EFFECTS OF THE COVID-19 PANDEMIC ON FOOD INTAKE, PHYSICAL ACTIVITY AND ANTHROPOMETRY OF BRAZILIAN UNDERGRADUATE STUDENTS

EFETOS DA PANDEMIA DA COVID-19 NA INGESTÃO DE ALIMENTOS, ATIVIDADE FÍSICA E ANTROPOMETRIA DE ESTUDANTES DE GRADUAÇÃO BRASILEIROS

EFECTOS DE LA PANDEMIA COVID-19 SOBRE LA INGESTA DE ALIMENTOS, LA ACTIVIDAD FÍSICA Y LA ANTROPOMETRÍA DE ESTUDIANTES UNIVERSITARIOS BRASILEÑOS

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ABSTRACT

The COVID-19 pandemic led to a change in lifestyle of the global population, including university students. The purpose of this study was to compare the food intake, physical activity practice and anthropometry of Brazilian undergraduate students before and during the COVID-19 pandemic. This is a cross-sectional study with 155 students

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(24.65±6.27 years) from undergraduate courses, licentiate degree, at the Federal University of Goiás (UFG), Brazil. The ConVid - Behavior Survey online questionnaire of the Oswaldo Cruz Foundation was used to data collection. The variables analyzed were frequency of food intake, physical activity and overweight (according to body mass index) before and during the COVID-19 pandemic. There was a reduction in vegetables, fruits, beans and whole foods consumption, an increase in processed meats, frozen meals, snacks and sweets consumption (p<0.001), the physical activity practice decreased (p<0.001) and the frequency of overweight (37.4% to 41.9%, p<0.001) increased during the COVID-19 pandemic, compared to the previous period. The COVID-19 pandemic led to a decline in the quality of life and health status of the Brazilian undergraduate students evaluated.

Keywords: COVID-19; health behavior; nutrition; sedentary behavior; overweight.

RESUMO
A pandemia da COVID-19 levou a uma mudança no estilo de vida da população global, incluindo os estudantes universitários. O objetivo deste estudo foi comparar a ingestão de alimentos, a prática de atividade física e a antropometria dos estudantes de graduação brasileiros antes e durante a pandemia da COVID-19. Este é um estudo transversal com 155 estudantes (24,65±6,27 anos) de cursos de graduação, licenciatura, na Universidade Federal de Goiás (UFG), Brasil. O questionário online ConVid - Pesquisa de Comportamento da Fundação Oswaldo Cruz foi utilizado para a coleta de dados. As variáveis analisadas foram frequência de ingestão de alimentos, atividade física e excesso de peso (de acordo com o índice de massa corporal) antes e durante a pandemia da COVID-19. Houve uma redução no consumo de vegetais, frutas, feijão e alimentos integrais, um aumento no consumo de carnes processadas, refeições congeladas, lanches e doces (p<0,001), a prática de atividade física diminuiu (p<0,001) e a frequência de excesso de peso (37,4% a 41,9%, p<0,001) aumentou durante a pandemia COVID-19, em comparação com o período anterior. A pandemia da COVID-19 levou a um declínio na qualidade de vida e no estado de saúde dos estudantes de graduação brasileiros avaliados.

Palavras-chave: COVID-19; comportamento de saúde; nutrição; comportamento sedentário; excesso de peso.

RESUMEN
La pandemia COVID-19 provocó un cambio en el estilo de vida de la población mundial, incluidos los estudiantes universitarios. El objetivo de este estudio fue comparar la ingestión de alimentos, la práctica de la actividad física y la antropometría de estudiantes de pregrado brasileños antes y durante la pandemia COVID-19. Se trata de un estudio transversal con 155 estudiantes (24,65±6,27 años) de pregrado y grado en la Universidad Federal de Goiás (UFG), Brasil. Para la recolección de datos se utilizó el cuestionario ConVid — Behavior Research de la Fundación Oswaldo Cruz. Las variables analizadas fueron frecuencia de ingesta de alimentos, actividad física y exceso de peso (según el índice de masa corporal) antes y durante la pandemia COVID-19. Se produjo una reducción en el consumo de verduras, frutas, frijoles y alimentos completos, un aumento en el consumo de carne procesada, comidas congeladas, tentempiés y dulces (p<0,001), disminución de la actividad física (p<0,001) y un aumento de la frecuencia de sobrepeso (37,4% a 41,9%, p<0,0001) durante el COVID-9 pandemia en comparación con el período anterior. La pandemia COVID-19 condujo a una disminución de la calidad de vida y la salud de los estudiantes de pregrado brasileños evaluados.

Palabras clave: COVID-19; comportamiento sanitario; nutrición; comportamiento
sedentario; sobrepeso.

1. Introduction

Coronavirus disease 2019 (COVID-19), defined as a severe acute respiratory infection, originated in December 2019 in Wuhan, China, and since its inception has affected countries all over the world in several areas, such as social, economic, political, and cultural. Its transmission can occur either through direct contact with a contaminated individual or through contact with objects or surfaces contaminated with secretions from infected people.1-3

To reduce the spread of the virus, several countries adopted lockdown, as a call for social distancing in public areas, and stay-at-home measures.3 In Brazil, with the high number of infected people and deaths due to COVID-19, the unfolding of the pandemic led to a reduction in the practice of physical activity, outdoors leisure activities and a greater consumption of unhealthy food, affecting the health status of the population, such as body weight gain.4-6

Regarding Brazilian college students, class, internships and other academic activities suspension due to COVID-19 led to a change in lifestyle, whose changes must be evaluated for the adoption of measures to minimize the negative impacts on these individuals.7,8

In this sense, this study aimed to compare the food intake, physical activity practice and anthropometry of Brazilian undergraduate students before and during the COVID-19 pandemic.

2. Materials and Methods

2.1 Study Design, Selection Criteria and Sample Size Calculation

This cross-sectional study was carried out in the first semester of 2021, with students from undergraduate courses, licentiate degree, at the Federal University of Goiâs (UFG) – Campus Goiânia. The courses were: Visual Arts, Biological Sciences, Social Sciences, Dance, Field Education, Physical Education, Intercultural Education, Philosophy, Physics, Geography, History, Languages (Spanish, French, English, Libras and Portuguese), Mathematics,
Music (Singing, Music Education and Musical Instrument Teaching), Pedagogy, Psychology, Chemistry and Theater.9

The selection criteria were: in-class students and regularly enrolled in UFG courses. All students enrolled in a distance education (EaD) modality were excluded. A total of 4,481 students were enrolled during the data collection period, and 186 answered the questionnaire. However, the questionnaires whose answers were incomplete (n=20) and EaD students (n=11) were excluded, resulting in a final number of 155 participants (Figure 1).

The sample included in the study (n=155) had a power of 0.80, $\alpha = 0.05$, $\beta = 0.20$ and effect size of 0.36, which means that the sample presented a medium effect size, performed in G*Power 3.1.10

Figure 1. Flowchart of participants recruitment.
2.2 Ethical Aspects

This research was approved by the Research Ethics Committee of the Federal University of Goiás (protocol n° 4.767.509/2021 and Certificate of Presentation for Ethical Appreciation n° 81781618.9.0000.5083). All participants electronically signed the Term of Free and Informed Consent.

2.3 Data Collection

The coordination of the academic units was contacted to send the questionnaire to the students, by e-mail, stipulating a period of one month for reply. The questionnaire was resent 15 days later to ensure that the e-mail had been read.

The questionnaire, entitled “How did the COVID-19 pandemic affect the lives of undergraduate students at the Federal University of Goiás?”, was prepared on the Google Forms platform from the ConVid - Behavior Survey questionnaire of the Institute of Scientific and Technological Communication and Information in Health of the Oswaldo Cruz Foundation (ICICT/FIOCRUZ). The self-administered form consists of validated questions related to changes in the lifestyle of Brazilians due to the COVID-19 pandemic.

The variables used in this study were: age, sex, race, performance and result of the RT-PCR test for coronavirus diagnosis, hospitalization due to COVID-19, frequency of food intake and physical activity, body weight and height, before and during the COVID-19 pandemic.

Regarding food intake, it was evaluated how many days a week the participant used to eat raw or cooked vegetables, fruits, beans, whole foods (bread, rice, crackers, pasta, whole grains, oatmeal, granola, flaxseed), processed meats (ham, salami, mortadella, sausage, linguiça, hamburger), frozen meals (pizza, lasagna), snacks and sweets (chocolate, cookie, pie).

In relation to the practice of physical activity, it was evaluated how many days a week the participant used to practice a physical exercise or sport and how long the activity lasted.

From the values of body mass (kg) and height (m) the body mass index (BMI) (kg/m²) was calculated, and individuals with BMI ≥ 25.00 kg/m² were...
classified as overweight.\textsuperscript{12}

2.4 Statistical Analysis

Double data entry was performed, and normal distribution of the data was determined by Shapiro-Wilk test. Continuous variables were expressed as mean ± standard deviation (SD) and categorical variables in relative frequency (%).

Paired Student’s t-test was performed to compare BMI values before and during the COVID-19 pandemic. The effect size was calculated using Cohen’s d.\textsuperscript{13}

A comparison of the frequency of overweight, food intake and practice of physical activity, before and during the COVID-19 pandemic, was made using Pearson’s Chi-square.

The data were analyzed using Statistical Package Science Social (SPSS) software 21.0, and P < 0.05 was considered significant.

3. Results

Most participants, aged 24.65±6.27 years, were female (57.4%) and white race (49.0%) (Table 1). Overall, 68 (43.9%) performed the RT-PCR test for coronavirus diagnosis, of which 17 (25.0%) were positive, with no need for hospital admission.

Table 1. Characterization of sex and self-reported race of the participants.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Male</th>
<th>64(41.3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female</td>
<td>89(57.4)</td>
</tr>
<tr>
<td></td>
<td>Another</td>
<td>2(1.3)</td>
</tr>
<tr>
<td>Self-reported race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>76(49.0)</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>31(20.0)</td>
<td></td>
</tr>
<tr>
<td>Yellow</td>
<td>2(1.3)</td>
<td></td>
</tr>
<tr>
<td>Brow</td>
<td>44(28.4)</td>
<td></td>
</tr>
<tr>
<td>Indigenous</td>
<td>2(1.3)</td>
<td></td>
</tr>
</tbody>
</table>

Data are presented in n(%).

Regarding BMI, there was an increase when comparing the period before and during the COVID-19 pandemic (24.07±4.75 and 24.88±5.52 kg/m\textsuperscript{2}, respectively) (p<0.001, Cohen’s d = 0.16). There was also an increase in the frequency of overweight (BMI ≥ 25.00 kg/m\textsuperscript{2}) from 37.4% (n=58) to 41.9% (n=65).
(p<0.001).

The food intake evaluation showed a reduction in vegetables, fruits, beans and whole foods consumption, with an increase in processed meats, frozen meals, snacks and sweets consumption during the COVID-19 pandemic (p<0.001) (Table 2). In addition, both the number of days a week and duration of physical activity practice decreased during the COVID-19 pandemic (p<0.001 and p=0.001, respectively) (Table 3).

Table 2. Food intake frequency of undergraduate students before and during the COVID-19 pandemic.

<table>
<thead>
<tr>
<th></th>
<th>Before COVID-19 pandemic</th>
<th>During COVID-19 pandemic</th>
<th>P value¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw/cooked vegetables</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>≤ 1 day</td>
<td>20 (12.9)</td>
<td>30 (19.4)</td>
<td></td>
</tr>
<tr>
<td>2-4 days</td>
<td>71 (45.8)</td>
<td>72 (46.4)</td>
<td></td>
</tr>
<tr>
<td>≥ 5 days</td>
<td>64 (41.3)</td>
<td>53 (34.2)</td>
<td></td>
</tr>
<tr>
<td>Fruits</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>≤ 1 day</td>
<td>45 (29.0)</td>
<td>57 (36.8)</td>
<td></td>
</tr>
<tr>
<td>2-4 days</td>
<td>74 (47.8)</td>
<td>65 (41.9)</td>
<td></td>
</tr>
<tr>
<td>≥ 5 days</td>
<td>36 (23.2)</td>
<td>33 (21.3)</td>
<td></td>
</tr>
<tr>
<td>Beans</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>≤ 1 day</td>
<td>27 (17.4)</td>
<td>34 (21.9)</td>
<td></td>
</tr>
<tr>
<td>2-4 days</td>
<td>37 (23.9)</td>
<td>51 (32.9)</td>
<td></td>
</tr>
<tr>
<td>≥ 5 days</td>
<td>91 (58.7)</td>
<td>70 (45.2)</td>
<td></td>
</tr>
<tr>
<td>Whole foods</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>≤ 1 day</td>
<td>25 (16.1)</td>
<td>31 (20.0)</td>
<td></td>
</tr>
<tr>
<td>2-4 days</td>
<td>44 (28.4)</td>
<td>50 (32.3)</td>
<td></td>
</tr>
<tr>
<td>≥ 5 days</td>
<td>86 (55.5)</td>
<td>74 (47.7)</td>
<td></td>
</tr>
<tr>
<td>Processed meats</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>≤ 1 day</td>
<td>86 (55.5)</td>
<td>83 (53.5)</td>
<td></td>
</tr>
<tr>
<td>2-4 days</td>
<td>59 (38.0)</td>
<td>61 (39.4)</td>
<td></td>
</tr>
<tr>
<td>≥ 5 days</td>
<td>10 (6.5)</td>
<td>11 (7.1)</td>
<td></td>
</tr>
<tr>
<td>Frozen meals</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>≤ 1 day</td>
<td>137 (88.4)</td>
<td>125 (80.7)</td>
<td></td>
</tr>
<tr>
<td>2-4 days</td>
<td>14 (9.0)</td>
<td>27 (17.4)</td>
<td></td>
</tr>
<tr>
<td>≥ 5 days</td>
<td>4 (2.6)</td>
<td>3 (1.9)</td>
<td></td>
</tr>
<tr>
<td>Snacks</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>≤ 1 day</td>
<td>131 (84.5)</td>
<td>128 (82.6)</td>
<td></td>
</tr>
<tr>
<td>2-4 days</td>
<td>24 (15.5)</td>
<td>21 (13.5)</td>
<td></td>
</tr>
<tr>
<td>≥ 5 days</td>
<td>0 (0.0)</td>
<td>6 (3.9)</td>
<td></td>
</tr>
<tr>
<td>Sweets</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>≤ 1 day</td>
<td>70 (45.2)</td>
<td>64 (41.3)</td>
<td></td>
</tr>
<tr>
<td>2-4 days</td>
<td>69 (44.5)</td>
<td>63 (40.6)</td>
<td></td>
</tr>
<tr>
<td>≥ 5 days</td>
<td>16 (10.3)</td>
<td>28 (18.1)</td>
<td></td>
</tr>
</tbody>
</table>

Data are presented in n(%).

¹ Pearson’s Chi-square.
EFFECTS OF THE COVID-19 PANDEMIC ON FOOD INTAKE, PHYSICAL ACTIVITY AND ANTHROPOMETRY OF BRAZILIAN UNDERGRADUATE STUDENTS

Table 3. Frequency and duration of physical activity practice of undergraduate students before and during the COVID-19 pandemic.

<table>
<thead>
<tr>
<th>Number of days/week</th>
<th>Before pandemic</th>
<th>COVID-19</th>
<th>During pandemic</th>
<th>COVID-19</th>
<th>P value¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 day</td>
<td>43(27.7)</td>
<td>79(51.0)</td>
<td>32(20.7)</td>
<td>2(1.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>1-2 days</td>
<td>32(20.7)</td>
<td>33(21.3)</td>
<td>33(21.3)</td>
<td>2(1.3)</td>
<td>0.001</td>
</tr>
<tr>
<td>3-4 days</td>
<td>51(32.9)</td>
<td>33(21.3)</td>
<td>10(6.4)</td>
<td>2(1.3)</td>
<td></td>
</tr>
<tr>
<td>≥ 5 days</td>
<td>29(18.7)</td>
<td>10(6.4)</td>
<td>26(16.8)</td>
<td>2(1.3)</td>
<td></td>
</tr>
</tbody>
</table>

Data are presented in n(%).

¹Pearson’s Chi-square.

4. Discussion

The present study identified a worsening of diet quality, physical activity practice and anthropometry during the COVID-19 pandemic among the undergraduate students evaluated, which has also been identified in other studies with this population.⁷,¹⁴,¹⁵

Regarding BMI, a study that investigated 7,024 Chinese university students (20.6±2.0 years), identified an increment in the values of this anthropometric parameter during the COVID-19 pandemic (21.4±5.2 kg/m² vs. 22.2±12.4 kg/m², p< 0.001), in addition to an increase in the frequency of overweight (21.3% vs. 25.1%, p<0.001), as found in the present study.¹⁴ The increase in the BMI during the COVID-19 pandemic also occurred among 176 Romanian male university students (19.3±0.67 years) (22.4±4.51 kg/m² vs. 24.2±3.69 kg/m², p=0.003).¹⁶

Higher BMI values, identified in the period of social isolation among 2,002 British adults (34.74±12.3 years), were associated with lower physical activity practice (β=0.078, p=0.004) and poorer diet quality (β=0.080, p=0.003).¹⁵

The restrictions due to the lockdown led to a reduction in outdoor activities, which contributed to a decrease in energy expenditure and an increase in energy intake, raising BMI.¹⁷ It is worth mentioning that overweight contributes to the development of several diseases, such as type 2 diabetes mellitus, hypertension, dyslipidemias and cancer.¹⁸

In relation to physical activity, a research with Chinese and North American
undergraduate students also found a reduction in the time spent exercising during the COVID-19 pandemic.\textsuperscript{14,19} In Brazil, a study with 11,154 individuals (18-29 years) found a reduction in the frequency of sufficient physical activity (at least 150 minutes per week) during the COVID-19 outbreak compared to the previous period (32.6\% vs. 10.9\%).\textsuperscript{5} Another survey conducted with 13,696 adults (34.1±14.4 years) from 18 countries, including Brazil, found that 23.7\% also reduced the physical activity practice during the COVID-19 pandemic.\textsuperscript{20}

The practice of physical activity is associated to a better quality of life, and a reduction in the time spent exercising may compromise mental health and well-being.\textsuperscript{19-21} Changes in physical activity also usually alter food intake, and individuals with sedentary behavior are more likely to present unhealthy eating behavior.\textsuperscript{22}

Among Brazilian young adults evaluated by Malta et al.,\textsuperscript{5} the COVID-19 outbreak also negatively influenced eating behavior. This research, which applied the same questionnaire used in the present study, identified a reduction in the frequency of regular consumption (\textgeq{} 5 days a week) of vegetables, fruits, and beans (29.8\% vs. 27.8\%, 21.8\% vs. 20.6\%, 49.1\% vs. 45.3\%, respectively), while there was an increase in the participants who consumed frozen meals, snacks, and sweets \textgeq{} twice a week (12.7\% vs. 20.5\%, 14.6\% vs. 21.8\%, 54.2\% vs. 63.0\%, respectively).

Another survey, which also used the ConVid questionnaire, demonstrated that among 33,862 Brazilian adults (\textgeq{} 18 years) 10.4\% increased consumption of sweets, snacks, processed meats, and frozen meals, and among 12,618 adults 17.6\% reduced fruits and vegetables consumption during the COVID-19 pandemic.\textsuperscript{22}

Some reasons that may contribute to the increased intake of unhealthy foods during the social isolation are a greater development of stress and anxiety, and financial difficulty to purchase healthy foods.\textsuperscript{23-25} However, the best practice during the COVID-19 pandemic would be to consume healthy foods, since adequate nutrition is one of the pillars for the immune system function, even for reducing the severity of infectious diseases, such as SARS-CoV-2.\textsuperscript{26-28}

Actions to face the impacts of the COVID-19 pandemic should be taken by
the coordination of academic units so that the restrictions caused by social isolation affect the health of the students as little as possible. Among some educational practices, it is suggested the implementation of actions that instruct students on how to practice physical activity at home, besides the distribution of online books with easy-to-prepare and low-cost recipes that encourage healthy eating behavior.\textsuperscript{29,30}

The selection of only one university was considered a limitation of this study, since the results cannot be extrapolated to all Brazilian undergraduate students. However, the results found, added to data from other studies can contribute to important information about the lifestyle and health status of this population during the COVID-19 outbreak.

Sample size was also a limitation of this study. However, the low response rate of the questionnaires seems to be the biggest obstacle in conducting online surveys, and can be justified by the need for internet access and the high demand for participation in studies that use online questionnaires.\textsuperscript{31}

5. Conclusion

The Brazilian undergraduate students evaluated showed an increase in the consumption of foods considered harmful to health, reduced the consumption of healthy foods and the practice of physical exercise, and increased the frequency of overweight during the COVID-19 pandemic, compared to the previous period.

These data reflect the decline in quality of life that COVID-19 has brought, demonstrating that even those who did not contract the disease were negatively affected by it.

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REFERENCES


