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Association of sociodemographic characteristics, mental health, and sleep quality with COVID-19 fear in an elderly Brazilian population

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Aim: This study determined whether COVID-19 fear is correlated with sociodemographic characteristics, general health, mental health, and sleep quality in an elderly Brazilians. **Methods:** Elderly people aged ≥ 60 years replied to an online survey containing questions about their sociodemographic characteristics; general health; levels of stress, anxiety, and depression; sleep quality; and COVID fear. **Results:** Data were statistically analyzed using descriptive statistics (α = 5%). In total, 705 elderly people with mean age of 66 ± 5 years, and most (82.7%) respondents were women, graduated and from southeastern Brazil. COVID-19 fear correlated positively and moderately with sleep quality and symptoms of depression, anxiety, and stress (all $p < 0.001$). It was associated with females. Elderly people from northern and northeastern Brazil and diabetics had increased COVID-19 fear (all $p < 0.05$). **Conclusion:** The fear of COVID-19 exists among Brazilian female old people, diabetics, increases anxiety and stress symptoms, and worsen sleep quality in elderly people.

Keywords: Coronavirus. COVID-19. Mental disorder. Sleep. Aged.

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has spread worldwide, causing the novel 2019 coronavirus disease (COVID-19), considered by the World Health Organization (WHO) to be a public health emergency of international concern. The rapid progression of COVID-19, the fear of contracting the infection, shortages of essential survival elements (e.g., food, water, clothing), and the closure of educational and business institutions have had adverse effects on human health during the pandemic[1].

Anxiety and fear associated with social distancing measures implemented during the COVID-19 outbreak may lead to excessive mental overload, which is often harmful to individuals' psychological health[2-4]. The adoption of these measures has resulted in the loss of daily routines, leading to sleep dysregulation and worsening insomnia symptoms in most of the population[5]. The measures' adverse psychological effects can exacerbate pre-existing illnesses, increasing clinical and subclinical mental conditions such as anxiety, depression, acute stress syndrome, and post-traumatic stress disorder[2].

Incidence of depressive and anxiety-, trauma-, and stress-related disorders are expected to increase worldwide during and after the COVID-19 pandemic. Depression and anxiety already affect 4.4% and 3.6% of the world's population, respectively; in Brazil, 5.8% and 9.3% of citizens (the largest proportion among Latin American countries)[6], have been affected by these disorders. According to the World Mental Health Report[7], depression is common among elderly people. However, depressive disorders are detected less in this population than in young adults, as the aging process is often neglected. With populational aging, the numbers of people with depression and anxiety are increasing, mainly in developing countries[8].

Given the COVID-19 pandemic, elderly people are at high risk of infection, and stricter social isolation measures (e.g., family confinement) may cause more significant mental health problems in this age group. Mental disorders, in turn, can be related to psychosocial and physiological problems, such as metabolic diseases (e.g., diabetes and cardiovascular, autoimmune, neurocognitive, and neurobiological diseases) and other age-related health problems, in elderly people[9]. However, little is known about the effects of COVID-19–related fear on the mental health of Brazilian elderly people. Thus, this study was conducted to assess associations of elderly Brazilians' sociodemographic characteristics and medical factors with COVID-19 fear during social isolation. We also examined correlations of COVID-19 fear with anxiety, stress, depression, and sleep quality in this population.

Material and methods

Study design, sample, and procedure

In this cross-sectional observational study, the effects of the COVID-19 pandemic on sociodemographic and psychological factors of elderly Brazilian people were assessed using an online survey.

According to the Continuous National Household Sample Survey, the Brazilian population contained an estimated 33,707,000 people aged ≥ 60 years, of whom 37.8% (12,590,000) had internet access (and thus could participate in an online survey), in 2018. Sample calculation was based on the variable with the lowest prevalence (depression), which is a psychological factor accounting for about 20% of the elderly population[10]. To obtain power and response rate of 80%, and 20% of expected sample loss, a study design effect of 2.0 and a 95% confidence level were adopted. Thus, the minimum sample needed to detect significant differences was determined to be 615 respondents. The sample yielded a final target of 705 participants.

Volunteers from all Brazilian regions were selected to participate in this study through digital media (open Facebook and Instagram accounts, journalistic websites, and local radio stations). The inclusion criteria were: 1) age ≥ 60 years, 2) Brazilian citizenship and residence, and 3) internet access. This study conformed the recognized standards required by Declaration of Helsinki and was approved by the local ethics committee.

The researchers established a hyperlink that took eligible individuals to the survey site, hosted on a Google Forms platform (Google LLC, Mountain View, CA, USA). Those who accepted the invitation to participate digitally signed an informed consent form to gain access to the questionnaire. The questionnaire could be filled out using a cellphone, tablet, computer, or other electronic means. Data collection took place from September to December 2020. Incomplete questionnaires were excluded from the study automatically; data from these surveys could not be displayed and were not available for analysis.

Socioeconomic characteristics and general health

Data on respondents' age, sex, civil status, city and state of residence, monthly income, and educational level were collected. General health data (weight, height, presence of disease, previous diagnoses, symptoms) and data on the receipt of COVID-19 information were also collected.

Depression, anxiety, and stress

The short (21-item) version of the Depression, Anxiety and Stress Scale (DASS-21), adapted for Brazil[11], was used to assess participants' depression, anxiety, and stress (with seven items each) in the past week, during the COVID-19 pandemic. Responses are structured by a Likert scale (0, not applicable at all; 1, applicable to some degree or for a short time; 2, applicable to a considerable degree or for a good part of the time; 3, applicable much or most of the time)[12]. DASS-21 scores are used to classify the three mental conditions as normal, mild, moderate, severe, and extremely severe, with higher scores reflecting greater severity[11,12].

Sleep quality

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), validated for Brazilian population, which consists of 19 items in seven domains: subjective perception of sleep quality, latency, duration, efficiency, disorders, medications, and

daytime disorders[13]. Responses covered the past month of sleep. Component scores ranged from 0–3 and are summed to yield final scores (0–21); higher scores indicate worse sleep quality[13]. Total scores > 5 indicate significant or moderate difficulties in at least two or three scale components.

COVID-19 fear

The survey also included the Brazilian version of the COVID-19 Fear Scale (FCV-19S), which consists of seven items assessing respondents' fear of SARS-CoV-2[14,15]. Responses are structured by a Likert scale (1, strongly disagree; 2, disagree; 3, neither agree nor disagree; 4, agree; 5, strongly agree), with total scores ranging from 7 to 35 and higher scores indicating greater fear[15].

Data analysis

The data were characterized using descriptive statistics [frequencies, dispersions, and central tendencies (absolute and relative frequencies, means and standard deviations, medians, and interquartile ranges)]. As the Kolmogorov–Smirnov test demonstrated that the dependent variable (COVID-19 fear) was not distributed normally, non-parametric tests were used for inferential data analysis. All analyses were performed using SPSS software (version 20.0 for Windows; SPSS Inc, Chicago, IL, USA).

Spearman's correlation test was used to evaluate correlations of COVID-19 fear with mental health domains and sleep quality. Poisson regression was used to analyze associations between COVID-19 fear and the independent variables (sociodemographic characteristics, comorbidities, depression, anxiety, stress, and sleep quality). The independent variables were allocated hierarchically to distal and proximal blocks. The distal block included sociodemographic characteristics (age, sex, region of residence, educational level) and comorbidities (diabetes, hypertension, cardiomyopathy, respiratory disease, kidney disease, cancer, stroke, obesity). The proximal block included depression, anxiety, stress, and sleep quality. Using the backward procedure, only variables with p values < 0.20 in the crude model (sex, region of residence, diabetes, obesity, depression, anxiety, and stress) were included in the adjusted model. Measures of the regression coefficient (B), prevalence ratios, and 95% confidence intervals were obtained. The significance level was set to $p < 0.05$.

Results

In total, 705 elderly people participated in the study. Considering dropouts, for the PSQI, only 600 completed the questionnaire; thus, only for this variable the reduced sample was considered. Their sociodemographic characteristics are presented in Table 1. Most participants were women (82.7%) and from southeastern Brazil (42.7%) and had complete higher education (44.5%). Their mean age was 66 years (range, (61–71 years; Table 2) and most elderly present only one comorbidity.

Table 1. Sample characterization according to the nominal variables: sociodemographic data and presence of comorbidities (n = 705).

Characteristics	Frequency	
	n	%
Sex		
Female	583	82.7
Male	122	17.3
Brazilian regions		
Northern	41	5.8
Northeastern	144	20.4
Southeastern	300	42.7
Midwestern	51	7.3
Southern	167	23.8
Educational level		
Elementary school	66	9.4
High school	162	23.0
Graduate	314	44.5
Postgraduate	163	23.1
Diabetes		
Yes	107	15.2
No	598	84.8
Hypertension		
Yes	333	47.2
No	372	52.8
Cardiomyopathy		
Yes	59	8.4
No	646	91.6
Respiratory disease		
Yes	61	8.7
No	644	91.3
Kidney disease		
Yes	12	1.7
No	644	91.3
Cancer		
Yes	25	3.5
No	680	96.5
Stroke		
Yes	3	0.4
No	702	99.6
Obesity		
Yes	294	41.7
No	411	58.3
Total	705	100.0

Table 2. Sample characterization according to the quantitative variables: age, number of comorbidities, fear of COVID-19 (FCV-19S), depression, anxiety, stress, and sleep quality.

Characteristics	Mean (SD)	Median	Percentile 25-75
Age (years)	66 +/- 5	64	62-68
Number of comorbidities	1 +/- 1	1	0-2
COVID-19 Fear Scale (FCV-19S)	21+/- 6	20	17-25
Depression (DASS-21)	4 +/- 5	3	0-7
Anxiety (DASS-21)	3 +/- 4	2	0-5
Stress (DASS-21)	6 +/- 5	5	1-8
DASS- 21 total score	13 +/- 14	10	2-20
Sleep quality (PSQI)	8 +/- 4	7	4-10

DASS-21 = Depression, Anxiety and Stress Scale - short version.
PSQI = Pittsburgh Sleep Quality Index.
FCV-19S = Fear of COVID-19 Scale.

The total FCV-19S score was high (mean, 21 ± 6; Table 2). DASS-21 stress scores (mean, 6 ± 5; median, 5) were higher than anxiety and depression scores, although the DASS-21 overall score was classified as normal for 97.2% of respondents (Table 3). The median sleep quality score was 7 (mean, 8 ± 4), indicating major or moderate sleep difficulties (Table 2). FCV-19S score was correlated positively and moderately with DASS-21 scores for symptoms of depression ($r2 = 0.518$; $p < 0.001$), anxiety ($r2 = 0.587$; $p < 0.001$), and stress ($r2 = 0.595$; $p < 0.001$), and with sleep quality scores (PSQI; $r2 = 0.424$; $p < 0.001$)) ($p < 0.001$; Table 4). In the adjusted regression model, FCV-19S score was related to female ($B = 0.061$), residence in northern ($B = 0.132$) and northeastern ($B = 0.067$) Brazil relative to residence in southern Brazil, diabetes ($B = 0.047$; all $p < 0.05$), and the presence of more anxiety ($B = 0.013$) and stress ($B = 0.026$) symptoms on DASS-21 (both $p < 0.001$; Table 5).

Table 3. Frequency (n) and percentage (%) of DASS-21 score classification in the study volunteers.

DASS-21 Classification	*n*	%
Normal	685	97.2%
Mild	2	3%
Moderate	7	1%
Severe	3	0.4%
Extremely severe	3	0.4%
Total	705	100%

DASS-21 = Depression, Anxiety and Stress Scale – short version.

Table 4. Correlation between fear of COVID-19 (FCV-19S), mental health and sleep quality in Brazilian elderly people.

Mental health variables	Fear of COVID-19	
	r^2	*p*-value
Depression (DASS-21, n=705)	0.518	<0.001*
Anxiety (DASS-21, n=705)	0.587	<0.001*
Stress (DASS-21, n=705)	0.595	<0.001*
Sleep quality (PSQI, n=600)	0.424	<0.001*

* p-value < 0.05 was considered statistically significant.
DASS-21 = Depression, Anxiety and Stress Scale - short version.
PSQI = Pittsburgh Sleep Quality Index.
FCV-19S = Fear of COVID-19 Scale.

Table 5. Poisson Regression for factors associated with fear of COVID-19 (FCV-19S) in Brazilian elderly people (n=597).

Variable	Adjusted model				
	B	p-value	PR	95% CI	
				Lower	Upper
Sex					
Female	0.061	0.039*	1.063	1.003	1.126
Male			Ref		
Brazilian regions					
Northern	0.132	0.002*	1.141	1.051	1.238
Northeastern	0.067	0.026*	1.069	1.008	1.134
Southeastern	0.042	0.086	1.043	0.994	1.094
Midwestern	0.057	0.117	1.059	0.986	1.138
Southern			Ref		
Diabetes					
Yes	0.047	0.049*	1.048	1.000	1.098
No			Ref		
Obesity					
Yes	0.024	0.182	1.024	0.989	1.061
No			Ref		
DASS-21					
Depression	-0.005	0.179	0.995	0.989	1.002
Anxiety	0.013	<0.001*	1.013	1.006	1.021
Stress	0.026	<0.001*	1.027	1.019	1.034

B = Regression Coefficient
PR = Prevalence Ratio; 95%
CI = 95% Confidence Interval
DASS-21 = Depression, Anxiety and Stress Scale - short version.
PSQI = Pittsburgh Sleep Quality Index.
FCV-19S = Fear of COVID-19 Scale.
Ref = Reference category used in the Poisson Regression.
* p-value < 0.05 was considered statistically significant.

Discussion

In this study, associations of COVID-19 fear with mental health and sleep quality were evaluated in a nationwide elderly Brazilian population. Emerging mental health issues related to the COVID-19 pandemic may evolve into long-lasting health problems and isolation in elderly people, who are at high risk of complications of this disease[16,17]. The literature on the impacts of COVID-19 on people's quality of life is diverse and accumulating rapidly, but it lacks information about elderly people' mental health during the pandemic. The fear of COVID-19 has also been found to be most pronounced in elderly participants[18], which emphasizes the concern about the virus disease course. The effects of quarantine on the mental and physical health of aged people have been summarized in only one review to date[19]. The present study revealed that the COVID-19 outbreak has had a negative impact on the mental health of the elderly population of Brazil, with COVID-19 fear associated with high stress and anxiety levels, especially among women, residents of northern and northeastern Brazil, and diabetics.

The ease of access to technology, digital media, and information likely contributed to our achievement of the target number of participants. The predominance of women in our sample corroborates previous findings, although most respondents in other recent studies about COVID-19 have been young adults[20-22]. Moreover, the association of COVID-19 fear with females is noteworthy. Women's sense of care, consciousness, educational levels, and concerns about post-outbreak family well-being likely increase their fear of the disease[23]. Consistent with our findings, other researchers have noted that COVID-19 fear was pronounced in females, families with children, laid-off workers, and individuals with symptoms of depression and anxiety[20,24].

As expected, most of our elderly respondents had complete higher education and were from southeastern Brazil, which has the greatest concentration of elderly people with the country's highest social, educational, and economic levels[25]. However, elderly people from northern and northeastern Brazil were more afraid of SARS-CoV-2 than were those residing in southern Brazil. COVID-19 fear is concentrated in densely populated urban areas, which have larger case numbers[24]. In March 2020, when Brazil was ranked 50th in the world in the number of COVID-19 cases, the greatest average daily percentage changes in confirmed cases had been reported in the northern and northeastern regions of the country[26]. These regional disparities highlight the non-egalitarian distribution of public health, education, and human development resources in Brazil. Poor people are more vulnerable to COVID-19 given the lack of health insurance, as well as limited intensive care unit availability in low-income regions[27]. Similar to our findings, Demenech et al. observed the greatest economic inequity and mortality rates in the north rather than the lowest imbalance in the south of Brazil[27]. To date, the poorest regions have had enlarged numbers of COVID-19 deaths and, considering the insufficient SARS-CoV 2 surveillance in Brazil, the adoption of measures to restrict virus spread has also been inadequate.

Hypertension and obesity were prevalent in our sample, although they did not affect the majority of respondents. The prevalence of these conditions is increasing in

Latin America due to socioeconomic trends and increasingly sedentary lifestyles[28]. Obesity and metabolic syndrome are potential risk factors for the development of hypertension[28], cardiovascular disease, dyslipidemia, and cancer. In the elderly population, changes in metabolism also result in lean mass reduction and the accumulation of more body fat[29].

This study revealed a high level of COVID-19 fear among people with diabetes, who made up a minority of our sample. Many patients admitted to hospitals with diagnoses of COVID-19 have severe chronic diseases, such as hypertension and diabetes[30,31]. In individuals of advanced age, such conditions are of great concern once no treatment has been identified to the various symptoms the virus disease may induce in organs besides the respiratory system[32]. More elderly people than expected have contracted SARS-CoV-2 infection, although studies have explored the impact of the pandemic in adults[20,24,33]. Due to the limited understanding of the pathophysiology of COVID-19 and the lack of therapeutic interventions[32], disease severity may be greatest in infected elderly people with pre-existing chronic diseases. High COVID-19 fatality rates have been associated with elderly age, cardiovascular and cerebrovascular diseases, and diabetes[16,17]. Patients with these conditions may be frequent users of medications, such as angiotensin-converting enzyme inhibitors and other angiotensin blockers, that upregulate protein expression in the cells to which the virus attaches and into it penetrates[34]. Thus, the severity of SARS-CoV-2 infection would be intensified in these patients[34], requiring an awful lot of healthcare workers' attention. In the context of isolation and social distancing, elderly people with chronic diseases are feeling a great deal of apprehension about COVID-19 progression, treatments, and future protocols. Dissemination of scientific arguments and information in the press and social media may have contributed to COVID-19 fear among elderly diabetic individuals. Other comorbidities requiring constant medical attention (i.e., hypertension and obesity) were more prevalent than diabetes in our sample but were not associated significantly with COVID-19 fear, raising questions about how elderly people in Brazil are dealing with their general healthcare in terms of medical treatment and follow-up assessments.

Not surprisingly, elderly people with symptoms of anxiety, stress, and depression had more COVID-19 fear. Most studies of the effects of isolation during the COVID-19 pandemic have documented the high prevalence of these mental disorders in elderly people[19]. In contrast, a Brazilian study[20] revealed higher levels of sadness and anxiety often or all the time during the pandemic in young adults than in elderly people; in 70% of respondents, prior diagnoses of depression contributed to these symptoms. As we did not collect such data in the present study, we cannot comment on the causality of the relationships we identified. Perrin et al.[4](2009) reported that determinants of psychological outcomes included being elderly, female, in isolation or quarantine, having a low educational level, and having a weak or support network. Duarte et al.[21](2020) also reported that women are 2.73 times more likely than men to present minor mental disorders; as our sample was predominantly women, this confirms our results. The critical associations of stress and anxiety symptoms with COVID-19 fear in this study agree with a previous report[35]. Anxiety and fear are intimately related, but they are different concepts. The former is a state mood bearing

a possible negative situation, and the latter is an alarm response to a present or perceived hazard[35]. Symptoms of both may range from subjective perceptions to motor acts or visceral activities, such as muscle tension, nausea, sweating, heart palpitation, avoidance, and worry[35]. As a consequence, stress disorders may also develop. Thus, the imminent possibility of infection with a fatal disease such as COVID-19 generated an alerted state of mind and emotional and behavioral reactions in many of our elderly respondents, although most respondents had normal mental health according to the DASS-21 classification.

Elderly people with COVID-19 fear are also more prone to have worse sleep quality, leading to moderate or major sleep difficulties. More than half of participants in an American study had worse sleep quality, high anxiety rates, and signs of insomnia caused by the pandemic[23]. The authors of that study[23] did not identify sex differences in sleep disorders and anxiety, but they noted a major female predisposition for mental disorder development. In contrast, other authors have reported pronounced sleep difficulties among women[20], supporting our findings. However, no conclusion about sleep quality during lockdown can be addressed once people have shown heterogeneous sleep results before the pandemic due to individual attitudes, and different experiences towards emotions during the pandemic[36]. The protective factor of the lack of lifestyle change during isolation has been observed in elderly samples, although most elderly people wake up early or during the night and have difficulties falling asleep[37]. Quarantine provided better sleep opportunities and reduced responsibilities among respondents[23]. Our findings suggest that the retirement condition did not affect the way elderly people dealt with their daily routines, but uncertainties about the future and new measures implemented to restrain disease spread may have impacted their quality of sleep.

Finally, elderly people in Brazil appear to have socioeconomic and social vulnerability and fear of COVID-19. The country failed to adopt public measures to restrain the spread of the disease in time, which has resulted in massive numbers of COVID-19 infections and deaths since the beginning of the pandemic[26,27]. Despite this, strategies have been proposed to the population to avoid psychological problems and maintain quality of life during the COVID-19 outbreak; they include limiting the time spent receiving COVID-19 updates and news, working, and exercising as much as possible, and seeking behavioral therapy to minimize the development of mental disorders[5].

Limitations of this study include: 1) its online basis, as elderly people may have difficulty filling in online questionnaires; 2) the use of digital media for recruiting, which is challenging for the target elderly group to access it without help from a familiar member; 3) the possibility of bias common to all online surveys, as responses could be softened, misleading, or incomplete; 4) the self-reporting nature of the survey, with no clinical evaluation performed by appropriate professionals, which could probably be misunderstood and answered; and 5) the inability to make causal inferences concerning COVID-19 fear and mental disorders, as we did not know respondents' pre-pandemic mental health status. The findings suggest, however, that the development of healthcare strategies and mental health programs to control the onset of anxiety and stress symptoms, especially for those with chronic diseases,

will aid elderly people across Brazil. Further clinical research could explore the ability of mental health assistance and other proposed treatments to minimize post-outbreak side effects in the elderly population.

Conclusions

The fear of COVID-19 exists among Brazilian female old people, diabetics and increases the symptoms of anxiety and stress and worsen sleep quality in the aged population.

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Data availability

Datasets related to this article will be available upon request to the corresponding author.

Conflict of interest

None

Author Contribution

The participation of each author is described below, according to the authorship and co-authorship criteria:

- Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work – Talita, Ingrid, Lorena, Mariana, Yuri and Renata;
- Drafting the work or revising it critically for important intellectual content – Talita, Ingrid, Lorena, Mariana, Yuri and Renata;
- Final approval of the version to be published – Talita and Renata;
- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved – Talita, Ingrid, Lorena, Mariana, Yuri and Renata.

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