

# Covid-19: Repercussions on the mental health of higher education students

## *Covid-19: repercussões na saúde mental de estudantes do ensino superior*

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**ABSTRACT** This article aimed to assess the repercussions of Covid-19 and social isolation on the mental health of higher education students in Ceará, Brazil. The sample consisted of 3,691 higher education students taking online classes from June to September 2020, who answered to two instruments: a sociodemographic and situational profile questionnaire concerning the pandemic/social isolation, and the Mental Health Inventory. The results showed that 21.2% of the students had their activities canceled, with no expected return. The majority, 77.2%, reported concern about the death of relatives and acquaintances by Covid-19. The overall state of mental health average measured by the inventory was 48.8. This result suggests that students had their mental health affected by the conditions imposed by the pandemic. Therefore, educational institutions should promote strategies to protect the mental health of the student community.

**KEYWORDS** Higher education. Pandemics. Social alienation. Mental health. Covid-19.

**RESUMO** Este artigo teve como objetivo avaliar as repercussões da Covid-19 e do isolamento social na saúde mental de estudantes do ensino superior no Ceará, Brasil. A amostra foi composta por 3.691 alunos do ensino superior participando de aulas on-line no período de junho a setembro de 2020, que responderam a dois instrumentos: um questionário sociodemográfico e situacional referente à pandemia/isolamento social e o Inventário de Saúde Mental. Os resultados mostraram que 21,2% dos alunos tiveram suas atividades canceladas, sem expectativa de retorno. A maioria, 77,2%, relatou preocupação com a morte de parentes e conhecidos pela Covid-19. O estado geral de saúde mental médio, medido pelo inventário, foi de 48,8. Esse resultado sugere que os alunos tiveram sua saúde mental afetada pelas condições impostas pela pandemia. Assim, as instituições de ensino devem promover estratégias para proteger a saúde mental da comunidade estudantil.

**PALAVRAS-CHAVE** Ensino superior. Pandemia. Alienação social. Saúde mental. Covid-19.

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## Introduction

The coronavirus outbreak (Sars-CoV-2, or Covid-19 infection), has spread rapidly in various regions of the world and generated different impacts. According to the World Health Organization (WHO), on January 15, 2021, confirmed cases of Covid-19 were 91,816,091 worldwide<sup>1</sup>.

Covid-19 installed in the world reflected in the forms of sociability of the population. It has imposed complex challenges for the functioning of local economies with the promotion of social isolation measures<sup>2</sup>. It is projected that the macroeconomic impacts caused by Covid-19 are greater than the ones from the post-World War II based on the world Gross Domestic Product (GDP)<sup>3</sup>.

Little scientific knowledge about the new coronavirus, high speed of dissemination, and the ability to cause deaths in vulnerable populations produce uncertainties about the best conduct and strategies to be used to face the pandemic worldwide. In Brazil, the challenges are even greater due to factors that include insufficient knowledge about the transmission characteristics of the virus, a scenario of great social inequality with thousands of people living in precarious housing and sanitation conditions, difficult access to water, and agglomeration situations<sup>4</sup>.

The health crisis caused by the Covid-19 epidemic found the Brazilian population in an extremely vulnerable situation, with high unemployment rates and deep cuts in social policies. Moreover, in recent years, especially after the approval of Constitutional Amendment No. 95 with the radical implementation of a ceiling on public spending and economic policies imposed by the current government, there is a growing and intense bottleneck in investments in health and research in Brazil. Nevertheless, at this very moment of crisis, society calls for a strong science and technology system and a single health system that guarantees the universal right to health<sup>4</sup>.

The rapid spread of Covid-19 and the large amount of information disseminated in the

context of the pandemic (some unreliable) generated changes in the population's behavior, psychological suffering, and mental illness<sup>5</sup>. In addition, the pandemic caused a large part of plans, projects, and expectations to be rethought, resulting in fear, uncertainty, and insecurity. Furthermore, there have been changes in education, such as suspension of the school calendar, introduction of new teaching methodologies, and incorporation of digital technologies. This teaching-learning scenario, which is loaded with tension, anxiety, and uncertainties, triggers emotional imbalance and mental health issues.

A study by Son et al.<sup>6</sup> with 195 university students found increase in stress and anxiety in 138 (71%) students due to the Covid-19 pandemic. As mentioned in the study, several stressors related to stress, anxiety, and depressive thoughts were identified among the students, such as fear and concern for their health and that of their loved ones (91%), difficulty in concentration (89%), sleep pattern disturbances (86%), decrease in social interactions due to isolation measures (86%), and increased concern about their academic performances (82%).

Before the Covid-19 pandemic, some studies had already revealed university students as a class with many challenges that affect mental health<sup>7,8</sup>. For example, according to Auerbach et al.<sup>9</sup>, one in five university students suffers from one or more diagnosable mental disorders worldwide.

During the pandemic, all higher education institutions decided to suspend regular face-to-face classes and evacuate students in response to the growing concerns. For some experts, this action can lead to negative psychological consequences among university students. In addition, the closing of schools can bring negative emotions since, for many students, a university campus is a welcoming place to meet friends<sup>10</sup>.

In this context, the objective of this study was to assess the repercussions of Covid-19 and social isolation on the mental health of higher education students in Ceará, Brazil.

## Material and methods

This is an exploratory, descriptive study using a cross-sectional approach. Cross-sectional research is characterized by exposure to a given factor or cause and measurement of cause and effect at the same time<sup>11,12</sup>.

The population consisted of approximately 260,000 students enrolled in public or private universities, in higher education centers and colleges in Ceará, Brazil<sup>13</sup>. The sample size calculation was based on a prevalence of 20% university students with low levels of mental health in the northern region of the State of Ceará<sup>14</sup>. We set a significance level of 1% and an absolute sampling error of 2%. These values are relative to infinite populations (N=260,000), resulting in a sample size of 2,662 students. Due to the possibility of unreturned or incomplete returned questionnaires, a 25% additional value was added, resulting in a sample of 3,691 students.

A total of 3,691 university students participated in the study. The inclusion criteria were being 18 years of age or older, and an active enrollment in a higher education institute in the state of Ceará. The data collection was performed using a sociodemographic and situational profile questionnaire concerning the pandemic and social isolation. In addition, an adapted version of the Mental Health Inventory (MHI-38), a model of epidemiological investigation developed by researchers from the Rand Corporation Health Insurance Study, was used. The latter instrument aims to assess mental health in the general or specific populations in a two-dimensional perspective, including positive and negative aspects<sup>15</sup>.

The MHI has a great discriminative capacity, being used in young people to study the positive development and difficulties in adjustment processes in a global manner. It has been also considered a good instrument to differentiate levels of mental health in people without psychopathological or dysfunctional conditions. Research has demonstrated its usefulness and suitability in different cultures

and non-clinical populations, both in Europe and Brazil<sup>16,17</sup>.

The MHI instrument contains 38 items distributed on five scales grouped into two major dimensions. The Psychological Distress (negative) dimension includes traditional negative indicators of psychological distress divided into the following sub-dimensions: Anxiety (10 items), Depression (5 items), and Loss of emotional or behavioral control (9 items) scales. The Psychological Well-Being (positive) dimension covers positive mental health states and is divided into General positive affection (11 items) and Emotional ties (3 items) scales. The instrument is scored using Likert-type scales with five to six points. Each dimension derives from the gross sum of the sub-items and the sum of the two dimensions (negative and positive) provides the Mental Health Index. High MHI values correspond to high levels of mental health<sup>15</sup>.

The MHI-38 was psychometrically tested using the following procedures: each of the primary dimensions, sub-dimensions, and the global scale had their values calculated by summing up the answers given by the subjects (after the recoding process mentioned above). Then, the dimensions Well-Being and Distress were quoted as follows: Well-Being = (Dim2 – Emotional ties) + (Dim 1 – General positive affection); and Distress = (Dim3 – Loss of emotional or behavioral control) + (Dim4 – Anxiety) + (Dim5 – Depression). In the end, the global scale was calculated as follows: MHI-38 = Well-Being + Distress.

The results were transformed, for comparison proposes, in final scores ranging from '0' to '100'. The following algorithm was used to transform the results into points: = 100 x (gross score - lowest possible score) / (variation of score) [variation of score = highest possible score - lowest possible score].

Given the atypical scenario and the obligation of social isolation and interruption of face-to-face classes, the participants recruitment was done through social networks (Facebook, Instagram, and Twitter) using a snowball

technique. According to Flick<sup>18</sup>, this data collection technique is like a good reporter who tracks ‘clues’ from one person to another. Initially, the researcher specifies the characteristics of the selected sample members, then identifies a person or a group of people with similar characteristics of interest in the study. Afterward, the researcher presents the study proposal and, after obtaining/registering such characteristics, requests that the research participants indicate others.

The research instrument was created and made available to participants through Google Forms, available at: <https://forms.gle/YdD8iPKT4EyJz5fC8>. An informed consent form was also made available prior to participation, containing general explanations about the study and its voluntary nature. Due to the circumstances imposed by the pandemic, the online consent form did not allow us to collect signature, and an e-mail was sent to

the participants for the purpose of collecting signed consent forms. The data collection took place between July 6 and September 10, 2020.

A descriptive analysis of the results was performed. First, the chi-square statistical test was applied to assess behaviors, feelings, and gender. Then, the Anova test was applied to correlate MHI-38 scores and gender. The comparison of means was performed using the Anova test followed by multiple comparisons by the Games-Howell test.

## Results and discussion

According to *table 1*, most students were female (61.4%), from Fortaleza and Sobral (28.1% and 20.4%, respectively), single (85.0%), and self-declared brown and white (54.1% and 30.6%, respectively).

Table 1. Sociodemographic data

Variables		N	%
Gender	Male	1.409	38.2
	Female	2.265	61.4
	Other	17	0.5
Age	M=23,70 SD=6,45 Min=18 Max=60		
City of residence*	Caucaia	85	2.3
	Fortaleza	1.037	28.1
	Iguatu	50	1.4
	Itapipoca	64	1.7
	Juazeiro do Norte	23	0.6
	Maracanaú	50	1.4
	Quixadá	46	1.2
	Sobral	752	20.4
	Other	1.581	42.9
Family income (Amount in BRL)	M=4806 SD=64867 Min=0 Max=3000000		
Race / color	Black	384	10.4
	White	1.128	30.6
	Brown	1.997	54.1
	Indigenous	19	0.5

Table 1. (cont.)

Variables		N	%
	Yellow	74	2.0
	Not answered	89	2.4
Marital status	Single	3.137	85.0
	Married	315	8.5
	In a stable union	191	5.2
	Divorced	46	1.2
	Widower	2	0.1
<b>Total</b>		<b>3.691</b>	<b>100.0</b>

Source: own authors.

\*Three subjects did not answer this question.

Women, in general, seem to adhere more to studies, especially those on mental health. For example, in a study carried out in Rio Grande do Sul on Covid-19 and its impacts on mental health, 82.7% of the sample consisted of women<sup>19</sup>.

The marital status of the participants in our study was similar to that found in a study carried out with 460 Portuguese students, in which 99.3% of the sample was single and 81.4% was made up of female subjects<sup>20</sup>.

According to data from the 2019 Brazilian Higher Education Map<sup>21</sup>, most students from Higher Education Institutions in Brazil have a well-defined profile: white, female, aged between 19 and 24 years, studying in private institutions, attending classes in the evening, having attended high school in public schools, living with their parents, and working with an income of up to two minimum wages.

In a study carried out in Ceará, on the

behavioral aspects and beliefs of the population during the Covid-19 pandemic, it was observed that the approach to the Covid-19 pandemic varies according to social aspects, such as age, gender, education, place of residence, and belief system<sup>22</sup>.

In this scenario of health crisis, isolation, and social distancing, higher education students suffered significantly from the impacts on the educational process.

Table 2 presents important aspects related to the teaching-learning process during social isolation. Among the students interviewed, 1,492 (40.4%) had been enrolled in remote academic activities with partially online activities and assessments, and 1,305 (35.4%) had been enrolled in distance learning activities and assessments. In addition to these, 21.2% of the students said they had their activities canceled, with no definite answer on when they would resume.

Table 2. Learning conditions and social isolation perceptions

Learning conditions and social isolation questions		N	%
At your institution, what pedagogical approaches had been implemented during social isolation?	Distance learning - with online activities and assessments	1305	35.4
	Remote academic learning - with partially online activities and assessments	1492	40.4
	All activities were canceled, with no expected return	784	21.2
	Not applicable	110	3.0

Table 2. (cont.)

Learning conditions and social isolation questions		N	%
On a scale of 0 to 10 how big is your satisfaction with your participation in activities established pedagogical by your institution in this isolation period? M=5,27 SD=2,97 Min=0 Max=10	Very unsatisfied	386	10.5
	1	191	5.2
	2	187	5.1
	3	265	7.2
	4	278	7.5
	5	536	14.5
	6	382	10.3
	7	478	13.0
	8	493	13.4
	9	235	6.4
	Very satisfied	260	7.0
In relation to conditions and access the internet during social isolation, How would you rate it?	Excellent	549	14.9
	Very good	750	20.3
	Good	1113	30.2
	Regular	894	24.2
	Bad	301	8.2
	Very bad	84	2.3
During isolation social do you use the internet essentially through: (19 no answers)	Cellphone	2519	68.6
	Computer	354	9.6
	Notebook	772	21.0
	Cellphone and notebook	9	.2
	Another answer	18	.5
On a scale of 0 to 10 how big is your concern about continuity of its course in person? M=8,36 SD=2,31 Min=0 Max=10	Not worried	60	1.6
	1	24	.7
	2	47	1.3
	3	62	1.7
	4	65	1.8
	5	255	6.9
	6	132	3.6
	7	244	6.6
	8	486	13.2
	9	513	13.9
	Very worried	1803	48.8
Do you know someone that has been diagnosed with coronavirus? He can tick more than one option.	No	227	6.2
	Yes, a relative	2147	58.2
	Yes, a close friend	1770	48.0
	Yes, a neighbor	1166	31.6
	Yes, a health worker	845	22.9
	Other person	959	26.0
Are you afraid to be infected with coronavirus?	Yes	2832	76.7
	No	436	11.8
	I've been infected	423	11.5

Table 2. (cont.)

Learning conditions and social isolation questions		N	%
Do you feel worried if you need to leave home?	No	559	15.1
	Yes	3132	84.9
Has social isolation interfered with your routine?	No	116	3.1
	My routine changed, but I managed to be adapted	2506	67.9
	It changed my routine and I couldn't adapt to it	1069	29.0
What worries you most during social isolation? Tick more than one option. What worries you most	The severity of the disease in my municipality	2057	55.7
	The severity of the disease in my state	1877	50.9
	The severity of the disease in Brazil	2326	63.0
	The severity of the disease in the world	2084	56.5
	The death of a family member or a friend due to Covid-19	2849	77.2
	Staying away from my family	1473	39.9
	The obligation to stay at home	1278	34.6
	Other	226	6.1
<b>Total</b>		<b>3691</b>	<b>100.0</b>

Source: own authors.

The installed global health crisis resulted in the cancellation of regular face-to-face classes. Educational institutions needed to adapt to reduce pedagogical damage and risks to public health, ensuring the maintenance of high-quality and safe education. We know that it is up to the decision-making bodies of such institutions to make decisions to support teachers' decisions as to how to conduct their classes. Adjustments will need to be made to institutional development plans, pedagogical course projects, and departmental management to deal with the emergency situation<sup>23</sup>.

The students reported satisfaction with their participation in the remote educational activities established during social isolation. Answers were varied and, by using a scale from 0 to 10 and summing answers scored 0-5 and 5-6, it is observed that half of the sample was satisfied and half was dissatisfied.

When teaching is migrated to distance learning, a question to be raised is whether students and teachers have access to good quality computers and the internet. Before

the pandemic, most homes had one personal computer available and it was enough for a whole family. However, the pandemic made many people work remotely, and having only one computer was not compatible with the new demands. As a result, many people started using their computers to work. According to Dias and Pinto<sup>24</sup>, students and teachers who used to have computers available at home no longer have unlimited access to them.

For Gusso et al.<sup>23</sup>, the urgency for emergency remote education may have brought limitations related to time, planning, training, and technical support with negative effects on the quality of teaching. Moreover, consequences may be perceived in the institutions that adopted such a teaching model by the end of the first academic semester after the beginning of the pandemic, and may include: 1) low academic performance of students; 2) increased school failure; 3) increased probability of dropping out of higher education; and 4) work overload on teachers due to the accumulation of activities and the challenges of dealing with new technologies.

Some difficulties reported in studies on remote education during the pandemic include: lack of physical contact with colleagues, internet access issues, excessive activities, personal aspects affecting the full monitoring of students, lack of technological literacy presented by some teachers, difficulty to provide easily accessible materials for students, difficulty to access the virtual platforms or to locate links and e-mails, lack of access to computers/smartphones with enough memory to avoid crashing, difficulty to adjust schedules to reconcile classes (due to the increased demand), physical distancing from people, and compromised interpersonal relationships<sup>25,26</sup>.

It is worth remembering that in Brazil, before the pandemic, distance learning was only authorized for higher education (fully or comprising up to 40% of the workload), and partially for high school (up to 30% of the workload during the night and 20% during the day). Furthermore, the current Brazilian legislation does not allow distance learning in early childhood education and elementary education. However, given the public health emergency and the atypical situation, the teaching rules were relaxed so that students could be taught remotely<sup>27</sup>.

The students' concern with the continuity of the regular in person classes was quite expressive (48.8%). On a scale of 0 to 10, it is observed that the demonstration of this feeling was notorious. Fear of being infected by the virus also stood out among the responses (76.7%).

We also observed that the student's concerns are aligned with the ones presented by the general population, as follows: concerns

about the severity of the disease in the municipality (55.7%), in the State (50.9%), in Brazil (63.0%), in the world (56.5%), and worrying about a family member/friend dying from Covid-19 (77.2%).

According to Unesco's monitoring, more than 160 countries have implemented closures across the country, which has impacted more than 87% of the world's student population<sup>28</sup>. In this scenario, it is expected that people will have more concerns about what can happen to their lives, and this has many negative effects on their mental health.

Students reported being afraid of getting infected with the coronavirus (58.8%), especially female students (79.7%), and most students reported that they were adapted to the new routine imposed by the pandemic.

The fear of losing a family member or a friend due to the coronavirus disease was one of the main concerns, reported by 79.9% of the female students, 72.8% of the male students, and 82.4% of the non-binary participants.

As a social process, dying has been a great challenge during the pandemic due to the difficulties imposed by isolation. Relational experiences allow understanding and accepting terminality, and the prohibition of funerary rituals (which could facilitate family members' entry into the grieving process) affects the loss-making mechanisms<sup>29</sup>.

The pandemic brought drastic changes in the circumstances surrounding death and grief. As a result, thousands of people are living in adverse conditions while grieving with the experience of losing a loved one, which increases the risk of developing persistent mental suffering<sup>30</sup>.

Table 3. Behaviors and feelings during the pandemic

	Male (N=1409)		Female (N=2265)		Other (N=17)		p
	N	%	N	%	N	%	
<b>Are you afraid of being infected with the coronavirus?</b>							
Yes	1017	72.2	1805	79.7	10	58.8	0.000
No	230	16.3	204	9.0	2	11.8	
I've been infected	162	11.5	256	11.3	5	29.4	
<b>Do you feel worried if you or someone in your household needs to leave the house?</b>							
No	290	20.6	267	11.8	2	11.8	0.000
Yes	1119	79.4	1998	88.2	15	88.2	
<b>Did social isolation interfere with your routine?</b>							
Did not interfere	61	4.3	55	2.4	0	0.0	0.000
My routine changed, but I managed to adapt	963	68.3	1538	67.9	5	29.4	
It changed my routine and I couldn't adapt	385	27.3	672	29.7	12	70.6	
<b>What worries you most during social isolation?</b>							
<b>The severity of the disease in my municipality</b>							0.004
No	664	47.1	959	42.3	11	64.7	
Yes	745	52.9	1306	57.7	6	35.3	
<b>The severity of the disease in my State</b>							0.047
No	729	51.7	1077	47.5	8	47.1	
Yes	680	48.3	1188	52.5	9	52.9	
<b>The severity of the disease in Brazil</b>							0.002
No	572	40.6	788	34.8	5	29.4	
Yes	837	59.4	1477	65.2	12	70.6	
<b>The severity of the disease in the world</b>							0.000
No	715	50.7	887	39.2	5	29.4	
Yea	694	49.3	1378	60.8	12	70.6	
<b>The death of a family member or a friend due to Covid-19</b>							0.000
No	383	27.2	456	20.1	3	17.6	
Yes	1026	72.8	1809	79.9	14	82.4	
<b>Staying away from my family</b>							0.000
No	941	66.8	1266	55.9	11	64.7	
Yes	468	33.2	999	44.1	6	35.3	
<b>The obligation to stay at home</b>							0.434
No	912	64.7	1492	65.9	9	52.9	
Yes	497	35.3	773	34.1	8	47.1	

Source: own authors.

Table 3 shows that women are more concerned with all questions investigated than men. Other studies follow this trend. For example, Barros et al.<sup>31</sup> analyzed the frequency of sadness, nervousness, and sleep disorders during the

Covid-19 pandemic in Brazil and found a greater psychological impact of quarantine on women. In the same study, a higher frequency of feelings of depression, sadness, anxiety, and lack of sleep was identified among women.

In a study by Pereira et al.<sup>32</sup>, the extent to which fear of death can alter individuals' perceptions and beliefs was analyzed, and the results suggested that, as individuals become aware of fatal victims among their acquaintances, their perceptions changed. As a result, some individuals became favorable to isolation and willing to practice this measure for longer periods.

The second most prevalent concern is about the severity of the disease (65.2% women, 59.4% men, and 70.6% non-binary participants). The Covid-19 epidemic occurred in a period in which the Brazilian population was extremely vulnerable, with very high unemployment rates and significant cuts in social policies. Over the past few years, the approval of Constitutional Amendment No. 95 (which imposes a radical reduction in public spending) and economic policies implemented by the government caused a growing and intense

bottleneck in investments in health and research in Brazil<sup>4</sup>.

The students' fear of the seriousness of Covid-19 in Brazil may be related to what Werneck and Carvalho<sup>4</sup> claim because the country's epidemiological panorama, with the growing number of cases and deaths, comes up together with a lack of measures to protect the Brazilian population and suppression by the federal government of the recommendations of national and international health authorities.

Table 4 shows the MHI-38 assessment results with an emphasis on the best mental health status scores. High scores correspond to high mental health (reduced levels of anxiety, depression, and loss of emotional control). The scores obtained were medium in all dimensions (with standard deviations around 20), which indicate that some students may have scored 'very low' or 'very high'<sup>15</sup>.

Table 4. Health dimensions assessed by the Mental Health Inventory

	N	Average	Standard deviation
Dim1 - Positive affect	3691	42.4	17.8
Dim2 - Emotional ties	3691	51.1	22.8
Dim3 - Loss of emotional/behavioral control	3691	55.5	21.3
Dim4 - Anxiety	3686	48.2	21.2
Dim5 - Depression	3691	50.8	23.5
Positive Well-Being = Dim1 + Dim 2	3691	44.2	17.6
Distress = Dim3 + Dim4 + Dim5	3686	51.5	20.7
Global scale: MHI-38	3686	48.8	18.6

Source: own authors.

According to a study conducted in 2019 with 880 students before the pandemic, and with the use of the MHI-38, the overall mental health state was 53.4, distress score was 56.1, positive well-being was 48.9, anxiety was 52.6, depression was 58.7, loss of control was 58.6, positive affect was 47.7, and emotional ties 53.4<sup>14</sup>. The authors concluded that the student's mental health was affected since all the

sub-dimensions' scores were low. Nogueira and Sequeira<sup>33</sup> also assessed the mental health of higher education students using the Global Mental Health Scale (MHI-38), and the average score found was 64.3, which is higher than that found in our study (48.8).

In a study that identified predictors of psychosocial stress during the pandemic, those who were in social isolation were afraid of

being infected by the virus, felt worried about the need to leave home, had an altered pattern of sleep, and reported sadness or concern, resulting in a need for carrying out activities to alleviate suffering<sup>34</sup>.

As to gender, *table 5* shows that the scores of male students were higher in all dimensions evaluated. The non-binary group had the lowest scores. In all comparisons, the results were statistically significant.

Table 5. Mental health scores assessed by the Mental Health Inventory using gender as a comparator

	Male (n=1409)	Female (n=2265)	Other (n=17)	p
	Mean ± SD	Mean ± SD	Mean ± SD	
Dim1 - Positive affect	45.9±19.1 <sup>a</sup>	40.3±16.6 <sup>a</sup>	31.4±15.2 <sup>b</sup>	<0.0001
Dim2 - Emotional Ties	52.0±24.0 <sup>a</sup>	50.7±21.9 <sup>a</sup>	34.5±19.5 <sup>b</sup>	0.003
Dim3 - Loss of Emotional / Behavioral Control	61.4±20.9 <sup>a</sup>	51.9±20.6 <sup>b</sup>	39.6±22.7 <sup>c</sup>	<0.000
Dim4 - Anxiety	53.5±21.4 <sup>a</sup>	45.0±20.4 <sup>b</sup>	31.4±18.3 <sup>c</sup>	<0.0001
Dim5 - Depression	56.3±23.8 <sup>a</sup>	47.6±22.7 <sup>a</sup>	32.6±18.5 <sup>b</sup>	<0.000
Positive Well-Being	47.2±18.9 <sup>a</sup>	42.5±16.5 <sup>a</sup>	32.1±14.6 <sup>b</sup>	<0.000
Distress	57.0±20.8 <sup>a</sup>	48.1±20.0 <sup>a</sup>	34.7±18.6 <sup>b</sup>	<0.000
Global scale: MHI-38	53.4±19.0 <sup>a</sup>	46.0±17.7 <sup>b</sup>	33.7±16.7 <sup>c</sup>	<0.000

Source: own authors.

<sup>a-c</sup>Anova test. Different letters indicate significantly different pairs identified by the Games-Howell test.

In China, a study evaluated 52,730 people during the pandemic and found that around 35% of respondents had psychological problems, with women experiencing significantly greater psychological distress<sup>35</sup>.

A research carried out in the United States with 2,534 students from seven universities from late February to mid-May 2020 showed that the students have experienced negative impacts on their mental health and lifestyle. Concerning sociodemographic factors, women were more likely to be at risk than men<sup>36</sup>.

The study 'The Impact of the Covid-19 Pandemic on the Mental Health of University Students: A Longitudinal Examination of Risk and Protection Factors' shows an association between female gender and psychological distress. Women reported greater disruption to daily activities, mental and physical health, and personal finances than men<sup>37</sup>.

In Italy, the results of the study 'Affective temperament, attachment style and the

psychological impact of the Covid-19 outbreak' identified that men were, to some extent, less likely to develop psychological symptoms in the face of a stressful event. On the other hand, women showed to be more vulnerable to stressful stimuli; consequently, they presented greater mental suffering<sup>38</sup>.

## Strengths and limitations

The main strengths of this study were the identification of teaching and learning conditions during the pandemic and social isolation; the disclosure of feelings and perceptions in the face of the health crisis, and the reinforcement to the use of the MHI-38 as an instrument to measure psychosocial dimensions affected during the pandemic.

The virtual approach used for the recruitment and participation of the subjects can be considered a limitation of the study. In

addition, the data collection may have been conducted in the most critical moment of the pandemic (June to September 2020), when everyone seemed to be tired and discouraged by social isolation. Another limitation is the unequal distribution of universities in the state of Ceará. As a result, adherence to participation in the study was higher among those from public institutions, with greater participation of students from Fortaleza and Sobral.

## Conclusions

The growing spread of Covid-19 throughout the world, social isolation, doubts and uncertainties about how to control the disease and its severity, the unpredictability of its duration and the forecast of vaccine production and treatment, the circulation of fake news around the pandemic are all factors that pose risks to the mental health of the general population.

For students, the suspension of face-to-face school activities and adaptation to new teaching-learning methodologies can, at this moment of instability and uncertainty, promote mental disorders, or trigger or psychological disorders. As already evidenced by the authors, university students have high prevalence rates for symptoms of anxiety and depression, which may even be higher than those found in the general population.

The present study showed the importance of research on the repercussions of the Covid-19 pandemic on the mental health of university students from Ceará, pointing out indications of the situations that put them in a vulnerable state.

Regarding teaching and learning during social isolation, many students continued their student activities remotely. Others had their school activities canceled, with no expected return.

The overall result suggests that the students' mental health was affected by the social isolation imposed by the pandemic, with more intensity among women.

Thus, knowing students' mental health and psychosocial well-being in this scenario of

global health crisis is relevant for educators, parents, and health professionals.

Education bodies can bring alternatives to minimize the negative impacts on students' mental health. It is essential to create or improve psychosocial support centers to monitor students in the current scenario.

It is concluded that university students from Ceará were negatively affected by the Covid-19 pandemic, and it is up to educational institutions to promote strategies for the protection of the mental health of this group through projects to identify students with problems of adaptation to the pandemic situation and creating networks to assist those students.

Some recommendations for higher education institutions include: creating a technical chamber on mental health to monitor mental health indicators, planning and implementing actions to respond to institutional needs, carrying out studies to assess the mental health of students, teachers, and workers, conducting projects to welcome students during and after the pandemic, and implementing a permanent psychosocial support service in the university.

## Collaborators

Oliveira EN (0000-0002-6408-7243)\* contributed for the study design, planning, data collection, results interpretation, and writing. Vasconcelos MIO (0000-0002-1937-8850)\* contributed for the study supervision, data analysis, results interpretation, and critical review of the manuscript. Almeida PC (0000-0002-2867-802X)\* contributed for the data analysis, results interpretation, and critical review of the manuscript. Pereira PJA (0000-0001-6416-9591)\* contributed for the data analysis, results interpretation, writing, and critical review of the manuscript. Linhares MSC (0000-0001-9292-1795)\* contributed for the study design, planning, data analysis, results interpretation, writing, and critical review of the manuscript. Ximenes Neto FRG (0000-0002-7905-9990)\* contributed for the

data analysis, results interpretation, writing, and critical review of the manuscript. Aragão JMN (0000-0003-2865-579X)\* contributed

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