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Anxiety, anhedonia and food consumption during the COVID-19 quarantine in Chile

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ABSTRACT

The current epidemic of COVID-19 has gained attention and highlighted the need for a better understanding of the population's mental health. Diet has been identified as an environmental determinant of mental health. In this regard, it has been suggested that the consumption of palatable foods represents a strategy to mitigate negative emotions, such as anxiety. This study aimed to evaluate the association between symptoms of anxiety and/or anhedonia to food consumption patterns during the period of COVID-19 quarantine in Chile. We conducted a cross-sectional study with non-randomized sampling via an online survey. A total of 1725 responses were collected. Each person self-answered the Beck Anxiety Inventory, Snaith-Hamilton Pleasure Scale for anhedonia, the Food Intake Questionnaire, and questions regarding type and duration of lockdown, as well as body weight and food serving variation. Significant correlations were observed between fried food consumption and self-reported body weight. The subjects who consumed fried food three times a week, had higher weight (63.5%) ($\chi^2 = 48.5$ and $p < 0.001$). Those who ate one and two or more pastries on a week had 1.41 and 1.49, respectively higher odds of reporting increased body weight. We found a relationship anxiety level and sugar-sweetened beverages level ($\chi^2 = 25.5$; p 0.013), fast food intake ($\chi^2 = 63.4$; $p < 0.001$), and pastry consumption ($\chi^2 = 37.7$; $p < 0.001$). In conclusion, it is important to monitor the evolution of these findings since they could represent a risk of increased health problems in the future post-lockdown period.

1. Introduction

The current pandemic of coronavirus disease (COVID-19) has become the world's biggest health headline of widespread public concern. In January 2020, the World Health Organization (WHO) declared the coronavirus outbreak a public health emergency of international concern (Sohrabi et al., 2020).

The current epidemic has also gained attention with respect to the need for a better understanding of the state of mental health in the population (Xiang et al., 2020). It is widely accepted that the complex interactions of social, environmental, and biological factors contribute to psychological disorders (Nanri et al., 2014). Previous work has revealed a wide range of psychosocial effects on individuals and communities during infection outbreaks. For example, in the 2009 H1N1 influenza epidemic, a study in Hong Kong revealed that 10% of its participants experienced psychological distress, and 20% respondents perceived that influenza A/H1N1 had very high fatality rate (Lau et al., 2010).

Diet is considered an environmental determinant that plays a key role in mental health (Nanri et al., 2014). Research on dietary factors and psychological health has shown contradictory results, and limited information is available on the relationship between food consumption and mental health in confined conditions. Different studies have suggested that palatable foods consumption (i.e., high-calorie foods containing high amounts of sugars, other carbohydrates and/or fat) represent a strategy for mitigating negative emotions, for example, anxiety, which may be induced by stressors (Dallman et al., 2005; Maniam & Morris, 2010; Pecoraro et al., 2004). These stressors may also alter food selection for many people, leading to increased consumption of calories from these palatable foods (Groesz et al., 2012; Kim et al., 2013; Tryon et al., 2013). In a study conducted in Italy, 46.1% of participants reported eating more during confinement, particularly foods

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such as chocolates, ice cream and desserts (42.5%), and salty snacks (23.5%) (Scarmozzino & Visioli, 2020). Further, 42.7% of participants attributed the increase to higher levels of anxiety. In another study, conducted in China, 28.8% of the sample reported moderate and severe anxiety symptomatology (Wang et al., 2020).

Similarly, anhedonia (i.e., the decrease in the ability to feel pleasure) is associated with a preference for palatable foods, and could have a more important role than physiological stimuli such as hunger and satiety (Singh, 2014). This phenomenon is called hedonic hunger, and it is a trait-based psychological factor. It is characterized by an extreme response to reward, pleasure, and food drive in the absence of physiological hunger (Lowe et al., 2016). Also, it is associated with several adverse health effects, including obesity and maladaptive eating behaviors (e.g., binge eating, unhealthy snacking, and eating in the absence of hunger), (Feig et al., 2018; Lowe et al., 2016; Schüz et al., 2015; Stok et al., 2015).

Finally, the COVID-19 outbreak could be causing stress and anxiety in a large part of the population. In order to protect public health, governments of several countries have been forced to take protective measures. In Chile, these actions have included closing some cities, shops, schools and declaring quarantines, and lockdown to impose social distancing. Lockdown is one of the oldest and most effective tools for controlling outbreaks of communicable diseases (Wilder-Smith & Freedman, 2020).

While containing the virus as quickly as possible is the most urgent public health priority, there have been few health guidelines about what people could do to maintain their daily food, physical and occupational exercise routines. While, on the one hand, staying at home is a safety measure, it may have unwanted negative consequences, such as less physical activity, increased consumption of certain foods, and increased anxiety levels, impacting general and mental health. Confinement could also trigger an increase in levels of anxiety and anhedonia and relate to an increase in the intake of palatable foods and consequently an increase in body weight. However, to our knowledge, diet and psychological variables have not been studied in the context of the COVID-19 pandemic in Latin America. This study aims to relate anxiety and anhedonia symptomatology to food consumption and body weight during the confinement due to the COVID-19 pandemic in Chile.

2. Methods

We conducted a cross-sectional study between April 1st and May 8th, 2020. The study followed the Declaration of Helsinki, regarding work with human beings and, according to the Singapore Declaration on Integrity in Research and was approved by the Scientific Ethics Committee of the Universidad de Las Américas, Chile, Number 2020001.

2.1. Participants

All subjects were invited to participate voluntarily and anonymously through different digital platforms and social networks such as Facebook, Instagram, Twitter, personal and institutional emails. Potential participants could be Chilean or foreign citizens who have been living in Chile for at least one year. All potential participants (18 years old or older) accessed a link to read more detailed information about the study and gave their online informed consent to participate. The exclusion criteria were pregnant or breastfeeding women (first 4 months) and those with pharmacological treatment or psychological therapies for depression, anxiety disorders, stress, or mood disorders. Subjects with pathologies that required dietary treatment were excluded. An initial screening questionnaire included questions to identify exclusion criteria (e.g., currently have a diagnosis of mood disorders or depression, pregnant or breastfeeding). If someone responded "YES" to any of the screening questions, the questionnaire automatically closed, and participation ended.

2.2. Data collection

We used Google Forms (Google LLC, Menlo Park, CA, USA). The Beck Anxiety Inventory (BAI), Snaith-Hamilton Pleasure Scale for anhedonia and the Food Intake Questionnaire were answered by participants on a single occasion.

2.2.1. Beck Anxiety Inventory (BAI)

To evaluate anxiety symptoms, we adapted the validated Spanish version of the BAI (Magán et al., 2008; Sanz & Navarro, 2003). Specifically, we changed some words from the Spanish version for synonymous more frequently used in Chile to improve their understanding. The psychometric properties of the instrument for the Chilean population have been evaluated with the sample of this study (In progress, by the authors of this research. Cronbach's Alpha = 0.929; 4-factor model fit indexes IFC = 0.93; TLI = 0.918; RMSEA = 0.063; SRMR = 0.041). The BAI is a useful tool to assess the physiological (somatic) and cognitive aspects of anxiety that the subject may have experienced during the last week before application. The questionnaire consists of 21 questions, providing a range of scores between 0 and 63. Each item is scored from 0 to 3, with the score 0 corresponding to "not at all", 1 to "slightly, I don't mind much", 2 to "moderately, it was very unpleasant, but I could bear it" and the score 3 to "severely, I could hardly bear it". According to the latest edition of the original manual, we interpreted the BAI scores, which proposes the cut-off points that define different levels of severity of anxiety symptoms: 0–7 minimal anxiety, 8–15 mild anxiety, 16–25 moderate anxiety, and 26–63 severe anxiety (Beck & Steer, 1993). These scores correspond with the Spanish adaptation of the BAI.

2.2.2. Snaith-Hamilton Pleasure Scale for anhedonia

The Snaith-Hamilton Pleasure Scale (SHAPS) is a rapid screening battery created for assessing the presence of anhedonia, namely the inability to experience pleasure. SHAPS was applied in its version translated into Spanish in the Mexican population (Fresán & Berlanga, 2013), with Alpha Cronbach values of 0.77. The psychometric properties of the instrument in the Chilean population have been evaluated (study in progress by the authors of this research) with the sample of this study (Cronbach's Alpha = 0.904; 4-factor model fit indexes IFC = 0.959; TLI = 0.947; RMSEA = 0.057; SRMR = 0.034). This scale considers 14 sentences with a brief description of situations or pleasant sensations related to the last days and a scale of 4 possible answers among which the subject must indicate with an "X" the one that best describes him/her; "Totally disagree"; "Disagree"; "Agree"; "Totally agree". Any "Agree" response is scored as 0 and any "Disagree" response is scored as 1. The original scoring was used to investigate the proportion of participants that could be classified anhedonic (original SHAPS score > 2) (Assogna et al., 2011; Franken et al., 2007; Snaith et al., 1995).

2.2.3. Food intake questionnaire

We evaluated food consumption with a closed food consumption frequency survey, which was established in accordance with the Food-Based Dietary Guidelines for the Chilean population (Olivares et al., 2013). Also, closed-ended questions were considered regarding changes in serving size in food consumption and body weight self-report during lockdown (Appendix A).

Finally, closed-ended questions were considered to describe general characteristics of the participants such as self-perception of socioeconomic status, and other questions regarding the type and duration of lockdown (Appendix B).

2.3. Statistical analysis

Sample size was calculated based on the main statistical analyses to be carried out. First, the sample size n = 1077 was determined with a 3% error and a 95% confidence interval, considering a Chilean population

over 18 years old of 11,367,882 according to the latest census ((INE), 2017). Further, the sample size was evaluated for logistic regression considering an alpha of 0.05 and a power of 0.9, which considered a minimum sample of 424 participants (Faul et al., 2007). The Jamovi statistics package version 1.1 (The jamovi project, 2020) and R statistical software (CoreTeam, 2018) were used for descriptive, psychometric statistical analysis and the logistic regression model. R code with details about preparing data is provided as supplementary material. The figures were made with dplyr (Hadley Wickham et al., n.d.), ggplot2 (H. Wickham., 2016), jtools (JA, 2020), and finalfit (Harrison et al., 2019).

Participants were grouped according to the dimensions addressed by the demographics, specifically according to their structure, age and sex, as determined by INE (National Institute of Statistics, INE for its acronym in Spanish) (INE, 2017). Together with the perception of socio-economic level, socio-demographic variables were presented in descriptive tables with absolute and relative frequencies. Furthermore, to verify the relationships between variables, chi-square tests with a significance of 5% were applied. Finally, we conducted two logistic regression models, the first evaluating items related to increased (versus maintained) food serving size and the second exploring the factors associated with increased (versus maintained) body weight.

3. Results

Table 1 describes the distribution of the study sample according to age groups, self-perceived socio-economic status, self-perceived change in food serving size, bodyweight and characteristics related to the type and duration of quarantine/lockdown. In total, 1741 responses were collected, with 1725 accepting the informed consent (99.1%). Only one case was eliminated because they did not complete all questions. Women accounted for 82.3% of the responses. The average age of participants was 33.2 ± 10.3 years. Fig. 1 shows the average food consumption profile in the sample as a percentage of usual consumption by food groups and average weekly consumption frequency (servings/week). 72.2% of fruit consumers consumed only 8.2 servings per week, and 61.9% of vegetable consumers consumed only 7.2 servings per week. On the other hand, 85.5% of pastry eaters consumed 5.5 servings on average per week.

Table 1
Distribution of the sample according to the frequency of general characteristics. Total number (n), % total, and % accumulated.

	N	% of total	% accumulated
Age, years			
18 to 29	768	44.5	44.5
30 to 59	904	52.4	96.9
≥60	53	3.1	100.0
Self-perception of socio-economic status			
Low class	61	3.5	3.5
Middle low class	295	17.1	20.6
Middle class	974	56.5	77.1
Middle high class	348	20.2	97.3
High class	47	2.7	100.0
Change in serving size (self-perceived)			
Same as before	859	49.8	49.8
Increased	645	37.4	87.2
Decreased	221	12.8	100.0
Change in body weight (self-report)			
Same as before	721	41.8	41.8
Increased	767	44.5	86.3
Decreased	237	13.7	100.0
Type of lockdown			
Never on lockdown	112	6.5	6.5
Mandatory total lockdown	401	23.2	29.7
Non-mandatory lockdown	1212	70.3	100.0
Lockdown duration			
1 week	153	8.9	8.9
2 weeks	371	21.5	30.4
3 weeks	677	39.2	69.6
4 weeks or longer	437	25.3	94.9
No restriction of social contact/distancing	87	5.0	100.0

For anxiety, the mean value was 16.9 points with a standard deviation of 12.1 points, a median of 15 points, minimum of 0 points and maximum of 63 points, and an asymmetry of 0.796. For anhedonia, these values were a mean of 2.63 points with a standard deviation of 3 points, a median of 1 point, a minimum of 0 points and a maximum of 14 points, and an asymmetry 1.94. Persons with severe anxiety levels made up 22.7% of the sample, 23.5% moderate, 28.3% mild, and 25.3% minimal levels. Moreover, anhedonic subjects were 35.1% while those with hedonic tone were 64.9%.

Regarding food consumption variables, significant relationships were observed between fried food consumption and self-reported body weight ($\chi^2 = 48.5$, $p < 0.001$). Participants who consumed fried food three times a week were those who reported having gained the most weight (63.5%). On the other hand, most of the participants who declared that they "did not consume" fried food were those whose weight decreased the most (20.7%). Furthermore, significant relationships were observed between vegetable consumption and self-reported body weight ($\chi^2 = 33.7$, $p < 0.001$). Participants who consumed vegetables2 or more times a day maintained their bodyweight the most (44.0%), whereas 62.5% of participants who reported not consuming vegetables gained weight. We observed relationships between the consumption of fried foods and anxiety level. Of the participants with minimal anxiety, 23.9% declared that they never consume fried foods, while at severe anxiety, only 11.2% declared never consuming fried foods. In contrast, 3.0% of participants with lower anxiety consumed 3 or more fried food servings, while 7.1% do so at the highest level for anxiety, ($\chi^2 = 54.6$ and a $p < 0.001$).

Additionally, the relationship between anxiety level and consumption of sugar-sweetened beverages, fast food (burgers, hot dogs, pizza), and pastries was evaluated. We found a relationship between sugar-sweetened beverages and anxiety level ($\chi^2 = 25.5$; p 0.013). In addition, we observed a relationship between anxiety level and fast food and pastry consumption ($\chi^2 = 63.4$; $p < 0.001$; $\chi^2 = 37.7$; $p < 0.001$, respectively).

Regarding perception of socio-economic level, we observed that those with the lowest socio-economic level and more frequent consumption (≥2 servings a week) of fried foods and pastries (blue color, Fig. 2), had higher anxiety symptom scores. In contrast, in middle-high level, we observed that more consumption of unhealthy food was related to higher levels of anxiety. Finally, at higher socio-economic levels, the median of anxiety score was below 20 points, independent of fried food and sugary beverage consumption, but those who consume more fried food had more anxiety than those that consumed less.

The relationship between lockdown and the level of anxiety was also analyzed, as well as the presence of anhedonia. There was no relationship ($\chi^2 = 9.6414$; $p = 0.6474$ and $\chi^2 = 2.0877$; $p = 0.7196$, for anxiety and anhedonia, respectively). A relationship between lockdown duration and self-reported body weight was also tested without finding any relationship ($\chi^2 = 12.275$; $p = 0.1394$).

AIC: 1692.6. Null deviance: 2026.9 on 1482 degrees of freedom. Residual deviance: 1644.6 on 1459 degrees of freedom. Because the dependent variable only considered increased serving size comparing maintained, 213 cases who decreased serving size are excluded in this analysis.

Fig. 3 shows that increased food servings was positively associated with increased body weight (OR = 4.87, $p < 0.001$), and moderate (OR = 2.80, $p = 0.018$) and severe (OR = 3.03, $p = 0.013$) anxiety levels. On the other hand, decreased weight was associated with lower odds of increasing food serving size. However, higher socio-economic status showed a tendency for lower odds of increasing the food serving size, although confidence intervals were wide and include 1. Finally, there was no significant association between pastry consumption frequency, sugar-sweetened beverages, fried foods, or fast/junk food.

Fig. 4 demonstrates that those who reported eating one and two or

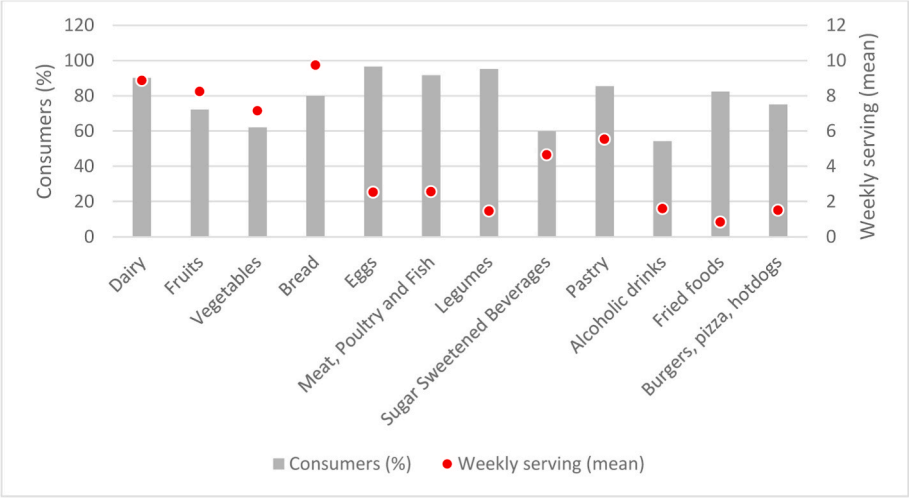

Fig. 1. Food consumption profile of participants by food groups and average servings consumed per week by each group.

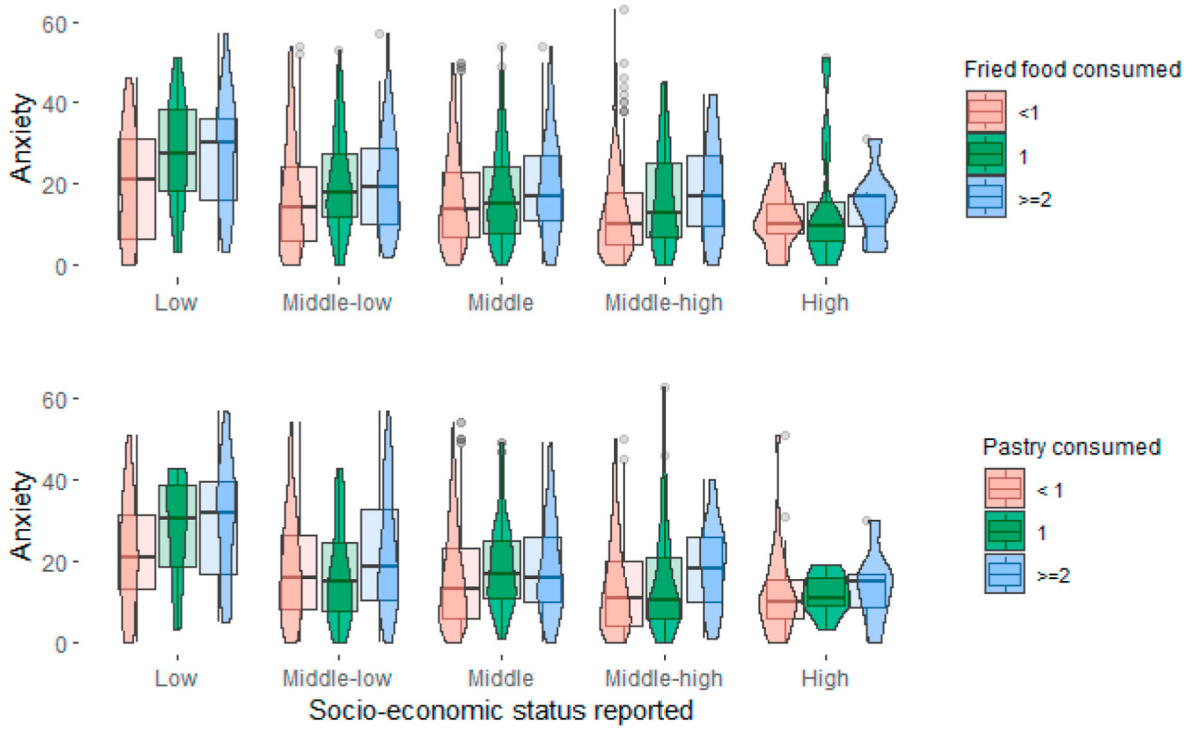

Fig. 2. Anxiety [a] and consumption of fried foods or pastry according to socio-economic status reported. [a] Anxiety level according to Beck Anxiety Inventory (BAI). Higher scores represent a higher level of anxiety [b] Food consumption in frequency per week <1 time per week; 1 time per week; ≥2 times per week.

more pastries per week have 1.41 and 1.49, respectively, higher odds of reporting increased body weight. Fast/junk food was associated with increased body weight: with those who reported <1 serving per week and those with 2 or≥3 having increased odds (Fig. 4). Those who reported having increased food serving sizes had a strong positive relationship with increased body weight: OR 5.76 ($p < 0.001$). Also, those who reported severe anxiety levels and anhedonia symptoms had increased odds of reporting increase in bodyweight: OR 1.81 and 1.33, respectively.

4. Discussion

Our results showed that in a sample of persons studied during the period of quarantine and/or lockdown for COVID-19 in Chile, 22.7% presented severe anxiety levels with 16 points or more (average 16.9). These findings are higher than the values shown by other studies. In one study conducted among Chinese medical students, severe anxiety levels was reported in 0.9% of the sample, 2.7% had moderate anxiety and 21.3% mild anxiety (Cao et al., 2020). In another study, conducted among 500 respondents from the general Hong Kong population, 14% had anxiety (GAD score ≥ 10) (Choi et al., 2020). Our results were more comparable with a study in the Irish population, where general anxiety disorder was found in 20% (Hyland et al., 2020). Whereas, if we consider moderate and severe anxiety levels, the prevalence we found in the current study (46.2%) was similar to another study in the Turkish population, where 45.1% of the sample scored above the cut-off point for anxiety (Hospital Anxiety and Depression Scale) (Özdin & Bayrak Özdin, 2020).

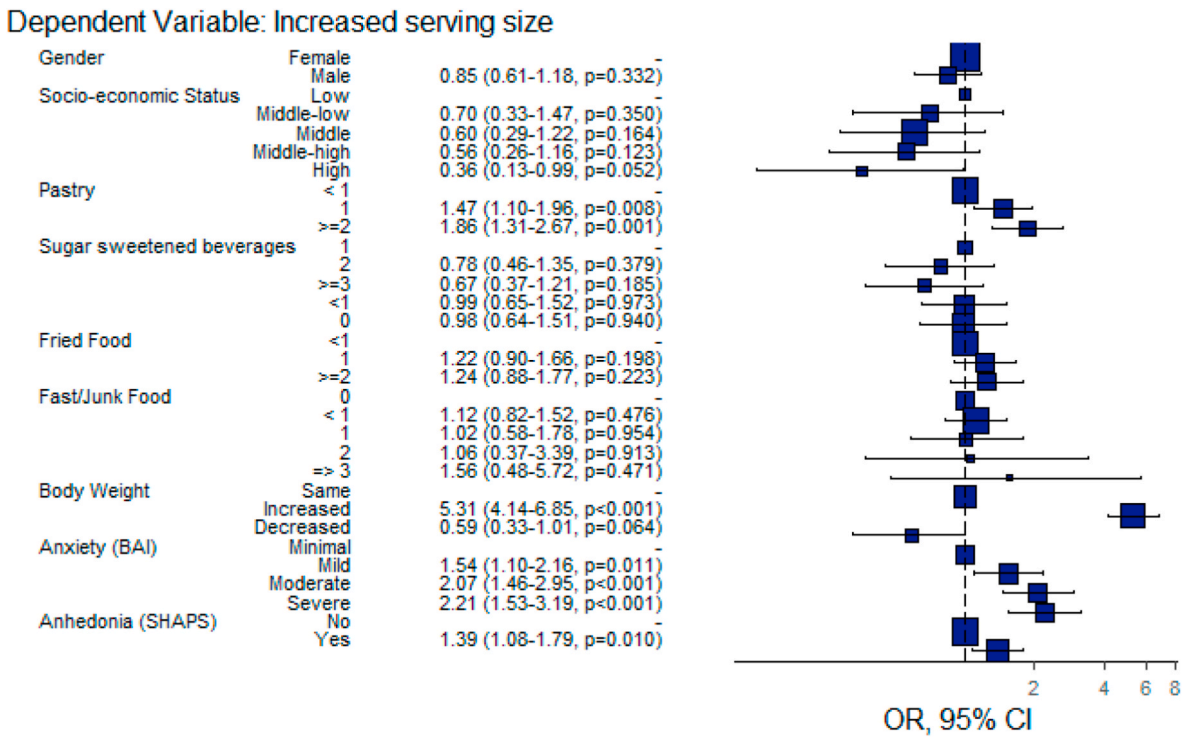

Fig. 3. Multivariable logistic regression analyses.

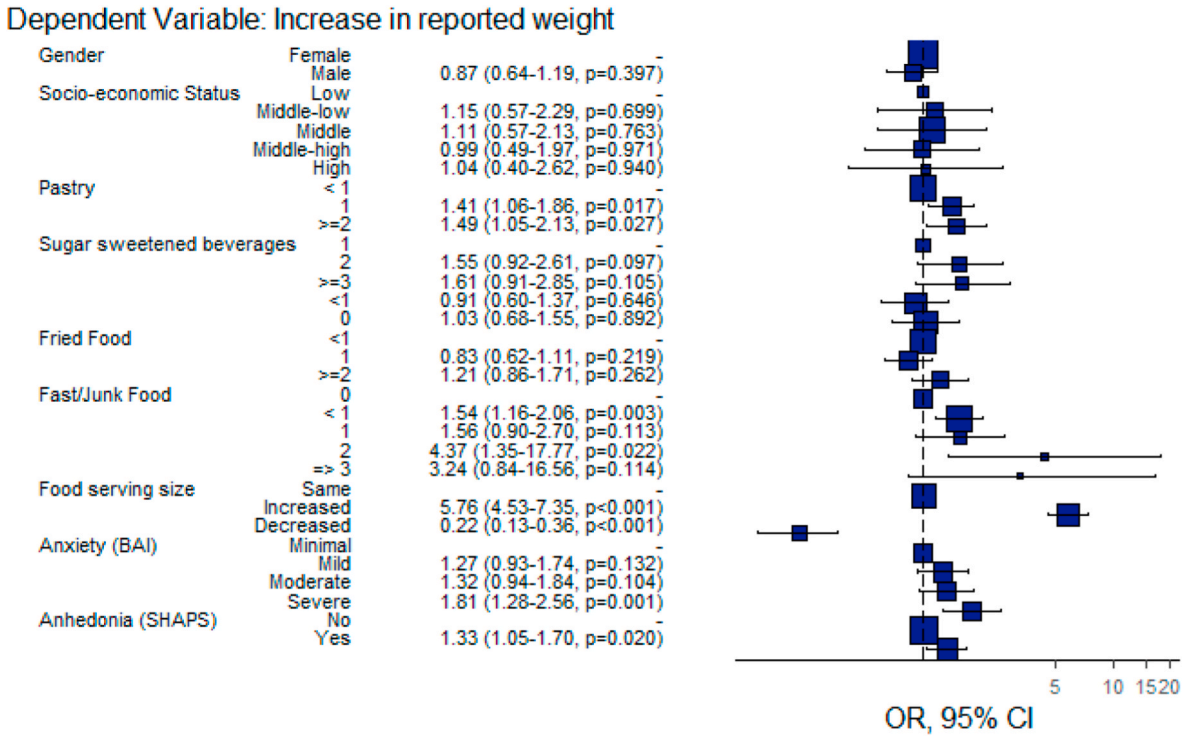

Fig. 4. Multivariable logistic regression analyses.

A more direct comparison can be made with a study among the Chilean population during the first week of lockdown. In this study (Dagnino et al., 2020), 60.3% reported that anxiety was one of the perceived impacts of quarantine. While the prevalence reported in the Dagnino study is greater than in the current work, that study did not use a psychological scale to evaluate each anxiety symptom, thus, it is possible that the prevalence is overestimated. Finally, a recent meta-analysis in 17 studies consisting of a total sample size of 63,439 showed that the prevalence of anxiety was 31.9% (95% confidence interval: 27.5–36.7) (Salari et al., 2020), thus our results are similar to this international trend.

Considering the nutritional aspects of the research, our results show higher levels of anxiety were associated with more food consumption such as fried foods, pastries, and sugar-sweetened beverages. Chile is

one of the countries with the highest consumption of sugar drinks globally (Popkin & Hawkes, 2016) and consumption is considered within the usual diet of Chileans. These results are consistent with studies that show that in situations of greater stress and anxiety, people tend to regulate their emotions through food (Braden et al., 2018; Schneider et al., 2012). Moreover, recent observations show that in Italy, a high percentage of respondents experienced a depressed mood and feelings of anxiety (61.3% and 70.4%) and that almost half of those surveyed who felt anxious consumed comfort/palatable food, and were inclined to increase food intake to feel better (Renzo et al., 2020). Other results have demonstrated altered eating habits, since a significant percentage of participants reported that they started to eat more often (45.2%), in larger quantities (31.6%) and that they had no careful food selection (58.1%) (Antunes et al., 2020).

Anxiety disorders and other psychologic disorders of greater severity are more frequent in those who consume a more deficient quality diet (Gibson-Smith et al., 2018). Furthermore, such positive emotional reactions to tasty, energy-rich foods, including their rewarding and hedonic actions, are considered to play an important role in over-eating and the possible development of overweight and obesity (Fulton, 2010). In our study, increased serving size was the variable with the highest odds for increased bodyweight, followed by anxiety, anhedonia, pastry and fast/junk food consumption.

In this regard, recent work has shown that self-reported anxiety/depression associated with the COVID-19 pandemic would be largely associated with weight gain (Pellegrini et al., 2020). Our results are consistent with this and show that a significant percentage of participants recognized weight gain during the quarantine/lockdown period (44.5%) and made changes in the portion size (37.4% increased) and type of food consumed. These results are consistent with a study in Poland (Sidor & Rzymski, 2020) that reported that almost 30% of participants experienced weight gain and more than 43% and almost 52% reported eating and snacking more, respectively; these tendencies were more frequent in overweight and obese individuals. Thus, individuals with overweight or obesity that increased bodyweight may increase risk of either chronic or acute diseases, including COVID-19 infection and complications (Kalligeros et al., 2020; Muscogiuri et al., 2020).

Also, increased risk might potentiate the immune dysregulation and pro-inflammatory response, and have detrimental effects on lung function (Malavazos et al., 2020; Sattar et al., 2020) and required mechanical ventilation (Simonnet et al., 2020). Finally, the consumption of unhealthy diets has been proposed to adversely impact susceptibility to COVID-19 and recovery (Butler & Barrientos, 2020; Naja & Hamadeh, 2020). Additionally, mental illness has been associated with inflammation and diet (Berk et al., 2013; Kirkpatrick & Miller, 2013; Misra & Mohanty, 2019). However, lifestyle factors have the most considerable influence on inflammation (Gialluisi et al., 2020). Therefore, psychological, and biological factors must be investigated to promote more healthy behaviors and better immune response in the COVID-19 context.

On the other hand, weight gain was mostly observed in the lower socio-economic levels (low and medium), who ate more caloric foods (e.g., fried foods and pastries), which is consistent with other Latin American (Kovalskys, 2020; Mello et al., 2020) and global results (Thompson et al., 1999). Low socioeconomic status seems to be a condition that could affect food selection. For example, increased purchase of more processed foods at the expense of less processed, less energy-dense, fresh, and perishable foods, which are generally more expensive. Furthermore, in terms of predictors, while low income is the strongest and most consistent predictor of food insecurity, higher income is not a proxy for food security as income level does not always reflect the economic conditions of the household (Kleve et al., 2018). It is also crucial to understand the impact that the current pandemic may have on this group's nutrition, considering that confinement restricts people's purchasing ability and food availability (Jeżewska-Zychowicz et al., 2020).

Additionally, increased social isolation, anxiety, and anhedonia in our study may have played a role in lifestyle changes. This has also been observed in recent studies that have described an increase in the rate of depression and anxiety disorders during the COVID-19 pandemic (Huang & Zhao, 2020; Wang et al., 2020).

Finally, it is important to mention that anxiety and anhedonia symptoms emerge as one of many transdiagnostic symptoms in various mental disorders (Nusslock & Alloy, 2017; Vargas, 2019), and this approach is useful when treatments are implemented (Steele et al., 2018). However, this approach represents an insufficiently explored research area (Spano et al., 2019), and, therefore, it could be included to evaluate nutritional interventions. Therefore, both symptoms are essential variables to consider describing the effects that lockdown can have on the population, either as warning signals that activate anxious responses or as measures that limit people's activities, especially in their leisure time (for example, social activities, sports, or cultural events) and that can affect typical experiences of pleasure.

4.1. Limitations and strengths

The strengths of our study include the use of internationally validated surveys, which allowed for comparison with other similar studies. The results showed that sociodemographic characteristics follow a pattern like the national reality (proportions according to socioeconomic levels). However, no inferences can be made about specific groups due to small sample sizes in strata. Future studies may consider applying a stratified random sampling to obtain more participants from specific groups, such as older people or those with lower incomes. However, these groups may have lower ability to participate in an online survey. Therefore, certain groups with smaller sample sizes impeded more accurate comparisons. Moreover, biometrics variables were not measured, and we could not compare the association of variables considering BMI. For example, obese people could be affected in different ways compared to the healthy weight population. Also, due to the cross-sectional study design, relationships detected must be interpreted with caution as it is not possible to conclude causal effects between them. Finally, our results must be interpreted with caution since it is necessary to consider the brief quarantine time, which does not cover more than four weeks of voluntary or mandatory quarantine. The current study was conducted at the beginning of the lockdown in Chile, however, anxiety may become worse as confinement time increases.

From the perspective of the national context and international evidence, these results point to the importance of a more longitudinal screening for anxiety and other emotional disorders. Similarly conducted studies could be useful to understand other potential changes in health behavior, not only increasing food serving sizes of unhealthy food but less physical exercise or alcohol consumption too.

5. Conclusions

The main finding of the current study was that during the first months of the COVID-19 pandemic in Chile, 37.4% of participants reported an increase in food serving size, and 44.5% increased body weight. Secondly, increased anxiety levels were associated with increasing food serving size and body weight, whereas anhedonia only with increased body weight. Thirdly, sugar-sweetened beverage intake, pastry and fast/junk food were associated with increased body weight. Analysis in lower socio-economic classes suggest more unhealthy food habits and higher anxiety levels, but future studies focused on that group are needed to elucidate the context and causes.

Finally, prospective studies monitoring psychological and food habits changes during lockdowns would be of interest for a greater understanding of public health. Also, how to stimulate and facilitate healthy lifestyles across different groups in the population. In this sense, further studies should be looking at if diet and psychological changes are maintained or generate new disease burden once the pandemic is over.

Declaration of competing interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Ethical statement in the text (p. 4).

Ethical approval for this study was obtained from the ethical review board at Universidad de Las Américas, Chile.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.appet.2021.105259.

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