risk of psychological distress. Additional support is warranted to people at increased risk for adverse psychological and social consequences of quarantine/confinement.

List Of Abbreviations

COVID–19: Coronavirus disease 2019, EDE-Q: Eating Disorder Examination—Questionnaire, BMI: Body Mass Index, SARS: severe acute respiratory syndrome, SARS-CoV2: Severe acute respiratory syndrome coronavirus 2, WHO: World Health Organization, USD: United States dollar, SBPS: Short Boredom Proneness Scale, LAS: Lebanese Anxiety Scale, SPSS: Statistical Package for Social Sciences.

Declarations

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Authors' contributions

CH designed the study; CH, MZ and MBK drafted the manuscript; CH and PS carried out the analysis and interpreted the results; PS and HS assisted in drafting and reviewing the manuscript; MAH was responsible for data collection; HS and RH edited the paper for English language. All authors reviewed the final manuscript and gave their consent.

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Availability of data and materials

Data can be made available under reasonable request form the corresponding author.

Ethical Approval

The Psychiatric Hospital of the Cross Ethics and Research Committee approved this study protocol (HPC–012–2020). Online consent was obtained from all participants on the first page of the questionnaire.

Consent for publication

Not applicable.

Competing interests

The authors have nothing to disclose.

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