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# Factors associated with mental health in the Brazilian population during Covid-19

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## Abstract

Research on factors associated with mental health during a pandemic can support effective intervention strategies. Meeting this demand, the objective was to investigate the variables associated with mental health (general health, anxiety, depression, and perceived stress) of Brazilians during the coronavirus disease 2019 (Covid-19) pandemic. A national study was carried out, with a sample composed of 2,705 Brazilians, who answered six instruments, addressing sociodemographic and clinical data related to Covid-19, adherence to guidelines for pandemic control, information consumption, coping, general health, and perceived stress. The data were analyzed using descriptive and analytical statistics. The results show that agreement and adherence to social distancing, the experience of becoming ill, being part of or living with people from the risk group, less information consumption, and less coping are associated with mental health illness. We conclude that there is a need for continuous mental health intervention during the pandemic.


*Keywords:* Covid-19, pandemics, social distancing, mental health, public health

# FATORES ASSOCIADOS À SAÚDE MENTAL NA POPULAÇÃO BRASILEIRA DURANTE A COVID-19


## Resumo

Os levantamentos sobre os fatores associados à saúde mental durante uma pandemia podem subsidiar estratégias de intervenção eficazes. Respondendo a essa demanda, objetivou-se investigar as variáveis associadas à saúde mental (saúde geral, ansiedade, depressão e estresse percebido) de brasileiros durante a pandemia da *coronavirus disease 2019* (Covid-19). Realizou-se um estudo de levantamento nacional que contou com uma amostra de 2.705 brasileiros, que responderam a seis instrumentos que abordavam dados sociodemográficos e clínicos relacionados à Covid-19, a adesão às orientações de controle da pandemia, o consumo de informação, o enfrentamento, a saúde geral e o estresse percebido. Os dados foram analisados por meio de estatística descritiva e analítica. Os resultados apontaram que a concordância com o distanciamento social e a adesão a ele, a experiência de adoecimento, ser pessoa do grupo de risco ou morar com indivíduos com essa característica, o menor consumo de informação e o menor enfrentamento estão associados ao adoecimento em saúde mental. Concluiu-se que é necessária a intervenção contínua em saúde mental durante a pandemia.


*Palavras-chave:* Covid-19, pandemias, distanciamento social, saúde mental, saúde pública

# FACTORES ASOCIADOS A LA SALUD MENTAL EN LA POBLACIÓN BRASILEÑA DURANTE LA COVID-19


## Resumen

Las encuestas sobre factores asociados a la salud mental durante una pandemia pueden respaldar estrategias de intervención eficaces. Respondiendo a esta demanda, el objetivo fue investigar las variables asociadas a la salud mental (salud general, ansiedad, depresión y estrés percibido) de los brasileños durante la pandemia de la *coronavirus disease 2019* (Covid-19). Se realizó un estudio de encuesta nacio-

nal, con una muestra de 2.705 brasileños, quienes respondieron a seis instrumentos, abordando datos sociodemográficos y clínicos relacionados con la Covid-19, adherencia a las medidas de control de la pandemia, consumo de información, afrontamiento, salud general y estrés percibido. Los datos se analizaron mediante estadística descriptiva y analítica. Los resultados muestran que el acuerdo y la adherencia al distanciamiento social, la experiencia de la enfermedad, ser o convivir con personas del grupo de riesgo, menor consumo de información y menor afrontamiento se asocian a enfermedades mentales. Concluimos que hay una necesidad de intervención continua en salud mental durante la pandemia.

*Palabras clave:* Covid-19, pandemias, distanciamiento social, salud mental, salud pública

The area of study on mental health and its influence on the general health of the population has become increasingly robust using data based on scientific evidence (Borloti et al., 2020; Castro-de-Araujo & Machado, 2020; Serafim et al., 2020; Silva et al., 2020). There are different indicators to study mental health, but the most common are those related to coping, stress levels, anxiety, and depression (Faro et al., 2020; Serafim et al., 2020; Silva et al., 2020). When some of these aspects are out of balance, some symptoms appear and, if aggravated, they can develop mental disorders and, consequently, cause problems in people's lives.

As soon as the World Health Organization (WHO, 2020) declared the coronavirus disease 2019 (Covid-19) a pandemic, people's lives have changed. Due to the ease of infection, great number of deaths, lack of vaccine or proven effective treatment, and risk of exhaustion of health services, different measures to contain the disease were implemented under the guidance of the WHO. These included hygiene etiquette rules (wearing masks, washing hands, and using alcohol-gel), social isolation (for people who had been in contact with infected people), and social distancing (avoiding crowds). These were measures that were implemented to contain the proliferation, and, in order for them to function effectively, the collaboration of the population was necessary. In more extreme cases, lockdown, which consists of a more rigorous intervention that closes trade and all non-essential services and is applied to the entire community, was also used (Faro et al., 2020).

Recognizing that the change in routine, the feeling of vulnerability, the climate of uncertainty about the future, and the excess of information on the rates of illness and mortality in the media and social networks were affecting the daily lives of the population (Serafim et al., 2020), the WHO (WHO, 2020) and national (Borloti et al., 2020; Castro-de-Araujo & Machado, 2020; Serafim et al., 2020; Silva et al., 2020) and international (Brooks et al., 2020; Duan & Zhu, 2020) mental health researchers organized studies, based on previous research on the effects of other pandemics on the mental health of the population, to look at possible psychological changes that the current Covid-19 pandemic could cause and propose some initiatives aimed at the mental health area. There was also the proposal of an initial discussion on how interventions in this area should be carried out (Borloti et al., 2020; Brooks et al., 2020; Schmidt et al., 2020; Zhang et al., 2020). Likewise, the American Psychological Association (APA, 2020) published a series of guiding and psychoeducational articles on actions that must be taken and aspects that must be monitored by mental health professionals, as well as possible interventional practices based on proven evidence – from the perspective of previous pandemics –, which could help the population to manage coping strategies to deal with problems associated with the context from the pandemic. Coping, according to the interactive model of stress, refers to a set of cognitive and behavioral strategies used to manage internal or external demands, seen as an overload on the individual's personal resources due to stressful situations (Lazarus & Folkman, 1984).

Hence, studies addressing the first cases of Covid-19 began to arise. Wang et al. (2020) carried out a longitudinal study in which they evaluated 1,210 participants people from

194 Chinese cities in two moments – during the initial outbreak and the peak of the epidemic four weeks later. They found that a little more than half of the participants (53.8%) reported experiencing the psychological impact of the pandemic as moderate or severe. In addition, the data indicated the presence of moderate or severe symptoms of anxiety (28.8%), depression (16.5%), and stress (8.1%) regarding the pandemic.

There are some studies with more specific populations, such as health professionals. Liu et al. (2020), for instance, by analyzing a sample of 4,679 doctors and nurses from 348 Chinese hospitals, found that 15.9% of them demonstrated changes in aspects of mental health, and, among these, 34.6% had depression and 16%, anxiety.

The effects on university students have also been investigated. The study by Maia and Dias (2020), with two groups of Portuguese students – the data of the first group, with 460 participants, were collected in 2019; and the data of the second group, with 159 participants, were collected right after the suspension of face-to-face activities in Portugal –, showed an increase in symptoms of anxiety, depression, and stress during the pandemic. Zhao (2020), when studying the same aspects in Chinese university students who were outside their country of origin, found high indicators of anxiety, depression, and stress in high school and fourth-year higher education students.

In Brazil, right at the beginning of the pandemic, Filgueiras and Stults-Kolehmainen (2020) carried out an initial survey on the behavioral and psychosocial effects on 1,460 Brazilians who were in quarantine. The results indicated that the levels of stress, depression, and anxiety were predicted by gender (higher risk among women), care through online psychotherapy, physical exercise, presence of elderly people in quarantine with the person, obligation to work away from home, educational level (lower risk among people with higher education), and age (greater risk among younger people). Being in the risk group of Covid-19 predicted a state of depression and anxiety, but not stress; and the presence of children in quarantine with the participant was a protective factor for depression. The authors suggested the continuation of studies to assess a more significant part of the population and that intervention proposals be elaborated, since the results indicate an increased possibility of the development of mental illnesses.

Also, in Brazil, Duarte et al. (2020) sought to analyze whether there was an association between some situations resulting from isolation during the pandemic and symptoms of mental disorder. A total of 799 people from a state in Southern Brazil participated in the survey, most of them women (82.7%). The data show that not being a health worker, having their income reduced during the isolation period, being part of the risk group, and continuously consuming more information about the deaths and the number of infected people are factors that can cause great damage to mental health. Accordingly, Filgueiras and Stults-Kolehmainen (2020) pointed out the regionalization of the study as a factor to be considered.

Recently, Prati and Mancini (2021) reviewed 25 longitudinal and natural experiment studies on the relationship between Covid-19 lockdowns and the mental health of the population. The data showed relatively small effects on anxiety and depression, and the effects on social support, loneliness, general distress, negative affect, and suicide risk were not significant.

Similarly, Robinson et al. (2021) reviewed 65 longitudinal cohort studies that examined changes in mental health among the same group of participants before and during the pandemic. The data indicated that there was a small increase in some symptoms at the onset of the pandemic, which then decreased becoming comparable to pre-pandemic conditions.

Several studies carried out in the area of mental health present important information to this research when analyzing the relationship between mental health indicators and different variables, supporting the choice of variables tested in the model of factors associated with mental health: disease and health history (Wei et al., 2020; Zhao, 2020); agreement and adherence to social isolation (Aquino et al., 2020; Brooks et al., 2020; Faro et al., 2020); being part of the risk group or living with people from risk groups – people at greater vulnerability to having more severe reactions to the disease, such as the elderly and people with chronic diseases (Borloti et al., 2020; Duarte et al., 2020; Liu et al., 2020; Filgueiras & Stults-Kolehmainen, 2020); access to and consumption of information (Duarte et al., 2020; Faro et al., 2020); and the existence of coping strategies (Borloti et al., 2020).

Online studies, at this time of pandemic, have become an important way of working considering the need for social isolation, allowing real-time data collection (Duarte et al., 2020, Filgueiras & Stults-Kolehmainen, 2020; Liu et al., 2020; Wang et al., 2020). These scientific data can feed national and international scientific databases, guide care practices for the population and support decision-making by government officials to create effective interventions for the prevention and promotion of mental health.

In response to this urgent demand, the aim of this study was to investigate the variables associated with the mental health (general health, anxiety, depression, and perceived stress) of Brazilians during the Covid-19 pandemic. Based on the literature review presented, our hypothesis is that the history of Covid-19 cases, belonging to or living with people from the risk group, agreement with social isolation/distancing measures, adherence to voluntary social distancing, index of information consumption, and coping are associated with mental health.

Through this study, it was possible to carry out a national survey, with participants from different regions of the country, obtaining data from the local reality. Although it is not intended for generalization, this study is relevant because it proposes to offer empirical data that indicate variables associated with mental health in the context of a pandemic, in order to know whether the variables addressed in international studies can be determinants for our population.

## Method

This is a descriptive, correlational, transversal research, with a quantitative approach and a national reach. When using this type of research, the phenomenon is described based on direct questioning, covering a range of participants (Gil, 2008).

### Participants

This research had a convenience sample (non-probabilistic), composed of 2,705 Brazilians, with representation from the five regions of the country. The following inclusion criteria were considered: being Brazilian and being over 18 years old. The exclusion criteria were the following: having no access to the internet; and/or being unable to read the questionnaire.

### Instruments

Data collection was carried out through an online questionnaire, elaborated on Google Forms, which contained six instruments. The first was a sociodemographic questionnaire, addressing age, gender, family income, employment, education, region of the country, history of infection, belonging or not to the risk group of Covid-19, living or not with people from the risk group, and agreement with the social isolation measures recommended by WHO.

The second instrument, developed by the authors, is a questionnaire regarding the behavior of adherence to the recommendations for containing the pandemic ($\omega$ = 0.63). It consists of three items that assess behaviors such as staying at home, wearing masks, and hand hygiene, with a five-point Likert scale (ranging from 1 = "strongly disagree" to 5 = "strongly agree"). For evaluation and interpretation, the total sum of items is obtained, which varies between 3 and 15 points, and the higher scores, the higher the level of adherence.

Another instrument created by the authors is a questionnaire about information consumption in regard to Covid-19 ($\omega$ = 0.79) aimed at assessing how often and intensely the respondent seeks information about Covid-19 and its consequences. It consists of three questions that assess the level of consumption of information about Covid-19 from newspapers, social networks, or friends and family, through a five-point Likert scale (ranging from 1 = "strongly disagree" to 5 = "strongly agree"). For evaluation and interpretation, the total sum of items is obtained, which varies between 3 and 15 points. The higher the scores, the higher the level information consumption.

The fourth instrument was developed from a coping strategy questionnaire (Lazarus & Folkman, 1984) to measure coping behavior in stressful situations in the context of the pandemic. It consists of four items ($\omega$ = 0.56), with a Likert-type scale ranging from 0 to 3 points. For evaluation and interpretation, the total sum of items is obtained, which varies between 0 and 12 points. The higher the scores, the greater the coping capacity.

The General Health Questionnaire (QSG-12), validated in Brazil by Gouveia et al. (2003), aims to track common mental disorders. The instrument consists of 12 items, divided

into three subscales – general health (sum of 12 items, ω = 0.88), depression (eight items, ω = 0.85), and anxiety (four items, ω = 0.70). The questionnaire is answered using a Likert scale that can vary between 1 and 5 points, requiring the inversion of the positive items. For data interpretation, an average of the scores from the three subscales is performed, which, in the end, can vary between 1 and 5 points. It is understood that higher scores indicate low levels of mental health, that is, general health deficit, and a greater presence of symptoms of depression and anxiety.

Finally, the Perceived Stress Scale (PSS-10) was also used and is widely adopted to assess self-perceived stress (Luft et al., 2007). The scale has ten items (ω = 0.87), four of them positive and six negatives, requiring the inversion of positives for the sum. It allows a total perceived stress index, in which it is assumed that higher values are associated with higher levels of stress.

## Ethical procedures

Concerning the ethical aspects of research involving human beings, this study was approved by the Research Ethics Committee of the University of Fortaleza (Unifor) under ruling No. 4.014.996. It is also noteworthy that the ethical aspects required by the resolutions No. 466, of December 12, 2012, and No. 510, of April 7, 2016, of the National Health Council were complied with.

## Data collection procedures

After approval of the project by the ethics committee, the instruments were made available on the internet, together with a Free and Informed Consent Form (FICF), through a specific page in a private domain. The dissemination took place between May 8 and June 21, 2020, through social networks, newspaper reports, and digital portals. After the disclosure of the research, people who followed these media were able to autonomously enter the questionnaire and answer it individually, self-administered, and anonymously, with an average duration of 15 minutes.

## Data analysis procedure

Data were analyzed in four steps, with the aid of the Statistical Package for Social Science (SPSS), version 25. First, the sample profile was outlined using descriptive statistics (frequency, percentage, and measurements of central tendency and dispersal). To present the results, in the second step, the scores of the variables studied from the questionnaires regarding adherence to pandemic guidelines, consumption of information about Covid-19, coping, factors of the GHQ-12 (Gouveia et al., 2003), and the Perceived Stress Scale (Luft et al., 2007) were evaluated through descriptive statistics, following the assessment and interpretation instructions of the instruments.

In the third stage, tests were carried out to compare the scores in different mental health indexes (general health, depression, anxiety, and perceived stress) between the groups regarding following data: Covid-19 infection case histories, being part of the risk group, living with people from the risk group, agreement with social isolation/distancing measures recommended by the WHO, and adhering to voluntary social isolation/distancing. Subsequently, to better understand the relevance of the studied variables in explaining changes in the indexes of mental health constructs, four multiple linear regression models were performed, which considered general health, anxiety, depression, and stress as dependent variables, while behavior of adherence to the recommendations for containing the pandemic, information consumption, coping, and the variables mentioned above were considered independent variables.

## Results

From the sociodemographic data, it was found that the mean age of the participants was 38.63 years (*SD* = 14.26). Most were female (*n* = 2,099, 77.60%) and were undergoing voluntary social isolation/distancing at the time of data collection (*n* = 2,244, 83.00%). In addition, higher percentages were found in other sociodemographic data among those who worked as self-employed/liberal professionals (*n* = 795, 29.40%), with monthly income greater than BRL 5,000 (*n* = 951, 35.20%), with a postgraduate level of education (*n* = 1,316, 48.70%) and living in the Northeast Brazil (*n* = 1,298, 48.00%). More data of the sample are presented in Table 1.

**Table 1**

*Sample sociodemographic data*

| Variable | *n* | % |
|---|---|---|
| **Sex** | | |
| Male | 606 | 22.40 |
| Female | 2,099 | 77.60 |
| **Family income** | | |
| No income | 317 | 11.70 |
| Up to BRL 1,000 | 178 | 6.60 |
| From BRL 1,001 to BRL 2,000 | 376 | 13.90 |
| From BRL 2,001 to BRL 3,000 | 350 | 12.90 |
| From BRL 3,001 to BRL 4,000 | 273 | 10.10 |
| From BRL 4,001 to BRL 5,000 | 260 | 9.60 |
| Above BRL 5,000 | 951 | 35.20 |

**Table 1**

*Sample sociodemographic data (continuation)*

| Variable | *n* | % |
|---|---|---|
| **Type of employment** | | |
| Self-employed | 795 | 29.40 |
| Under the Consolidation of Labor Laws (Consolidação das Leis Trabalhistas [CLT])[1] | 667 | 24.70 |
| Unemployed | 547 | 20.20 |
| Public employee | 468 | 17.30 |
| Retirees | 228 | 8.40 |
| **Education** | | |
| Elementary school | 18 | 0.70 |
| Middle school | 200 | 7.40 |
| Incomplete higher education | 512 | 18.90 |
| Complete higher education | 659 | 24.40 |
| Postgraduate | 1,316 | 48.70 |
| **Level of adherence to social distancing** | | |
| Voluntary distancing | 2,246 | 83.00 |
| Not distancing | 459 | 17.00 |
| **Region of country** | | |
| North | 78 | 2.90 |
| Northeast | 1,298 | 48.00 |
| Midwest | 51 | 1.90 |
| Southeast | 698 | 25,80 |
| South | 580 | 21.40 |

*Note.* [1]CLT: Brazilian formal jobs are governed by this law, i. e., participants with an employment relationship determined by the Consolidation of Labor Laws.

The behavior of adherence to the pandemic control guidelines, with a score ranging between 3 and 15 points, presented an average of 14.38 points (*SD* = 1.35), demonstrating that the sample adhered mostly to the recommendations. The level of consumption of information on Covid-19, which had a possible variation between 3 and 15 points, had an average of 11.90 points (*SD* = 2.71), indicating a high level of information consumption. Both scores are above the midpoint (see Table 2). Furthermore, considering a distribution in quartiles, both scores are in the highest score stratum.

In the GHQ-12 (Gouveia et al., 2003), with a score varying between 1 and 5 points, an average of 2.18 points was found for the general health factor (*SD* = 0.59), 2.40 points for

anxiety (*SD* = 0.60), and 2.06 points for depression (*SD* = 0.61). For the perceived stress indexes (Luft et al., 2007), with the score ranging from 0 to 40 points, an average of 21.02 points was obtained (*SD* = 7.46). Such scores are below the midpoint (Table 2), and they already indicate symptoms of mental illness. Finally, for the coping index, which varied between 0 and 12 points, there was an average of 7.56 points (*SD* = 2.35), above the midpoint, reflecting a good coping ability. All these data can be better observed in Table 2.

**Table 2**

*Descriptive statistics of the studied variables*

| Variables | Minimum possible | Midpoint | Maximum possible | Minimum obtained | Maximum obtained | Average | *SD* |
|---|---|---|---|---|---|---|---|
| Adherence behavior | 3 | 9 | 15 | 3.00 | 15.00 | 14.38 | 1.35 |
| Information consumption | 3 | 9 | 15 | 3.00 | 15.00 | 11.90 | 2.71 |
| General health | 1 | 3 | 5 | 1.00 | 4.00 | 2.18 | 0.59 |
| Anxiety | 1 | 3 | 5 | 1.00 | 4.00 | 2.40 | 0.67 |
| Depression | 1 | 3 | 5 | 1.00 | 4.00 | 2.06 | 0.61 |
| Perceived stress | 0 | 20 | 40 | 0.00 | 40.00 | 21.02 | 7.46 |
| Coping | 0 | 6 | 12 | 0.00 | 12.00 | 7.56 | 2.35 |

Next, comparisons were made, using bivariate statistics, regarding mental health indexes (general health, depression, anxiety, and perceived stress) between the following groups according to the history of Covid-19 infection cases: belonging to the risk group, living with people from the risk group, agreement with social isolation/distancing measures proposed by the WHO (WHO, 2020), and adherence to voluntary social isolation. No differences were found in comparisons between people who are in social isolation or not. Only the evaluations that stood out due to the existence of statistically significant differences will be described, but all of them are presented in Table 3.

First, there was a statistically significant difference in anxiety indexes [$t(154.431) = 3.714$, $p < 0.001$)] among participants due to the cases of infection by Covid-19. Those who already had Covid-19 had more anxiety than those who had not had the disease. There were no differences between these groups regarding the other indexes.

When comparing participants who were or were not part of the risk group, there was a statistically significant difference in general health indexes [$t(2703) = -3.495$, $p < 0.05$)], anxiety [$t(1452.462) = -2.776$, $p < 0.05$)], depression [$t(2703) = -3.455$, $p < 0.05$)], and perceived stress [$t(1472.830) = -5.310$, $p < 0.05$)]. In all cases, subjects who did not belong to the risk group presented higher indexes than those who were in the risk group, suggesting worse mental health indexes.

We also compared the indices of mental health parameters between participants who lived or not with people from the risk group. We found that there were statistically significant differences in the general health indexes [$t(2676.003) = 5.696$, $p < 0.001$)], anxiety [$t(2703) = 4.718$, $p < 0.001$)], depression [$t(2684.496) = 5.601$, $p < 0.001$)], and perceived stress [$t(2703) = 4{,}411$, $p < 0.001$)]. All indexes were higher among subjects who lived with people who are from the risk group.

Subsequently, comparisons were made between participants who agreed and those who disagreed with the WHO (WHO, 2020) position of recommendation towards isolation and social distancing. There was a statistically significant difference in general health indexes [$t(2703) = 6.348$, $p < 0.001$)], anxiety [$t(398.726) = 5.864$, $p < 0.001$)], depression [$t(2703) = 5.919$, $p < 0.001$)], and perceived stress [$t(395.123) = 5.475$, $p < 0.001$)]. Participants who agreed with social isolation/distancing showed higher indexes in all comparisons performed.

**Table 3**

*Comparison of scores in mental health indexes (general health, anxiety, depression, and stress) according to data related to Covid-19*

| Groups | Variables Mean ± SD | | | |
|---|---|---|---|---|
| | General health | Anxiety | Depression | Perceived stress |
| **Covid-19 infection cases** | | | | |
| Infected | - | 2.60 ± 0.05 | - | - |
| Not infected | - | 2.39 ± 0.01 | - | - |
| **Belonging to the risk group** | | | | |
| Belonging to the risk group | 2.12 ± 0.02 | 2.35 ± 0.02 | 2.00 ± 0.02 | 19.84 ± 0.27 |
| Not belonging to the risk group | 2.20 ± 0.01 | 2.43 ± 0.01 | 2.09 ± 0.01 | 21.53 ± 0.16 |
| **Living with persons from the risk group** | | | | |
| Living | 2.23 ± 0.01 | 2.46 ± 0.01 | 2.12 ± 0.01 | 21.59 ± 0.19 |
| Not living | 2.11 ± 0.01 | 2.34 ± 0.01 | 1.99 ± 0.01 | 20.33 ± 0.20 |
| **Agreement with the WHO's recommendations** | | | | |
| Agree | 2.20 ± 0.01 | 2.43 ± 0.01 | 2.09 ± 0.01 | 21.33 ± 0.14 |
| Disagree | 1.98 ± 0.03 | 2.20 ± 0.04 | 1.87 ± 0.03 | 18.71 ± 0.45 |

Then, in order to better understand the relationship between the collected variables and the mental health indexes, four multiple linear regression models were carried out, in which the following were considered dependent variables: general health, anxiety, depression,

and stress. The independent variables were: history of Covid-19 infection (not having a history of infection or having a history of infection), being in the risk group (not being in the risk group for the disease or being in the risk group), living with someone from the risk group (not living with someone who is part of the risk group or living with someone), agreeing or not with WHO's recommendation, index of adherence behavior regarding the recommendations for the containment of the pandemic, index of consumption of information on Covid-19, and coping.

In the first regression model, in which general health was considered dependent variable, a statistically significant model can be seen [$F(6.2698) = 42.388$, $p < 0.001$], which explained 8.60% of the variations in general health indexes. The variables of coping ($R^2 = 5.20$, $\beta = -0.223$, $p < 0.001$), agreement with the isolation recommendations proposed by the WHO ($R^2 = 1.40$, $\beta = 0.132$, $p < 0.001$), living with someone from the risk group ($R^2 = 1.10$, $\beta = 0.116$, $p < 0.001$), being part of the risk group ($R^2 = 0.50$, $\beta = 0.069$, $p < 0.001$), adherence behavior ($R^2 = 0.20$, $\beta = 0.049$, $p < 0.05$), and infection history ($R^2 = 0.20$, $\beta = 0.041$, $p < 0.05$) indexes were significant for the model (see Table 4). From these results, it is understood that lower coping rates, agreeing with the WHO, living with someone from the risk group, greater adherence to pandemic control recommendations, and having a history of Covid-19 infection are associated with worse rates of mental health (general factor).

In the second regression model, in which anxiety was configured as a dependent variable, a statistically significant model was found [$F(5.2699) = 42.388$, $p < 0.001$], which explained 4.60% of the variations in anxiety indexes. The variables of coping ($R^2 = 1.50$, $\beta = -0.123$, $p < 0.001$), agreement with the isolation proposed by the WHO ($R^2 = 1.20$, $\beta = 0.103$, $p < 0.001$), living with someone from the risk group ($R^2 = 0.80$, $\beta = 0.096$, $p < 0.001$), history of infection ($R^2 = 0.50$, $\beta = 0.071$, $p < 0.05$), and being part of the risk group ($R^2 = 0.60$, $\beta = 0.069$, $p < 0.001$) were significantly associated with anxiety indexes (see Table 4). It was found that lower coping indexes, agreeing with the WHO, living with someone from the risk group, having a history of infection of Covid-19, and being part of the risk group are associated with greater presence of anxiety symptoms.

The third regression model, adjusting depression indexes as a dependent variable, showed a statistically significant model [$F(5.2699) = 59.808$, $p < 0.001$], which explained 10.00% of the variations in depression indexes. The variables of coping ($R^2 = 6.80$, $\beta = -0.253$, $p < 0.001$), agreement with the isolation recommendations proposed by the WHO ($R^2 = 1.20$, $\beta = 0.133$, $p < 0.001$), living with someone from the risk group ($R^2 = 1.10$, $\beta = 0.114$, $p < 0.001$), being part of the risk group ($R^2 = 0.50$, $\beta = 0.066$, $p < 0.05$), and adherence behavior ($R^2 = 0.40$, $\beta = 0.068$, $p < 0.001$) were variables significantly associated with depression rates (see Table 4). It was found that lower coping rates, agreeing with the WHO, living with someone from the risk group, being part of the risk group, having a history of infection of Covid-19, and greater adherence to pandemic control recommendations are associated with a higher prevalence of symptoms of depression.

Finally, using the stress indexes as a dependent variable, a statistically significant model can also be found [$F(5.2699) = 40.656$, $p < 0.001$], verifying an explanation of 7.00% of the stress index variations. It was found that coping ($R^2 = 3.60$, $\beta = -0.182$, $p < 0.001$), in agreement with the isolation recommendations proposed by the WHO ($R^2 = 1.20$, $\beta = 0.109$, $p < 0.001$), being part of the risk group ($R^2 = 1.00$, $\beta = 0.101$, $p < 0.05$), living with someone from the risk group ($R^2 = 0.80$, $\beta = 0.094$, $p < 0.001$), and consumption of information about Covid-19 ($R^2 = 0.30$, $\beta = -0.056$, $p < 0.001$) are variables significantly associated with stress indexes (see Table 4). It appears that lower coping rates, agreeing with the WHO, being part of the risk group, living with someone from the risk group, and lower consumption of information about Covid-19 are associated with higher stress rates.

**Table 4**

*Multiple linear regression analysis with mental health factors as dependent variables and variables associated with Covid-19 as independent variables*

| DV* | IV** | $R^2$ | β | *p* < |
|---|---|---|---|---|
| General health | Coping | 5.20% | -0.223 | 0.001 |
| F(6.2698) = 42.388*** | Agreement with WHO | 1.40% | 0.132 | 0.001 |
| | Living with someone from the risk group | 1.10% | 0.116 | 0.001 |
| | Being part of the risk group | 0.50% | 0.069 | 0.001 |
| | Adhesion behavior | 0.20% | 0.049 | 0.05 |
| | Infection history | 0.20% | 0.041 | 0.05 |
| Anxiety | Coping | 1.50% | -0.123 | 0.001 |
| F (5.2699) = 42.388*** | Agreement with WHO | 1.20% | 0.103 | 0.001 |
| | Living with someone from the risk group | 0.80% | 0.096 | 0.001 |
| | Infection history | 0.50% | 0.071 | 0.05 |
| | Being part of the risk group | 0.60% | 0.069 | 0.05 |
| Depression | Coping | 6.80% | -0.253 | 0.001 |
| F (5.2699) = 59.808*** | Agreement with WHO | 1.20% | 0.133 | 0.001 |
| | Living with someone from the risk group | 1.10% | 0.114 | 0.001 |
| | Being part of the risk group | 0.50% | 0.066 | 0.05 |
| | Adhesion behavior | 0.40% | 0.068 | 0.001 |
| Stress | Coping | 3.60% | -0.182 | 0.001 |
| F (5.2699) = 40.656*** | Agreement with WHO | 1.20% | 0.109 | 0.001 |
| | Being part of the risk group | 1.00% | 0.101 | 0.05 |
| | Living with someone from the risk group | 0.80% | 0.094 | 0.001 |
| | Consumption of information about Covid-19 | 0.30% | -0.056 | 0.001 |

*Note.* *DV = dependent variables in the analyses; **VI = independent variables of the respective models; *** = statistically significant models and variables with p value < 0.001; $R^2$ = adjusted coefficient of determination; β = standardized coefficients.

## Discussion

The main results of the present study indicated that agreement and adherence to social isolation, the experience of illness due to Covid-19, being or living with someone from the defined risk group for the disease, having a lower consumption of information about the pandemic and less capacity of coping are associated with mental health illness.

When detailing the data, it was found that the scores for mental illness were not high. The moment when the data were collected – May 2020 – is a factor to be considered. During this period, people, in general, were already more used to the new care behaviors in relation to the pandemic, which had been requested two months earlier. This is a different collection context from previous studies carried out by Wang et al. (2020), in China, Maia and Dias (2020), in Portugal, and Duarte et al. (2020) and Filgueiras and Stults-Kolehmainen (2020), in Brazil – all of whom found high scores for all mental health indexes. The data from Prati and Mancini (2021) and Robinson et al. (2021) report that the advance of the pandemic tends to be accompanied by a reduction in mental illness rates.

In general, the population studied showed high rates of adherence to isolation and information consumption, corroborating data from previous research (Duarte et al., 2020; Filgueiras & Stults-Kolehmainen, 2020). It is inferred that these data are specifically due to the context of collection, which was during the peak of the first wave of Covid-19, when social isolation was established, and everyone was consuming information to understand this new threat.

When comparing data from different mental health indexes (general health, depression, anxiety, and perceived stress) between groups with different Covid-19 case histories, it was found that people who had had the disease had higher anxiety rates. Likewise, this variable was found to be statistically associated with general health and anxiety. These data are also identified in the studies by Maia and Dias (2020), Liu et al. (2020), Wang et al. (2020), and Zhao (2020), who pointed out that the pandemic increased indexes of vulnerability to the issue of loss of control over people's lives, with changes in various patterns of behavior and care, raising the anxiety rates.

When analyzing the comparisons between people included or not in the risk groups for Covid-19 and between those who live or not with people from these groups, a worse index was identified in mental health indicators among participants who were not from this group and those who live with people from the risk group. Belonging to the risk group and living with people from these groups were also variables associated with general health, anxiety, depression, and stress. This can indicate that participants who belong to risk groups have some health condition that need care and, therefore, may have already received previous self-care guidelines (Faro et al., 2020), while individuals who do not need care felt anxiety more intensely at this time. The responsibility of living with people from the risk group, in turn, can cause sickness, according to the data found by Filgueiras and Stults-Kolehmainen (2020).

The results indicated differences in mental health indexes between groups with different positions of agreement with the WHO recommendations, showing that the groups with a greater agreement have worse general health, anxiety, depression, and stress. Agreement with the WHO was also presented as a variable associated with the four constructs. Adherence to isolation, in turn, did not show a statistically significant association with general health and depression. These data corroborate the literature, indicating that, despite social isolation being necessary to contain the disease, it causes symptoms of mental illness (Faro et al., 2020; WHO, 2020).

Regarding information consumption and how much it affects mental health aspects, the data showed that this variable is significantly associated only with stress, with no association with general health, anxiety, and depression. These findings contradict previous recommendations of the WHO (WHO, 2020) and data from other surveys (Duarte, 2020), which advocated that the information consumption should be lower, so that people's mental health is not affected. Participants in this research showed little stress and depression when consuming information.

The results also indicated that coping is associated with mental health, showing that people who are able to face adversity tend to have less affected mental health. At the time of data collection, many psychoeducational materials (APA, 2020; WHO, 2020) had already been consumed by the population, and this could have contributed to the protection of mental health.

At the end of this study, we conclude that agreement and adherence to social isolation, the experience of illness, being or living with someone from the risk group, less information consumption, and less coping are significantly associated with the types of mental illness investigated – general health, anxiety, depression, and/or stress. Confirmation of these data can enable contributions to interventions in the pandemic context. The identification of factors associated with mental health can help health agencies to develop more effective actions for prevention, care, and promotion of mental health.

As all scientific research, although the results obtained represent a significant contribution to the identification of mental health parameters in the Brazilian population during the Covid-19 pandemic, the present study has limitations. We recognize that a non-probabilistic and primarily Northeastern sample that is female and with high level of education and income cannot be considered representative of the Brazilian population and may bias the data. It is reinforced, however, that the purpose of this study is not to generalize the results but rather to point out some factors associated with mental health in the context of a pandemic. Consequently, we defend the importance of further studies addressing this topic, with more representative and specific samples, including in post-pandemic periods. Finally, based on these findings and on the studies cited, it is suggested that, in addition to physical and biological changes, Covid-19 also represents an epidemiological problem of a psychological nature that impacts the world population, which requires constant evaluation and intervention.

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