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Association between Food Intake and Mood Status in Students at the Faculdade De Saúde Pública - Usp during the Covid-19 Pandemic

Maria Carolina Zsigovics Alfino, Leonardo Dias Negrão, Elizabeth Aparecida Ferraz da Silva Torres*

Universidade de São Paulo, Faculdade de Saúde Pública, Departamento de Nutrição, Laboratório de Componentes Alimentares e Saúde (LACAS), São Paulo, SP, Brasil.

***Corresponding Author:** Elizabeth. A. F. da Silva. T, Food Components and Health Laboratory (LACAS), Department of Nutrition, School of Public Health, University of Sao Paulo, Av. Dr. Arnaldo, 715, 01246-904, Sao Paulo, Brazil.

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Abstract

Objective: This study aimed to assess the food intake and its relationship to mood status in undergraduate and graduate students at the Faculdade de Saúde Pública - USP.

Methods: This is a cross-sectional study, carried out during the pandemic period, from July to October 2021. Food intake and mood status were assessed using an online food frequency questionnaire and the Depression, Anxiety and Stress Scale (DASS-21), respectively. **Results:** Most of the sample showed symptoms of anxiety, depression and stress. There was an association (p-value < 0.05) between the intake of “sweets and desserts” and the presentation of symptoms of stress and the “soups and pasta”; “rice and tubers”, “greens and vegetables”, “legumes” and “bread and cookies” groups and presentation of anxiety symptoms, as well as the association between the weekly intake of the “meat and fish”; “legumes and eggs”; “rice and tubers” and “sweets and desserts” groups according to the course.

Conclusions: Studies that delve more deeply into the psychological phenomena involved in food intake are needed so that adequate nutritional strategies can be developed.

Keywords: Mood; mental health; depressive symptoms; nutritional psychiatry; nutrition.

Introduction

Mood changes are related to several neurological and mental disorders, which are characterized by a condition of psychological arousal whose main characteristics are mood disorders, such as depression and anxiety disorders, and which, from a pathophysiological point of view, have been associated with an inflammatory state characterized by an increase in pro-inflammatory cytokines and neuronal damage, leading to a loss of brain plasticity (Grosso et al., 2014).

Major depressive disorder (MDD) is a recurrent disorder characterized by the repetition of major depressive episodes (MDE), and although remission is the natural course of a depressive episode (50% in one year), even in the absence of intervention, unfortunately, a relapse is reported in 80% of patients within 15 years (Lutz and Kieffer, 2013). According to data from the World Health Organization (WHO) in 2017, Brazil is the second country with the highest rate of depression in the Americas, with 5.8% of the population having the disease, and in the Metropolitan Region of São Paulo, according to the study São Paulo Megacity Mental Health Survey, this number

reaches the value of 10% of the population, whereas the disease affects 4.4% of the population worldwide (WHO, 2017).

Anxiety disorders (AD), according to the definition of the Ministry of Health (2015), are related to the functioning of the body and life experiences, and can be framed in definitions such as distress, anguish, disturbance of the spirit caused by uncertainty, relationship with any context of danger, etc. Data from the WHO (2017) indicate that the world prevalence of AD is 3.6%, with Brazil being the most anxious country in the world, with 9.3% of the population with some type of disorder (WHO, 2017), and according to the São Paulo Megacity Mental Health Survey, it affects 19.9% of the metropolitan population of the state of São Paulo, being the most common mental disorder in the city (Viana et al., 2009). Anxiety symptoms can manifest before the defined and complete disorder, resulting from stressful events, characterizing themselves as responsible for the emergence of mental disorders, in the short, medium and long term (Rueter et al., 1999).

According to data, at least half of suicides are due to mood disorders (Isometsa, 2014), and approximately 7.4% of total illnesses in 2010 were due to mental disorders and substance use (Lutz and Kieffer, 2013; Whiteford et al. al., 2013), depression is a serious disease that has been affecting developed and developing countries, and has an estimated lifetime prevalence of around 15-20% (Pathak et al., 2013).

In recent decades, diets around the world have shifted dietary patterns, including mainly vegetables, fruits, meat, fish and whole foods to those favoring more convenient and/or industrially prepared meals (e.g., fast food). In modern Western diets, foods high in refined sugars and saturated fats and low in nutrient density account for a significant proportion of the energy consumed daily, and these dietary changes can negatively affect depression prevalence rates (Jacka & Berk, 2007). Intake of processed foods (e.g., processed meats and refined grains) has been associated with an increased risk of depression (Akbaraly et al., 2009), while the Mediterranean diet and other more traditional dietary patterns rich in fruits, vegetables, fish and whole grains are associated with lower rates (Rienks et al 2013). There are reports of a dose-response relationship between poorer diet quality and greater depression severity (Appelhans et al., 2012), the so-called “comfort foods”, high-fat and high-carbohydrate foods are the main choices for individuals with depressive symptoms (Tomiyama et al., 2012). Studies indicate a direct relationship between diabetes and depression, with individuals with diabetes being more likely to have depression and patients with depression having a greater risk of having diabetes, so that both comorbidities possibly share underlying physiological mechanisms, such as abnormality and inflation of the hypothalamic-pituitary-adrenal axis (Sher, 2022). In addition to studies indicating that DASH (Dietary Approaches to Stop Hypertension), plant-based, low-glycemic, ketogenic, and Paleolithic diets may improve mood more than others (Arab et al., 2018), with an inverse association between fruit and vegetable consumption and depression being reported (Liu et al., 2016).

Anxiety is one of the factors that influence binge eating, indicated not only by the simultaneity between these disorders, but also by the role of anxiety in the genesis of binge eating syndrome (Rosenbaum & White, 2015). Jacka et al. (2007) point out that adults with a better diet quality, characterized by the intake of fruits, vegetables, meats, whole grains and fish are less likely to develop anxiety. In addition, specific elements of the diet, such as sugar, can lead to withdrawal symptoms in the individual, when deprived of its intake, leading to signs of anxiety and aggression (Avena et al., 2008).

The symptoms of mood change have been associated with attitudes that are barriers to healthy eating, skipping meals (and the related increase in less healthy foods) and disordered eating, which ends up increasing the risk of developing obesity (Goodman & Whitake, 2002). Social isolation was necessary given the context of the COVID-19 pandemic. In recent studies, a significant increase in psychological disturbance was verified, when compared to previous periods, among university students in the pandemic period (Maia & Dias, 2020), in addition to feelings of fear, stress, anxiety, grief, guilt, anger and helplessness in the face of uncertainty (Texeira & Dahl, 2020). Considering the context of economic stressors, effects on everyday life and possible academic delays, interventions focused on changing eating-related behaviors and changing habitual eating patterns in university students are a way to change the diet and influence the appearance of mood changes.

Thus, the association between mood changes and various neurological and mental disorders, with a high prevalence in the population, and their relationship with food intake, which has evidence of association with a high prevalence of consumption of animal-origin foods, rich in sugars and fats, explain the importance of evaluating the relationship between food intake and mood in these students, for the future establishment of more appropriate therapeutic proposals.

Materials and Methods

Study Outline

This is a cross-sectional, quantitative and descriptive study, carried out during the pandemic period, starting in July 2021 and ending in October 2021, remotely by applying an online form with undergraduate and graduate students of the courses of Nutrition and Public Health at the Faculdade de Saúde Pública - USP, located in the city of São Paulo - SP.

The disclosure and invitation to participate in the research was carried out by email to undergraduate and graduate students at the Faculdade de Saúde Pública - USP, through the mediation of the institution without providing any contact information for the research team.

Data collection was done through a questionnaire applied in a virtual environment, where the participants first had access to the Free and Informed Consent Form (ICF)

online, for the reading declaration and acceptance to participate in the research. The questionnaire elaborated in modules started only after the term acceptance: Socioeconomic Data; Food Intake; and Anxiety, Depression and Stress Scale.

The questionnaire was answered anonymously and without any personal identification of the participants, identified according to the institutional registration number (USP ID), to avoid data duplication from the same participant.

Sampling Number

The total population of students at the Faculdade de Saúde Pública counts 904 individuals, being students enrolled in the Nutrition undergraduate (n= 442) and Public Health (n=175), as well as graduate students in the programs: Environment, Health and Sustainability, Entomology in Public Health, Epidemiology, Nutrition in Public Health, Global Health and Sustainability and Public Health (n=287). A confidence interval of 95% (a=0.05) was adopted and the statistical software Raosoft Sample Size Calculator was used, totaling a sample size of 270 individuals (n=270). A total of 142 responses were obtained, however, after excluding duplicate information, recognized from the USP ID, the sample number totaled 136 individuals.

Individual Admission

For individual admission, the undergraduate and graduate coordinators communicated the students via email, with an explanation of the project, its objective and a link to access the ICF and the project's questionnaire.

Data Collection

Data collection was carried out using a questionnaire prepared using the questionnaires on Google platform (Google LLC, Menlo Park, CA, USA).

Socioeconomic Data and Lifestyle

Data were collected on gender (female, male, transgender and others), age (years old), marital status (single, married, separated, divorced, widow(er)), the student's relationship with the university (undergraduate in Nutrition, undergraduate in Public Health, postgraduate in Environment, Health and Sustainability, postgraduate in Entomology in Public Health, postgraduate in Epidemiology, postgraduate in Nutrition in Public Health, postgraduate in Global Health and Sustainability, postgraduate degree in Public Health), self-perception of weight change (lost weight, maintained it, gained weight or did not know how to give an opinion), self-reported height and weight, smoking (smoker, former smoker or non-smoker), physical activity (practice and non-practice), time of physical activity (minutes per week), number of hours of sleep per day (less than 5 hours, 5 to <7 hours, 7 to 9 hours, >9 hours), the habit to skip meals (if yes, how many per day) and if the participant lives alone or with more people.

Food Intake Questionnaire

The Food Intake Frequency Questionnaire – FIFQ, developed in a population-based study in the state of São Paulo by Fisberg et al. (2008), was applied as a validation method for the evaluation of food intake. The choice of using a FIFQ was based on the assumption that the average dietary intake over a relatively long period constitutes a more representative exposure than the dietary intake of a few days. Even if limited to a specific period of exposure, adult individuals tend to maintain a dietary pattern, and thus consumption in the last year probably reflects a longer-term dietary pattern.

The FIFQ items were grouped according to the classification proposed in the questionnaire, into the following food groups: “soups and pasta”; “meat and fish”; “milk and dairy products”; “legumes and egg”; “rice and tubers”; “greens and vegetables”; “sauces and seasonings”; “fruits”; "drinks"; “bread and cookies” and “sweets and desserts”.

For the analysis of intake frequency, weekly consumption was considered with the following possibilities: more than 3 times a day, 28 times a week; 2 to 3 times a day, 17.5 times a week; 1 time a day, 7 times a week; 5 to 6 times a week, 5.5 times a week; 2 to 4 times a week, 3 times a week; 1 time a week, 1 time a week; 1 to 3 times a month, 0.5 times a week and never or almost never, 0 times a week.

Scale Of Stress, Anxiety and Depression

To assess mood, the Stress, Anxiety and Depression Scale (DASS-21) was used, a scale that presented adequate validity and reliability for the university population, in a study by Martins et al., (2019). To obtain the score for each factor, the following calculation was performed according to the scale questions: Depression = [Q3 + Q5 + Q10 + Q13 + Q16 + Q17 + Q21] * 2; Anxiety = [Q2 + Q4 + Q7 + Q9 + Q15 + Q19 + Q20] * 2; Stress = [Q1 + Q6 + Q8 + Q11 + Q12 + Q14 + Q18] * 2. Levels were classified according to cut-off intervals for depression (0-9: normal; 10-12: mild; 13-20: moderate; 21-17: severe; 18-42: extremely severe), anxiety (0- 6: normal; 7-9: mild; 10-14: moderate; 15-19: severe; 20-42: extremely severe) and stress (0-10: normal; 11-18: mild; 19-26: moderate; 27-34: severe; 35-42: extremely severe). Subsequently, the individuals were classified according to the absence (normal) or presence (mild, moderate, severe and extremely severe) of anxiety, depressive and stress symptoms.

Data Analysis and Processing

The chi-square test was applied to assess the difference between the groups, expressed in frequency, proportion, mean and standard deviation. The data were tabulated in spreadsheets and processed to enable comparisons and inferences, and later, the SPSS software (version 28) was used to perform the analyses. A linear regression was applied to explore associations between anxiety, depression and stress symptoms and food consumption per week adjusted for sex, and age. The results were estimated using β coefficient and 95%CI.

Ethical Aspects

Participation in the study offered minimal risks to respondents and researchers and is voluntary, after agreeing to an informed consent form. The project was approved by the Ethics Committee for the Analysis of Research Projects of the School of Public Health - University of São Paulo under protocol number 4.765.974.

The researcher undertook to maintain absolute confidentiality of the analyzed parameters, and guarantees that no individual data will be published.

Results

Sample Feature

A total of 136 individuals aged between 17 and 71 years were evaluated, with average age, height and weight of 29.77 years, 1.64 m and 63.05 kg, respectively, with most individuals being female (86%) , who recognized themselves as women (83.8%), single (77.2%), being undergraduate students (42.7%), who gained weight during the last year (39.7%), non-smokers (79 .4%), practitioners of physical activity (63.2%), who slept 5 to 7 hours a night (50.7%), did not have the habit of skipping meals (61.8%), had no changes in eating habits during the last year (51.5%) and did not use food supplements (61.8%) (Table 1).

Table 1 - **Sample** characterization in frequency (f) and mean (M), São Paulo, Brazil

Table 1 - Sample characterization in frequency (f) and mean (M), São Paulo, Brazil.

Variables	(n=136)	
Biological sex	**f**	**(%)**
Female	117	86
Male	19	14
Gender	**f**	**(%)**
Women	114	83.8
Men	19	14
Non binary	2	1.5
Preferred not to answer	1	0.7
Marital status	**f**	**(%)**
Single	105	77.2
Married	26	19.1
Separated)	-	-
Divorced	5	3.7
Widowed	-	-
Student level	**f**	**(%)**
Undergraduate	58	42.7
Graduate	49	37.4
	M	**(Minimum-maximum)**
Age (years)	29.77	(17-71)
Height (meters)	1.64	(1.49-1.86)
Weight (Kg)	63.05	(42-122)
Weight perception	**f**	**(%)**
Lost weight	40	29.4
Kept	39	28.7
Gained	54	39.7
Didn't know how to say	3	2.2
Smoker	**f**	**(%)**
No	108	79.4
Ex-smoker	13	9.6
Yes	15	11
Physical activity	**f**	**(%)**
No	50	36.8

Yes	86	63.2
Sleep hours	**f**	**(%)**
Less than 5 hours a night	9	6.6
From 5 to 7 hours a night	69	50.7
From 7 to 9 hours a night	56	41.2
More than 9 hours a night	2	1.5
Skip meals	**f**	**(%)**
No	84	61.8
Yes	52	38.2
Change in eating habits recently	**f**	**(%)**
No	70	51.5
For weight loss	32	23.5
By medical advice	4	2.9
For vegetarian diet or reduced meat consumption	18	13.2
For salt reduction	1	0.7
For lowering cholesterol status	4	2.9
For weight gain	5	3.7
Others	2	1.5
Use of food supplements	**f**	**(%)**
No	84	61.8
Yes	36	26.5
Yes. but not regularly	16	11.8

Food Consumption and Mood Status

The weekly intake of food groups was divided into quartiles, and it was observed that the greens and vegetable group was the group with the highest intake frequency (41.7 times a week), while soups and pasta were characterized as the group with the lowest intake frequency (1.6 times a week) (Table 2).

As for the relationship between the intake of different food groups and the presentation of anxiety, depressive and stress symptoms, a statistically significant association was observed between the intake of the “sweets and desserts” group and the presentation of stress symptoms of the “soups and pasta"; “rice and tubers”, “greens and vegetables”, “legumes” and “bread and cookies” groups and presentation of anxiety symptoms (Table 3).

Table 2 - Consumption in weekly frequency by food group in quartiles, São Paulo, Brazil.

Food groups	weekly consumption							
	1st Quartile		2nd Quartile		3rd Quartile		4th Quartile	
	Mean	**Min-Max**	**Mean**	**Min-Max**	**Mean**	**Min-Max**	**Mean**	**Min-Max**
Soups and pasta	1.6	1.43-1.77	2.81	2.72-2.89	3.99	3.83-4.14	7.47	5.5-9.44
Meat and Fish	8.06	4.98-11.14	7.81	4.72-10.89	8.97	6.8-11.14	10.78	7.24-14.32
Milk and dairy products	4.51	2.24-6.78	4.31	2.83-5.79	7.54	4.92-10.16	5.45	3.98-6.92
Legumes and eggs	14.83	1.49-18.19	14.07	11-17.15	12.31	9.45-15.16	11.64	8.2-15.03
Rice and tubers	11.62	9.07-14.16	10.37	8.13-12.61	11	8.96-13.04	10.12	7.76-12.49
Vegetables	43.57	29.94-57.21	33.01	23.27-42.76	27.65	21.69-33.62	41.69	27.66-55.72
Sauces and Seasonings	18.87	13.38-24.35	15.53	11.63-19.42	15.5	10.82-20.18	21.31	15.97-27.26
Fruits	17.85	14.81-20.89	15.68	11.74-19.62	12	9.46-14.54	17.70	11.45-23.96
Beverages	16.12	12.77-19.47	15.21	11.65-18.76	13.24	10.27-16.20	17.02	12.53-21.5
Breads and Cookies	8.72	5.3-12.14	13.23	9.71-16.76	11.5	8.26-14.74	10.69	7.39-13.99
Sweets and desserts	5.68	3.98-7.37	6.78	4.96-8.6	8.49	6.78-10.19	7.91	5.6-10.21

Table 3- Simple Linear Regression of weekly consumption by food group associated with scores on the scale of symptoms of stress, anxiety and depression (DASS-21), São Paulo, Brazil.

Food Groups (Frequency/week)	Stress			Anxiety			Depression		
	β coefficient	95%CI		β coefficient	95%CI		β coefficient	95%CI	
		Inferior limit	Upper limit		Inferior limit	Upper limit		Inferior limit	Upper limit
Soups and pasta	0.31	-1.90	4.97	**0.73***	**0.50**	**4.23**	0.51	-1.44	6.64
Rice and tubers	1.48	-0.26	3.67	**1.88***	**0.37**	**2.50**	1.41	-0.62	4.00
Vegetables	0.18	-0.23	0.34	**0.71***	**0.00**	**0.31**	0.01	-0.33	0.34
Meat and Fish	-0.60	-2.24	0.57	-0.49	-1.21	0.32	-0.12	-1.83	1.47
Milk and dairy products	0.34	-1.13	2.49	-0.28	-1.35	0.62	-0.10	-2.33	1.93
Eggs	-0.29	-1.33	0.56	0.35	-0.20	0.83	-0.23	-1.43	0.80
Legumes	-0.89	-2.61	0.73	**-1.37***	**-1.86**	**-0.06**	-0.51	-2.52	1.40
Sauces and Seasonings	-0.28	-0.77	0.40	-0.44	-0.51	0.13	-0.09	-0.74	0.63
Fruits	0.12	-0.61	0.83	-0.26	-0.54	0.24	-0.06	-0.91	0.79
Beverages	-0.07	-0.69	0.57	0.53	-0.06	0.63	-0.15	-0.87	0.62
Breads and Cookies	-0.50	-1.45	0.38	**-0.98***	**-1.18**	**-0.19**	-0.49	-1.61	0.54
Sweets and desserts	**-0.96***	**-3.21**	**-0.02**	-0.38	-1.29	0.45	-0.65	-3.02	0.74

Model ajusted by age. and sex. 95%CI= 95% confidence interval.

*Statistically significant difference (p-value <0.05).

As for the consumption of vegetables specifically, considering all those plant-origin foods, being them the group of legumes (disregarding eggs); rice and tubers; greens, vegetables and fruits, no association was found (p-value < 0.05) between depressive, anxiety and stress symptoms (Table 4).

Table 3- Simple Linear Regression of weekly consumption by food group associated with scores on the scale of symptoms of stress, anxiety and depression (DASS-21), São Paulo, Brazil.

Food Groups (Frequency/week)	Stress			Anxiety			Depression		
	β coefficient	95%CI		β coefficient	95%CI		β coefficient	95%CI	
		Inferior limit	Upper limit		Inferior limit	Upper limit		Inferior limit	Upper limit
Soups and pasta	0.31	-1.90	4.97	**0.73***	**0.50**	**4.23**	0.51	-1.44	6.64
Rice and tubers	1.48	-0.26	3.67	**1.88***	**0.37**	**2.50**	1.41	-0.62	4.00
Vegetables	0.18	-0.23	0.34	**0.71***	**0.00**	**0.31**	0.01	-0.33	0.34
Meat and Fish	-0.60	-2.24	0.57	-0.49	-1.21	0.32	-0.12	-1.83	1.47
Milk and dairy products	0.34	-1.13	2.49	-0.28	-1.35	0.62	-0.10	-2.33	1.93
Eggs	-0.29	-1.33	0.56	0.35	-0.20	0.83	-0.23	-1.43	0.80

Legumes	-0.89	-2.61	0.73	**-1.37***	**-1.86**	**-0.06**	-0.51	-2.52	1.40
Sauces and Seasonings	-0.28	-0.77	0.40	-0.44	-0.51	0.13	-0.09	-0.74	0.63
Fruits	0.12	-0.61	0.83	-0.26	-0.54	0.24	-0.06	-0.91	0.79
Beverages	-0.07	-0.69	0.57	0.53	-0.06	0.63	-0.15	-0.87	0.62
Breads and Cookies	-0.50	-1.45	0.38	**-0.98***	**-1.18**	**-0.19**	-0.49	-1.61	0.54
Sweets and desserts	**-0.96***	**-3.21**	**-0.02**	-0.38	-1.29	0.45	-0.65	-3.02	0.74

Model ajusted by age. and sex. 95%CI= 95% confidence interval.

*Statistically significant difference (p-value <0.05).

Relationship between Course and Food Intake

An association (p-value < 0.05) was observed between the weekly intake of meat and fish (p-value < 0.001), legumes and eggs (p-value <0.001), rice and tubers (p-value = 0.001) and sweets and desserts (p-value = 0.028) according to the course.

Table 5 - Weekly consumption by food group in quartiles by course (undergraduate/graduate), São Paulo, Brazil.

Food groups	Quatile	Course (%)		χ^2	P-value
		Undergraduate	Graduate		
Soups and pasta	1st	14.7%	11%	3.15	0.369
	2nd	10.5%	10.1%		
	3st	11.9%	17.4%		
	4th	10.1%	8.3%		
Meat and fish	1st	23.9%	2.8%	23.73	0.001**
	2nd	11%	12.8%		
	3st	6.4%	17.4%		
	4th	11.9%	13.8%		
Milk and dairy products	1st	18.3%	8.3%	7.05	0.07
	2nd	9.2%	17.4%		
	3st	11.9%	10.1%		
	4th	13.8%	11%		
Legumes and eggs	1st	6.4%	17.4%	17.99	<0.001***
	2nd	8.3%	13.8%		
	3st	17.4%	9.2%		
	4th	21.1%	6.4%		
Rice and tubers	1st	14.7%	16.5%	16.13	0.001**
	2nd	10.1%	6.4%		
	3st	8.3%	19.3%		
	4th	20.2%	4.6%		
Vegetables	1st	3.2%	13.8%	6.01	0.111
	2nd	11%	12.8%		
	3st	14.7%	12.8%		
	4th	18.3%	7.3%		
Sauces and Seasonings	1st	8.3%	11%	1.51	0.679
	2nd	14.7%	11%		
	3st	15.6%	14.7%		
	4th	14.7%	10.1%		
Fruits	1st	12.8%	11%	0.64	0.886
	2nd	11.9%	11%		
	3st	15.6%	11%		
	4th	12.8%	13.8%		
Beverages	1st	15.6%	10.11%	4.33	0.228

	2nd	14.7%	9.2%		
	3st	14.7%	12.8%		
	4th	8.3%	14.7%		
Breads and cookies	1st	14.7%	8.3%	4.47	0.215
	2nd	15.6%	13.8%		
	3st	13.8%	9.2%		
	4th	9.2%	15.6%		
Sweets and desserts	1st	11.9%	11.9%	9.12	0.028*
	2nd	11%	13.6%		
	3st	19.3%	5.5%		
	4th	11%	13.8%		

$\chi 2$ = Chi-square; *p -value < 0.05; **p-value < 0.005; ***p-value < 0.001.

Discussion

In the present study, a greater number of female participants and female gender expression were observed, representing a Brazilian reality in health courses, in which cisgender women (female biological sex and identify herself as a woman) are the majority (Haddad et al. al., 2010). This is a fact that reflects sociocultural issues in our society, referring to the feminization of health occupations and professions from the perspective of the sexual division of labor, in which the female gender is associated with health care (Lopes & Leal, 2005). Thus, women present more symptoms of anguish and depressive disorders, when compared to men (Lennon, 1995), with depression corresponding to the third and fifth biggest health problems among women in developed and developing countries, respectively (Bertolote, 2001).

The majority of the population indicated the presence of depressive, anxiety and stress symptoms, of the 136 individuals in the study, being 75, 81 and 99, respectively. Previous studies have found a significant increase in psychological disturbance in the university population during the COVID-19 pandemic (Maia & Dias, 2020; Aragão et al., 2021; Gundim et al., 2020), related to factors such as disruption of academic routine, absence of friends and colleagues, concerns about delays in activities, interruption of practical classes and curricular internships and the insertion of remote activities, leading to concerns about internet access and functioning and the difficulties related to this new teaching modality, causing delays in the course and even at its conclusion (Gundim et al., 2020).

It was also observed that the majority of the population reported weight gain during the last year, in addition to a lower concentration of depressive and stress symptoms in individuals who claimed to have maintained their weight, when compared to those who lost or gained weight. Weight gain may be related to a higher intake of energy-dense foods, which may be a consequence of a diet guided by stress, such as the so-called “comfort foods”, which include snacks and ready-to-eat snacks, foods that have been shown to be the main choices for individuals with symptoms of depression (Tomiyama et al., 2012), and these are also related to greater stress reports (Penaforte et al., 2016; Liu et al., 2007; Al Ansari et al., 2014), while dietary patterns rich in fruits, vegetables, fish and whole grains are associated with lower depression rates (Rienks et al 2013). In addition, there is evidence of a higher incidence of overweight in the psychiatric population, especially in those with schizophrenia and depression, when compared to the population without psychiatric disorders (Santos et al., 2018).

An association was found between the intake of the “sweets and desserts” group, foods that are characteristically rich in fat and carbohydrates, especially sugars, and the presentation of symptoms of stress, with emotional eating being related to the search to attenuate stress effects, being common in literature findings that indicate positive associations between the intake of foods rich in carbohydrates and fats, in particular sweets in general, and stress levels (Penaforte et al., 2016; Liu et al., 2007; Al Ansari et al., 2014), in the face of stressful situations, food choices are redirected to more palatable foods, such as sweets and desserts, also accompanied by a reduction in the intake of fresh foods, such as fruits and vegetables (Jacques et al., 2019; Penaforte et al., 2019). The stress effects are partially regulated by the hypothalamic-pituitary-adrenal (HPA) axis, as this has been shown to have reduced activity through the intake of foods containing sugar. After the intake, hormones are released to reduce stress feelings, which consequently increases the desire for the so-called "comfort foods", thus lasting emotional eating habits, which alter emotional states and subsequent behaviors. Evidence indicates that the pathophysiological consequences, such as morphological neuronal changes, altered emotional processing and modified behavior, generated by sucrose intake are similar to rewarding sensations of psychoactive drug use, given that they activate the mesocorticolimbic system in a similar way, and stress is associated with both motivations to use rewarding substances and the effect of not taking such substances (Jacques et al., 2019).

As for the presentation of anxiety symptoms, an association was observed with the intake of “soups and pasta”, “rice and tubers”, “greens and vegetables”, “legumes” and “bread and cookies” groups, with foods predominantly rich in carbohydrates, as well as “sweets and desserts”, a nutrient related to the increase in serum levels of serotonin, a neurotransmitter associated with a well-being feeling, and which is involved in mood modulation (Penaforte et al., 2016), in a way that previous

studies have found a relationship between a higher intake of simple or refined carbohydrates, a diet with a higher glycemic index or sugar intake and higher anxiety levels (Aucoin et al., 2021), whereas impulsive behavior has already been shown to be predictive to the higher intake of sugar and saturated fat in women with anxiety disorder (Fonseca et al., 2020)

According to the WHO (1985), in homeothermic organisms, energy expenditure increases when a greater production of heat is needed to maintain body temperature in a cold climate, whereas in hot climates, energy consumption by the organism in fasting and in a state of physical and mental rest may decrease. Thus, previous studies have evaluated the influence of seasonality on food intake, suggesting a large number of environmental variables that can affect food consumption, including weather and atmosphere conditions, demonstrating a greater tendency to choose hot foods with greater energy density, such as those rich in fats and carbohydrates, in cold climates, to the detriment of colder and lighter foods, such as fruits, foods with a greater preference on hotter days (Castro, 1996) and since the present study was carried out in São Paulo (SP, Brazil) mostly during the time of year when the days were cold in the south and southeast of the country, it is possible to understand the choices by the food groups mentioned by the participants.

The vegetarianism trend has been occupying space mainly among young people, mainly related to concerns for the environment and animal protection (PUCRS, 2020), a fact shown in the present study, observing that undergraduate students are consuming less meat and fish and more foods from the legume and egg groups; rice and tubers; as well as sweets and desserts, when compared to graduate students, taking into account that undergraduate students have a lower average age than graduate students. However, we cannot fail to take into account the price increase of meat that occurred during the pandemic period, which may have influenced the decrease in these foods' intake (CNN, 2021).

Conclusions

Likewise, we cannot ignore the fact that the population of university students stood out as to the suffering caused by the reorganization from the need for social isolation due to the COVID-19 pandemic, when they found themselves overwhelmed by the new teaching environment, with a large number the participants of the present study reporting stress, anxiety and depression symptoms, however, we cannot disregard other external factors that may be associated.

Therefore, it is worth highlighting the importance of carrying out studies that delve more deeply into the psychological phenomena involved in food intake, and vice versa, when we consider the influence of eating guided by stress and weight gain, which is related to the occurrence of disorders in the population, so that adequate nutritional strategies can be developed, taking into account that the role that food plays goes far beyond just the nutritional sphere.

Finally, this research also expressed the relevance of short and validated questionnaires for assessing dietary patterns in relation to mental suffering both in clinical and research environments. The investment power in the availability of tools for associating such behaviors is thus noted.

Conflict of Interest

The authors declares that there are no conflicts of interest in carrying out this work.

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