






# Adult eating behavior at the beginning of the COVID-19 pandemic

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## ABSTRACT

**Introduction:** Difficulties in accessing food and social distancing triggered more anxiety, stress and consumption of low-cost and ultra-processed foods. Objective: To investigate changes in eating behavior and its relationship with socioeconomic aspects. **Method:** Study conducted virtually between May and June 2020 with 949 adults, with questionnaires on socioeconomic data, changes in eating behavior, frequency of food consumption and the TFEQ-21. The analysis was performed descriptively and the TFEQ-21 according to the scores of each factor. The relationship between the variables was analyzed using Pearson's correlation test. **Results:** 63% considered cooking more food, 41% and 38% said they were more likely to eat with company and in peace, respectively. 38.6% reduced fast-food purchases, but 43.2% increased food consumption and 41.8% consumption of sweets. In women, the higher the BMI, the greater the emotional eating and cognitive restriction ( $p < 0.001$ ). In these, emotional eating was greater if they did not have children or higher education ( $p < 0.001$ ), and the restriction was greater with physical activity, not having a stable relationship, having children ( $p < 0.001$ ), employment and higher education ( $p < 0.05$ ). In men, emotional eating was related to higher BMI ( $p < 0.05$ ) and both variables were related to physical activity ( $p < 0.001$ ). **Conclusion:** Changes such as cooking more, reducing fast food, eating calmly and with company were observed compared to before the pandemic. It is noted that in women there is a greater relationship between restriction and emotional eating with various aspects of the social and economic context.

**Keywords:** Eating behavior, COVID-19, Pandemic.

## INTRODUCTION

The causative agent of the Coronavirus disease (COVID-19) is Severe Acute Respiratory Syndrome (SARS-CoV-2), which mainly affects the respiratory tract<sup>1</sup>. Among the main strategies described to stop human transmission of the virus are social distancing and social isolation.<sup>2</sup>

Changes in routine as a result of the pandemic have required reorganization, and adaptations to daily personal and professional activities, along with greater health-related concerns, triggering increased anxiety and stress symptoms.<sup>3,4</sup> Social isolation has associations with psychological and emotional aspects, mood swings, sleep disorders, changes in eating habits, and decreased exposure to sunlight. It also favors a sedentary lifestyle.<sup>5</sup> In addition, access to food, especially high-quality

food, was affected due to the closing of establishments and restrictions on movement.<sup>6</sup>

Another fact is that the pandemic has increased social inequality in Brazil, threatening the human right to adequate food. Wage reduction has led to changes in food consumption, such as the reduction in natural food consumption and the increase in ultra-processed food consumption. Access to food is directly correlated with the regular supply of food products, income availability and retail prices. At the beginning of the pandemic, it was already possible to observe that social isolation intensified the pandemic's effects and led to an increase in food prices in Brazil<sup>7</sup>. In Brazilian regions with less economic power, there was an increased consumption of food considered unhealthy, which may be related to a reduction in purchasing power and less access to food,

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marked by social inequality exacerbated by the pandemic.<sup>8</sup>

In addition to reducing access to food, social distancing was responsible for higher anxiety and stress levels, which also had consequences regarding food, such as the increased consumption of food with poorer nutritional value.<sup>4</sup> All of these changes imply an increased chance of risk behaviors for psychiatric and eating disorders, along with longer exposure to media, with changes in daily activities, decreased physical activity, changes in sleep, negative effect, and the fear of contagion by the virus. The reduction of social support favors emotional dysregulation and another aggravating factor is the reduction in access to healthcare facilities.<sup>6</sup>

It is worth noting that during social distancing, there was an increased media use as a form of entertainment, work, communication, and obtaining information. On social media, it was possible to observe useful posts for those seeking support, entertainment and encouragement for healthy life habits during the pandemic period. However, there were also posts favoring the increase of negative and stigmatizing feelings regarding the body, posts related to the fear of gaining weight, and discrimination towards specific body types<sup>4</sup>. Many posts and websites point out that increasing body weight is something intolerable that should be avoided at all costs. In addition, we find a lot of dissemination of unrealistic skinny ideals, inappropriate eating attitudes, and restrictive diets for weight control or loss<sup>4</sup>.

Eating attitudes imply a set of cognitions and effects that govern eating actions and behaviors<sup>9</sup>. Eating behavior, in turn, involves quantitative and qualitative factors related to food consumption.<sup>10,11</sup> The obsession with weight control or weight loss favors cognitive restraint, a term used to name excessive thoughts, imposition, and food prohibitions in order to reduce caloric intake<sup>12</sup>. In response to negative emotional states, such as loneliness, anxiety, and depression, and even in response to stress generated by cognitive restraint, emotional eating can favor overeating.<sup>12</sup>

Emotional eating is related to a greater activation of the food reward system in the brain, further increasing the motivation to overeat.<sup>13</sup> This reward system works through signaling in the mesolimbic areas of the brain, releasing serotonin, enkephalin,  $\gamma$ -Aminobutyric acid (GABA), dopamine, and acetylcholine, among others. This circuit is

involved in the pleasure triggered by rewards, i.e., the feeling of well-being.<sup>14</sup>

Mood changes are commonly observed, which can lead to maladaptive coping strategies, such as reduced care with food. So, as we are in a social and health situation never before experienced by this globalized generation, assessing the impact of the COVID-19 pandemic on individual eating behavior can favor intervention, prevention and health promotion strategies, specifically in the context of eating habits. Therefore, this study aimed to evaluate changes in adult eating behavior at the beginning of the COVID-19 pandemic regarding consumption, habits, desires, and emotions directed toward food, body modification, and diseases. In addition, the relationships between socioeconomic aspects, body mass index, and dysfunctional eating behavior, such as emotional eating and cognitive restraint, were evaluated during this pandemic period.

## METHOD

This is cross-sectional quantitative research for which data collection took place virtually from May to June 2020.

### *Participants*

The study participants consisted of 949 adults of both sexes, and recruitment took place virtually. The number of participants is not probabilistic, i.e., a convenience sample was obtained for the research. As inclusion criteria, participants had to be Brazilian and over 18 years old. As exclusion criteria, the participants could not have special dietary conditions, such as inflammatory bowel diseases, or intolerances, as they impact consumption, or any type of self-reported eating disorder, such as having received a diagnosis of Anorexia Nervosa, Bulimia Nervosa, or Binge Eating. The participants could also not be pregnant.

### *Instruments*

**Sample characterization.** The questionnaire developed by the researchers included questions about age, education, relationship status, family income, and children. Participants were also asked to self-report their height and weight.

**Health conditions and social impacts caused by COVID-19.** The questionnaire developed by the researchers included questions regarding health status during the previous four weeks, with questions such as "Do you have any health problems?" for which the participant should mark one or more of the following options: heart disease; hypertension; diabetes; low acuity or vision loss; low acuity or hearing loss; terminal illness; tuberculosis; and suffering from or having behavior indicative of a psychological disorder. It also included questions with "yes or no" answer options about practicing sports activity before and during the pandemic, with the questions "Did you practice any physical activity before the pandemic?" and "Are you currently practicing any physical activity?". Regarding the social impact caused by COVID-19, it was evaluated if the participants were diagnosed with or had a suspected case of COVID-19, if they were hospitalized for COVID-19, if they had a family member or someone close to them who was diagnosed with COVID-19 and if there was a wage reduction, with following respective questions: "Have you been diagnosed with or were you considered to have a suspected case of COVID-19?", "Have you been hospitalized for COVID-19?", "Has any family member or someone close to you been diagnosed with or had a suspected case of COVID-19?" and "Has there been any wage reduction due to COVID-19?". Participants were asked whether they considered themselves to be in social isolation due to COVID-19 with the question, "Do you consider yourself to be in social isolation due to COVID-19?" with "yes or no" response options. They were also asked about the frequency with which they leave home (never, once a week, twice a week, three times a week, and four or more times a week) with the question, "How often do you leave the house?"

**Changes in eating behavior.** The questionnaire developed by the researchers asked about the previous four weeks and included questions about changes in various aspects related to eating behavior resulting from the COVID-19 pandemic. Some examples are: "I have the habit of buying food and groceries (even if online)"; "I have the habit of preparing and cooking food"; "Food is available to me (access, variety, acquisition)"; "I consume sweets (candies, chewing gum, cakes, cookies, chocolates, desserts, ice cream)"; "I consume industrialized beverages with or without sugar (soda, juice from

a carton, instant juice)"; "I consume fruit"; "I consume vegetables and legumes"; "I'm concerned about having a healthy diet"; "I'm concerned about my current weight"; "I watch what I eat in order to achieve a certain body shape/figure". The items evaluated changes in shopping habits, dietary choices and food consumption through three answer options: "Greater than before the COVID-19 pandemic", "Equal to before the COVID-19 pandemic" and "Less than before the COVID-19 pandemic".

**Frequency of food consumption.** The questionnaire developed by the researchers included questions about the intake frequency of various food types. Some examples are: "Fried food (e.g., "pastel", "coxinha", "rissoles", "bolinhos") and fried tubers (cassava, french fries)"; "Industrialized packaged (e.g., chips)"; "Ready-made pasta (instant noodles, frozen boxed lasagna)"; "Soda (normal, diet, zero)"; "Leafy vegetables (lettuce, watercress, arugula, cabbage, chicory, etc.)"; "Vegetables (zucchini, eggplant, tomato, carrot, broccoli, pumpkin, cauliflower, green beans, okra, etc.)"; and "Fruits". The participant should mark an answer among the options ranging from daily to never.

**Cognitive restraint of food intake and emotional eating.** To assess these aspects, cognitive restraint of food intake (1,5,11,17,18, and 21) and emotional eating (2,4,7,10,14, and 16) subscales from the Three Factor Eating Questionnaire-21 (TFEQ) were used, translated into Brazilian Portuguese ( $\alpha = 0.85$ ).<sup>15,12</sup> The "cognitive restraint" factor, with six items, evaluates the intentional restraint of food consumption for weight regulation. The "emotional eating" factor, also with six items, evaluates food consumption triggered by feelings, emotions, or psychic stress. For the analysis of the results, the answers were scored from 0 to 4 points, and item 21 was scored on an 8-point numerical rating scale. The mean of each factor was calculated separately and transformed into a scale from 0 to 100 points, considering the value of the total score found. Participants were asked to answer each item based on the four weeks prior to the study, that is, the previous month, in order to assess eating behavior during the pandemic. The authors of the Brazilian version of the TFEQ-21 authorized the modification of the instruction, which is not part of the original instrument since the original instrument does not restrict the answer to the previous month, instead asking generally.

## Procedures

After obtaining approval from the Research Ethics Committee (Protocol CEP No. 4.041.854), the study was carried out in an online format through the Google Forms platform. The dissemination was carried out through the researcher's social networks (Facebook®, Instagram®, and WhatsApp®). All researchers lived in the city of Ribeirão Preto, São Paulo, Brazil, and shared the research with people from different regions of Brazil. Those interested in participating were instructed to click on a link that redirected them to a home page that described the objectives and importance of the research, as well as the institution's identification data and the researchers' contact details. On the second page, participants had access to the ICF, and those who declared their free consent to participate in the research were redirected to the sociodemographic questionnaire, followed by the TFEQ-21 and questions regarding dietary changes due to the COVID-19 pandemic. If the participant marked "yes" for any of the exclusion criteria or "no" if they did not consent to the study, the research was terminated without any data collection or harm to the participant. Completing all the instruments took an average of fifteen minutes.

## Data analysis

A descriptive analysis of the categorical variables (sample characteristics, health conditions, social impacts caused by COVID-19, changes in eating behavior, and frequency of food consumption) was carried out through frequencies and percentages.

Through the calculation of weight (kg) / height (m)<sup>2</sup>, the participant's Body Mass Index (BMI) was calculated. The BMI is an international measure to classify nutritional status. The values recommended by the WHO were used to classify nutritional status: <18,5 kg/m<sup>2</sup> - Low Weight; > 18,5 and < 25 kg/m<sup>2</sup> - Adequate or Eutrophic; > 25 and < 30 kg/m<sup>2</sup> - Overweight; > 30 and < 35 kg/m<sup>2</sup> - Obesity Class I; > 35 and < 40 kg/m<sup>2</sup> - Obesity Class II; > 40 kg/m<sup>2</sup> - Obesity Class III.<sup>16</sup>

The TFEQ's "cognitive restraint" and "emotional eating" subscales were analyzed according to the authors' recommendations so that a score from 0 to 100 was obtained and the results were analyzed as mean and standard deviation.

All virtual questions were mandatory, and therefore the collection did not present missing or blank data. The skewness and kurtosis values indicated that all variables were normally distributed. To investigate the variables "emotional eating" and "cognitive restraint", Pearson correlation analyses were performed. The variables mentioned above were correlated with the BMI, with physical activity (0= practices physical activity and 1= does not practice physical activity), with employment (0= employed and 1= unemployed), with wage reduction (0= wage reduction and 1= no wage reduction), with schooling (0= completed higher education and 1= did not complete higher education), with relationship status (0= without a partner and 1= with a partner) and with having children (0 = yes and 1= no). As a way of evaluating the differences between the predictors of emotional eating and cognitive restraint between the sexes, separate analyses were performed for the female and male participants.

The SPSS statistical software version 23.0 was used for data analysis, considering the value  $p < 0.05$ .

## RESULTS

### *Sample characterization data, health information and social impact caused by COVID-19*

In Table 1, we observe the study's participant data. The majority of participants were female (80.1%), under 30 years old (76.4%), in a stable relationship (59.1%), with no children (76.3%), complete higher education (72.4%), and a family income above five living wages (48.6%) (reference value R\$ 1,045.00). About a third of respondents said they were unemployed.

Table 2 shows health data and the social impact caused by COVID-19. We observed that 50.6% of the participants had a normal nutritional status, followed by 27.9% who were overweight and 17.6% who were obese. Almost 60% of the sample reported not exercising during the pandemic, and 81.5% had no health problems. Forty participants (4.2%) were diagnosed with COVID-19. No participant was hospitalized due to the diagnosis, and 23.2% had family members or people close to them diagnosed with COVID-19. Most participants (86.7%) considered themselves as being in social isolation, 54.7% left home once or twice a week, and

**Table 1**

Sample characterization of Brazilian adults (N = 949), 2020.

	% (n)
<b>Sex</b>	
Female	80.1% (760)
Male	19.7% (187)
Preferred not to answer	0.2% (2)
<b>Age</b>	
Less than 30 years old	76.4% (725)
Between 30 and 50 years old	12.4% (118)
More than 50 years old	11.2% (106)
<b>Relationship status</b>	
In a stable relationship	59.1% (561)
Not in a stable relationship	40.9% (388)
<b>Children</b>	
No children	73.3% (696)
1 to 2 children	22.7% (215)
3 or more children	4.0% (38)
<b>Education</b>	
Complete higher education	72.4% (687)
Incomplete higher education	18.9% (179)
Complete high school	7.6% (72)
Incomplete high school	0.8% (8)
Complete primary education	0.2% (2)
Incomplete primary education	0.1% (1)
<b>Employment</b>	
Employed	66.9% (635)
Unemployed	33.1% (314)
<b>Family income</b>	
Up to 1 living wage (R\$ 1045,00)	3.0% (28)
Up to 2 living wages	13.0% (123)
Up to 5 living wages	35.5% (337)
More than 5 living wages	48.6% (461)

20.9% left home four times a week. Nearly half of the participants suffered pay cuts due to COVID-19.

### Changes in eating behavior

Table 3 shows the results of changes in eating behavior, described as greater than, equal to, or less than before the COVID-19 pandemic. During the four weeks prior to the study, most participants (63%) reported they were preparing and cooking more meals than they had before the pandemic and

reported a greater possibility of eating with company (41%), eating at the table (37.9 %) and eating calmly and with attention (38.5%). In addition, 32.8% reported better food quality than before COVID-19, and 38.6% reported having reduced the purchase of snacks and ready-to-eat food through fast-food apps.

Also, 43.2% reported an increase in food consumption throughout the day, and 41.8% reported their consumption of sweets to be higher than before the pandemic.

Approximately half of the participants were more concerned about their current weight than before the pandemic (48.5%) and reported a greater desire to lose weight (42.6%). In addition, they showed greater concern than before COVID-19 about having a healthy diet (41.8%) and about preventing diseases through food (38.9%) and considered that their food choices were influenced by the fear of getting sick and to improve their immune system (25%).

### Frequency of food consumption

Table 4 shows the frequency of food consumption in the four weeks prior to the study. Grains and cereals were consumed daily by 68.4% and 53.4% of the sample, respectively. Other types of whole grains, such as oats, quinoa, and wheat, were consumed daily by 19.6% of the participants, and 31.9% reported not consuming this type of food. Daily consumption of homemade bread, cakes, and pasta was reported by 24.2%, 6.7%, and 7.7% of the sample, respectively. On the other hand, ultra-processed and industrialized bread, cakes, and pasta were consumed less. Daily consumption of fruits, leafy greens, and vegetables was reported by almost 50% of participants. Meat and eggs were consumed daily by a large number of individuals (68.1% and 49.9%, respectively). Pizza, chocolates, and soda were consumed daily by 1.8%, 24.4%, and 11.1% of the participants, respectively, but only a few times a week by 33.4%, 40.1%, and 24.3% of the participants, respectively.

### Emotional Eating and Cognitive Restraint

The score found for emotional eating among the participants was 41.62 (SD= 20.88), with 43.17



**Table 2**

Health data and social impact caused by COVID-19 on Brazilian adults (N = 949), 2020.

	<b>% (n)</b>
<b>Data on COVID-19</b>	
Diagnosed with COVID-19	4.2% (40)
Not diagnosed with COVID-19	95.8% (909)
Hospitalized due to COVID-19	0.0% (00)
Did not need to be hospitalized due to COVID-19	100% (949)
Had a person close to them diagnosed with COVID-19	23.2% (220)
Did not have a person close to them diagnosed with COVID-19	76.8% (729)
<b>Physical activity</b>	
Practiced physical exercise before COVID-19	62.7% (595)
Did not practice physical exercise before COVID-19	37.3% (354)
Currently practicing physical exercise	41.6% (395)
Not currently practicing physical exercise	58.4% (554)
<b>Social isolation</b>	
Considered themselves to be in social isolation	86.7% (823)
Did not consider themselves to be in social isolation	13.3% (126)
<b>Frequency leaving home</b>	
0 times a week	14.6% (139)
Once a week	36.6% (347)
Twice a week	18.1% (172)
3 times a week	9.8% (93)
4 times a week	20.9% (198)
<b>Health status and nutritional status</b>	
With a health problem (cardiovascular disease, hypertension, diabetes, low acuity or vision loss, low acuity or hearing loss, a terminal illness, tuberculosis, suffering from or behavior indicative of a psychological disorder)	18.5% (176)
No health problems	81.5% (773)
Low weight	3.9% (37)
Eutrophy	50.6% (480)
Overweight	27.9% (265)
Obese	17.6% (167)
<b>Wage impact due to COVID-19</b>	
Pay cut due to the pandemic	46.3% (439)
Did not have a pay cut due to the pandemic	53.7% (510)

(SD= 28.83) among the 760 female participants and 35.11 (SD= 27.92) among the 187 male participants. As for cognitive restraint, the score found among the adults in this study was 42.95 (SD= 20.88), with 42.68 (SD= 21.07) among the female participants and 44.35 (SD= 19.97) among the male participants for the mean scores.

### *Relationship between Emotional Eating, Cognitive Restraint, BMI, and socioeconomic factors*

Table 5 describes the correlation analysis between the TFEQ subscales “emotional eating”

**Table 3**

Changes in eating behavior due to COVID-19 in Brazilian adults (N = 949), 2020.

	Equal to before COVID-19 % (n)	Greater than before COVID-19 % (n)	Less than before COVID-19 % (n)
1. Buying food and groceries at supermarkets and markets (consider buying online)	40.5% (384)	38.6% (366)	21.0% (199)
2. Purchasing ready-to-eat meals and sandwiches through apps	33.8% (321)	27.6% (262)	38.6% (366)
3. Habit of preparing and cooking food	31.4% (298)	63.0% (598)	5.6% (53)
4. Food availability (access, variety, and purchase)	63.8% (605)	20.9% (198)	15.4% (146)
5. Consumption of alcoholic beverages	47.9% (455)	17.8% (169)	34.2% (325)
6. Consumption of industrialized and ultra-processed ready-to-eat food (packaged or frozen)	51.2% (486)	20.5% (195)	28.2% (268)
7. Consumption of sweets (candies, cakes, cookies, chocolates, desserts, and ice cream)	42.3% (401)	41.8% (397)	15.9% (151)
8. Fast food consumption (like pizzas and sandwiches)	43.9% (417)	21.6% (205)	34.5% (327)
9. Consumption of processed drinks with or without sugar (soda)	61.0% (579)	15.8% (150)	23.2% (220)
10. Consumption of fruits	56.9% (540)	26.4% (251)	16.6% (158)
11. Consumption of vegetables	59.5% (565)	27.8% (264)	12.6% (120)
12. Consumption of natural or minimally processed food	62.2% (590)	26.9% (255)	11.0% (104)
13. Water intake	57.7% (548)	23.9% (227)	18.3% (174)
14. Concern about having a healthy diet	45.8% (435)	41.8% (397)	12.3% (117)
15. Concern about disease prevention through diet	53.8% (511)	38.9% (369)	7.3% (69)
16. Concern about current weight	41.5% (394)	48.5% (460)	10.0% (95)
17. Desire to reduce body weight	47.9% (455)	42.6% (404)	9.5% (90)
18. Food choices as a way to achieve a certain shape / figure	54.6% (518)	20.0% (190)	25.4% (241)
19. Food quality	41.5% (394)	32.8% (311)	25.7% (244)
20. Amount of food consumed throughout the day	43.6% (414)	43.2% (410)	13.2% (125)
21. Food choices influenced by fear of getting sick (thinking about improving the immune system)	62.0% (588)	25.0% (237)	13.1% (124)
22. Possible to eat calmly and with more attention	47.8% (454)	38.5% (365)	13.7% (130)
23. Possible to eat at the table	54.6% (518)	37.9% (360)	7.5% (71)
24. Possible to eat with company	42.0% (399)	41.0% (389)	17.0% (161)

and “cognitive restraint”, the BMI, and some socioeconomic aspects of the participants according to sex. In females, there was a significant positive correlation between emotional eating and BMI, not having higher education and not having children. In males, emotional eating was positively correlated with BMI and lack of physical activity.

In females, cognitive restraint was positively correlated with BMI and negatively correlated with lack of physical activity, not having employment, not

having higher education, having a stable relationship, and not having children. As for males, a significant negative correlation between cognitive restraint and lack of physical activity was observed.

## DISCUSSION

This study investigated changes in eating behavior, food consumption data, cognitive restraint

**Table 4**

Food frequency questionnaire over the last 30 days in Brazilian adults (N = 949), 2020.

	<b>Every day or almost every day % (n)</b>	<b>A few times a week % (n)</b>	<b>A few times a month % (n)</b>	<b>Never % (n)</b>
1. Homemade bread	24.2 (230)	36.6 (346)	23.6 (224)	15.7 (149)
2. Industrialized bread	27.6 (262)	36.0 (342)	22.6 (214)	13.8 (131)
3. Cookies	7.4 (70)	28.2 (268)	24.4 (232)	39.9 (379)
4. Crackers	6.1 (58)	27.3 (259)	20.7 (196)	45.9 (436)
5. Fried food ("pastel", "coxinha", "rissoles", "bolinhos")	1.9 (18)	32.7 (310)	43.4 (412)	22.0 (209)
6. Baked snacks and savory pies	1.1 (10)	24.9 (236)	35.6 (338)	38.5 (365)
7. Industrialized packaged snacks (chips)	1.1 (10)	15.5 (147)	26.7 (253)	56.8 (539)
8. Pizza	1.8 (17)	33.4 (317)	52.8 (501)	12.0 (114)
9. Homemade cake	6.7 (64)	36.7 (348)	39.0 (370)	17.6 (167)
10. Industrialized cake	1.4 (13)	12.6 (120)	16.5 (157)	69.4 (659)
11. Rice	68.4 (649)	18.0 (171)	10.4 (99)	3.2 (30)
12. Wheat flour, cassava flour, tapioca, corn flour, couscous	16.6 (158)	31.9 (303)	21.6 (205)	29.8 (283)
13. Oats, quinoa, wheat	19.6 (186)	29.4 (279)	19.1 (181)	31.9 (303)
14. Homemade noodles/pasta	7.7 (73)	46.8 (444)	34.7 (329)	10.9 (103)
15. Ready-to-eat Industrialized pasta	1.8 (17)	15.0 (142)	22.0 (209)	61.2 (581)
16. Beans and legumes	53.4 (507)	28.1 (267)	14.2 (135)	4.2 (40)
17. Tubers	19.5 (185)	52.4 (497)	24.7 (234)	3.5 (33)
18. Leafy greens and vegetables	49.9 (473)	29.8 (282)	14.6 (138)	5.5 (52)
19. Meat (beef, chicken, fish, pork)	68.1 (646)	17.1 (162)	8.3 (79)	6.5 (62)
20. Eggs	40.9 (388)	38.7 (367)	16.3 (155)	4.1 (39)
21. Ultra-processed meat (sausage, ham, steak)	13.2 (125)	32.5 (308)	26.6 (252)	27.8 (264)
22. Fruits	49.8 (473)	31.0 (304)	14.5 (138)	3.6 (34)
23. Seeds and nuts	17.2 (163)	25.5 (242)	24.8 (235)	32.6 (309)
24. White skim milk cheese	26.7 (253)	32.2 (306)	20.4 (194)	20.7 (196)
25. Yellow cheese	24.4 (232)	46.2 (438)	21.3 (202)	8.1 (77)
26. Milk or yogurt (natural)	36.9 (350)	29.5 (280)	15.8 (150)	17.8 (169)
27. Flavored yogurt	6.2 (59)	20.5 (195)	16.8 (159)	56.5 (536)
28. All-natural juice	19.6 (186)	31.1 (295)	21.2 (201)	28.1 (267)
29. Industrialized juice	6.1 (58)	15.5 (147)	12.0 (114)	66.4 (630)
30. Soda	11.1 (105)	24.3 (231)	23.6 (224)	41.0 (389)
31. Chocolate	24.4 (232)	40.1 (381)	26.0 (247)	9.4 (89)
32. Industrialized dessert	4.0 (38)	14.6 (139)	24.0 (228)	57.3 (544)
33. Homemade dessert	8.4 (80)	33.2 (315)	35.7 (339)	22.7 (215)

of food intake, and emotional eating in adults at the beginning of the COVID-19 pandemic. Participants reported an increase in the purchase of food and groceries at supermarkets, in addition to cooking more, eating with company, and eating with more

attention. In addition, we found a reduction in the purchase of food through online applications, in the purchase of fast food, and in alcohol consumption.

There was an increase in the concern about food and obtaining a healthier diet. About half of



**Table 5**

Correlation analysis between "Cognitive Restraint", "Emotional Eating", BMI, and socioeconomic data, divided by sex in Brazilian adults (N = 949), 2020.

	1	2	3	4	5	6	7	8	9
<b>Female</b>									
1. Emotional Eating	1.000								
2. Cognitive Restraint	0.041	1.000							
3. BMI	0.275**	0.113**	1.000						
4. Physical activity	0.051	-0.170**	0.122**	1.000					
5. Employment	0.049	-0.075*	-0.082*	-0.012	1.000				
6. Wage Reduction	-0.016	0.024	-0.049	0.018	0.003	1.000			
7. Education	0.094**	-0.086*	-0.044	-0.001	0.437**	-.121**	1.000		
8. Relationship Status	0.070	-0.156**	-0.130**	-0.023	0.241**	0.015	0.128**	1.000	
9. Children	0.096**	-0.213**	-0.192**	-0.108*	0.151**	0.025	0.038	0.346**	1.000
<b>Male</b>									
1. Emotional Eating	1.000								
2. Cognitive Restraint	0.017	1.000							
3. BMI	0.151*	-0.016	1.000						
4. Physical activity	0.201**	-0.201**	0.205**	1.000					
5. Employment	0.076	-0.094	-0.009	0.059	1.000				
6. Wage Reduction	0.032	-0.025	-0.061	-0.038	0.084	1.000			
7. Education	0.052	0.023	0.109	-0.024	0.171*	-0.073	1.000		
8. Relationship Status	-0.075	0.019	-0.311**	-0.227**	0.167*	0.038	0.122	1.000	
9. Children	0.051	-0.042	-0.349**	-0.111	0.103	0.080	-0.053	0.325**	1.000

\*p < 0.05; \*\*p < 0.001.

the sample expressed greater concern with healthy eating as a way to prevent disease and revealed that food choices are influenced by the fear of getting sick or gaining weight. Although the food frequency questionnaire showed that only half of the sample consumed fruits and vegetables on a daily basis, a quarter of the participants reported an increase in the consumption of these items when compared to before the pandemic. In addition, we observed the reported increase in the consumption of natural food, water, and higher quality food; however, the participants also reported a greater daily food consumption and greater consumption of sweets when compared to before the COVID-19 pandemic.

Similar findings were found in an Italian study in which there was a 21.2% increase in the consumption of fruits and vegetables, but also an increase in the consumption of sweets and in the total amount of food intake.<sup>21</sup> In other countries in Europe, North Africa, West Asia, and the Americas, increased consumption of unhealthy food, uncontrolled eating, increased snacking between meals, and increased consumption of food in general, have been identified.<sup>5</sup>

Another study also carried out with Brazilians during the pandemic identified a modest but significant increase in healthy food consumption and stability in the consumption of food considered unhealthy.<sup>17</sup> However, in Brazilian regions with

lower socioeconomic conditions, the study's authors observed an increase in unhealthy food consumption, which may be related to lower purchasing power and even to less access to food, with social inequality possibly having been exacerbated by the pandemic.<sup>8</sup> Thus, the changes in food quality are an evident result of the pandemic.

This study identified that the higher the emotional eating, the higher the body mass index in both men and women. We also found a relationship between greater emotional eating and the lack of physical activity in men and a relationship between greater emotional eating and not having higher education or children in women. A study with Brazilian men and women identified the male participants' greatest weight change over the six-month period in 2020, in which social isolation was greatest, with weight gain or loss of at least 2 kg. Both weight gain and loss were associated with younger age and previously being overweight. Lower education was associated only with weight gain.<sup>18</sup> Therefore, it may be possible to reflect on the characteristics that favor and relate to dietary changes in response to a given context.

Food intake as a way to deal with emotions caused by stress can be characterized as a maladaptive strategy that has long-term consequences for health.<sup>10</sup>

As for cognitive restraint, the higher this variable was, the higher the BMI for women. In addition, in females, the greatest cognitive restraint was related to practicing physical activity, having children, being employed, having higher education and not being in a stable relationship. In men, cognitive restraint was greater in participants who practiced physical activity.

The numerous changes and restrictions on daily activities resulting from the pandemic can favor the development of eating disorders and the worsening of preexisting disorders.<sup>6</sup> The current global situation hinders protective factors against eating disorders, such as reduced social support, worsening emotional distress and fear of contagion, all of which favor changes in eating behavior. Furthermore, excessive social media use can also build unhealthy relationships with food.<sup>7</sup> Therefore, studies that assess changes in eating behavior among populations in different cultural contexts are fundamental for a better understanding

of the pandemic's impact on people's health and psychological well-being. This better understanding can be used to create intervention strategies to reduce eating disorder symptoms, thus promoting a healthier relationship with food during the current global crisis.

This study has some limitations. The most relevant is related to the sample. As the distribution by sex, educational level, and family income differ from the national population, the results cannot be extrapolated. Furthermore, the change in the TFEQ-21, with the answers only considering the four weeks prior to the study, is not part of the original validation process and the questionnaire's scope can be influenced by the researchers' dissemination network. Finally, the results cannot inform us about COVID-19's long-term effects on the population's eating behavior.

The present study presents itself as an important assessment of a portion of Brazilians regarding their food consumption, dietary changes and emotional and restrictive eating during the beginning of the COVID-19 pandemic. The data is valuable as it provides information on eating behavior in a critical period worldwide.

Other studies can assess whether people's return to work and leisure routines, greater social interaction and less precaution regarding the pandemic caused individuals to return to their previous habits or if the pandemic period and greater social isolation gave people the opportunity to acquire and maintain healthier habits, such as eating more fruits and vegetables or cooking at home more often, or if the habits of consuming higher amounts of sugar-rich food or food with little nutritional value remained. Likewise, it is also important to evaluate populations with different socioeconomic conditions and the possible consequences their respective socioeconomic conditions have on food purchasing and consumption.

## CONCLUSION

It can be concluded that some positive changes were observed in this sample during the pandemic, such as cooking more, reducing fast food, eating calmly, and eating with company. We also found that many people who reported increased concern about

their current weight and about the consumption of food and sweets, as well as a greater desire to lose weight, have a healthy diet, and prevent diseases through food. Regarding the relationship between eating behavior and socioeconomic aspects, it is noted that in women, there is a relationship between cognitive restraint, emotional eating, and social and economic contexts. Emotional eating is greater in those who do not have higher education and children, and cognitive restraint is greater in those who do not have employment, higher education, a stable relationship, and children. In men, we found no association between socioeconomic variables.

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