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ARTIGO ORIGINAL

PHYSICAL DISTANCING AMID COVID-19: DID LEVELS OF DEPRESSION, ANXIETY, AND STRESS INCREASE AMONG UNIVERSITY STUDENTS?

DISTANCIAMENTO FÍSICO FRENTE À COVID-19: HOUVE AUMENTO NOS NÍVEIS DE DEPRESSÃO, ANSIEDADE E ESTRESSE EM ESTUDANTES UNIVERSITÁRIOS?

DISTANCIAMIENTO FÍSICO FRENTE AL COVID-19: ¿HA HABIDO UN AUMENTO EN LOS NIVELES DE DEPRESIÓN, ANSIEDAD Y ESTRÉS EN ESTUDIANTES UNIVERSITARIOS?

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ABSTRACT: In 2020, COVID-19 was characterized as a pandemic by the WHO, so several containment protocols were drawn up, including restrictions and closure of establishments. University students were directly affected by these changes, as demonstrated in some studies, in which there was a significant increase in their levels of depression, anxiety and stress. Therefore, the present study aimed to analyze whether the COVID-19 pandemic and remote teaching increased levels of depression, anxiety and stress in university students at a Brazilian public university. The study was carried out using an electronic questionnaire divided into two parts: a preliminary questionnaire and the translated and validated version of the DASS-21 into Portuguese. Data collection took place over a period of three months and the total sample was 314 university students. Data were analyzed in SPSS. Descriptive and inferential analyzes were carried out, with a significance level of 0,05. Students with higher levels of anxiety, depression and stress demonstrated a decrease in performance and delivery of academic activities. Therefore, measures must be designed to prevent and remedy psychological illness among students in isolation situations such as the COVID-19 pandemic.

Keywords: Mental-health. College students. Pandemic. COVID-19.

RESUMO: Em 2020, a COVID-19 foi caracterizada como pandemia pela OMS, deste modo vários protocolos de contenção foram elaborados, incluindo restrições e fechamento de estabelecimentos. Os estudantes universitários foram diretamente afetados por essas mudanças, como demonstrado em alguns estudos, nos quais ocorreu um aumento significativo dos seus níveis de depressão, ansiedade e estresse. Dessa maneira, o presente estudo teve o intuito de analisar se a pandemia de COVID-19 e o ensino remoto aumentaram os níveis de depressão, ansiedade e estresse em estudantes universitários de uma universidade pública brasileira. O estudo foi realizado por meio de um questionário eletrônico dividido em duas partes: um questionário preliminar e a versão traduzida e validada da DASS-21 para o português. A coleta de dados ocorreu em um período de três meses e a amostra total foi de 314 estudantes universitários. Os dados foram analisados no SPSS. Foram realizadas análises descritivas e inferenciais, com nível de significância de 0,05. Os discentes com maiores níveis de ansiedade, depressão e estresse demonstraram ter uma queda no desempenho e na entrega de atividades acadêmicas. Dessa maneira, medidas devem ser pensadas para prevenir e remediar o adoecimento psicológico entre os estudantes em situações de isolamento como a pandemia de COVID-19.

Palavras-chave: Saúde mental. Universitários. Pandemia. COVID-19.

RESUMEN: En 2020, COVID-19 fue caracterizada como una pandemia por la OMS, por lo que se elaboraron varios protocolos de contención, incluyendo restricciones y cierres de establecimientos. Los estudiantes universitarios se vieron directamente afectados por estos cambios, como se demuestra en algunos estudios, en los que se produjo un aumento significativo de sus niveles de depresión, ansiedad y estrés. De esta manera, el presente estudio tuvo el objetivo de analizar y verificar si la pandemia de COVID-19 y la enseñanza remota aumentaron los niveles de depresión, ansiedad y estrés en estudiantes universitarios de una universidad pública brasileña. El estudio fue realizado por medio de un cuestionario electrónico dividido en dos partes: un cuestionario preliminar y la versión traducida y validada de la DASS-21 al portugués. La recolección de datos tuvo lugar en un período de tres meses y la muestra total fue de 314 estudiantes universitarios. Los datos recogidos fueron analizados en el SPSS. Se realizaron análisis descriptivos e inferenciales, con nivel de significancia de 0,05. Los estudiantes con mayores niveles de ansiedad, depresión y estrés han demostrado tener una caída en el rendimiento y la entrega de actividades académicas. Por lo tanto, se deben adoptar medidas para prevenir y remediar la enfermedad psicológica entre los estudiantes en situaciones de aislamiento como la pandemia de COVID-19.

Palabras-clave: Salud mental. Estudiantes universitarios. Pandemia. COVID-19.

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1. Introduction

At the end of 2019, the World Health Organization (WHO) learned of a pneumonia outbreak in Wuhan, a city in China's Hubei Province (Pascarella et al., 2020; Santos et al., 2021). In early 2020, the cause of the epidemic was identified as a new coronavirus (SARS-CoV-2), which belongs to the same family as SARS-CoV and Middle East Respiratory Syndrome (Maia; Dias, 2020; Pascarella et al., 2020; Santos et al., 2021). On January 30, 2020, the WHO declared Coronavirus Disease 2019 (COVID-19) a Public Health Emergency of International Concern (PHEIC) (Maia; Dias, 2020). Shortly thereafter, on March 11, the WHO characterized the outbreak as a pandemic (Maia; Dias, 2020; Pascarella et al., 2020; Santos et al., 2021). By March 28, 2020, there had been 570,000 confirmed cases of the highly contagious disease, with 26,495 deaths worldwide (Pascarella et al., 2020; World Health Organization, 2023). By March 25, 2022, almost two years after the start of the pandemic, there had been approximately 476,374,234 confirmed cases and 6,108,976 deaths worldwide (World Health Organization, 2023). Brazil alone recorded 29,729,991 of these cases, resulting in 657,998 deaths (World Health Organization, 2023).

SARS-CoV-2 may have neuroinvasive and neurotropic potential, meaning it can invade the central nervous system and infect neurons and glial cells (Pascarella et al., 2020). The entry of the virus into the central nervous system could contribute to the development of respiratory failure in some individuals (Pascarella et al., 2020). Like other viruses, coronaviruses can cause neurological and psychiatric manifestations in patients with viral infections through a mechanism known as the "cytokine storm" (Mazza et al., 2020; Yachou et al., 2020). This exaggerated immune response to infection includes pro-inflammatory and anti-inflammatory cytokines, which can lead to death in severe cases (Yachou et al., 2020). Coronaviruses have been associated with the development of neuropsychiatric diseases during and after SARS and MERS outbreaks (Mazza et al., 2020). SARS-CoV-1 patients reported some psychiatric symptoms during and after the SARS epidemics, including post-traumatic stress symptoms (PTSS), post-traumatic stress disorder (PTSD), panic syndrome, depression, anxiety, and obsessive-compulsive disorder (OCD)(Cheng et al., 2004; Chua et al., 2004; Mazza et al., 2020; Vindegaard; Benros, 2020).

In addition, the mandatory daily and behavioral changes caused by the pandemic have negatively impacted the mental health of many individuals (Algazal Marin et al., 2021). The impact on mental health extends beyond that caused by the virus itself and includes several factors associated with increased levels of depression, anxiety, and stress in the general population during the pandemic(Algazal Marin et al., 2021). Increased panic regarding the virus, isolation, and public restrictions can have serious consequences for the mental health of the world's population (Algazal Marin et al., 2021; Khan et al., 2022). Physical isolation has negatively impacted various social groups, particularly students, who have had to isolate themselves and complete their academic work remotely (Algazal Marin et al., 2021).

It is important to note that physical and social distancing can negatively impact mental health because social interaction is crucial for maintaining it (Esteves et al., 2021). Thus, due to the ongoing pandemic, remote learning has directly influenced students' social relationships and mental health(Esteves et al., 2021). Despite concerning data on the mental health of university students, limited research in Brazil portrays these students' experiences during the pandemic (Algazal Marin et al., 2021). Therefore, it is essential to understand the psychological behavior of university students, future professionals in the labor market

(Algazal Marin et al., 2021). Studies that assess and analyze students' mental health in the face of the COVID-19 pandemic are highly relevant for the development of future interventions and preventive measures against depression, anxiety, and stress in this group during emergency situations, such as the one experienced in the pandemic. In this sense, the present article aimed to analyze and determine whether social distancing and remote learning caused by the COVID-19 pandemic increased levels of depression, anxiety, and stress among university students at the Institute of Biosciences, Letters, and Exact Sciences of the São Paulo State University "Júlio de Mesquita Filho" (IBILCE/UNESP).

2. Methodology

Data were collected using an electronic questionnaire targeting undergraduate and postgraduate students at the Institute of Biosciences, Letters and Exact Sciences (IBILCE/UNESP) in São José do Rio Preto, São Paulo, Brazil. The study was approved by the IBILCE/UNESP Research Ethics Committee (CEP) under opinion number 5,161,180 and consisted of a descriptive quantitative survey.

2.1. Participants

The minimum sample size was 300 IBILCE university students, based on a similar study which used the Depression, Anxiety and Stress Scale (DASS-21) Short Form and had 339 participants (Orellana; Orellana, 2020). Sampling was random and 322 people responded to the electronic questionnaire. Of these, 314 were considered valid for the study, since participants had to be IBILCE/UNESP students.

2.2. Measures

The questionnaire consisted of two parts. The first part was an initial questionnaire addressing personal, academic and pandemic-related issues. The second part was the Portuguese version of the DASS-21 (short form), which had been translated and validated by Vignola and Tucci, 2014.

2.2.1. Initial questionnaire

The questionnaire consisted of 26 mandatory and optional multiple-choice and open-ended questions. The questions covered topics such as gender, age, course, comorbidities and academic performance. The questionnaire aimed to outline the profile of university students on campus during remote learning (March 2020 to mid-2022) during the pandemic. In conjunction with DASS-21, we sought to identify factors associated with symptoms of depression, anxiety and stress.

2.2.2 DASS-21

In this second part of the study, the Brazilian Portuguese version of the DASS-21 questionnaire (Vignola; Tucci, 2014) was applied. This questionnaire aimed to assess levels of depression, anxiety, and stress during the period of remote activities due to physical isolation caused by COVID-19 (Graduate studies: March 2020 to March 13, 2022; Postgraduate studies: March 2020 to April 17, 2022). The DASS-21 consists of a self-assessment questionnaire containing three subscales, totaling 21 items developed to measure the severity of symptoms common to depression, anxiety, and stress (Vignola; Tucci, 2014). Each DASS-21 subscale consists of seven items that assess emotional levels in individuals (Ronk et al., 2013; Vignola; Tucci, 2014). Participants indicated the degree to which they experienced each of the symptoms described in the DASS-21 during the past week. The levels were obtained by summing the scores of the items on each

subscale (Vignola; Tucci, 2014). Each DASS-21 subscale was multiplied by two to generate scores comparable to those of the original DASS-42 (Ronk et al., 2013; Vignola; Tucci, 2014). The maximum scores (value of 42) for each subscale are shown in Table 1 (Ronk et al., 2013).

Table 1. DASS-21 Severity Ratings

Severity	Depression	Anxiety	Stress
Normal	0–9	0–7	0–14
Mild	10–13	8–9	15–18
Moderate	14–20	10–14	19–25
Severe	21–27	15–19	26–33
Extremely Severe	28+	20+	34+

Adapted from Vignola and Tucci, 2014.

2.3. Procedures

The questionnaire was created using Microsoft Forms, which generated a shareable online link. This was made available to the institution's groups via social media (Facebook, Instagram and WhatsApp) and email. The shareable link was available for responses from January 7 to March 22, 2022, and data collection took place over a period of three months.

2.4. Statical analysis

The data collected were transformed into numerical categories and exported to the SPSS statistical analysis program (version 20, IBM, 2020). Descriptive and inferential analyses were then performed at a significant level of 0.05.

3. Results

3.1. Sociodemographic and school characteristics

The summarized results from the first part of the questionnaire are shown in Table 2. Participants were predominantly female (65.3%), with three identifying as another gender. The average age was 22.97 years (SD = 4.8), ranging from 17 to 47 years old. The majority (91.7%) were young people up to 29 years old, with no significant difference between genders. As expected, with a sample of university students, most are single (90.8%). Among the 9.2% who are married or in a stable relationship, 89.7% are female ($\chi^2 = 8.022$, $p = 0.005$).

Table 2 – Absolute and relative frequencies of the following variables by gender: age group, marital status, current course level, personal income, area of knowledge, and good performance in remote classes.

	Female		Male		P
	f	%	*f*	%	
Age group					
Young	187	92,1	98	93,3	0,148
Adults	16	7,9	7	6,7	
Marital status					
Married or in a stable relationship	26	12,7	3	2,8	0,005
Single	179	87,3	103	97,2	
Current course level					
Graduation	150	73,2	82	77,4	0,421
Post-Graduation	55	26,8	24	22,6	
Own income					
No	93	45,5	49	46,2	0,885
Yes	112	54,6	57	53,8	
Area of knowledge					
Biological sciences	79	38,9	26	24,8	0,001
Exact sciences	80	39,4	70	66,7	
Humanities	44	21,7	9	8,6	
Good performance in remote classes					
No	101	49,3	53	50,0	0,903
Yes	104	50,7	53	50,0	

Source: own work.

Most students are undergraduates (74.8%), while the rest are in postgraduate programs. The majority are in their third to twelfth semesters (52.9%), while 21.3% are freshmen in their first or second semesters. Twenty-five-point eight percent did not respond to this question. Slightly more than half of the students have some form of income, either through academic scholarships or employment. There is no significant difference in income between genders. The students are enrolled in courses in the three areas of knowledge offered at the institute where the research was conducted. Female students are distributed almost evenly among the Biological Sciences (38.9%), Exact Sciences (39.4%), and Humanities (21.7%), while male students are predominantly in the Exact Sciences (66.7%), compared to 24.1% in the Biological Sciences and 8.6% in the Humanities. This difference by area and gender is significant ($\chi^2 = 21.530$, $p = 0.001$). Regarding school activities carried out remotely during the pandemic, 94.3% of students reported participating. However, only half (50.0%) reported good academic performance, and 51.9% reported failing to submit some academic work. These three variables did not show significant gender differences. Regarding remote activities, 78.5% of students who did not submit assignments attributed this to discouragement.

3.2 Alcohol and other drug use

As shown in Table 3, which presents the absolute and relative frequency by gender, slightly more than half of the students (54.8%) reported using alcohol and other drugs. Among these users, alcohol alone was the most used drug (68.6%), followed by alcohol combined with other drugs (27.9%). Isolated use of illicit drugs was low; for instance, only 2.3% reported using marijuana. Of those who reported using these substances, 38.4% said they consumed more than usual during the pandemic. Meanwhile, 23.3% said they

decreased their use, and 38.4% said their consumption remained the same. These results did not show a significant difference related to the gender of the study participants (Table 3).

Table 3 – Absolute and relative frequency of alcohol and other drug use by gender.

	Female		Male		p
	f	%	*f*	%	
Alcohol	83	73,5	33	57,9	0,199
Alcohol + Marihuana	13	11,5	8	14,0	
Alcohol + Tobacco	9	8,0	5	8,8	
Alcohol + two or three drugs	6	5,3	7	12,3	
Tobacco	1	0,9	1	1,8	
Marihuana	1	0,9	3	5,3	

Note: own work.

3.3 The impact of the COVID-19 pandemic on students' lives

The students in this study experienced the same impact from the pandemic as the general population. Thirty-six percent had the disease, and 55.4% believed they had it asymptomatically. However, only one participant required hospitalization. The situation was more serious for family members, with 47.1% of students reporting hospitalizations and 33.1% reporting deaths due to the disease.

3.4 Students' mental health

Approximately 44.9% of students reported having been diagnosed with a mental disorder when it comes to mental health. Among this group, anxiety was the most common diagnosis, either by itself (36.9%) or combined with other disorders (29.1%), accounting for 64.9% of diagnoses. Depression, either alone or combined with other disorders, accounted for 23.4% of diagnoses. Other diagnoses were reported by 10.6% of this group. To increase the number of participants per category in comparisons, the five DASS-21 diagnostic classifications were reduced to three. The "normal" and "mild" categories were combined, while the "moderate" category remained unchanged. The “Severe” and “Extremely Severe” categories were also grouped together. When analyzing the associations of these three classifications with gender, no gender difference in the diagnosis of “depression” was observed. However, this does not apply to the other two diagnoses, anxiety and stress, in which a higher proportion of female participants were in the "severe and extremely severe" category compared to male participants (Table 4).

Table 4 – Absolute and relative frequency of DASS-21 diagnostic categories by diagnostic classification and gender.

	Female		Male		p
	f	%	*f*	%	
Depression					
Normal + Mild	46	22,4	30	28,3	
Moderate	47	22,4	17	16,0	0,301
Severe + Extremely Severe	113	55,1	59	55,7	
Anxiety					
Normal + Mild	45	22,0	52	49,1	
Moderate	37	18,0	17	16,0	0,001
Severe + Extremely Severe	123	60,0	37	34,9	
Stress					
Normal + Mild	49	23,9	47	44,3	
Moderate	41	20,0	21	19,8	0,001
Severe + Extremely Severe	115	56,1	38	35,8	

Note: own work.

3.5 School characteristics, alcohol and other drug use, and the impact of the COVID-19 pandemic on students' mental health

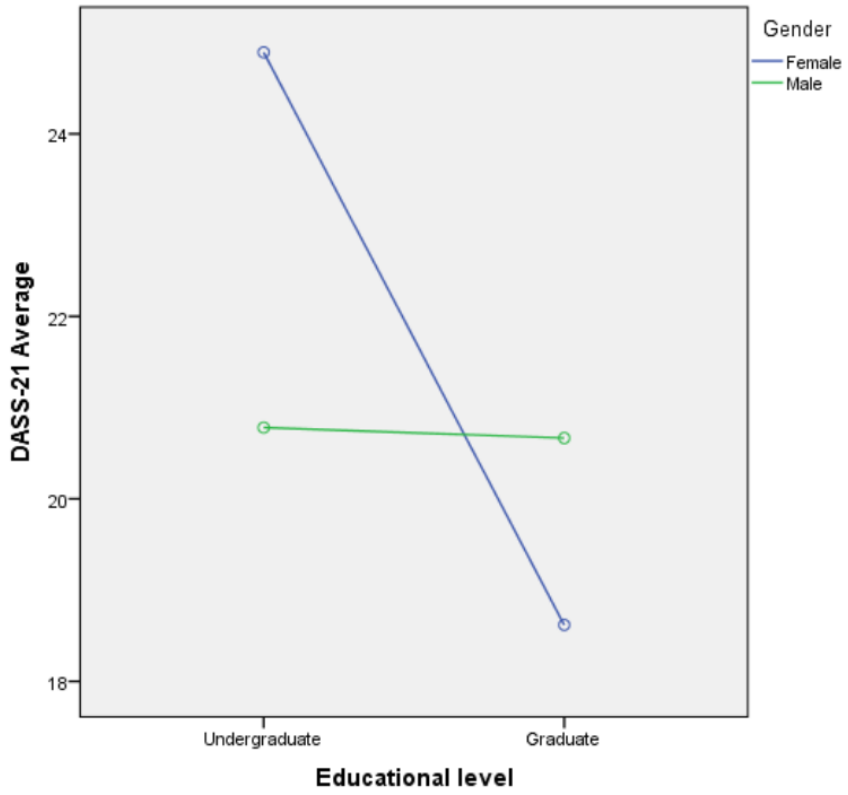
A multivariate analysis of variance was performed with gender (female/male) and level of education (undergraduate/postgraduate) as the independent variables, and total DASS-21 scores for depression, anxiety and stress as the dependent variables. The analysis began with an assessment of the equality of covariance matrices using Box's test, which proved insignificant (p = 0.385) (Field, 2009). The results showed the following: a) In relation to gender, there was an isolated significant effect for anxiety ($F_{1, 307}$ = 15.533, p = 0.001) and stress ($F_{1, 307}$ = 13.115, p = 0.001). The F statistic is used to test for significant differences in the means of different groups based on independent variables; thus, a high F value with a p-value <0.05 indicates significant differences between compared groups (Field, 2009). In both categories, women had higher mean scores than men (Table 5). b) In relation to educational level, there was a significant effect for depression ($F_{1, 307}$ = 4.021, p = 0.046) and anxiety ($F_{1, 307}$ = 4.038, p = 0.045). In both categories, women had higher averages than men (Table 5). c) Interactions: There was an almost significant effect of gender with educational level (F 1, 307 = 3.739, p = 0.054). Undergraduate students had higher averages than postgraduate students (Figure 1 and Table 5).

Table 5 – Mean and Standard Deviation of Depression, Anxiety, and Stress Diagnoses by Gender and Educational Level

	Female				Male			
	Graduation		Post-Graduation		Graduation		Post-graduation	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Depression	24,89	10,58	18,62	12,52	20,78	11,36	20,67	13,18
Anxiety	18,89	11,41	16,36	11,26	13,34	10,45	10,58	10,07
Stress	26,67	9,56	23,31	9,91	20,46	11,54	19,0	11,64

Note: own work.

Figure 1: Average depression diagnosis on DASS-21, categorized by gender and educational level.



Note: own work.

Academic performance in remote classes is affected by the scores achieved in the three DASS-21 diagnoses: depression, anxiety and stress. Students who reported good performance had significantly lower average scores than those who reported poor performance for all three diagnoses: depression ($F_{1, 307}$ = 26.489, p = 0.001), anxiety ($F_{1,307}$ = 28.539, p = 0.001) and stress ($F_{1,307}$ = 15.036, p = 0.001).

Neither the use of alcohol and other drugs nor being diagnosed with COVID-19 affected the DASS-21 results of these students. However, students who believed they may have had this disease asymptomatically had significantly higher averages in all three DASS-21 diagnoses than those who did not report this condition: depression ($F_{1,307}$ = 8.310, p = 0.004), anxiety ($F_{1,307}$ = 14.748, p = 0.001) and stress ($F_{1,307}$ = 18.543, p = 0.001).

Finally, we found that students who reported a mental health diagnosis had significantly higher mean scores on all three DASS-21 subscales than those who did not report a mental health diagnosis: depression ($F_{1,307}$ = 26.245, p = 0.001), anxiety ($F_{1,307}$ = 48.750, p = 0.001) and stress ($F_{1,307}$ = 37.092, p = 0.001). These results demonstrate that DASS-21 is an effective tool for the initial assessment of mental health in university students.

4. Discussion

Most participants were women, single, and between 22.97 years old. Most were undergraduate students with some type of income. Notably, the majority were young (up to 29 years of age), with no significant gender differences. Compared to male participants, the participants were enrolled more evenly in the three major areas of knowledge. However, most male students were in the exact sciences, which showed a significant difference between the genders. This finding corroborates those of other studies that have shown a greater preference for exact science courses among males (Brasil, 2023; Pinto; Carvalho; Rabay, 2017).

In response to the new coronavirus, preventive measures were adopted to reduce contamination, and students participated in academic activities online (Algazal Marin et al., 2021; Barros et al., 2021; Esteves et al., 2021). Our study was no different, with approximately 94.3% of students reporting that they could participate in remote activities. Algazal Marin et al. (2021) conducted an integrative review and found that, during the pandemic, students experienced a decline in performance and delays in completing academic activities. Consistent with other studies (Algazal Marin et al., 2021; Meo et al., 2020; Portela et al., 2022), 50.0% of students reported poor performance, and 51.9% failed to submit an assignment, primarily due to discouragement and time constraints.

In this sense, the implementation of remote learning posed challenges in many places (Barros et al., 2021). Several factors made it difficult for students to access and complete activities, including lack of adaptation

to remote learning, lack of technological knowledge, socioeconomic conditions, and discouragement(Barros et al., 2021; Gundim et al., 2021). Despite these challenges, only 31.42% of participants dropped on a subject and/or course during the pandemic. The main reasons were difficulty keeping up with activities, discouragement, and remote learning itself. In addition to social condition-related problems, such as internet access, remote learning hindered the interaction and interpersonal relationships common in face-to-face teaching (Portela et al., 2022). This may have contributed to the results of this study (Portela et al., 2022). Therefore, many students experienced challenges with remote learning that may have exacerbated depressive and anxiety symptoms and stressors.

During the pandemic, some studies have shown that alcohol and cigarette consumption increased, while physical exercise decreased and consumption of unhealthy foods increased (Duarte et al., 2020; Esteves et al., 2021). When asked about substance use during the pandemic, approximately 54.8% of participants reported consuming some type of drug. Of these participants, 68.6% reported drinking alcohol, followed by alcohol plus another drug(s) (27.9%). The prevalence of alcohol consumption among university students corroborates pre-pandemic data (Barros; Costa, 2019) and indicates this group's vulnerability to risky behaviors(Portela et al., 2022). Portela et al. (2022) conducted a study that aimed to analyze the use of psychoactive substances among university students during the pandemic. Their results showed that the use of alcoholic beverages was prevalent (suggestive and abusive use), similar to our findings. Although the increase in substance use was inconclusive, a significant proportion of students increased their substance use during the pandemic. This is still a cause for concern, as excessive use can lead to dependence and cause harm to individuals' daily lives, affecting various academic and personal aspects(Barros; Costa, 2019; Portela et al., 2022). According to Silveira et al. (2008), individuals who consume alcohol are more likely to consume other types of drugs, which is consistent with the data found in this study. Furthermore, combining alcohol with other drugs can lead to abusive consumption of these substances (Barros; Costa, 2019).

With respect to the impact of the pandemic on student health, it is worth noting that most students did not contract the virus (64.5%). However, about 55.4% of students said that at some point during the pandemic, they believed they had the virus even though they did not have any symptoms, showing an increase in negative mental health symptoms during the pandemic (Barros et al., 2020). Although many students believed they had the disease without exhibiting symptoms, only 30 participants had some type of comorbidity. Students were very concerned about contracting the disease even though they were not part of any risk group. This behavior may indicate an increase in negative mental health symptoms (Barros et al., 2020). In their study, Ran et al. (2024) indicated that many students had high levels of psychological stress due to fear and worry about becoming infected with the Coronavirus. This may lead to severe mental health problems (Ran et al., 2024).

Additionally, 47.1% of participants had a family member hospitalized due to the novel coronavirus, and 76.5% reported having family members with at least one comorbidity. Furthermore, 33.1% had family members and/or acquaintances who died from the virus. A study addressing the main factors related to mental illness reported that 70% of students were very concerned about their family members contracting the virus (Gundim et al., 2021). Therefore, these difficulties related to the illness of close relatives may also be associated with greater mental illness prevalence among students (Gundim et al., 2021). Another study found that high rates of anxiety, depression, insomnia, and PTSD symptoms were seen among students who had a high number of family members infected by the virus (Chen et al., 2023).

Studies conducted during other emergency situations and the ongoing pandemic have shown that social isolation can trigger mental health issues, exacerbate depression and anxiety, and increase suicidal behavior and substance use (Barbisch et al., 2015; Cao et al., 2020; Matsuishi et al., 2012; Wang et al., 2020). When faced with a health emergency, it is common for people to fear getting sick or dying (Gundim et al., 2021; Maia; Dias, 2020). They may also experience feelings of helplessness and stigma due to the shutdown of activities, which makes negative feelings more frequent (Gundim et al., 2021; Maia; Dias, 2020). Thus, isolation, business and school closures, fear of contracting the disease, and insecurity are associated with increased levels of depression, anxiety, and stress in the general population, especially among university students, during the pandemic (Cao et al., 2020; Gundim et al., 2021; Maia and Dias, 2020; Teodoro et al., 2021).

In terms of students' mental health, approximately 44.9% reported a previous diagnosis of a psychological disorder. This finding corroborates studies showing that university students are a vulnerable group in terms of mental health (Duarte et al., 2020; Esteves et al., 2021). Among this group, anxiety was predominant, either alone (36.9%) or in combination with other disorders (29.1%), accounting for 64.9% of diagnoses. Depression, either alone or combined with other disorders, accounted for an additional 23.4% of diagnoses. Other diagnoses accounted for the remaining 10.6%. It is important to note that many students have more than one diagnosis. Depression and anxiety often occur concurrently. Silva et al. (2020) demonstrated this in their study, which showed that 43.4% of students exhibited anxiety, depression, or both traits. Additionally, a literature review by Algazal Marin et al. (2021) revealed that university students exhibit higher levels of depression than other populations.

Concerning students' mental health, the DASS-21 analysis showed no gender difference in the diagnosis of "depression." However, female students presented higher levels in the "Severe and Extremely Severe" category in the "Anxiety" and "Stress" data compared to male students. In the multivariate analysis of variance, gender and education level were the independent variables, and the total DASS-21 score was the dependent variable. We observed a significant isolated effect in relation to anxiety and stress. Female

participants had higher mean scores than male participants, which is consistent with other studies (Algazal Marin et al., 2021; Duarte et al., 2020; Esteves et al., 2021; Silva et al., 2020; Teodoro et al., 2021). Taking educational level into account revealed significant effects for depression and anxiety. In both categories, women had higher averages than men. A study conducted in Rio Grande do Sul during the pandemic found that women were three times more likely than men to develop mental disorders (Duarte et al., 2020). Another study analyzing the mental health of university students found higher scores indicating poorer mental health in self-identified Black women (Teodoro et al., 2021). A systematic review revealed that, of the 18 studies that considered gender, 14 (77.8%) concluded that being female is the most significant factor influencing stress, anxiety, and depression (Gunewardena et al., 2025).

A study conducted at a university in the Carajás region found that female participants had a higher prevalence of mental disorders (Silva et al., 2020) Many studies have attempted to explain the reasons for this higher incidence of mental disorders in women (Duarte et al., 2020; Moreira; Melo; Jorgetto, 2022). Among the factors that have been investigated are biological reactions to stress, double or triple work shifts, hormonal, genetic, and physiological aspects, personality, and, above all, gender inequality and the devaluation of women in the labor market (Duarte et al., 2020; Moreira; Melo; Jorgetto, 2022). Additionally, environmental factors and interpersonal relationships appear to contribute to the higher incidence of illness among women, considering the increased cases of violence, abuse, and discrimination during the lockdown due to the pandemic(Duarte et al., 2020).

Due to the novel coronavirus, preventive measures were adopted to reduce contamination, and students participated in online academic activities (Algazal Marin et al., 2021; Esteves et al., 2021; Lima, 2020).Algazal Marin et al. (2021) conducted an integrative review and found that students experienced a decline in performance and delays in academic activities during the pandemic. Our study found similar results, showing that academic performance in remote classes was affected by the total score on the three subscales of DASS-21. Students who performed well academically had significantly lower averages on the three subscales than those who reported poor performance. A study by Chen et al. (2023) demonstrated that college students have higher levels of anxiety, depression, insomnia, and PTSD symptoms were observed among those studying at home and school during the pandemic. These findings suggest that changes in study location may impact college students' psychological well-being (Chen et al., 2023).

It is worth mentioning that, prior to the pandemic, university students were the subject of study, as they undergo many changes when entering university(Gundim et al., 2021; Rocha et al., 2021). These changes make them a risk group for developing mental disorders, such as anxiety and depression (Gundim et al., 2021; Rocha et al., 2021). Thus, high levels of anxiety and stress in university students may be related to several factors: entering university, distancing from family, conflicts with peers or faculty, excessive

academic activities, difficulty with course material, fear and insecurity about exams, working multiple jobs, and financial and family issues (Portela et al., 2022; Rocha et al., 2021).The advent of the pandemic has exacerbated these conditions among university students, as evidenced by a study conducted by Maia and Dias (2020). This study compared normal periods (2018 and 2019) with pandemic periods (early 2020), revealing a higher prevalence of psychological distress (anxiety, depression and stress) among students. Such disorders can hinder students' ability to adapt to online learning, as they may exhibit symptoms such as attention deficit and mental fatigue due to the demanding nature of the activities and prolonged screen time, as well as distress related to the substantial content load (Barros et al., 2021; Esteves et al., 2021). These signs may suggest underlying mental health issues (Barros et al., 2021; Esteves et al., 2021).

Despite this data, when analyzing alcohol and other drug use, as well as positive diagnoses of COVID-19, we found that neither had an influence on the DASS-21 results. However, when we compared the data from students who believed they had the disease despite not presenting symptoms, we found that their average scores for the three DASS-21 diagnoses were significantly higher than those who did not report this condition. Therefore, although most students do not belong to any risk group, they were still very concerned about contracting the disease. This type of behavior could indicate an increase in negative symptoms related to mental health (Barros et al., 2020)

In conclusion, our study found that the mean scores for the three DASS-21 subscales were higher among students with a previous mental health diagnosis than among those without. This finding is consistent with the results of other studies which have warned of the emergence of new mental health problems and the exacerbation of existing ones during the pandemic (Barros et al., 2020; Ornell et al., 2020). In their article on the mental health of the Brazilian population during the pandemic, Barros et al. (2020) demonstrated that the prevalence of depression and anxiety was higher among Brazilians with a previous diagnosis of these conditions than among those without. This suggests that the changes caused by the pandemic may have contributed to an increase in anxiety and depression, as well as the onset of new cases (Cao et al., 2020). It is important to note that people with pre-existing mental health conditions are more vulnerable and require special care, particularly in emergency situations such as the COVID- 19 pandemic (Barros et al., 2020; Ornell et al., 2020).

Therefore, psychological distress ranging from moderate to very severe (depression, anxiety and stress) may have impaired the teaching and learning processes of the university students in this study. This could have contributed to both the worsening of existing mental health conditions and the emergence of new ones, negatively impacting students' mental health (Esteves et al., 2021; Gundim et al., 2021). The data obtained in this study corroborates the findings of other studies which have shown that the mental health of university students has been affected by the pandemic and exacerbated by remote learning (Algazal Marin et al., 2021;

Barros et al., 2021; Gundim et al., 2021).Social interaction is important for maintaining mental health and psychological support can reduce psychological distress and act as a protective factor (Esteves et al., 2021; Gundim et al., 2021). Therefore, both university administrators and government authorities should consider and adopt measures to prevent, reduce and manage mental illness, with the aim of alleviating the psychological distress caused by the pandemic (Gundim et al., 2021). According to the literature, these conditions may persist beyond the post-pandemic period, making it essential to plan new strategies for the remediation and prevention of mental health issues among students (Gundim et al., 2021; Maia and Dias, 2020).

4.1. Limitations

This study has several limitations that should be acknowledged. First, the sample was drawn from a single Brazilian public university, which may limit the generalizability of the findings because the results may be specific to this context. Future studies should include students from multiple public and private universities in different regions of the country to increase diversity in the sample and the external validity of the results. Additionally, the cross-sectional design did not permit comparisons across different stages of the pandemic. Future research could benefit from longitudinal approaches, which would enable comparisons between different stages, such as the early stages of the pandemic, its later phases, and the period following the return to in-person classes.

5. Conclusion

Physical isolation during the pandemic was essential to contain the spread of the new coronavirus and enable universities to continue with their teaching programs. However, this research suggests that social distancing and remote learning may have negatively impacted students' academic performance. Additionally, remote learning and the pandemic may have contributed to mental health issues among students. This impact on mental health can be attributed to a lack of physical and social contact, an absence of face-to-face interaction with classmates and teachers, difficulty accessing essential resources, and uncertainties and concerns relating to family and the pandemic. Thus, the results of this study suggest an association between pandemic and social isolation and the onset or worsening of depression, anxiety, and stress symptoms among university students. However, it is important to note that this study has limitations. For example, the sample only included students from a single public university. Future studies would benefit from comparing public and private universities, as well as courses in different subject areas and universities from other states.

Therefore, the data obtained in this study are valuable because they provide insight for future research with the vulnerable university population, which is especially susceptible to mental health problems during

emergency periods, such as epidemics and/or pandemics. Additionally, this study can inform university management's development of new mental health initiatives for the academic community, such as informational booklets, lectures, support groups, and extracurricular activities focused on physical and mental well-being. These initiatives could include flexibility in academic activities for students with previous diagnoses. Further studies, particularly longitudinal ones, are needed as there are still few long-term studies on the mental health of university students during the pandemic. These studies could provide essential information for addressing new public health emergencies.

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