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The Covid-19 pandemic: a traumatic event for health and biological science students?

Pandemia da Covid-19: um evento traumático para estudantes de Ciências Biológicas e da Saúde?

Sérgio Ricardo Freire Ramos[1] sergioricardofreireramos@gmail.com
Rodrigo Araújo Braga Filho[1] rodrigo.bragafilho@gmail.com
Mateus Almeida de Carvalho[2] mcarvalho230298@gmail.com
Danilo Duarte Costa[3] costa.daniloduarte@gmail.com
Lucas Almeida de Carvalho[4] lucasalmcar@hotmail.com
Maria Tereza Carvalho Almeida[3] tereza.farmaco@hotmail.com

ABSTRACT

Introduction: Health Sciences university students were especially affected by the Sars-CoV-2 virus pandemic. The anxieties intrinsically related to Covid-19 were added to the impacts related to the changes that have taken place in academic institutions, particularly the change to online teaching, a methodology that can generate discomfort for students, in addition to several obstacles related to teaching and learning, which can have important traumatic effects on the mental health of this population.

Objective: To assess the mental health burden caused by the COVID-19 pandemic, as a traumatic event capable of triggering psychiatric disorders, such as Post-Traumatic Stress Disorder (PTSD), in university students.

Methods: This is a cross-sectional and quantitative study, of analytical-descriptive nature, carried out by filling out an anonymous digital form, initiated after prior approval by the Research Ethics Committee. The subjects were students of Biological and Health Sciences at a State University located in the southeastern region of Brazil. The sample consisted of 618 students.

Results: 618 forms were answered by students attending the courses of Physical Education (28.8%), Medicine (25.4%), Dentistry (18.1%), Biological Sciences (15.2%) and Nursing (12.5%). The presence of post-traumatic stress symptoms assessed by the Impact of Event Scale – Revised (IES-R) obtained a prevalence of 32.7% (n = 202) among university students from Biological and Health Sciences courses.

Conclusions: There was a significant impact on the mental health of university students, with the presence of depressive symptoms, anxiety and stress above those found in the scientific literature and, consequently, a high prevalence of PTSD.

Keywords: Students, Health Occupations; Covid-19; Stress Disorders, Post-Traumatic.

RESUMO

Introdução: *Os universitários de Ciências da Saúde se tornaram especialmente afetados pela pandemia do vírus Sars-CoV-2. As angústias intrinsicamente relacionadas à Covid-19 foram somadas aos impactos referentes às mudanças acontecidas nas instituições acadêmicas, particularmente a mudança para o ensino on-line, uma metodologia que pode gerar desconforto aos estudantes, além de vários obstáculos relacionados ao ensino e à aprendizagem, o que pode ter repercussões traumáticas importantes na saúde mental dessa população.*

Objetivo: *Este estudo teve como objetivo verificar a carga mental provocada pela pandemia da Covid-19, como um evento traumático ao ponto de desencadear transtornos psiquiátricos, como o transtorno do estresse pós-traumático (Tept), em universitários.*

Método: *Trata-se de um estudo transversal e quantitativo, com orientação analítico-descritiva, mediante preenchimento de formulário digital anônimo, iniciado após prévia aprovação do Comitê de Ética em Pesquisa. Os sujeitos foram estudantes de Ciências Biológicas e da Saúde de uma universidade estadual localizada na Região Sudeste do Brasil. A amostra foi constituída por 618 estudantes.*

Resultado: *Foram respondidos 618 formulários pelos estudantes que pertenciam aos cursos de Educação Física (28,8%), Medicina (25,4%), Odontologia (18,1%), Ciências Biológicas (15,2%) e Enfermagem (12,5%). A presença de sintomas de estresse pós-traumático verificados pela Escala de Impacto do Evento-Revisada (IES-R) obteve prevalência de 32,7% (n = 202) entre os estudantes universitários das Ciências Biológicas e da Saúde.*

Conclusão: *Houve impacto significativo na saúde mental dos universitários com presença de sintomas depressivos, ansiedade e estresse acima dos encontrados na literatura científica, e, consequentemente, constatou-se alta na prevalência do Tept.*

Palavras-chave: *Estudantes de Ciências da Saúde; Covid-19; Transtornos de Estresse Pós-Traumáticos.*

[1] Instituto de Ciências da Saúde, Montes Claros, Minas Gerais, Brazil.
[2] Instituto Nacional do Coração, Rio de Janeiro, Rio de Janeiro, Brazil.
[3] Universidade Estadual de Montes Claros, Montes Claros, Minas Gerais, Brazil.
[4] Centro Universitário FIPMoc, Montes Claros, Minas Gerais, Brazil.

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INTRODUCTION

At the end of 2019, Covid-19 gained worldwide visibility due to its action in the province of Wuhan, China. In an abrupt and accelerated way, it spread globally, thus gaining the status of a pandemic and, consequently, affecting people's normal lives due to its devastating effects[1], causing worldwide changes at personal, professional and social levels[2]. The need to face all these levels, the fear of the unknown, the risk of transmitting the virus to family members, the health system overload, and the experience of mourning were established as new problems that impacted people's mental health[3].

Moreover, sanitary measures were taken to mitigate contamination, particularly, the use of face masks and social distancing[4]. Therefore, several issues emerged as a reflection of these measures, such as conflicting social life, financial problems, difficulty in practicing physical exercises, increased stress and reduced sleep quality[5]. In view of its severity, the Covid-19 pandemic became the greatest challenge faced after the Second World War, with more than 230 million people infected worldwide, around 5 million deaths, in addition to generating social and economic calamity, such as 205 million unemployed individuals in 2022[6]. The psychological stress experienced in this context affected healthy individuals, causing fear and stress, and intensified these symptoms in those with pre-existing psychiatric disorders, which could lead to chaos in personal and family life[7].

However, aiming to follow one's life projects, the pandemic has become an important moment for changes in personal lifestyles, in family, economic and educational contexts[8,9]. Society had to reorganize itself and face the current reality and more challenges were imposed on schools and universities, which had to adapt their teaching format, migrating from the in-person to the remote teaching model[10], changing both teaching and learning and social interaction and communication. Online teaching brought some discomfort to a large number of students, such as those with difficulties related to internet access, in addition to apathy in attending classes, which can lead to problems with attendance and participation in virtual classes[11].

The existence of obstacles faced by some students in the pandemic has become evident. And the quality of life of University students may have been negatively impacted by mental suffering caused by social and economic interruptions, uncertainty about their future careers, loneliness and fear of losing loved ones[12]. A previous study[1] showed important changes in mental health among the general population around the world, with high rates in the results, describing a prevalence of up to 50.9% for anxiety, 48.3% for depression, 53.8% for post-traumatic stress disorder, 38% for psychological distress and 81.9% for stress. In view of this, this period can become a traumatic event and develop into Post-Traumatic Stress Disorder (PTSD), and put one's own life at risk, since it is negatively linked to suicidal ideation.

PTSD is a type of anxiety disorder that encompasses emotional and psychic symptoms, and may have physical manifestations, caused by a traumatic event. According to the Diagnostic and Statistical Manual of Mental Disorders[13], it can be defined as a function of exposure to a concrete episode or threat of death, serious injury or sexual violation. The individual may directly experience the traumatic event, witness it personally when it occurs to others, discover its occurrence from a family member or close friend, or be repeatedly or extremely exposed to aversive details of the event.

PTSD is a prevalent and disabling psychiatric disorder that, according to the World Health Organization (WHO), affects two million people in Brazil. It is well known that several diseases and disorders can increase the risk of emotional problems in an individual. However, a traumatic event can also affect one's mental health, since the risk of developing PTSD can reach 15% of the general population[14]. Bo H-X et al. (2020) showed that most evaluated people with COVID-19 experienced both physical suffering and great psychological suffering, with PTSD symptoms being present in 96.2% of them[15].

Therefore, this study aimed to assess the mental burden caused by the COVID-19 pandemic, caused by the new coronavirus, SARS-CoV-2, as a traumatic event to the point of triggering psychiatric disorders, such as PTSD and favoring the development of mental disorders among University students.

METHOD

Study type

This is a cross-sectional, quantitative study, carried out between September 10, 2020 and January 4, 2021, in which the investigated dependent variable was the presence of symptoms related to post-traumatic stress mediated by the psychological effect caused by the SARS-CoV-2 pandemic.

Population and Sample

The target population consisted of students from the Center of Biological and Health Sciences (CCBS, *Centro de Ciências Biológicas e da Saúde*) of a university located in the Southeast region of Brazil. There were 1,912 students enrolled in at least one of five courses: Biological Sciences (406), Physical Education (639), Nursing (204), Medicine (426), and Dentistry (237). All students were invited to participate in the study; however, the sample was defined by means of sample calculation for finite populations, considering the prevalence of

the event of interest at 30%, confidence level of 95%, margin of error of 3%, design effect (Deff) = 2 and considering the proportionality of participation of students from all courses. The minimum sample size calculated was 611 students, with the study sample consisting of 618 students, a number greater than the minimum required in the sample calculation.

Data collection

Data were collected using a self-administered digital form, created on Google Forms platform (Google LLC, Menlo Park, CA, USA) and sent directly to the email of each class of the CCBS courses. The form was disseminated during lectures in all classes and on social networks – Instagram and WhatsApp – aiming to encourage greater student participation.

In addition, course and semester coordinators, as well as teachers and students representing classes, were invited, via email and WhatsApp, to disseminate the research among university students and, thus, create opportunities for greater awareness of the study importance. A partnership was also established with the Athletic Associations and Academic Centers of the CCBS courses to disseminate the research and raise awareness about its adherence.

The form was anonymous and organized into sections, according to topics of interest. Validated questionnaires were used for data collection, such as the Impact of Event Scale – Revised (IES-R), the Patient Health Questionnaire 9 (PHQ-9), the Depression, Anxiety and Stress Scale 21 (DASS-21) and items from the 'Fantastic Lifestyle' questionnaire were used for the collection of sociodemographic data, questions related to the students' characteristics, such as gender, age, skin color/ethnicity, sexual orientation, presence of special needs and chronic diseases, marital status, enrolled course, satisfaction with the remote teaching model implemented by the university during the pandemic, as well as self-perception of academic overload due to activities during the pandemic, whether the student lived alone, whether the student had a paid work and family income before the pandemic.

Symptoms of post-traumatic stress caused by the pandemic were assessed using the IES-R instrument, validated in Brazil[16]. The IES-R is a scale consisting of 22 items, with a score ranging from 0 to 4 points, related to the presence, in the last 7 days, of the diagnostic criteria for PTSD established by the DSM-IV[17]. The IES-R is divided into 3 subscales: avoidance, intrusion and hyperstimulation. The instrument final score is calculated by adding the average of the subscales and the cutoff point adopted for the presence of PTSD was 5.6 points[16].

Some items from the 'Fantastic Lifestyle' questionnaire[18] were used to verify the practice of weekly vigorous and moderate physical activity, alcohol and tobacco consumption in the last 30 days, as well as the use of illicit drugs (such as marijuana and cocaine) during the pandemic.

The PHQ-9 was used to assess the presence of depressive symptoms. The PHQ-9 has ten items, of which the first nine are scored from 0 ("none of the days") to 3 ("almost every day"), according to the number of days the symptoms were present in the last two weeks[19]. The tenth item of the questionnaire assesses the degree of functional impairment caused by the symptoms to perform activities, ranging from "no difficulty" to "extreme difficulty". Based on the instrument score, obtained by adding the points of the first 9 questions, the severity of the depressive symptoms can be classified as: none/minimal (0 to 4 points), mild depression (5 to 9), moderate depression (10 to 14), moderately severe depression (15 to 19) and severe depression (20 to 27).

Symptoms of anxiety and stress were verified through DASS-21[20]. This is a self-report scale consisting of 21 items graded from 0 (totally disagree) to 3 (totally agree), which assesses how the individual felt in the previous week. The DASS-21 instrument is divided into subscales for depression, anxiety and stress and the score of each subscale is calculated separately, allowing classifying the symptom levels into normal, mild, moderate, severe and very severe[20].

Other evaluated factors were: self-perception of health: (poor to very good); religiosity – through the question: "To what extent do you consider yourself a religious person?", with answers ranging from "very religious" to "not at all religious"; thoughts about suicide ("in the past 12 months, have you ever seriously thought about committing suicide?").

The questions related to the COVID-19 pandemic were: infection and positive diagnosis for COVID-19; death of a relative or close friend due to complications from Covid-19 and presence of flu-like symptoms during the pandemic such as fever, chills, headache, productive cough, dyspnea, fatigue or tiredness, sore throat, rhinorrhea, nasal congestion, nausea or vomiting, diarrhea, arthralgia, myalgia and anosmia or dysgeusia. It was also verified whether any student needed hospitalization due to Covid-19 or lived with an individual considered to be at risk for Covid-19.

Inclusion criteria were: being enrolled in the institution, regularly attending the course and being 18 years of age or older. The exclusion criteria comprised students who did not comply with the Free and Informed Consent Form (FICF) and did not agree to participate in the research.

Statistical analysis

For data analysis, the Statistical Package for Social Sciences (SPSS®) software, version 22.0 was used. The simple and relative frequencies of the dependent and independent

variables were presented, as well as the association of the independent variables in relation to the presence of post-traumatic stress symptoms. Bivariate analyses were performed using Poisson Regression, presenting crude Prevalence Ratio (PR), 95% Confidence Interval (95%CI) and p-value. The independent variables with a p-value ≤ 0.20 in the bivariate analysis were selected to initially constitute the multiple model through Poisson Regression, with robust variance. The variables were removed one by one until only the variables associated at the 5% level remained in the final model. The magnitude of the multiple model associations was estimated by the adjusted PR, 95%CI and p-value ≤ 0.05, and the presence of post-traumatic stress disorder was the category to be tested. Model quality was assessed using the Deviance test.

Ethical Considerations

All research participants were informed about the methodological procedure and invited to carefully read the Free and Informed Consent Form, available digitally. The research project was approved by the Research Ethics Committee under the Presentation Certificate for Ethical Appreciation (CAAE, *Certificado de Apresentação para Apreciação Ética*) n. 25716019.1.0000.5146 and Approval Opinion number 3.724.553 of November 25, 2019. Therefore, the present study is supported by ethical precepts and these were duly followed, guaranteeing the voluntary participation, the anonymity of the participants' responses and the confidentiality of the collected data. All participants agreed to participate in the research by agreeing with the digitally informed FICF.

RESULTS

A total of 618 forms were answered by students who were enrolled in the Physical Education (28.8%), Medicine (25.4%), Dentistry (18.1%), Biological Sciences (15.2%) and Nursing (12.5%) courses. There was a predominance of females among the participants, aged between 21 and 25 years, non-white, heterosexual orientation, without special needs or chronic diseases and single. Table 1 shows the participants' characteristics through the descriptive analysis of sociodemographic and independent variables that were analyzed.

Regarding the COVID-19 pandemic, the absence of diagnosis for SARS-CoV-2 infection predominated, as well as the absence of death of relatives and friends due to complications caused by COVID-19. On the other hand, most participants reported having flu-like symptoms during the period and living with people from a risk group. Regarding hospitalization due to COVID-19, none of the students required hospital care (Table 2).

The presence of post-traumatic stress symptoms verified by the Impact of Event Scale – Revised (IES-R) showed

Table 1. Characterization of participants and descriptive analysis of the sample. 2020 (n = 618).

VARIABLE	*n*	(%)
Gender[a]		
Male	173	(28.1)
Female	442	(71.9)
Age (years)		
18 to 20	214	(34.6)
21 to 25	329	(53.2)
26 or older	75	(12.1)
Skin color/ethnicity		
White	188	(30.4)
Black/Brown/Yellow/Indigenous	430	(69.6)
Sexual Orientation		
Heterosexual	533	(86.2)
Other orientation	85	(13.8)
Has special needs		
No	589	(95.3)
Yes	29	(4.7)
Presence of chronic diseases		
No	429	(69.4)
Yes	189	(30.6)
Marital status		
Single	570	(92.2)
Other	48	(7.8)
University course		
Biological Sciences	94	(15.2)
Physical education	178	(28.8)
Nursing	77	(12.5)
Medicine	157	(25.4)
Dentistry	112	(18.1)
Academic overload		
No	83	(13.4)
Yes	535	(86.6)
Satisfaction with remote teaching		
Satisfied	133	(21.5)
Not satisfied (dissatisfied/indifferent)	485	(78.5)
Lives alone		
Yes	79	(12.8)
No	539	(87.2)
Has paid work		
No	411	(66.5)
Yes (formal/informal)	207	(33.5)

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Tabela 1. Continuation.

VARIABLE	*n*	(%)
Family income before the pandemic		
Up to 2 minimum wages	351	(56.8)
Between 2 and 5 minimum wages	160	(25.9)
More than 5 minimum wages	107	(17.3)
Considers themselves a religious person		
Very/Moderately	343	(55.5)
Little/Not at all	275	(44.5)
Self-perceived health		
Good/Very good	416	(67.3)
Regular/Poor	202	(32.7)
Vigorous physical activity		
Up to 3 times a week	526	(85.1)
More than 3 times a week	92	(14.9)
Moderate physical activity		
Up to 3 times a week	491	(79.4)
More than 3 times a week	127	(20.6)
Symptoms of Depression		
No depressive symptoms/mild depression	208	(33.6)
Moderate/moderately severe depression	294	(47.6)
Severe depression	116	(18.8)
Anxiety Symptoms		
Normal/mild anxiety	286	(46.3)
Minimal/moderate anxiety	137	(22.2)
Severe/very severe anxiety	195	(31.6)
Stress Symptoms		
Normal/mild stress	274	(44.3)
Minimal/moderate stress	153	(24.8)
Severe stress/ very severe	191	(30.9)
Alcohol consumption in the last 30 days		
0 to 10 times	553	(89.5)
More than 10 times	65	(10.5)
Tobacco consumption in the last 30 days		
0 to 10 times	603	(97.6)
More than 10 times	15	(2.4)
Illicit drug use during the pandemic		
Never	582	(94.2)
Sometimes	36	(5.8)
Suicidal thoughts		
No	510	(82.5)
Yes	108	(17.5)

Source: The authors.
[a]Variation in n due to data losses.

a prevalence of 32.7% (n = 202) among university students of Biological and Health Sciences. Additionally, the mean and median of the instrument score and its subscales were calculated, of which results are shown in Chart 1.

The bivariate analysis carried out using Poisson Regression, with robust variance, showed a significant association ($p \leq 0.05$) between PTSD and being female, having another sexual orientation (homosexual, bisexual, pansexual, asexual), having a chronic health condition, attending the Physical Education course, reporting one's self-perception of health as regular or poor, presence of depressive symptoms,

Table 2. Descriptive analysis of variables related to the COVID-19 pandemic among Biological and Health Sciences students. 2020 (n = 618).

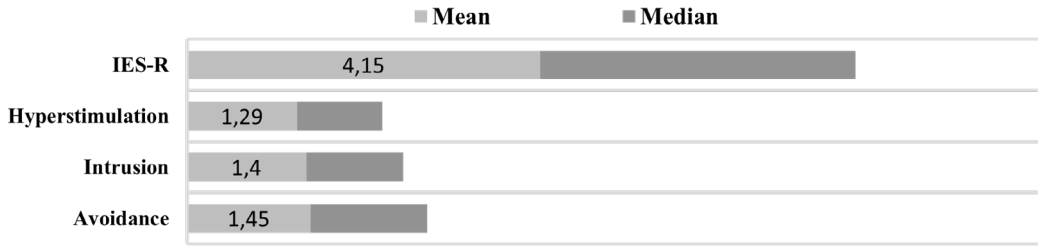
VARIABLE	*n*	(%)
COVID-19 diagnosis		
No	589	(95.3)
Yes	29	(4.7)
Any relatives or friends died from COVID-19		
No	588	(95.1)
Yes	30	(4.9)
Presence of flu-like symptoms during the pandemic		
No	240	(38.8)
Yes	378	(61.2)
Symptoms experienced during the pandemic		
Fever	82	(13.3)
Chills	35	(5.7)
Headache	249	(40.3)
Productive cough	66	(10.7)
Dyspnea	70	(11.3)
Fatigue/Tiredness	145	(23.5)
Sore throat	171	(27.7)
Rhinorrhea	186	(30.1)
Nasal congestion	162	(26.2)
Nausea or vomiting	50	(8.1)
Diarrhea	102	(16.5)
Arthralgia	40	(6.5)
Myalgia	93	(15)
Anosmia/Dysgeusia	49	(7.9)
Hospitalization due to COVID-19		
Not necessary	157	(25.4)
Not infected with the coronavirus	461	(74.6)
Living with someone from the risk group		
No	158	(25.6)
Yes	460	(74.4)

Source: The authors.

anxiety and stress, consuming alcohol and tobacco more than 10 times in the last 30 days, thoughts about suicide in the previous year and the presence of flu-like symptoms during the pandemic (Table 3).

In the multiple model with adjusted PR, 95%CI and p ≤ 0.05, the factors that maintained a statistically significant association with the presence of Post-Traumatic Stress Disorder symptoms induced by the COVID-19 pandemic among students of Biological Sciences and Health were the presence of symptoms of depression, stress and anxiety, the presence of regular or poor self-perception of health, the presence of flu-like symptoms during the pandemic and the academic course (Table 4).

Chart 1. Application of the Impact of Event Scale – Revised (IES-R) among Biological and Health Sciences students during the COVID-19 pandemic. 2020 (n = 618).



Source: The authors.

Table 3. Post-traumatic stress symptoms mediated by the SARS-CoV-2 pandemic and crude association of independent variables among university students. 2020 (n = 618).

VARIABLE	PTSD (IES-R)		Crude $_{PR}$ ($95_{\%CI}$)	p-value
	No	Yes		
	n (%)	*n* (%)		
Gender[a]				< 0.001
Male	142 (82.1)	31 (17.9)	1.0	
Female	271 (61.3)	171 (28.7)	2.15 (1.53;3.03)	
Age (years)				0.074
18 to 20	140 (65.4)	74 (34.6)	1.0	
21 to 25	216 (65.7)	113 (34.3)	0.57 (0.35;0.94)	
26 or older	60 (80)	15 (20)	0.99 (0.78;1.25)	
Ethnicity/Skin color				0.650
White	129 (68.6)	59 (31.4)	1.0	
Black/Brown/Yellow/Indigenous	287 (66.7)	143 (33.3)	1.06 (0.82;1.36)	
Sexual Orientation				0.030
Heterosexual	367 (68.9)	166 (31.1)	1.0	
Other orientation	49 (57.6)	36 (42.4)	1.36 (1.03;1.79)	
Has special needs				0.119
No	400 (67.9)	189 (32.1)	1.0	
Yes	16 (55.2)	13 (44.8)	1.39 (0.91;2.12)	
Presence of chronic diseases				< 0.001
No	313 (73)	116 (27)	1.0	
Yes	103 (54.5)	86 (45.5)	1.68 (1.35;2.09)	
Marital status				0.161
Single	379 (66.5)	191 (33.5)	1.0	
Other	37 (77.1)	11 (22.9)	0.68 (0.40;1.16)	

Continue...

Tabela 3. Continuation.

VARIABLE	PTSD (IES-R)		Crude $_{PR}$ ($95_{\%\ CI}$)	p-value
	No	Yes		
	n (%)	*n* (%)		
University course				0.003
Biological Sciences	58 (61.7)	36 (38.3)	1.0	
Physical education	133 (74.7)	45 (25.3)	0.66 (0.46;0.94)	
Nursing	51 (66.2)	26 (33.8)	0.88 (0.58;1.32)	
Medicine	113 (72)	44 (28)	0.73 (0.51;1.04)	
Dentistry	61 (54.5)	51 (32.7)	1.18 (0.85;1.64)	
Academic overload				0.091
No	63 (75.9)	20 (24.1)	1.0	
Yes	353 (66)	182 (34)	1.41 (0.94;2.10)	
Satisfaction with remote teaching				0.089
Satisfied	98 (73.7)	35 (26.3)	1.0	
Not satisfied (dissatisfied/indifferent)	318 (65.6)	167 (34.4)	1.30 (0.96;1.78)	
Lives alone				0.963
Yes	53 (67.1)	26 (32.9)	1.0	
No	363 (67.3)	176 (32.7)	0.99 (0.70;1.39)	
Has paid work				0.245
No	283 (68.9)	128 (31.1)	1.0	
Yes (formal/informal)	133 (64.3)	74 (35.7)	1.14 (0.91;1.44)	
Family income before the pandemic				0.276
Up to 2 minimum wages	234 (66.7)	117 (33.3)	1.0	
Between 2 and 5 minimum wages	103 (64.4)	57 (35.6)	1.06 (0.82;1.38)	
More than 5 minimum wages	79 (73.8)	28 (26.2)	0.78 (0.55;1.11)	
Consider themselves a religious person				0.219
Very/Moderately	238 (69.4)	105 (30.6)	1.0	
Little/Not at all	178 (64.7)	97 (35.3)	1.15 (0.91;1.44)	
Self-perceived health				< 0.001
Good/Very good	326 (78.4)	90 (21.6)	1.0	
Regular/Poor	90 (44.6)	112 (55.4)	2.56 (2.05;3.19)	
Vigorous physical activity				0.798
Up to 3 times a week	353 (67.1)	173 (32.9)	1.0	
More than 3 times a week	63 (68.5)	29 (31.5)	0.95 (0.69;1.32)	
Moderate physical activity				0.463
Up to 3 times a week	327 (66.6)	164 (33.4)	1.0	
More than 3 times a week	89 (70.1)	38 (29.9)	0.89 (0.66;1.20)	
Depression				< 0.001
No depressive symptoms/mild depression	198 (95.2)	10 (4.8)	1.0	
Moderate/moderately severe depression	183 (62.2)	111 (37.8)	7.85 (4.21;14.63)	
Severe depression	35 (30.2)	81 (69.8)	14.52 (7.84;26.9)	
Anxiety				< 0.001
Normal/mild anxiety	262 (91.6)	24 (8.4)	1.0	
Minimal/moderate anxiety	97 (70.8)	40 (29.2)	3.47 (2.18;5.53)	
Severe/very severe anxiety	57 (29.2)	138 (79.8)	8.43 (5.69;12.49)	

Continue...

Tabela 3. Continuation.

VARIABLE	PTSD (IES-R)		Crude $_{PR}$ ($95_{\%CI}$)	p-value
	No	Yes		
	n **(%)**	***n*** **(%)**		
Stress				< 0.001
Normal/mild stress	256 (93.4)	18 (6.6)	1.0	
Minimal/moderate stress	106 (69.3)	47 (30.7)	4.67 (2.81;7.75)	
Severe stress/ very severe	54 (28.3)	137 (71.7)	10.91 (6.92;17.2)	
Alcohol consumption in the last 30 days				< 0.001
0 to 10 times	385 (69.6)	168 (30.4)	1.0	
More than 10 times	31 (47.7)	34 (52.3)	1.72 (1.32;2.24)	
Tobacco consumption in the last 30 days				< 0.001
0 to 10 times	412 (68.3)	191 (31.7)	1.0	
More than 10 times	4 (26.7)	11 (73.3)	2.31 (1.67;3.21)	
Illicit drug use during the pandemic				0.208
Never	395 (67.9)	187 (32.1)	1.0	
Sometimes	21 (58.3)	15 (41.7)	1.29 (0.86;1.94)	
Suicide thoughts				< 0.001
No	368 (72.2)	142 (27.8)	1.0	
Yes	48 (44.4)	60 (55.6)	1.99 (1.60;2.48)	
Diagnosis of COVID-19				0.345
No	394 (66.9)	195 (33.1)	1.0	
Yes	22 (75.9)	7 (24.1)	0.72 (0.37;1.40)	
Any relatives or friends died from COVID-19				0.624
No	397 (67.5)	191 (32.5)	1.0	
Yes	19 (63.3)	11 (36.7)	1.12 (0.69;1.83)	
Presence of flu-like symptoms during the pandemic				< 0.001
No	188 (78.3)	52 (21.7)	1.0	
Yes	228 (60.3)	150 (39.7)	1.83 (1.39;2.40)	
Hospitalization due to COVID-19				0.080
Not infected by the coronavirus	319 (69.2)	142 (30.8)	1.0	
Not necessary	97 (61.8)	60 (38.2)	1.24 (0.97;1.57)	
Living with someone from the risk group				0.143
No	114 (72.2)	44 (27.8)	1.0	
Yes	302 (65.7)	158 (34.3)	1.23 (0.93;1.63)	

Source: The authors.
Abbreviations: PTSD: Post-Traumatic Stress Disorder; IES-R: Impact of Event Scale-Revised; PR: Prevalence Ratio; 95%CI: 95% Confidence Interval; p-value: Wald test. [a] Variation in n due to data losses.

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Table 4. Post-traumatic stress symptoms mediated by the SARS-CoV-2 pandemic and associated factors among University students. 2020 (n = 618).

Associated Factors	$_{Adjusted}$PR ($_{95\% CI}$)	p-value
Depression		0,023
No depressive symptoms/ mild depression	1	
Moderate/moderately severe depression	2.81 (1.31;6.17)	
Severe depression	2.85 (1.34;5.89)	
Stress		0,001
Normal/mild stress	1	
Minimal/moderate stress	1.97 (1.05;3.72)	
Severe stress/ very severe	2.93 (1.53;5.62)	
Anxiety		0,003
Normal/mild anxiety	1	
Minimal/moderate anxiety	1.57 (0.95;2.62)	
Severe/very severe anxiety	2.29 (1.35;3.87)	
Self-perception of health		0,035
Good/Very good	1	
Regular/Poor	1.24 (1.01;1.51)	
Presence of flu-like symptoms during the pandemic		0,019
No	1	
Yes	1.30 (1.04;1.63)	
Course		0,034
Biological Sciences	1	
Physical education	0.86 (0.64;1.15)	
Nursing	0.88 (0.64;1.22)	
Medicine	1.14 (0.87;1.48)	
Dentistry	1.25 (0.96;1.63)	
Deviance: 0.442 / p-value: 0.550		

Source: The authors.
Abbreviations: PR: Prevalence Ratio; 95%CI: 95% Confidence Interval; p-value: Wald's test.

DISCUSSION

This study assessed 618 students from courses in the area of Biological and Health Sciences during the Covid-19 pandemic. The multivariate analysis showed a significant association between PTSD and the presence of depression, stress and anxiety symptoms, a negative self-perception of health, the presence of flu-like symptoms during the pandemic and attending the Dentistry course.

The prevalence of severe depression symptoms, severe to very severe anxiety and severe to very severe stress observed in the assessed population is noteworthy, being found 18.8%, 31.6% and 30.9% of the participants, respectively. Furthermore, a significant association was observed between PTSD and the presence of these symptoms. The anxiety levels among university students during the Covid-19 pandemic showed that their mental health was affected, considering that 24.9% of this population had some type of anxiety symptoms, ranging from mild to severe[21]. This indicates the genesis of mental suffering during the pandemic period and as a direct result of it. In this sense, feelings of discomfort, worry, restlessness, loss of the meaning of life, imminence of panic and feelings of not knowing what to do were reported[22], corroborating the high prevalence of symptoms of anxiety, stress and depression and their association with the symptoms of PTSD.

A systematic review with meta-analysis carried out in 2021[23], which included a total of 55 studies and considered 68 independent samples or subsamples, showed that research carried out in populations affected by the SARS-CoV-2 outbreak indicated that the risk of contamination, infection and death of loved ones, virus containment measures, social isolation and loneliness are among the main risk factors associated with psychological distress, anxiety and stress. The disruption of the academic routine, practical classes and curricular internships, culminating in the distancing from friends and classmates, as well as the concern regarding the delay in activities and continuation of the course constituted other factors related to the change in mental health during the pandemic[24]. That said, it is evident that the pandemic, by increasing the levels of mental suffering, had an important impact on the high prevalence of PTSD, depression, anxiety, insomnia and psychological suffering[23].

Moreover, it is possible that the sudden change from the traditional teaching methodology in the classroom to remote learning negatively influenced the students' mental health, since the frustration with the structure and approach of online teaching may have caused the unsatisfactory acquisition of knowledge by university students[11], and, consequently, the increase in anxiety and stress levels. One must also consider the impact of social isolation and the impediment of usual social interactions due to the mitigation strategies caused by the Covid-19 pandemic, since, together, these factors produced negative psychological consequences, which decompensated or intensified previous symptoms of mental disorders and, in parallel, limited access to psychiatric services to provide support to these diseases[25]. Similarly, it is possible that social isolation has increased the experience of loneliness[26].

Additionally, psychosocial stressors may also have contributed to the intensification of mental distress during the pandemic[25], as they were associated with relatively high rates of anxiety, depression, PTSD and symptoms of psychological distress in the population affected by Covid-19 in several countries[27]. From this perspective, having relatives

or acquaintances infected with the SARS-CoV-2 virus was described as an important stressor, intrinsically associated with anxiety among university students. As a result, the presence of mental health disorders, especially depression, highlighted behavioral changes and the adoption of inappropriate health habits, such as substance abuse[28]. Therefore, the increase in alcohol consumption, on the one hand, emerges as part of a maladjusted coping strategy[10], as a result of the stressors concerning the pandemic; and, on the other hand, it aggravates the psychopathological symptoms[29] initially present, increasing their prevalence.

This study also showed the prevalence of a negative self-perception of health (32.7%), above that found in other studies, which is, in general, around 20%[30]. This difference is perhaps related to the specificity and particularities of the assessed sample, such as the experience of changes related to online teaching, the academic overload and the fact that they are students of health sciences courses, in addition to the entire current context of the Covid-19 pandemic and its implications. The self-assessment of one's health status subjectively seeks to describe the individual's current health conditions and constitutes one of the most often used variables in epidemiological studies[31]. There is an important association between regular or poor self-perception of health and the development of signs of psychological stress, which predisposes the individual to develop mental health disorders, including PTSD[32], which, therefore, may have contributed to the validity of the significant association found in the multiple model carried out in this research.

The association between the presence of flu-like symptoms and PTSD found in this study was significant ($p \leq 0.001$), with 60.3% of those assessed who had these symptoms also manifesting PTSD symptoms. Hence, it is possible that this variable is an important contributing factor to the development of PTSD, since people who had flu-like symptoms during the SARS-CoV-2 outbreak had a harmful impact on their physical and mental health due to accusations of spreading the virus, in addition to suffering hostile attitudes that caused them psychological stress, as verified in the study by Baohua Zhen (2022), carried out with 1,153 university students. Also according to this study, the Covid-19 pandemic can be seen as a traumatic event, having the capacity to cause PTSD symptoms, since among young individuals who experienced and suffered with the pandemic and the quarantine caused by the coronavirus, many had their aggressive behaviors amplified, with a tendency to experience high levels of anger and fear[33].

As for the undergraduate courses in which the respondents were enrolled, there was an association of a higher prevalence of PTSD symptoms among Dentistry students in the multiple model (PR=1.25), which is perhaps justified by the fact that dental procedures involve the production and dissemination of droplets and aerosols[34]. Saliva, with which dentists and Dentistry students are in constant contact, originates from the salivary glands, which act as reservoirs of the Sars-CoV-2 virus, thus putting these individuals at greater risk[35,36]. A study carried out among dentists, in 2020, with a sample of 669 participants (n = 669) from more than 30 countries around the world, found that more than 2/3 of the participants had symptoms of anxiety and fear related to the effects of the COVID-19 pandemic, making them more susceptible to the development of mental disorders, such as PTSD[37]. However, it is worth highlighting the important association with PTSD found in this study in medical students (PR=1.14), which may be related to economic issues, the effects of the quarantine on their daily routines and academic changes[38]. Added to these factors, there was the interruption of plans and the uncertainty regarding their future in the professional career[7].

It is necessary to emphasize, however, the contribution of a significant impact factor in academic life, during the pandemic period – online teaching. Since online communication has the same objective as face-to-face teaching, i.e., the transfer of information, knowledge, thoughts, among others[39], it is possible that the sudden change from the traditional approach in the classroom (in-person approach) to remote learning, has contributed negatively to the students' mental health status, as the method used to attain this objective was modified. In agreement with other studies, it was possible to establish, therefore, that the pandemic and its associated factors impacted the academic life and health of university students and their families, considering the observation of negative emotional reactions such as stress, anxiety, grief, anger and panic, as a result of concerns about delaying academic activities and fear of becoming ill[24].

CONCLUSION

This study investigated the self-perception of the psychological status among university students of Biological and Health Sciences during the COVID 19 pandemic. It was found that there was a significant impact on the mental health of these students, with the presence of symptoms of depression, anxiety and stress above the levels found in the scientific literature and, consequently, a high prevalence of PTSD. University students constitute a vulnerable population to psychological problems, and who, during public health emergencies, may have their mental health more affected than the general population. As this is a population with a tendency to experience suicidal behaviors, they require greater attention, help and support from the family, society

and academic institutions. The findings of this study indicate the importance of implementing earlier intervention programs and stringent actions, by providing evidence for universities and the government to implement public policies aiming to minimize this problem, whether in the reflection on the role they play in the promotion and prevention of psychological suffering, acting energetically against this problem, or through qualified psychological services, aimed at university students and their families. Moreover, additional longitudinal studies may reinforce our findings.

AUTHORS' CONTRIBUTION

Sérgio Ricardo Freire Ramos and Rodrigo Araújo Braga Filho participated in the analysis and interpretation of data, discussion of results, writing of the manuscript, review and approval of the final version of the manuscript, formatting according to the journal rules and article submission. Mateus Almeida de Carvalho and Lucas Almeida de Carvalho participated in the conception and design of the study, collection, analysis and interpretation of data, discussion of results, review and approval of the final version of the manuscript. Danilo Duarte Costa participated in the collection, analysis and interpretation of data, discussion of results, writing of the manuscript, review and approval of the final version of the manuscript. Maria Tereza Carvalho Almeida was responsible for the conception and design of the study, collection, analysis and interpretation of data, discussion of results, writing of the manuscript and review and approval of the final version of the manuscript.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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