

Comparison of the levels of depression and anxiety during the first and fourth waves of coronavirus disease-2019 pandemic in Brazil

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Abstract. – OBJECTIVE: To compare the levels of depression, anxiety, physical activity, and mobility restrictions between the first wave in June 2020 and the fourth wave in January 2022 of the coronavirus disease-2019 (COVID-19) pandemic in Brazil.

PATIENTS AND METHODS: Brazilian citizens answered a self-administered questionnaire that included questions related to personal information, mobility restriction levels, physical activity levels, and the status of mood disorders in June 2020 (n=1853) and January 2022 (n=728).

RESULTS: The levels of mobility restrictions ($p<0.001$), anxiety ($p<0.001$), and depression ($p<0.001$) significantly decreased from 2020 to 2022. In June 2020, 23.2% of the participants presented moderate to severe anxiety, and in January 2022, this percentage decreased to 14.8%. In June 2020, 29.6% of the participants presented moderate to severe depressive symptoms, and in January 2022 this percentage decreased to 19.3%. On the contrary, physical activity levels significantly increased between 2020 and 2022 ($p<0.001$).

CONCLUSIONS: During the fourth wave of the COVID-19 pandemic, participants were less restricted and more physically active than in the first wave. Furthermore, anxiety and depression levels were significantly lower in the fourth wave than in the first wave. Despite this reduction, levels of anxiety and depression remain high; therefore, the authors suggest measures to encourage physical activity and promote mental health.

Key Words:

COVID-19, Anxiety, Depression, Physical activity, Mobility restriction, Web-based survey.

Introduction

The Coronavirus disease 2019 (COVID-19) pandemic has affected everyone's mental health, including both infected and uninfected individuals¹. Several previous studies²⁻⁵ have reported that the incidence of depressive and anxiety disorders significantly increased following the COVID-19 pandemic in 2020.

Several COVID-19 impact indicators could be associated with the increased prevalence of depressive and anxiety disorders. Government actions and insufficient or inconsistent information regarding COVID-19 can influence mental health negatively^{4,6}. Uncertainties regarding the future, worries about health, frustration, boredom, the worldwide economic crisis, reduced family income, political turmoil, and decreased physical activity levels have also been reported to impact the levels of depression and anxiety symptoms in the population^{4,6-8}. More recently, an extensive systematic review of data concluded that the increase in the daily SARS-CoV-2 infection rates and reduction in human mobility were two impact indicators associated with increased prevalence of depressive and anxiety disorders². Before the COVID-19 pandemic began, depression and anxiety disorders were already recognized as a global health burden⁹.

Two years after the beginning of the COVID-19 pandemic in Wuhan, China, the virus has mutated several times, causing several waves. At the end of 2021, the new Omicron

variant has posed a high risk of infection and spread rapidly, starting the fourth wave of the COVID-19 pandemic¹⁰. This new variant was first detected in South Africa and Botswana and has been confirmed in more than 80 different regions of the world¹⁰. The Omicron variant of SARS-CoV-2 has had a very high risk of infection, leading to a significant increase in the daily SARS-CoV-2 infection rates. Therefore, it has been considered as the fourth wave of the COVID-19 outbreak in Brazil¹⁰. This new mutation has reignited anxieties about the economic recovery from pandemic¹⁰ and the possibility of getting sick, despite being vaccinated. Conversely, hospitalization risk and case severity have been suggested to be lower among people infected with the Omicron variant than people infected with the Delta variant¹¹. However, it is currently unknown how this change will impact the population's mental health.

Therefore, the present study aimed to compare the levels of depression, anxiety, mobility restrictions, and physical activity between June 2020 and January 2022. We hypothesized that even with an increase in infection rates brought by the new Omicron SARS-Cov-2 variant, the Brazilian population would be less restricted and more physically active during the fourth pandemic wave than during the first one, which will positively impact anxiety and depression levels among Brazilians.

Patients and Methods

Study Design

This cross-sectional study was conducted in two phases during the COVID-19 pandemic as follows: the first between 02-12 June 2020, and the second between 12-21 January 2022. During the initial assessment (June 2020), the Brazilian government adopted emergency measures nationwide, including closing schools, universities, and parks and halting commercial and non-essential services⁸. During the second evaluation (January 2022), these restrictions had been relaxed. Schools, universities, and parks had reopened, and commercial and non-essential services had been resumed, despite an increase in the COVID-19 cases caused by the Omicron variant.

A questionnaire was developed to collect data related to physical activity, depression, and anxiety levels. The questionnaire was structured and

shared using a digital platform (Google Forms). The online questionnaire was self-administered in Portuguese, and there was no contact between participants and researchers.

Questionnaire

Our research group developed a questionnaire containing five sections. The first section of the questionnaire collected data about sex, anthropometric characteristics (height, body mass, and age), and family income (less than a minimum wage, between 1-2 times the minimum wage, between 2-6 times the minimum wage, between 6-10 times the minimum wage, or more than 10 times the minimum wage). For analysis, scores from 1 to 5 were assigned to family income levels, where 1 was referred to the lowest (less than the minimum wage) and 5 to the highest (more than 10 times the minimum wage). The second section contained questions about restrictions (being entirely restricted, leaving home only for essential non-work activities, leaving home for work activities, no restrictions adopted). For analysis, scores from 1 to 4 were assigned to the restriction levels, where 1 was referred to the maximal restriction level, and 4 to the minimal restriction level. The third section evaluated physical activity levels through the use of the International Physical Activity Questionnaire (IPAQ)^{12,13}. Scores were also attributed to the physical activity levels: 0 was referred to inactive participants, 1 to very insufficiently active participants, 2 to insufficiently active participants, 3 to active participants, and 4 to very active participants. The fourth section evaluated depression levels through the use of the Patient Health Questionnaire-9 (PHQ-9) questionnaire^{14,15}. A PHQ-9 version, validated for Portuguese, was applied^{14,15}. Scores were attributed for analysis purposes: 0 was referred to minimal, 1 to mild, 2 to moderate, 3 to moderately severe, and 4 to severe depression. The fifth section evaluated anxiety levels through the use of the General Anxiety Disorder-7 (GAD-7) questionnaire validated for Portuguese^{16,17}. Scores were also attributed for analysis purposes: 0 was referred to no anxiety disorder, 1 to minimal, 2 to moderate, and 3 to severe anxiety disorder levels.

A more complete description of the entire questionnaire can be found in a previously published manuscript by Puccinelli et al⁸.

The study was approved by the Human Research Ethics Committee of the Federal Univer-

Table I. Characteristics of the sample.

	June 2020 (n = 1853)	January 2022 (n = 728)	p-value
Age (years)	38.7 ± 12.4	41.4 ± 12.2	<.001
Weight (kg)	71.4 ± 14.3	72.3 ± 14.8	.522
Height (cm)	168.8 ± 9.2	168.9 ± 9.6	.677

Data are mean ± standard deviation.

sity of São Paulo-UNIFESP (Approval number: 4,073,442) and conformed to the principles outlined in the Declaration of Helsinki.

Informed consent was obtained from all participants included in the study.

Participants

Participants were invited to participate in the study through e-mail, websites, Instagram (Meta Platforms, Inc., Menlo Park, CA, USA), Facebook (Meta Platforms, Inc., Menlo Park, CA, USA), and WhatsApp (WhatsApp Inc., Menlo Park, CA, USA). The questionnaire was shared by researchers and institutions involved in the research. After accessing the questionnaire link, everyone able to speak Brazilian Portuguese could participate in the study. No incentives were used in this survey. The inclusion criterion was that participants should be over 18 years of age and have Brazilian citizenship. Convenience sampling was used in this study.

In the 2020 survey, a total of 2,140 questionnaires were answered; however, 287 were excluded because they were incomplete (10 answers) or duplicate (277 answers), therefore we got 1,853 valid responses (743 men and 1,110 women) from 26 Brazilian states and Federal Districts. In the second survey, we received 730 (299 men and 430 women) responses from 21 Brazilian states and Federal Districts. Two participants were excluded because of disproportional IPAQ scores and because one was underage. Therefore, we analyzed 728 valid responses (298 men and 430 women). Participants’ ages, body masses, and heights are presented in Table I.

Statistical Analysis

As per the Kolmogorov-Smirnov test, none of the variables evaluated presented a normal distribution. Descriptive data are presented as percentages. A Chi-square test was employed to compare the percentages of each level of restriction, depression, and anxiety between June 2020 and January 2022. The Mann-Whitney test was used to verify the differences between the answer obtained from the two surveys applied in June 2020 and January 2022. Statistical analysis was performed using SPSS 21.0 (IBM Corp., Armonk, NY, USA). In all comparisons, a p-value < 0.05 was considered statistically significant.

Results

In June 2020, the participants’ family income was 4 minimal wages (3-5) and 5 minimal wages (3-5) in January 2022 (median and interquartile values) (p<0.05).

Restriction levels were lower in January 2022 compared to June 2020 (Table II). The percentage of each restriction levels was different between the two periods ($\chi^2=792.72$, gl=3, p<0.001). A significant difference was observed between the percentages of participants who were living with minimal or no restrictions (score 4), 5.6% in January 2022 and 48.9% in June 2020 (adjusted residual, 25.9), and between those who were leaving home only for essential non-work activities (score 2), 14.3% in January 2022 and 52.4% in June 2020 (adjusted residual, 17.7) (Figure 1).

Table II. Evaluated measurements in June 2020 and January 2022 (median and interquartile values).

	June 2020 (n = 1853)	January 2022 (n = 728)	p-value
Restriction level	2 (2-3)	3 (3-4)	< 0.001
Anxiety level (GAD-7)	1 (0-1)	0 (0-1)	< 0.001
Depression level (PHQ-9)	1 (0-2)	0 (0-1)	< 0.001
Physical activity level (IPAQ)	3 (3-4)	3 (3-4)	< 0.001

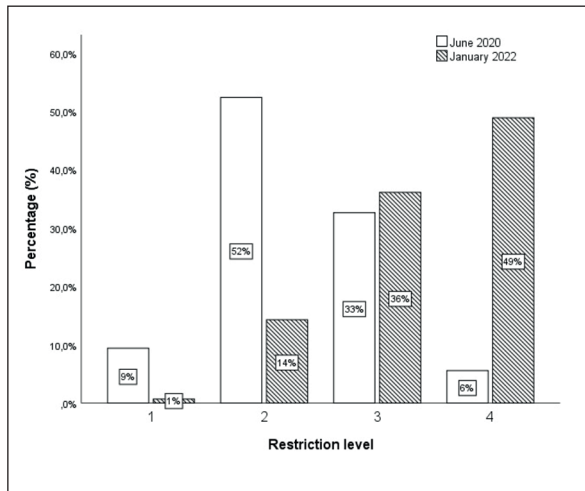


Figure 1. Histogram showing restriction level scores frequency.

There was a significant decrease in the median of anxiety levels from the first to the second evaluation ($p < 0.001$) (Table II). A significant difference was also seen in the percentage values of each anxiety level between the two periods ($\chi^2 = 44.68$, $gl = 3$, $p < 0.001$). A significant difference was observed in the percentage of participants without anxiety disorders (score 0), where an increase from 40.5% in June 2020 to 54.3% in January 2022 was observed (adjusted residual, 6.4) (Figure 2).

There was a significant decrease in the median of the depression levels between the first and the second evaluation ($p < 0.001$) (Table II). The percentage of each depression level was different be-

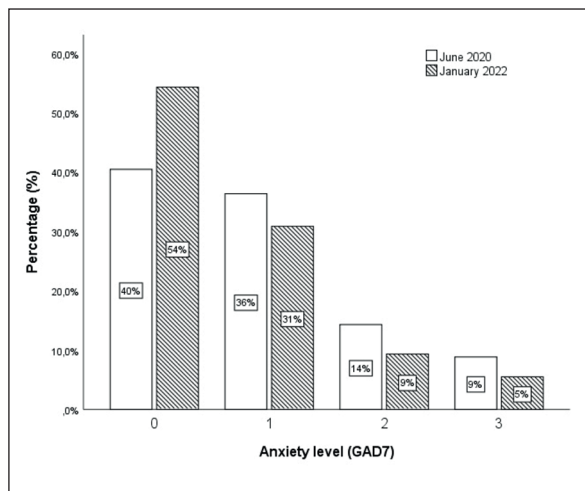


Figure 2. Histogram showing anxiety level scores frequency.

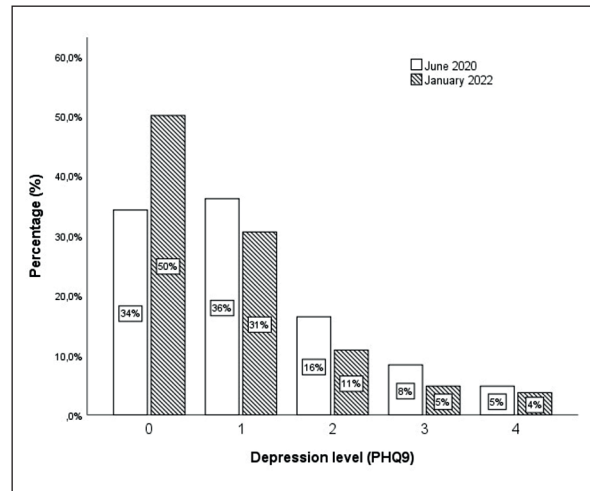


Figure 3. Histogram showing depression level scores frequency.

tween the two periods ($\chi^2 = 59.78$, $gl = 4$, $p < 0.001$). A significant difference was found in the percentage of participants presenting minimal depression levels (score 0), where an increase from 34.3% in June 2020 to 50.1% in January 2022 was observed (adjusted residual, 7.4) (Figure 3).

Finally, the median of the physical activity levels showed a significant increase from the first to second evaluation periods ($p < 0.001$) (Table I). The percentage of each physical activity level was different between the two periods ($\chi^2 = 29.60$, $gl = 4$, $p < 0.001$). A significant difference was found in the percentage of participants classified as very active (score 4), where an increase from 39% in June 2020 to 48% in January 2022 was observed (adjusted residual, 3.9) (Figure 4).

Discussion

The following findings were observed from June 2020 to January 2022: (1) restriction levels were minimal; (2) anxiety and depression levels improved; (3) physical activity levels increased.

Several differences in Brazil's social, economic, and sanitary conditions between June 2020 and January 2022 may contribute to the decreased restriction levels of the population between these two periods. On June 6th, 2020, there were 944,86 deaths per day, in a 14-day moving average, caused by the SARS-CoV-2 infection. On January 12th, 2022, there was a significant reduction to 133 deaths per day (Brazilian Ministry of Health)¹⁸. In January 2022, despite a sudden

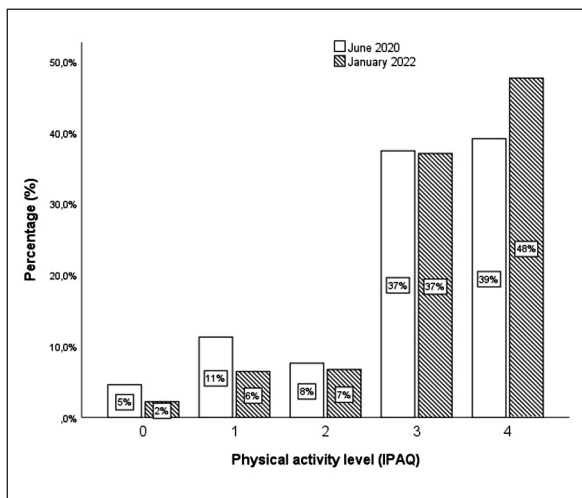


Figure 4. Histogram showing physical activity level scores frequency.

and fast increase in the COVID-19 infections by the Omicron variant, the illness became less deadly¹¹. The vast majority of the Brazilian population (71%) had been fully vaccinated in January 2022¹⁹. Therefore, the lower severity of the disease and widespread vaccination may have contributed to people feeling safer to go outside. In addition, there were few official restrictions related to social interactions (parks, restaurants, and all the commerce were open) in January 2022. This is starkly different from the situation in June 2020 when the following nationwide restrictions aimed to contain the virus spread: public parks and commerce closures, recommendations not to leave home unless it was essential, travel restrictions in the country and abroad, and others.

Another finding from the present study is that anxiety and depression levels had decreased between June 2020 and January 2022. This finding is very important because several previous studies² from 2020 showed very high anxiety and depression levels in the population. A study by Burkova et al²⁰, conducted between May and August 2020 with 15,375 participants from 23 countries, showed different anxiety levels among people from different nations and the highest levels were found in Brazil, Canada, Italy, Iraq, and the USA. Puccinelli et al⁸ reported that 30% of the Brazilian participants from their study presented symptoms of moderate to severe depression, and 23.3% displayed moderate to severe anxiety symptoms. The prevalence of depressive symptoms in the USA also was very high and it was more than three times higher

during the COVID-19 period (2020) than before the pandemic²¹. The number of individuals psychologically affected by the pandemic is higher than those infected with COVID-19 in 2020. It is estimated that one-third to half of the population could present psychological and psychiatric consequences, if not properly managed²².

While economic distress grew during the first wave of COVID-19, and the GDP fell by 4.1% in 2020²³, people became worried about the disease and possibly losing their employment²⁴. State government restrictions, such as the mandatory wearing of masks and vaccination, usually conflicted with the federal government mandates²⁵. Feelings of helplessness and confusion, decreased family income, fear of disease, social isolation, and diminishing physical activity levels could have contributed to increased anxiety and depression in 2020^{8,24}. Furthermore, two factors that are commonly associated with high anxiety and depression levels are the high daily SARS-CoV-2 infection rates and the high restriction levels². In January 2022, the Brazilian economy stabilized and there was a forecasted growth of 4.5% GDP in 2021 and 1.1% in 2022²⁶. Additionally, there was a relaxation of restrictions. Mental health improved despite the high number of cases in 2022 and the incomplete economic recovery. Furthermore, the physical activity levels among patients significantly increased between the two periods, positively impacting mental health, as reported previously^{8,27-32}.

Several hypotheses have been put forward to explain this relationship. The distraction hypothesis suggests that the subject's diversification of the interests may lead to an improvement in mood during and after the exercise. Another hypothesis, the self-efficacy/mastery hypothesis, suggests that physical activity can be seen as a challenging activity; thus, regular physical activity may lead to improvements in mood and self-confidence. The social interaction hypothesis suggests that the social interaction is able to reduce the symptoms of depression and anxiety. Another theory explores physiological mechanisms of increased monoamines during exercises enhancing neurosynaptic transmission, which is assumed to have antidepressant effects. Lastly, the increase of endorphins in the central nervous system, released upon physical activity, promotes feelings of calm and mood improvements³³. Exercising can promote changes in neuroplasticity, inflammation, oxidative stress, the endocrine system, self-esteem, social support, and self-efficacy³⁴.

Limitations of the Study

The study has some limitations. Some possible covariates, such as a previous diagnosis of mental illness or vaccination status, were not controlled. The study sample was also not homogenous as participants were not enrolled from all the regions in the country. Finally, depression and generalized anxiety disorder diagnoses are complex and should be performed by a psychiatric specialist, which was not done in this study.

Conclusions

In January 2022, there was a significant decrease in restriction levels compared to June 2020. There was also an increase in physical activity levels and a reduction in anxiety and depression levels in the Brazilian population. Despite this reduction, symptoms of anxiety and depression have remained high. Therefore, the authors suggest measures to encourage physical activity and to reduce depression and anxiety symptoms.

Conflict of Interest

The Authors declare that they have no conflict of interests.

Acknowledgements

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