

FACTORS ASSOCIATED WITH SYMPTOMS OF DEPRESSION AMONG THE BRAZILIAN POPULATION IN THE CONTEXT OF THE PANDEMIC: A CROSS-SECTIONAL STUDY

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Highlights: (1) Most of the Brazilian population presented symptoms of mild depression. (2) A significant percentage of symptoms of severe depression were observed. (3) Silent growth in the number of people developing symptoms of depression. (4) Social isolation stands out among the associated factors.

PRE-PROOF

(as accepted)

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ABSTRACT

Objective: To identify the factors associated with symptoms of depression among the Brazilian population in the context of the pandemic. **Method:** This is an analytical cross-sectional study, conducted with the Brazilian population between April and May of 2020 and 2021, the first period at the beginning of the pandemic and the second period after an increase in the number of cases of the disease. The Patient Health Questionnaire-9 was used for data collection. The Mann-Whitney and Kruskal-Wallis tests were used to analyze the mean scores. The chi-square test and logistic regression were used to assess the association of factors. **Results:** 25,132 (100%) Brazilians participated. The score obtained on the Patient Health Questionnaire-9 was 8.8 (Standard Deviation=6.6), showing that 62.7% of the participants presented mild symptoms of depression. In the logistic regression, several factors remained associated, such as female sex (Odds Ratio=2.02) and social isolation (Odds Ratio=1.48). **Conclusion:** Despite the low scores on the Patient Health Questionnaire-9, factors such as female sex, social isolation, and the year 2021 increased the likelihood of developing symptoms of depression among the Brazilian population during the pandemic.

Keywords: Depression. Mental Health. COVID-19

INTRODUCTION

Coronavirus disease (COVID-19) has rapidly altered the way of life for the world's population. In Brazil, as of March 20, 2023, 699,310 deaths from the disease had been recorded, placing it as the second country in the world ranking with the highest number of deaths¹. The measures imposed to contain the virus during the pandemic included the use of masks, isolation, and social distancing²⁻³. However, such changes and restrictions on social interaction, within the family, in work routines, and isolation, in order to reduce the spread of the virus, generated negative impacts on the mental health of the population³⁻⁴.

Like natural disasters, the COVID-19 pandemic triggered extreme stressors that resulted in the development of mental distress. Initial responses from individuals were uncertain, such as fear evolving into panic and shock⁵. In addition, other feelings such as

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worry, anxiety, and stress were aroused in the population, which could be related to infecting oneself and others, exposure to information about the pandemic, its transmission and mortality rates, and uncertainties about the future^{4,6}.

In this context, mental health is understood as a state in which the individual is able to recognize their abilities, being able to cope with the difficulties of daily life, as well as contribute to society⁷. In contrast, depression can be understood as a set of symptoms, such as sadness, emptiness, and irritability, along with somatic and behavioral changes, that significantly affect the individual's functional capacity. Thus, as a long-term response to COVID-19, feelings of fear and stress can influence the population, leading to mental health complications and triggering symptoms of depression⁸.

The Pan American Health Organization defines depression as a disorder that interferes with an individual's daily activities, caused by a combination of genetic, biological, environmental, and psychological factors, and which can be classified as mild, moderate, or severe, according to the intensity of the symptoms. Thus, an individual may present with symptoms of depression such as depressed mood, loss of interest and pleasure and reduced energy, anxiety, sleep and appetite disturbances, feelings of guilt or low self-esteem, and lack of concentration⁹.

The emotional response, amidst pandemic contexts, tends to affect healthy people and be intensified in those with pre-existing conditions, potentially becoming an aggravating risk factor for chronic diseases, as well as altering the quality of life of the population^{4,6,10}. Furthermore, a review of evidence in the literature conducted to identify the psychological impact of quarantine in past epidemics, such as the outbreak of Severe Acute Respiratory Syndrome (SARS), Ebola virus, H1N1 influenza, and equine influenza, highlighted negative psychological effects on individuals, including exhaustion, confusion, anger, and post-traumatic stress¹¹.

During the coronavirus pandemic, a study conducted in China between February and March 2020 to report the prevalence of risk factors associated with mental health symptoms among the general population showed that, among the 56,679 participants, 27.9% had symptoms of depression, 31.6% of anxiety, 29.2% of insomnia, and 24.4% of acute stress¹². Therefore, a growing number of people developing depressive symptoms can be observed as

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the coronavirus pandemic evolves, showing a silent epidemic of mental suffering, with implications that may last even longer than the pandemic period itself^{4,6}.

This highlights the importance of identifying symptoms of depression among the population in order to promote appropriate treatment for these individuals. In this sense, the Patient Health Questionnaire-9 (PHQ-9) is an appropriate, validated, and effective instrument for identifying individuals at risk of depression¹³. A study that used the PHQ-9 among elderly Brazilians in the context of the pandemic found that the main individual factors associated with symptoms of depression included sex, marital status, income, and education. It also highlighted that a higher score of depression symptoms during the COVID-19 pandemic was found among individuals who practiced social isolation¹⁴.

It is worth noting that most studies conducted in Brazil to assess symptoms of depression have been carried out among healthcare professionals¹⁵⁻¹⁶. Therefore, there is a need for studies focused on mental health, especially that related to depression, among the general population. Thus, the objective of the present study was to identify the factors associated with symptoms of depression among the Brazilian population in the context of the pandemic.

METHOD

This is an analytical cross-sectional online study, using non-probabilistic convenience sampling, conducted with the Brazilian population, encompassing the five regions of the country (North, Northeast, Central-West, Southeast, and South) during the COVID-19 pandemic. Data collection was carried out at two distinct times with independent samples, not constituting a longitudinal follow-up of the same participants. The first study was conducted between April and May 2020 and during the same period in 2021, with the first study occurring at the beginning of the pandemic and the second after an increase in the number of cases of the disease.

This study is part of a project entitled "Multinational Study on the Practice of Face Mask Use Among the General Public During the COVID-19 Pandemic," conducted in partnership with the Squina International Centre for Infection Control, School of Nursing, The Hong Kong Polytechnic University.

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The publication of the Brazilian Institute of Geography and Statistics was used to estimate the Brazilian population residing in the country, which in 2021 was 213,317,639 people¹⁷. Based on this result, a sample size calculation was performed with a 95% confidence level and a 5% margin of error, obtaining a minimum sample of 385 individuals. The following inclusion criteria were adopted: Brazilian individuals over 18 years of age with access to the internet and the electronic form. The exclusion criteria were: foreign individuals residing in Brazil. To determine the individuals who would be excluded, minimizing the possibility of sample selection bias, two filter questions were introduced: “What is your nationality?” and “Do you reside in Brazil?”. The exclusion of foreign residents in the country is justified by the need to guarantee the representativeness and homogeneity of the sample, allowing the generalization of the results to native Brazilians, as well as controlling for variables considering that cultural aspects can interfere with how individuals interpret symptoms of depression, social support, and coping strategies. It also allows for a more precise analysis of the factors associated with symptoms of depression within the specific Brazilian sociocultural context.

The data was collected through the dissemination of the research on the social networks of researchers and undergraduate students from various regions, where the link to the form was available and shared to increase the reach of the research. A Google Form was used, in which the research instruments were converted to an online format to facilitate participant access to the questions. By clicking on the link, the prospective participant was directed to a Google Form page containing an invitation to participate in the study and the Informed Consent Form (ICF), available for download. Only those who agreed and selected the "I accept" option would proceed with the research. The time to complete the form was estimated at 20 minutes, in accordance with other studies that used the same scale.

Two instruments were used: 1- A general information form; 2- The Brazilian Portuguese version of the Patient Health Questionnaire-9 (PHQ-9). The general information form included questions related to sex, age, family income, education level, marital status, whether the individual had close contact with individuals who might have respiratory symptoms, and measures to avoid COVID-19. This form was developed for this study and evaluated for content by the project team researchers.

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The PHQ-9 is a validated instrument for Brazilian Portuguese. It is open access and available online (<http://www.phqscreeners.com> (accessed on 05/02/2020)). Developed to screen for common depressive disorders, as well as measure their severity (mild, moderate, and severe depression symptoms). It presents nine questions, each assessing symptoms ranging from feeling depressed, loss of interest in activities, insomnia, lack of appetite or anxiety about eating, feeling worthless, concentration problems, restlessness, and even suicidal thoughts during the last two weeks. Its translation was carried out by Brazilian psychiatrists, and the back translation was done by one of the authors of the original instrument¹³.

For frequency analysis, response patterns vary on a four-item Likert scale, with scores ranging from 0 to 3: "never," "several days," "more than half the days," and "almost every day," in ascending order. The scale contains 9 items, and a score ranges from 0 to 27 points; the higher the score, the greater the severity of the depressive disorder. The following cutoff scores are considered for the instrument: 5 points for mild depression, 10 points for moderate depression, 15 points for moderately severe depression, and 20 points for severe depression.^{13,18}.

The data from the online form were exported to an Excel® spreadsheet. IBM®SPSS v.22 was used for statistical analysis. Descriptive statistics were employed, including measures of central tendency (mean, median, maximum, and minimum) and dispersion (standard deviation). The Mann-Whitney and Kruskal-Wallis tests were used to analyze the mean scores of the PHQ-9 and the independent variables, and multiple comparisons were performed in pairs. The Chi-square test was used to assess the association between demographic variables and the variable of having or not having symptoms of depression.

The dependent variables adopted comprised the mean PHQ-9 score, and the variable of having or not having symptoms of depression was categorized into two, "no" (not presenting symptoms of depression) and "yes" (having presented some symptoms of depression). The independent variables for both outcomes included: period, sex, region, age, marital status, income, education, measures to avoid COVID-19 (use of masks, hand washing, social isolation) and contact with individuals who may have respiratory symptoms.

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Subsequently, variables with $p < 0.20$ were subjected to logistic regression to estimate the probabilities associated with the occurrence of depressive symptoms, through the calculation of Odds Ratio (OR) and their respective 95% confidence intervals. A p -value < 0.05 was considered.

The study was approved by the National Research Ethics Committee (CONEP) (opinion number: 3.971.512; CAAE: 30572120.0.0000.0008) and met the requirements of Resolutions 466/2012 and 510/2016 of the National Health Council.

RESULTS

The study included 25,132 (100%) Brazilians, of whom 14,758 (58.7%) participated in 2020. Of the total, 18,453 (73.4%) were women, 8,959 (35.6%) were men, and 13,960 (55.5%) were single. The average age was 33 years ($SD=12.7$), ranging from 18 to 94 years. The average age of participants in 2020 was 36 years ($SD=13.2$), and the average age of those who participated in 2021 was 29 years ($SD=10.6$).

A total of 10,609 (42.2%) have completed higher education, 6,764 (26.9%) have a monthly income between 1 and 2 minimum wages, and 9,530 (37.9%) reside in the Northeast region of the country. On the other hand, 12,212 (48.6%) reported never having contact with individuals who may have respiratory symptoms. Regarding measures to avoid COVID-19, 24,111 (95.9%) stated that they wash their hands.

In 2020, 12,299 (83.3%) participants stated that they were practicing social isolation, while in 2021 this number was 4,721 (45.5%). Regarding mask use, 13,338 (90.4%) practiced mask use in 2020, while in 2021, 10,150 (97.8%) reported adhering to this practice (Table 1).

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Table 1-Frequency of participant responses according to sex, age, marital status, education, income, region, contact with individuals with respiratory symptoms, and measures to avoid COVID-19 (handwashing, social isolation, and mask use). Rio das Ostras, Rio de Janeiro, Brazil, 2020-2021 (n= 25,132)

Variables	n	%
Period		
2020	14758	58.7
2021	10374	41.3
Sex		
Masculine	6679	26.6
Feminine	18453	73.4
Age*		
18 to 24 years old	8959	35.6
25 to 34 years old	6725	26.8
35 to 44 years old	4588	18.3
45 or more	4850	19.3
Marital status		
Single	13960	55.5
Married/In a stable relationship	9578	38.1
Divorced/Separated	1299	5.2
Widower	295	1.2
Education		
He never studied.	4	0.0
She can read and write.	69	0.3
Complete elementary education	293	1.2
High school diploma	5742	22.8
Completed higher education	10609	42.2
Postgraduate studies	8415	33.5
Income		
No income	328	14.7
< 1 minimum wage	1304	5.2
1 to 2 salaries	6764	26.9
3 to 4 salaries	6714	26.7
5 to 6 salaries	3819	15.2
7 or more salaries	6203	24.7
Region		
North	3689	14.7
North East	9530	37.9
Central-West	2334	9.3
Southeast	6815	27.1
South	2764	11.0
You have contact with individuals who may have respiratory symptoms.		
Never	12212	48.6
Rarely	5668	22.6
At least once a month	769	3.1
At least once a week	1916	7.6
At least once a day	1794	7.1
Continuous direct contact	2773	11
Handwashing (soap and water) *		

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Yes	24111	95.9
No	1020	4.1
Social isolation*		
Yes	17020	67.7
No	8111	32.3
Use of a mask*		
Yes	23488	93.5
No	1643	6.5

Source: Prepared by the authors, 2024 /*Item presented Missing

For PHQ-9 items, the The majority of the Brazilian population presented symptoms. Respondents reported having little interest or pleasure in doing things more frequently (73.8%); feeling down, depressed, or lacking perspective (71.2%) several to almost every day; and more frequently having difficulty falling asleep, staying asleep, or sleeping more than usual (73.4%). In addition, respondents reported feeling tired or lacking energy for several days (45.4%), having a lack of appetite or overeating (35.7%), and having difficulty concentrating on things like reading the newspaper and watching television (38.5%). However, Brazilians never felt bad about themselves or felt they had disappointed their family or themselves (47.1%); they did not experience slowness of movement or speech or agitation (59.7%); and they did not think about hurting themselves in any way or that it would be better to be dead (87.3%) (Table 2).

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Table 2- Response frequencies of participants according to the Brazilian Portuguese version of the PHQ-9. Rio das Ostras, Rio de Janeiro, Brazil, 2020-2021 (n=25,132)

Item	No day	Several days	More than half the days	Almost every day
	n (%)	n (%)	n (%)	n (%)
1. Had little interest or little pleasure in doing things.	6576 (26.2)	10959 (43.6)	3490 (13.9)	4107 (16.3)
2- Have you felt down, depressed, or without hope?	7227 (28.8)	11411 (45.4)	2950 (11.7)	3544 (14.1)
3- Did you have difficulty falling asleep or staying asleep, or did you sleep more than usual?	6695 (26.6)	10072 (40.1)	3224 (12.8)	5141 (20.5)
4- Did you feel tired or low on energy?	5872 (23.4)	11414 (45.4)	3278 (13.0)	4568 (18.2)
5- Did you have a lack of appetite or did you overeat?	8086 (32.2)	8982 (35.7)	3267 (13.0)	4797 (19.1)
6- Have you ever felt bad about yourself, thought you were a failure, or felt you disappointed your family or yourself?	11829 (47.1)	7550 (30.0)	2350 (9.4)	3403 (13.5)
7- Had difficulty concentrating on things (like reading the newspaper or watching television)	8780 (34.9)	9680 (38.5)	2806 (11.2)	3866 (15.4)
8- Were you slow to move or speak (to the point that other people noticed), or conversely, were you so agitated that you were pacing back and forth more than usual?	15003 (59.7)	6551 (26.1)	1754 (7.0)	1824 (7.3)
9- Have you ever thought about hurting yourself in any way or that it would be better to be dead?	21947 (87.3)	2117 (8.4)	450 (1.8)	618 (2.5)

Source: Prepared by the authors, 2022

The average total PHQ-9 score among the Brazilian population was 8.8 (SD=6.6). Of the total, 15,746 (62.7%) participants presented a mild score for symptoms of depression, followed by 4,349 (17.3%) with moderate symptoms, 2,744 (10.9%) with moderately severe symptoms, and 2,293 (9.1%) with severe symptoms of depression.

When the average score on the PHQ-9 scale is related to demographic variables, it is noted that the period from 2021 ($p=0.001$) and the female sex ($p=0.001$) showed the highest median. Furthermore, a difference was observed in depression scores considering age ($p=0.001$). When examining multiple comparisons, all comparisons showed statistically significant differences ($p=0.001$); however, the three largest differences occurred in the following forms: “18 to 24 years” versus “45 or more” ($W = -73.00$), “25 to 34 years old” versus “45 or older” ($W = -48.4$), “18 to 24 years” versus “35 to 44 years” ($W = -46.8$).

There is a difference between depression variable scores and marital status ($p=0.001$). When multiple comparisons were performed, it was noted that all comparisons showed

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statistically significant differences, except for the comparison “Married/in a stable relationship” versus “Divorced/separated”, the three largest differences occurred between: “Single” versus “Married/in a stable relationship” ($W=-54.68$), “Single” versus “Divorced/separated” ($W=-22.96$), “Single” versus “Widowed” ($W=-17.63$).

Furthermore, considering the variable of education level ($p=0.001$), it was observed that no statistically significant differences were found in the multiple comparisons performed between "Never Studied" and the others. However, it was observed that individuals with completed higher education presented a higher score for symptoms of depression. The three largest significant differences were between "Completed Higher Education" versus "Postgraduate" ($W=-32.538$), "Completed Secondary Education" versus "Postgraduate" ($W=-17.939$), and "Completed Primary Education" versus "Completed Secondary Education" ($W=13.223$).

When comparing the income variable with depression scores, a significant difference was noted ($p=0.001$), demonstrating that a higher depression score was found for individuals with income < 1 minimum wage. However, in multiple comparisons, it was found that The three largest differences in scores occurred between: “1 to 2 salaries” versus “7 or more salaries”. ($W=-29.7469$) “3 to 4 salaries” versus “7 or more salaries” ($W=-22.4682$) and “ < 1 salary” versus “7 or more salaries” ($W=-19.8057$).

Furthermore, it is noticeable in the comparison between the means of the depression symptom scale that there was a significant difference with the variable region ($p=0.001$), highlighting the North region with the highest score for depression symptoms. When performing multiple comparisons, it was found that the following comparisons show statistically significant differences: "North" versus "Northeast" and "North" versus "Central-West," with the first comparison showing a greater difference ($W = -7.2208$).

For the variable “contact with individuals who may have respiratory symptoms” and the depression score, it can be stated that there is a difference ($p=0.003$), for the multiple analyses it was noted that the three largest differences were “At least once a month” versus “At least once a day” ($W=-5.807$), “Rarely” versus “At least once a month” ($W=5.706$), “Never” versus “At least once a month” ($W=5.432$).

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In the measures to avoid COVID-19, it was noted that only social isolation ($p=0.001$), and the use of a mask ($p=0.001$), showed a statistically significant difference, implying that performing them resulted in a higher median (Table 3).

Table 3- Comparison between mean depression symptom scale scores and demographic variables. Rio das Ostras, Rio de Janeiro, Brazil, 2020-2021 (n=25132)

Variables	Average	DP	Median	X ²	gl	p	ε ²
Period							
2020	8.09	6.40	7.00	452	1	0.001	0.0180
2021	9.84	6.80	8.00				
Sex							
Masculine	7.15	6.27	6.00	664	1	0.001	0.0264
Feminine	9.41	6.64	8.00				
Age							
18 to 24 years old	11.32	6.84	10.00	3109	3	0.001	0.124
25 to 34 years old	9.00	6.32	8.00				
35 to 44 years old	7.37	5.82	6.00				
45 or more	5.30	5.23	4.00				
Marital status							
Single	10.29	6.81	9.00	1658	3	0.001	0.0660
Married/in a stable relationship	6.96	5.83	6.00				
Divorced/Separated	7.23	6.13	6.00				
Widower	5.73	5.78	5.00				
Education							
Never studied	7.00	3.46	7.00	632	5	0.001	0.0252
She can read and write.	5.55	5.80	4.00				
Complete elementary education	5.68	6.19	4.00				
High school diploma	9.13	6.92	8.00				
Completed higher education	9.77	6.80	8.00				
Postgraduate studies	7.53	5.91	7.00				
Income							
No income	9.15	6.88	8.00	549	5	0.001	0.0218
< 1 salary	10.40	7.33	9.00				
1 to 2 salaries	9.79	6.90	8.00				
3 to 4 salaries	9.08	6.58	8.00				
5 to 6 salaries	8.43	6.26	7.00				
7 or more salaries	7.34	6.08	6.00				
Region							
North	9.31	6.89	8.00	32.5	4	0.001	0.00129
North East	8.58	6.47	7.00				
Central-West	8.58	6.65	7.00				
Southeast	8.93	6.69	8.00				
South	8.88	6.53	8.00				

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Do you have contact with individuals who may have respiratory symptoms?							
Never	8.87	6.80	8.00	18.0	5	0.003	7.15e-4
Rarely	8.71	6.49	8.00				
At least once a month	9.56	6.35	8.00				
At least once a week	8.74	6.26	8.00				
At least once a day	8.54	6.32	8.00				
Continuous direct contact	8.79	6.55	8.00				
Handwashing (soap and water)							
Yes	8.81	6.62	8.00	0.667	1	0.414	2.66e-5
No	8.95	6.67	8.00				
Social isolation							
Yes	8.96	6.64	8.96	25.1	1	0.001	0.001
No	8.51	6.57	8.51				
Use of a mask							
Yes	8.85	6.61	8.85	17.4	1	0.001	6.91e-4
No	8.31	6.81	8.31				

Source: Prepared by the authors, 2024/ χ^2 =Chi-square test; gl= group number ε^2 = Measure of effect

In the association between having or not having symptoms of depression, it was evident that the variables period, sex, age, marital status, education, income, region, and COVID-19 protection and prevention measures such as social isolation presented significant results ($p=0.000$). Thus, a greater number of individuals who participated in the study in 2021, female, aged 18 to 24 years, single, with completed higher education, with an income of <1 minimum wage, from the northern region and who carried out social isolation presented symptoms of depression (Table 4).

Table 4- Association between demographic variables and having or not having symptoms of depression. Rio das Ostras, Rio de Janeiro, Brazil, 2020-2021 (n=25132)

Variables	Yes n (%)	No n (%)	Test value χ^2	p
Period				
2020	4914 (33.3)	9844 (66.7)	250.57	0.000
2021	4472 (43.1)	5902 (56.9)		
Sex				
Masculine	1874 (28,1)	4805 (71.9)	335.41	0.000
Feminine	7512 (40.7)	10941 (59.3)		
Age*				
18 to 24 years old	4771 (53.3)	4188 (46.7)	1995.13	0.000
25 to 34 years old	2511 (37.3)	4214 (62.7)		
35 to 44 years old	1270 (27.7)	3318 (72.3)		
45 or more	833 (17.2)	4017 (82.8)		

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Marital status					
Single	6499 (46.6)	7461 (53.4)	1147.66	0.000	
Married/in a stable relationship	2458 (25.7)	7120 (74.3)			
Divorced/Separated	372 (28.6)	927 (71.4)			
Widower	57 (19.3)	238 (80.7)			
Education					
Never studied	2 (50.0)	2 (50.0)	509.85	0.000	
She can read and write.	13 (18.8)	56 (81.2)			
Complete elementary education	57 (19.5)	236 (80.5)			
High school diploma	2318 (40.4)	3424 (59.6)			
Completed higher education	4592 (43.3)	6017 (56.7)			
Postgraduate studies	2404 (28.6)	6011 (71.4)			
Income					
No income	196 (59.6)	132 (40.2)	429.49	0.000	
< 1 salary	606 (46.5)	698 (53.5)			
1 to 2 salaries	2969 (43.9)	3795 (56.1)			
3 to 4 salaries	2616 (39.0)	4098 (61.0)			
5 to 6 salaries	1339 (35.1)	2480 (64.9)			
7 or more salaries	1724 (27.8)	4479 (72.2)			
Region					
North	1500 (40.7)	2189 (59.3)	30.28	0.000	
North East	3409 (35.8)	6121 (64.2)			
Central-West	857 (36.7)	1477 (63.3)			
Southeast	2603 (38.2)	4212 (61.8)			
South	1017 (36.8)	1747 (63.2)			
You have contact with patients who may have respiratory symptoms.?					
Never	4614 (37.8)	7598 (62.2)	8,482	0.132	
Rarely	2102 (37.1)	3566 (62.9)			
At least once a month	311 (40.4)	458 (59.6)			
At least once a week	702 (36.6)	1214 (63.4)			
At least once a day	631 (35.2)	1163 (64.8)			
Continuous direct contact	1026 (37.0)	1747 (63.0)			
Handwashing (soap and water)*					
Yes	8986 (37.3)	15125 (62.7)	2,181	0.336	
No	400 (39.2)	620 (60.8)			
Social isolation*					
Yes	6498 (38.2)	10522 (61.8)	16,134	0.000	
No	2888 (35.6)	5223 (64.4)			
Use of a mask*					
Yes	8816 (37.5)	14672 (62.5)	5,895	0.052	
No	570 (34.7)	1073 (65.3)			

Source: Prepared by the authors, 2022 / *Item was missing; X² = Chi-square test

For binary logistic regression, the following variables were included: period, sex, age, marital status, education level, region, income, whether they had contact with patients who may have respiratory symptoms, social isolation, and mask use. Thus, after regression, individuals who participated in this study in 2021 showed a higher risk of experiencing

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depressive symptoms more than once, compared to 2020. Regarding sex, female participants had twice the risk of developing such symptoms compared to male participants.

On the other hand, those aged 25 to 34 also remained associated with symptoms of depression, although decreasing by 1.7 times. For the age group of 35 to 44, the protective factor increased 2.4 times, and participants aged 45 or older were 4.5 times less likely to experience symptoms of depression.

Regarding marital status, married and widowed individuals showed a 1.4 times greater chance of protection against depressive symptoms. Similarly, those with an income of 3 to 4 minimum wages and 7 or more showed this chance more than once.

It is noted that the Northeast and South regions presented protective factors of 1.1 times and 1.29 times, respectively, compared to the other regions of the country. However, individuals who had contact at least once a week or once a day have a 1.1 times greater risk of developing symptoms of depression, while those who had direct contact have a 1.2 times greater risk.

Regarding prevention and protection measures, individuals who practiced social isolation had approximately a 1.5 times greater risk of developing symptoms of depression compared to participants who did not practice social isolation (Table 5).

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Table 5-Odds ratios by binary logistic regression for having or not having symptoms of depression. Rio das Ostras, Rio de Janeiro, Brazil, 2020-2021 (n=25,132)

Variables	Having or not having symptoms of depression	p-value
	OR* (95% CI)†	
Period		
2021	1.25 (1.81-1.34)	0.000
Sex		
Feminine	2.02 (1.90-2.16)	0.000
Age		
25-34 years old	0.59 (0.55-0.64)	0.000
35-44 years old	0.41 (0.38-0.46)	0.000
Age		
45 years or older	0.22 (0.20-0.25)	0.000
Marital status		
Married	0.70 (0.65-0.75)	0.000
Widower	0.69 (0.51-0.94)	0.019
Income		
3 to 4 salaries	0.86 (0.76-0.98)	0.024
7 or more salaries	0.77 (0.68-0.89)	0.000
Region		
North East	0.86 (0.79-0.94)	0.001
South	0.85 (0.77-0.95)	0.006
You have contact with patients who may have respiratory symptoms.		
Rarely	1.07 (1.00-1.15)	0.035
At least once a week	1.12 (1.01-1.25)	0.033
At least once a day	1.12 (1.00-1.25)	0.036
Continuous direct contact	1.21 (1.10-1.33)	0.000
Social isolation		
Yes	1.48 (1.38-1.58)	0.000

Source: Prepared by the authors, 2022 *OR=Odds Ratio;†CI = 95% Confidence Interval

DISCUSSION

The results of this study highlighted the factors associated with symptoms of depression among the Brazilian population during the COVID-19 pandemic, emphasizing sex, age, marital status, education level, income, region, and contact with individuals who might have respiratory symptoms. Furthermore, protective and preventative measures in the fight against COVID-19, such as social isolation and the use of masks, also stood out. Studies indicate an association between frequent mask use and higher depression scores. However, this variable should be interpreted as an indicator of greater concern for health and strict adherence to protective measures, factors that, in the pandemic context, may be linked to states of anxiety and isolation.

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When comparing the periods of 2020 and 2021, it is noted that the period of 2021 was associated with a higher likelihood of depressive symptoms in the studied sample. According to a study conducted by the Center for Disease Control and Prevention (CDC), there was an increase in the percentage of adults reporting significant symptoms of depression during the COVID-19 pandemic, and a significant increase was observed when correlated with the number of cases of the disease. Furthermore, the frequency of symptoms peaked between December 2020 and January 2021, remaining elevated in June 2021. It is worth noting that prolonged exposure to protective and preventive measures, such as mask use and social isolation, directly influenced the mental health of the population¹⁹.

These results reflect that the COVID-19 pandemic period brought anxieties and uncertainties, such as moral suffering and grief experienced alone during the period of social isolation, potentially increasing the negative impact on mental health²⁰.

In this research, females stood out in the development of depressive symptoms compared to males. A study conducted with Turkish society demonstrated that women were severely affected by depressive symptoms during the pandemic period²¹. Furthermore, another investigation among 204 countries during the pandemic to assess the global prevalence of depressive and anxiety disorders showed that an increase in the prevalence of depressive disorder was reported among females²², thus corroborating the higher scores of the present Brazilian study.

Women are suffering the consequences of the COVID-19 pandemic, resulting in increased mental distress for various reasons. This group is particularly affected by...Household responsibilities and caregiving when family members fall ill. Furthermore, due to social isolation, they are at risk of becoming victims of domestic violence²². This leads to the development of depressive symptoms. Therefore, the findings reinforce the importance of considering gender-related specificities when developing prevention and intervention strategies, since the social and cultural contexts experienced by women can directly influence mental health outcomes⁵.

Regarding age, Brazilians aged 18 to 24 participating in the study were more likely to exhibit depressive symptoms. A study demonstrating the trajectory of mental distress among adults in the United States during the pandemic showed that sex, ethnicity, and age are factors

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associated with mental distress in the first months of the pandemic⁵. Due to social isolation and the closure of schools and leisure spaces as a measure to prevent the spread of the virus, young people were prevented from meeting in collective spaces, affecting their ability to learn and interact socially²².

A study conducted in 2020 by the Oswaldo Cruz Foundation (Fiocruz) revealed that during the pandemic, 52.6% of Brazilians reported experiencing anxiety and nervousness frequently or almost always. Furthermore, it was noted that this feeling was reported by 69.5% of young adults, and that 43.5% of these began to experience sleep problems¹⁰.

Regarding the marital status and education level of the participants in this research, the study highlights the higher risk level among single people with completed higher education, which differs from a study conducted in mainland China in 2020 with 1,300 participants from 194 cities, especially regarding marital status, since the majority of Chinese participants were married, but also had a good level of education (87.9% held a bachelor's degree). Furthermore, the study revealed that 53.8% of the Chinese respondents showed moderate or severe psychological impairment, and that among these, 16.5% were identified with depressive symptoms²³.

Regarding monthly income, participants who receive less than one minimum wage show signs of major depression symptoms, given that the pandemic generates social and economic impacts on society. Thus, low-income individuals feel vulnerable, as many have lost their jobs or been prevented from carrying out their work activities due to measures such as social distancing and isolation. This unstable scenario generates uncertainty and worry, thus contributing to the appearance of symptoms²⁴.

When relating depression symptoms to demographic variables, it is observed that individuals belonging to the North region of Brazil presented the highest average when compared to those from other regions. This data may be related to the per capita monthly household income, whose average in the region in 2019 was 950.71 reais, corresponding to the second lowest average. It is observed that the North region occupies the second position in the number of hospitalizations for respiratory diseases per 100,000 inhabitants, second only to the South region. Among the states in this region, Amazonas stands out for presenting the

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second highest average number of hospitalizations in Brazil, in addition to registering one of the highest numbers of deaths from respiratory diseases²⁵.

This scenario may be related to the geographical disparity in access to health services, considering the extensive forest area and the presence of hard-to-reach locations, which makes it difficult to seek emergency care²⁵.

Regarding participants having had contact with individuals who may have respiratory symptoms, significant data was obtained for those individuals who had contact at least once a month. This factor may be justified by the fear of contracting COVID-19, susceptibility to infection, exposure and close contact with individuals who presented respiratory symptoms or tested positive for the pandemic disease, thus affecting the mental health of the community²⁶.

The results indicate an association between frequent mask use and higher depression scores. However, this variable should be interpreted as an indicator of greater concern for health and strict adherence to protective measures, factors that, in the pandemic context, may be linked to states of anxiety and isolation. Social isolation subjects the population to a break in social ties, a distancing from activities, as well as stress factors, thus contributing to the development of symptoms of depression, such as anxiety disorder and fear²⁴.

The practice of wearing masks, coupled with a lack of clear information about their use and associated with a perceived susceptibility to COVID-19 infection, can generate insecurity which, related to fear, can be a trigger for mental distress in the population. Thus, the lack of health education along with the varied information available generates insecurity in the population²⁷.

Furthermore, a study conducted by the WHO in 2022 demonstrated that the global prevalence of anxiety and depression increased by 25% in the first year of the pandemic, corroborating the study's findings. Similarly, the Post-Pandemic Mental Health Guide in Brazil, produced by the Federal Nursing Council, divides the consequences of the pandemic into four waves, one of which is the increase in mental disorders, including depression and psychological trauma, caused directly by the disease or by secondary consequences^{28,29}.

It is noted that the COVID-19 pandemic has affected the mental health of the Brazilian population, thus reinforcing the importance of conducting studies and developing strategies in

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the area of mental health, as a high number of individuals have presented symptoms of depression.

As a limitation of the study, the need for internet access and knowledge of how to answer the online instrument may have restricted access for individuals with fewer social resources. Furthermore, individual perceptions of depression symptoms may influence questionnaire responses. There is also the possibility of sample selection bias, considering that foreign individuals residing in Brazil may have responded to the study; however, efforts were made to minimize this bias by using filter questions in the form.

CONCLUSION

In this study, the majority of the sample from the Brazilian population presented symptoms of mild depression, and a significant percentage of people with symptoms of severe depression were also observed during the COVID-19 pandemic. The main associated factors were year of data collection, sex, age, marital status, education level, income, region, and social isolation.

It became evident that the most frequent responses were related to symptoms of little interest in performing activities, feeling down, depressed without perspective, having difficulty falling asleep or staying asleep, and feeling tired with little energy. Furthermore, a higher prevalence of depressive symptoms was observed in the second data collection period (2021) compared to the first (2020).

Thus, this study contributes to strengthening knowledge about the impacts of the COVID-19 pandemic on the mental health of the Brazilian population, highlighting the need for expanded attention to the emotional and psychological conditions of individuals. The findings reinforce the importance of implementing prevention, monitoring, and care strategies in mental health, especially those aimed at the most vulnerable groups identified. Furthermore, it emphasizes the relevance of public policies and intersectoral actions that promote access to mental health services, as well as the development of interventions capable of minimizing the effects of health crises, such as that experienced during the pandemic.

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