

Negative effects of the COVID-19 pandemic on physical activity and binge eating disorder in Brazilian women: a cross-sectional study

Efeitos negativos da pandemia de COVID-19 na atividade física e no transtorno da compulsão alimentar periódica em mulheres brasileiras: um estudo transversal

Efectos negativos de la pandemia de COVID-19 sobre la actividad física y el trastorno por atracón en mujeres brasileñas: un estudio transversal

Caroline Pereira Garcês^{a*} , Luciana Oliveira e Silva^a , Sara Menezes Nunes^b ,
Guilherme Morais Puga^{a,b} , Nadia Carla Cheik^b 

Keywords:

Binge-eating disorder;
Coronavirus;
Women;
Sedentary behavior.

ABSTRACT

This study aimed to identify changes in physical activity, sitting time, and binge eating disorder in Brazilian women during the COVID-19 pandemic. A cross-sectional and retrospective study was conducted online on 150 Brazilian women adults. The prevalence of binge eating and physically inactive women increased during the COVID-19 pandemic ($p < 0.001$ and $p = 0.01$, respectively). Binge eating was associated with insufficient physical activity before ($p = 0.01$) and during the pandemic ($p = 0.05$). The physical activity time and sitting time showed no differences after adjustment for possible confounders ($p > 0.05$). In conclusion, the pandemic affected Brazilian women's lifestyle and eating behavior.

Palavras-chave:

Transtorno da compulsão alimentar;
Coronavirus;
Mulheres;
Comportamento sedentário.

RESUMO

Este estudo teve como objetivo identificar mudanças na atividade física, tempo sentado e transtorno da compulsão alimentar periódica em mulheres brasileiras durante a pandemia de COVID-19. Foi realizado um estudo transversal e retrospectivo por meio de um formulário on-line em 150 mulheres adultas brasileiras. A prevalência de compulsão alimentar e de mulheres fisicamente inativas aumentou durante a pandemia de COVID-19 ($p < 0,001$ e $p = 0,01$, respectivamente). A compulsão alimentar foi associada à atividade física insuficiente antes ($p = 0,01$) e durante a pandemia ($p = 0,05$). O tempo de atividade física e o tempo sentado não apresentaram diferenças após ajuste para possíveis fatores de confusão ($p > 0,05$). Em conclusão, a pandemia afetou o estilo de vida e o comportamento alimentar das mulheres brasileiras.

Palabras-clave:

Transtorno por atracón;
Coronavirus;
Mujeres;
Conducta sedentaria.

RESUMEN

El objetivo del estudio fue identificar cambios los cambios en la actividad física, el tiempo sentado y el trastorno por atracón en mujeres brasileñas durante la pandemia de COVID-19. Es un estudio transversal y retrospectivo que evaluó, a través de un formulario en línea en 150 mujeres brasileñas adultas. La prevalencia de atracones y de mujeres físicamente inactivas aumentó durante la pandemia de COVID-19 ($p < 0,001$ y $p = 0,01$, respectivamente). Los atracones se asociaron con actividad física insuficiente antes ($p = 0,01$) y durante la pandemia ($p = 0,05$). El tiempo de actividad física y el tiempo sentado no difirieron después del ajuste por posibles factores de confusión ($p > 0,05$). En conclusión, la pandemia afectó el estilo de vida y el comportamiento alimentario de las mujeres brasileñas.

^aUniversidade Federal de Uberlândia, Faculdade de Medicina. Uberlândia, MG, Brasil.

^bUniversidade Federal de Uberlândia, Faculdade de Educação Física e Fisioterapia. Uberlândia, MG, Brasil.

*Corresponding author:

Caroline Pereira Garcês
E-mail: carolgarces@outlook.com

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INTRODUCTION

On March 11, 2020, the World Health Organization officially announced the novel coronavirus (COVID-19) as a pandemic (OPAS, 2023), and since then, countless preventive and restrictive measures have been implemented to attempt to minimize and prevent the spread of the virus in Brazil, including social distancing and lockdowns. Nevertheless, despite these measures being necessary to reduce the spread of infection, the restrictions have negatively impacted the physical and mental health and eating behavior of the general population (Ammar et al., 2020; Kriaucioniene et al., 2020; Flanagan et al., 2021).

Recent studies have reported higher psychological distress, increased risk of anxiety, stress, depression, and feelings of overload in women during the COVID-19 pandemic (Pieh et al., 2020; Qiu et al., 2020; Wang et al., 2020). These emotional and psychological changes may increase the risk of developing disordered eating behaviors (Naja and Hamadeh, 2020), including binge eating disorder (BED), which primarily affects women and may be exacerbated during this period as binge eating may be a coping mechanism to regulate and reduce negative emotions (Albergaria et al., 2017; Galmiche et al., 2019; Keski-Rahkonen, 2021). Furthermore, excessive food intake is associated with positive energy balance and, consequently, chronic non-communicable diseases (NCDs), which are associated with worsening COVID-19 outcomes (Cheng et al., 2021).

Women are less likely to be physically active and report more significant barriers to physical activity before and during the pandemic (Troiano et al., 2008; Hickey and Mason, 2017; Guthold et al., 2018; Nienhuis and Lesser, 2020). This is quite concerning, given that the closure of fitness centers, gyms, and sports clubs and the restrictive protocols adopted for outdoor activities, together with other social distancing measures, may make it even more challenging for individuals to maintain healthy levels of physical activity, sitting time, and a healthy and active lifestyle during this worrisome period. This is a worrisome scenario, given that physical activity is highly effective in preventing NCDs, decreasing mortality risk, improving mental health (Mikkelsen et al., 2017), and boosting the immune response to infections such as those caused by COVID-19 (Mohamed and Alawna, 2020). In addition, excessive sitting time negatively affects cardiometabolic health, increasing the risk of NCDs, including obesity, diabetes, and cardiovascular disease (Biswas et al., 2015; Bailey et al., 2019). However, recent evidence has shown reduced physical activity and increased sedentary behavior in the general population (Ammar et al., 2020; Kriaucioniene et al., 2020; Flanagan et al., 2021).

Given the above, it is pivotal to evaluate the effects of the pandemic as women may present negative changes in weight-related behaviors and maintain a healthy lifestyle during this period. Additionally, few studies have evaluated the effects of the COVID-19 pandemic on the lifestyle of this population, especially Brazilian women.

Hence, this study sought to identify changes in physical activity, sitting time, and binge eating disorder in Brazilian women during the COVID-19 pandemic.

METHODOLOGY

This cross-sectional retrospective study was conducted between October and December 2020 with women aged 18 to 60. Data were collected using an anonymous online form with questions assessing the individuals' physical activity, sitting time, and binge eating behavior before and during the COVID-19 pandemic. The inclusion criteria were determined as women between 18 and 60 years old, agreeing to the digital informed consent form, and answering every question. There was no sample loss, every participant answered all questions and completed the study. The protocol and informed consent form were approved by the Ethics Committee of the Federal University of Uberlândia (no. 38439920.9.0000.5152).

QUESTIONNAIRE

An anonymous online questionnaire prepared on the Google Forms® platform and divulged on social networks (WhatsApp®, Instagram®, and e-mail) and media (e.g., radio and television programs) was used to collect data. The participants' information, including their sex, age, marital status, level of education, and weight and height, were obtained through self-reported measurements; their body mass index (body mass in kg/height in m²) was also calculated (WHO, 2000). The participants were also objectively asked whether there was a gain in body mass during the pandemic and, if so, how many kilograms.

The questions regarding their physical activity, sitting time, and binge eating behavior were presented differently, and they were required to provide two answers: one referring to the pre-pandemic period (retrospective information) and the other in terms of the conditions during the social-distancing period (23 October 2020 until 03 December).

PHYSICAL ACTIVITY AND SITTING TIME

The respondents' physical activity and sitting time were assessed using the short version of the International Physical Activity Questionnaire (IPAQ). This survey includes the time spent on walking, moderate physical activity (PA), and vigorous PA and allows one to estimate the total time spent on physical activity per week and estimated energy expenditure by multiplying the value of energy expenditure (in metabolic equivalents; METs) according to the activity effectively carried out (walking = 3.3 METs, moderate PA = 4.0 METs, and vigorous PA = 8.0 METs) according to the weekly frequency and duration. The questionnaire also allows researchers to evaluate the daily sitting time (IPAQ Research Committee, 2005).

BINGE EATING DISORDER

The Binge Eating Scale (BES) was employed to assess the presence of compulsive eating behavior.

It is a 16-question self-administered and validated survey with 62 statements, in which the statement that best represents the respondent's answer must be selected for each question. Each statement is scored on a 0–3 scale (where 0 is the absence and 3 is the maximum severity). The final score results from the sum of the points for each question, and individuals who score 17 or below are deemed to have no compulsion, scores from 18 to 26 have a moderate compulsion, and scores equal to or over 27 have a severe compulsion (Freitas et al., 2001).

STATISTICAL ANALYSIS

Statistical analyses were performed in the SPSS software (version 23.0). Data distribution normality was confirmed using the Kolmogorov-Smirnov test, and the values were calculated and reported as median and percentiles, mean \pm standard deviation, frequency, and percentage. We calculated the delta and delta % change. A general linear model for repeated measures was used for continuous variables in order for us to assess any significant differences in responses before and during the pandemic. Log10 was used for standardizing data that did not follow the normality curve, and variable sphericity was corrected by the Greenhouse-Geisser procedure.

The multivariate general linear model and binary logistic regression were used to test the relationship between the variables. In the logistic regression model, the physical activity level (active/inactive) was considered dependent, and sitting time and binge eating were independent variables. The calculation of posterior power was performed using the statistical program G*Power version 3.1.9.7. The test was performed with a beta power of 0.80 and alpha of 0.05, considering the F test (Means: Difference between two dependent means (matched pairs)) for the calculation. The effect size was obtained by averaging the scores before and after the pandemic for the variables of sitting time, physical activity (minutes/week), and binge eating. The Kappa Chi-square test was used to assess differences in categorical data. The significance of $p < 0.05$ was used for all analyses.

RESULTS

A total of 150 women participated in the study. The participants had a median age of 28 years (22 – 41 years), most were single (60.7%), had complete higher education (58.7%), had a high prevalence of body mass gain during the pandemic (71.6%), and a weight gain of 4 kg. The general characteristics of the participants are listed in Table 1.

Table 1. General characteristics of the sample.

	Median (percentile 25 - 75)
Age (years)	28 (22 - 41)
Body mass (kg)	69.15 (64 - 80)
Height (m)	1.65 (1.61 - 1.69)
BMI (kg/m ²)	25.03 (23.39 - 28.93)
Body mass gain (kg)	4 (0 - 6)
Prevalence of body mass gain during the pandemic (%)	106 (71.6)
Classification BMI	n (%)
Normal-weight	74 (49.3%)
Overweight	45 (30%)
Class I obesity	21 (14%)
Class II obesity	8 (5.3%)
Class III obesity	2 (1.3%)
Marital status	n (%)
Single	91 (60.7%)
Married	46 (30.7%)
Divorced	2 (1.3%)
Common-law marriage	11 (7.3%)
Level of education	n (%)
Incomplete elementary school	1 (0.7%)
Incomplete high school	1 (0.7%)
Complete high school	10 (6.7%)
Incomplete higher education	50 (33.3%)
Complete higher education	88 (58.7%)

Values are expressed as median and percentile (25 - 75) for continuous variables and as absolute number and percentage (n (%)) for categorical variables; Body mass index (BMI).

The prevalence of physically active women decreased significantly during the COVID-19 pandemic ($p = 0.01$) (Table 2). We also observed a reduction in the physical activity in all variables assessed (walking, moderate-intensity PA, vigorous-intensity PA, and total weekly physical activity time) ($p < 0.05$). In addition, there was a 46% increase in sitting time ($p < 0.001$). However, after adjusting for age, marital status, level of education, and BMI, these variables were no longer significant ($p > 0.05$) (Table 3).

As shown in Table 2, there was a 96% percent increase in the prevalence of binge eating and a high rate of severe binge eating during the pandemic ($p < 0.05$).

Table 4 shows that physical activity, sitting time, and binge eating were related before and during the COVID-19 pandemic ($p < 0.001$). Furthermore, the logistic regression analysis showed that binge eating was associated with low physical activity level before ($p = 0.01$) and during the pandemic ($p = 0.05$) (Table 5).

Table 2. Prevalence of the physical activity level and binge eating in women before and during the COVID-19 pandemic.

	Pre-pandemic	During the pandemic	Δ ($\Delta\%$)
PAL			
Inactive	29 (19.3%)	81 (54%)*	52 (179%)
Active	121 (80.7%)	69 (46%)*	- 52 (- 42%)
BED			
No compulsion	119 (79.3%)	89 (59.3%)*	- 30 (- 25%)
Presence of BED	31 (20.7%)	61 (40.7%)*	30 (96%)
Moderate compulsion	21 (14%)	30 (20%)	9 (42%)
Severe compulsion	10 (6.7%)	31 (20.7%)*	21 (210%)

Values are expressed as numbers and percentages (n (%)); Physical activity level (PAL); Binge eating disorder (BED); Statistical analysis: Kappa's Chi-square; * $p < 0.05$ in the difference between before and during the COVID-19 pandemic.

Table 3. Physical activity, sitting time, and binge eating before and during the COVID-19 pandemic.

	Pre-pandemic	During the pandemic	Δ ($\Delta\%$)	p value	p adjusted	Power
Sitting time Min/week	2778.06 \pm 1488.90	4065.26 \pm 2497.85	1287.2 (46%)	< 0.001*	0.47	0.99
Walking MET Min/week	857.67 \pm 1004.80 259.90 \pm 304.48	289.08 \pm 500.03 87.60 \pm 151.52	- 568.59 (- 66%) - 172.3 (- 66%)	< 0.001* < 0.001*	0.29 0.29	1.00
Moderate intensity MET Min/week	1067 \pm 1150.62 266.75 \pm 287.65	685.26 \pm 899.11 171.31 \pm 224.77	- 381.74 (- 35%) - 95.44 (- 35%)	< 0.001* < 0.001*	0.91 0.91	0.99
Vigorous intensity MET Min/week	1414.26 \pm 2499.44 176.78 \pm 312.43	816.61 \pm 1516.28 102.07 \pm 189.53	- 597.65 (- 42%) - 74.71 (- 42%)	< 0.001* < 0.001*	0.45 0.45	0.91
Total physical activity MET Min/week	3338.93 \pm 3693.82 703.43 \pm 673.12	1790.96 \pm 2085.49 360.99 \pm 380.83	- 1547.97 (- 46%) - 342.44 (- 48%)	< 0.001* < 0.001*	0.95 0.80	0.99
Binge eating Score	11.07 \pm 8.79	16.23 \pm 11.11	5.16 (46%)	< 0.001*	0.74	0.99

Values are expressed as mean \pm standard deviation; Statistical analysis: General linear model for repeated measures. * $p < 0.05$. p adjusted by age, marital status, level of education, and BMI classes.

Table 4. Relationship between physical activity, sitting time, and binge eating before and during the pandemic.

	Pre-pandemic	During the pandemic
Sitting time (min/week)	< 0.001*	< 0.001*
Walking (min/week)	< 0.001*	< 0.001*
Moderate intensity (min/week)	< 0.001*	< 0.001*
Vigorous intensity (min/week)	< 0.001*	< 0.001*
Total physical activity (min/week)	< 0.001*	< 0.001*
Binge eating (score)	< 0.001*	< 0.001*

Statistical analysis: Multivariate general linear model; * $p < 0.05$.

Table 5. Binary logistic regression model used to predict the relationship between physical activity level, sitting time, and binge eating pre and during the pandemic.

	B	p	Exp (B)	CI (95%)
Pre-pandemic				
Sitting time	0.00	0.20	1.00	1.00 – 1.00
Binge eating	0.05	0.01*	1.05	1.00 – 1.10
During the pandemic				
Sitting time	0.00	0.13	1.00	1.00 – 1.00
Binge eating	0.03	0.05*	1.03	1.00 – 1.06

Statistical analysis: Binary logistic regression; B = beta coefficient. p = statistical significance; Exp (B): beta exponential; CI (95%) = 95% confidence interval; *p < 0.05.

DISCUSSION

This study evaluated the effects of the COVID-19 pandemic on Brazilian women's lifestyles and eating behavior. The main findings are as follows: 1) The prevalence of binge eating and of physically inactive women increased during the COVID-19 pandemic; 2) After adjusting for age, marital status, level of education, and BMI, there were no changes in the physical activity time, metabolic equivalent, and sitting time during the COVID-19 pandemic; and 3) The binge eating increased was associated with insufficient physical activity levels before and during the pandemic.

Our findings revealed an increase in the prevalence of physically inactive women during the COVID-19 pandemic. This result is similar to the findings of [García-Tascón et al. \(2020\)](#), who also reported reduced physical activity in women during the pandemic. In addition, our data corroborate with other studies conducted in Brazil that also observed a remarkable reduction in the practice of physical activity in the population ([Cardoso et al., 2023](#); [Schuch et al., 2022](#); [Silva et al., 2022](#)). Furthermore, a study by [Nienhuis and Lesser \(2020\)](#) reported that COVID-19 restrictions resulted in barriers to physical activity for women and that stress and depression caused by quarantine lead to unhealthy lifestyles, including physical activity reduced ([Mattioli et al., 2020](#)).

Age, marital status, educational level, and BMI were confounding factors in our results. After adjusting for these variables, changes related to physical activity, including physical activity time and metabolic equivalent, sitting time, and binge eating score, became insignificant. Thus, our findings reinforce the influence of sociodemographic factors and BMI on lifestyle and eating behavior, as also reported elsewhere ([Souza da Silva et al., 2016](#); [Martins et al., 2021](#); [Pitanga et al., 2017](#)).

The results showed an increased prevalence of binge eating and frequency of severe binge eating during the pandemic, and our findings corroborate research that demonstrated higher levels of eating disorders after the onset of the COVID-19 pandemic ([Robertson et al., 2021](#); [Zhou and Wade, 2021](#)). These results may be related to research that reported a worsening in the mental health of women during social isolation ([Cardoso et al., 2023](#); [Pieh et al., 2020](#); [Hung et al., 2021](#)), as it is known that

emotions negative play an important role in initiating and maintaining binge eating ([Dingemans et al., 2017](#); [Zeeck et al., 2011](#)). A study by [Christofaro et al. \(2022\)](#) found that anxiety was associated with less healthy eating habits, such as higher consumption of sweets and fast foods, among physically inactive Brazilian adults during the COVID-19 pandemic.

Physical activity, sitting time, and binge eating were shown to be interrelated before and during the pandemic. Moreover, we found that binge eating was associated with low physical activity levels before and during the pandemic, which is in line with other studies that reported that binge eating disorder was associated with insufficient physical activity levels ([Souza da Silva et al., 2016](#); [Udo and Grilo, 2020](#)). Furthermore, [Staiano et al. \(2014\)](#) found an association between sitting time and physically inactive individuals. This is important, as it shows that lifestyle changes can impact eating behavior and vice versa. Hence, as many people changed their lifestyle and/or eating behavior during the pandemic, such changes may lead to other health risk behaviors.

Furthermore, the reduced physical activity of women and the increased prevalence of binge eating may be related to the high prevalence of body mass gain and weight gain. This is because physical activity is a protective factor against body mass gain and excessive food intake is associated with a positive energy balance and emotional eating, which, in turn, is related to the intake of comfort food, rich in sugars and fats that may result in body mass gain ([Vuori, 2001](#); [Wagner et al., 2014](#); [Matos and Ferreira, 2021](#)). Small changes in body weight over relatively short periods can become permanent and lead to substantial weight gain over time, potentially resulting in long-lasting effects on health and worsening the prevalence of obesity and the associated diseases, such as cardiovascular diseases, the leading cause of mortality in adult women ([Bhutani and Cooper, 2020](#); [Mehran et al., 2019](#)).

Despite our promising findings, this study has several limitations, including the use of self-reported data, which may have been affected by bias and low reliability. Additionally, the questions related to the pre-pandemic period did not specify a moment, thereby being susceptible to the choice of the participants' memory; therefore, it is impossible to infer how long this information refers to.

Furthermore, information related to the participants' work activities was not collected. In addition, longitudinal research must be conducted to shed more light on this theme and provide greater insight into how prolonged pandemic periods affect the lifestyle and eating behavior of this population.

Regardless of the limitations, the highly relevant data presented herein show that seven to ten months after the onset of the COVID-19 pandemic in Brazil, the pandemic continues to cause harmful effects on the lifestyle and eating behavior of women through decreased physical activity level and increased prevalence of binge eating, along with the increased prevalence of body mass gain and weight gain. Hence, these data show that formulating and implementing national public health policies focused on improving women's health are necessary to minimize the short- and long-term negative impacts of the pandemic.

CONCLUSION

The COVID-19 pandemic has caused negative changes in physical activity and binge eating among Brazilian women, who also showed a high prevalence of body mass gain. We emphasize that the combined consequences of the COVID-19 pandemic may have lasting effects on women's health and increased prevalence and worsening of chronic non-communicable diseases.

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CONFLICTS OF INTEREST

Nothing to declare.

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