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The COVID-19 pandemic's risk factors for depression among postgraduate healthcare students

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ABSTRACT

Introduction. The pandemic has generated challenges which impact the mental health of the population, including postgraduate healthcare students. **Objective.** To evaluate the factors associated with depression in postgraduate healthcare students during the COVID-19 pandemic. **Method.** This is a cross-sectional study with postgraduate healthcare students, with a sample of 117 participants. The data were collected through an online form, between September and November 2021, using semi-structured questionnaires with sociodemographic information and information regarding participants' mental health, as defined by the DSM-5 Scale, where the depression domain was considered a variable for this study. The variables were tested using the Poisson multiple regression model with robust variance in the bivariate analysis between the dependent and independent variables (95% CI). **Results.** In the bivariate analysis, there was an association between depression and not having a partner, also a low monthly income, studying for a master's or professional doctorate and having an employment relationship parallel to the postgraduate course. Regarding the mental health of the participants, the following factors were associated with depression: anger, mania, anxiety, somatic symptoms, suicidal ideation, mental disorder, memory, repetitive thinking, dissociation, personality functioning, and substance use ($p < .05$). In the multiple analysis, it was found that mania, anxiety, and dissociation remained statistically associated with depression ($p < .05$). **Discussion and conclusion.** Factors associated with depression in this population raise the importance of mental health promotion interventions for postgraduate healthcare students, who seek help both through mental health services and through their universities.

Keywords: Mental health, depression, COVID-19 pandemic, students, postgraduate healthcare programs.

RESUMEN

Introducción. La pandemia ha generado desafíos que impactan en la salud mental de la población, incluidos los estudiantes de posgrado en salud. **Objetivo.** Evaluar los factores asociados a la depresión en estudiantes de posgrado en salud durante la pandemia de COVID-19. **Método.** Se trata de un estudio transversal con estudiantes de posgrado en salud, con una muestra de 117 participantes. Los datos fueron recolectados a través de un formulario en línea, entre septiembre y noviembre de 2021, utilizando cuestionarios semiestructurados con información sociodemográfica e información sobre la salud mental de los participantes, según lo definido por la Escala DSM-5, donde el dominio depresión fue considerado una variable para este estudiar. Las variables se probaron mediante el modelo de regresión múltiple de Poisson con varianza robusta en el análisis bivariado entre las variables dependientes e independientes (IC 95%). **Resultados.** En el análisis bivariado, hubo asociación entre la depresión y no tener pareja, también una baja renta mensual, estudiar maestría o doctorado profesional y tener una relación laboral paralela al posgrado. En cuanto a la salud mental de los participantes, los siguientes factores se asociaron a la depresión: ira, manía, ansiedad, síntomas somáticos, ideación suicida, trastorno mental, memoria, pensamiento repetitivo, disociación, funcionamiento de la personalidad y uso de sustancias ($p < .05$). En el análisis múltiple se constató que la manía, la ansiedad y la disociación permanecieron estadísticamente asociadas a la depresión ($p < .05$). **Discusión y conclusión.** Los factores asociados a la depresión en esta población elevan la importancia de las intervenciones de promoción de la salud mental para los estudiantes de posgrado en salud, quienes buscan ayuda tanto a través de los servicios de salud mental como a través de sus universidades.

Palabras clave: Salud mental, depresión, pandemia de COVID-19, estudiantes, posgrados en salud.

INTRODUCTION

COVID-19 was declared a global pandemic in March 2020, the pandemic created new health and social care challenges that went beyond physical health care but also led to an increased incidence of mental disorders, including among postgraduate healthcare students. The students had their daily lives and organizational structures changed due to the need for social isolation and other widely implemented measures that were introduced to control the pandemic, which nonetheless resulted in psychosocial damage for some individuals (Camacho-Zuñiga, Pego, Escamilla, & Hosseini, 2021; Ribeiro et al., 2021).

The need to introduce new technologies to meet the demands created by the pandemic increased the workload associated with academic life, which added to the inherent demands of the pandemic. Across the population, there were increased levels of anxiety, depression, suicidal ideation, posttraumatic stress disorder, eating disorders and alcohol, and other drug abuse (Chi et al., 2020; Ribeiro et al., 2021).

There is a consensus in the literature that the pandemic harmed the mental health of postgraduate students, due to the numerous uncertainties generated. Not only are there the pressures of doing a postgraduate course but there was also the loss of coexistence due to social isolation, leading to feelings of frustration, impotence, and sometimes academic failure (Ribeiro et al., 2021; Viana & Souza, 2021). Thus, through the application of the DSM-5 Level 1 Cross-Sectional Symptom Scale – Adult, studies in this population were carried out with a view to identifying self-reported mental disorders, based on the manifestation of signs and symptoms over time by the participants (American Psychiatric Association [APA], 2013).

In the United States, during the pandemic, in addition to reports of mental fatigue and depressive symptoms, there was an increase of 14.57% in anxiety rates among graduate students (Camacho-Zuñiga et al., 2021). In the same period, 64.3% of postgraduate students in Kenya experienced some degree of insomnia, distress, mental exhaustion, and depression (Ali, Shah, Du, Leekha, & Talib, 2022). These findings were also experienced in Brazil, where graduate students had high scores for mental disorders, especially anxiety, stress, and depression (Scorsolini-Comin, Patias, Cozzer, Flores, & Hohendorff, 2021).

In Mato Grosso, postgraduate students suffered these impacts too; a study in ten pole cities of the state highlighted the mental health risk (Terças-Trettel et al., 2022). Additionally, another study with university professors during the pandemic found that 50% of them had symptoms of depression (Freitas et al., 2021), which could potentially have reflected negatively on the mental health of students. This study aims to evaluate the factors associated with depression in postgraduate healthcare students during the pandemic.

METHOD

Design of the study

This is an exploratory, cross-sectional, and quantitative study that is part of the matrix project, "Teaching, practices, and innovative technologies in health and education" of the University of the State of Mato Grosso (UNEMAT). This research was carried out in the State of Mato Grosso, located in the Center-West region of Brazil, and due to the social distancing caused by the COVID-19 pandemic, it was conducted remotely through digital resources.

Participants/ description of the sample

The population of this research were students from postgraduate healthcare courses in the State of Mato Grosso, whose courses were registered on the Sucupira platform in January 2021, totalling 439 students. The participants were either enrolled solely on postgraduate healthcare courses in the State of Mato Grosso or were students originally from Mato Grosso who were doing postgraduate healthcare courses in other Brazilian and/or international institutions. Those students who were absent from their course for health reasons, on maternity leave, or who had already defended their thesis before the data collection began and those who had their course suspended for any reason were excluded from the study.

To define the sample, the simple random probability sampling method was used for a proportion. Thus, when considering the population size of 439 ($N = 439$) and a proportion of 11.7%, an error of 5%, and a confidence level of 95%, the approximate sample size in the research was 137 students. To select the students, a random drawing was carried out using the MINITAB V17 program, which allows the selection of random samples from a list. Data were collected through an online form using the Google Forms® platform between September and November 2021. The survey was widely publicized and sent from institutional email lists, social networks, journalistic media, official websites, universities, and their postgraduate programs. The return of the completed questionnaire was considered as consent by the participant.

Measurements

Semistructured questionnaires with objective questions were used, covering sociodemographic information (gender, age group, race/colour, marital status, family income), information on aspects related to academic activities during the pandemic (singularly enrolled on a healthcare course, parallel to postgraduate employment, in receipt of a scholarship).

To assess mental health, the DSM-5 Self-Applicable Level 1 Symptoms Scale – Adult was used. This self-administered instrument assesses general mental health domains (APA, 2013). The main objective of this scale is to assist in the investigation of mental problems that can impact the

individual's health through a brief, yet comprehensive assessment of the mental health symptoms that are commonly reported by patients who present psychological distress (APA, 2013). This scale is composed of 23 items distributed across 13 domains: depression, rage, mania, anxiety, somatic symptoms, suicidal ideation, psychosis, sleep disorder, memory, repetitive thoughts and behaviours, dissociation, personality functioning, and substance use. Each item is analyzed by the score of each domain, with the "mild" score being considered a predictor for the presentation of depression, anger, mania, anxiety, somatic symptoms, sleep disturbance, memory, repetitive thoughts and behaviours, dissociation, and personality functioning. The "very mild" score is considered a predictor of substance use, suicidal ideation, and psychosis (APA, 2013). The depression domain variable (DSM-5) was considered a dependent variable, and the other sociodemographic variables, aspects related to academic activities during the pandemic and aspects of mental health of DSM-5 (except the depression domain) were classified as independent variables.

After collection, the data was imported from Google Forms and organized in Microsoft Excel version 2013 spreadsheets, with subsequent database checking. After this step, the database was coded using the Minitab 19® program. Subsequently, the data were analyzed using Stata software version 16, particularly the "svy" module, which allows the addition of weighting factors and takes into account the complex design of the sample.

Statistical analysis

Initially, a descriptive analysis of the data referring to the sociodemographic questionnaire was carried out, where prevalences were obtained with the respective 95% CI of the variables: sex, age group, self-declared race/color, marital status, family income, type of course, employment relationship parallel to the Graduate Studies and Graduate Scholarships. In the inferential analysis of the data, variables with p values less than .20 were tested in the multiple Poisson regression model with robust variance in the bivariate analysis between the dependent and independent variables, considering the prevalence ratio adjusted by the method. Prevalence ratios (PRs) and their respective 95% confidence intervals (95% CIs) were calculated by the model mentioned above. Variables that presented p values less than .20 in the bivariate analysis were included in the multiple model, and variables with p values less than .05 by the stepwise forward method remained in the final model.

Ethical considerations

This study was approved by the Research Ethics Committee (CEP) of the Universidade do Estado de Mato Grosso (UNEMAT) under the Certificate of Presentation for Ethical Assessment (CAAE) n. 28214720.9.0000.5166 and opinion No. 3.986.293/2020. In addition, all recommendations of Resolution No. 466/12 of the National Health Council were respected, preserving the anonymity of the participants involved in all stages of data collection and guaranteeing free choice of subjects by signing the Free and Informed Consent Term (ICF).

RESULTS

A total of 117 students who were only doing postgraduate healthcare courses in the State of Mato Grosso participated in this research. The socio-demographic profile was 80.34% women, 43.59% aged between 19 and 29 years old, 53.85%

Table 1
Sociodemographic profile of postgraduate healthcare students in the State of Mato Grosso, 2022

Variable	*n*	*%*	*95 CI*
Sex			
Female	94	80.34	(71.98, 87.11)*
Male	23	19.66	(12.89, 28.02)
Age Group			
19 to 29 years old	51	43.59	(34.44, 53.07)
30 to 39 years	50	42.74	(33.63, 52.21)
40 to 59 years	16	13.68	(8.02, 21.26)*
Self-declared race/colour			
Not white	54	46.15	(36.90, 55.61)
White	63	53.85	(44.39, 63.10)
Marital status			
No partner	63	53.85	(44.39, 63.10)
With partner	54	46.15	(36.90, 55.61)
Family income			
1 to 2 minimum wages	23	19.66	(12.89, 28.02)
3 to 4 minimum wages	26	22.22	(15.06, 30.84)
> 4 minimum wages	68	58.12	(48.64, 67.18)*
Type of course			
Professional Master's and Doctorate	5	4.27	(1.40, 9.69)
Academic Master's and Doctorate	112	95.73	(90.31, 98.60)*
Employment relationship parallel to postgraduate			
Yes	68	58.12	(48.64, 67.18)
No	49	41.88	(32.82, 51.36)
Postgraduate scholarship			
Yes	76	64.96	(55.59, 73.55)*
No	41	35.04	(26.45, 44.41)

Notes: #Value of the minimum wage in 2021: R$ 1.212,00.
* significant for confidence 95%.
Source: From the Authors.

self-reported as being of white race/colour, 53.85% had no partner, and 58.12% had a monthly income greater than four times the minimum wage. Regarding their studies, 95.73% were pursuing an academic master's or doctoral degree, 58.12% had an employment relationship parallel to the graduate course, and 64.96% had scholarships. The socio-demographic information is represented in Table 1.

In the bivariate analysis, when relating the sociodemographic variables with the dependent variable of this study, an association was observed between depression and not having a partner (p = .049; 95% CI = [1.01, 1.70]), as well as low monthly income (p = .021; 95% CI = [1.12, 1.85]). Both variables represent the greatest risks within the sociodemographic category for the depression domain, with RPb values of 1.30 and 1.44, respectively.

In the variables related to the study status of the graduate students, there was an association between depression and having a professional master's and doctoral degree (p = .041; 95% CI = [1.34, 1.76]) and having an employment relationship parallel to the course (p = .034; 95% CI = [.59, .97]). As regards the course that the participants were undertaking, only the variable of attending a professional master's and doctorate represents a risk regarding the dependent variable (RPb = 1.53), while the employment relationship and having a scholarship were variables that represented RPb as a protective factor for depression (Table 2).

Regarding the participants' mental health, evaluated by the DSM-5, it was found in the bivariate analysis that anger, mania, anxiety, somatic symptoms, suicidal ideation, psychosis, memory, repetitive thinking, dissociation

Table 2
Bivariate analysis between sociodemographic and study variables and depression among postgraduate healthcare students. Cuiabá, Mato Grosso, 2022

		Depression domain – DSM-5				
Variables		*Yes*	*No*	*RPb*	*95 CI*	*p value*
Sociodemographic	Sex					
	Female	63	31	1.03	.74 – 1.43	.869
	Male	15	8	1.00	-	-
	Age group					
	19 to 29 years old	39	12	1.23	.95 – 1.61	.115
	30 to 39 years	31	19	1.00	-	-
	40 to 59 years	8	8	.81	.47 – 1.38	.395
	Self-declared race/colour					
	Not white	39	15	1.17	.90 – 1.51	.238
	White	39	24	1.00	-	-
	Marital status					
	No partner	47	16	1.30	1.01 – 1.70	.049*
	With partner	31	23	1.00	-	-
	Family income					
	1 to 2 minimum wages#	20	3	1.44	1.12 – 1.85	.021EF*
	3 to 4 minimum wages	17	9	1.08	.77 – 1.52	.650
	> 4 minimum wages	41	27	1.00	-	-
Aspects related to academic activities during the COVID-19 pandemic	Type of course					
	Professional Master's and Doctorate	5	0	1.53	1.34 – 1.76	.041RV*
	Academic Master's and Doctorate	73	39	1.00	-	-
	Employment relationship parallel to the course					
	Yes	40	28	.76	.59 – 0.97	.034*
	No	38	11			
	Postgraduate Scholarship					
	No	47	29	.82	.64 – 1.05	.132
	Yes	31	10	1.00	-	-

Notes: RPb: crude prevalence ratio; 95 CI: confidence interval of 95%; *p*: *p* value for chi-square test; EF: Fisher's exact test; RV: likelihood ratio test. * significant for *p* less than .05 (p < .05).

and personality functioning were associated with statistically significant values ($p < .05$) with depression among postgraduate healthcare students in the State of Mato Grosso. The highest RPb were the anxiety (RPb = 4.77), mania (RPb = 2.60) and anger (RPb = 2.40) domains; that is, the prevalence of these symptoms represents greater chances for the development of depression in this population (Table 3).

Table 3
Bivariate analysis between variables of health conditions and depression among postgraduate students. Cuiabá, Mato Grosso, 2022

		Depression domain – DSM-5				
	Variables	*Yes*	*No*	*RPb*	*95 CI*	*p value*
Aspects of Mental Health	Anger					
	Yes	60	8	2.40	1.65 – 3.50	< .001*
	No	18	31	1.00	-	-
	Mania					
	Yes	67	15	2.60	1.58 – 4.29	< .001*
	No	11	24	1.00	-	-
	Anxiety					
	Yes	74	19	4.77	1.94 – 11.75	< .001*
	No	4	20	1.00	-	-
	Somatic Symptoms					
	Yes	53	8	1.95	1.43 – 2.65	< .001*
	No	25	31	1.00	-	-
	Suicidal ideation					
	Yes	24	2	1.56	1.27 – 1.91	.002*
	No	54	37	1.00	-	-
	Psychosis					
	Yes	8	2	1.22	.87 – 1.72	.492EF
	No	70	37	1.00	-	-
	Sleep disorder					
	Yes	39	6	1.60	1.26 – 2.04	< .001*
	No	39	33	1.00	-	-
	Memory					
	Yes	43	8	1.59	1.23 – 2.05	< .001*
	No	35	31	1.00	-	-
	Repetitive thinking					
	Yes	39	3	1.79	1.41 – 2.25	< .001*
	No	39	36	1.00	-	-
	Dissociation					
	Yes	37	1	1.88	1.51 – 2.33	< .001*
	No	41	38	1.00	-	-
	Personality functioning					
	Yes	46	6	1.80	1.38 – 2.34	< .001*
	No	32	33	1.00	-	-
	Substance use					
	Yes	48	16	1.32	1.01 – 1.74	.036
	No	30	23	1.00	-	-

Notes: RPb: crude prevalence ratio; 95 CI: confidence interval of 95%; *p*: *p* value for chi-square test; EF: Fisher's exact test; RV: likelihood ratio test. * significant for *p* less than .05 ($p < .05$).

Through Multiple Poisson Regression, the final model was adjusted between the depression domain variables and the health status variables, with their respective prevalence values and adjusted confidence intervals. Analyzing the health status variables, it was found that mania, anxiety, and dissociation were statistically associated with depression during the multiple analysis ($p < .05$). In this analysis, all variables were risk factors for depression and anxiety had the highest risk (PRa = 3.69) compared to the mania and dissociation domains (Table 4).

Table 4
Multiple analysis between variables of mental health conditions and depression among postgraduate healthcare students. Cuiabá, Mato Grosso, 2022

		Depression domain – DSM-5		
	Variables	RP_b	95 CI	p
Aspects of Mental Health	Mania			
	Yes	1.87	1.16 – 3.01	.011*
	No	1.00	-	-
	Anxiety			
	Yes	3.69	1.53 – 8.89	.004*
	No	1.00	-	-
	Dissociation			
	Yes	1.29	1.07 – 1.56	.008*
	No	1.00	-	-

Notes: RPb: crude prevalence ratio; 95 CI: confidence interval of 95%; *p* value for chi-square test; * significant for *p* less than .05 ($p < .05$).

DISCUSSION AND CONCLUSION

The profile of postgraduate healthcare students in Mato Grosso was highlighted by women, young adults, single, self-declared white race/colour, with monthly income above four minimum wages, who had an employment relationship parallel to their course and received government financial support as fellows. A similar profile was found among graduate students during the COVID-19 pandemic, as well as in studies carried out before this period (Faro, 2013; Ferreira et al., 2016; Santos et al., 2020; Viana & Souza, 2021). When analyzing the association of depression with sociodemographic characteristics, the following factors were observed: not having a partner, having a low monthly income (1 to 2 salaries), and having an employment relationship parallel to their course.

A study in London found that during the COVID-19 pandemic, people who resided and remained alone during social isolation were at greater risk for developing depression (Robb et al., 2020). In South Korea, among college students, including graduate students, the incidence of depression was directly related to the period of social isolation, especially for those who were physically and emotionally alone (Kim & Kim, 2021). Within the context of the pandemic, not having a partner highlights the importance of social support as a protective factor in the development of depressive symptoms, as affective relationships are capable of providing effective emotional support in the process of overcoming conflicts and preventing depression (Costa, Maynart, Oliveira, Albuquerque, & Correia, 2018; Mesquita et al., 2016).

In parallel, the negative impacts of the pandemic on the economy and its relationship with depression are evident, with Chinese research showing that since the beginning of the pandemic, lower income increased the probability of depression and anxiety in the general public (Lu, Li, Lu, & Zhang, 2020). For many graduate students, opting for a graduate degree may mean a decrease in income due to the need to dedicate exclusively to research, which is a potentiator for the risk of developing depressive symptoms, either because of the need to remain unemployed or because of becoming a scholarship holder and depending only on this financial resource to cover their expenses, a pathologizing condition for the development of mental disorders, such as depression (Abreu et al., 2021; Faro, 2013).

In contrast, the search for a parallel income during the pandemic increased the risk of developing depressive symptoms, since, as health professionals, the risk of mental illness was increased due to the psychological pressure, for example, increased workload, as well as working in unhealthy environments and precarious conditions. In addition, many experienced infections from friends and family, which caused a reduction in social support and further impacted their mental health (Santos et al., 2021).

Additionally, Scorsolini-Comin, Patias, Cozzer, Flores, and Hohendorff (2021) state that the professional performance of graduate students provides greater financial stability and socioeconomic security compared to those who exclusively dedicate themselves to graduate studies; however, the combination of high work demands and pressure for productivity exhausts their physical and mental resources, which impact affective and emotional dimensions, causing an increase in depressive symptoms in graduate students (Abreu et al., 2021; Sousa et al., 2022).

With the emergence of the pandemic, changes in daily life, fear, and uncertainties demanded immediate responses from populations, which generated emotional and psychological reflexes, whose emotions resulted in significant consequences in terms of mental health (Haddad et al., 2021). Thus, an association was also observed between depression and other domains of the DSM-5, anger, mania, anxiety, somatic symptoms, suicidal ideation, sleep disorders, memory, repetitive thoughts, dissociation, personality functioning, and substance use in the population of this study.

A Ugandan study highlighted the higher prevalence of feelings of anger, with a strong relationship between anger

and depression during the pandemic, where the increase in anger scores and depression grew in parallel (Archibong et al., 2021). Busch (2009) states that anger can be a symptom of depressive disorders, but it is not seen as an aetiology of the disease and is manifested in different ways by each individual, as the feeling of anger refers to an emotional state generated by a perception of threat and difficulty in psychological adaptation, capable of being influenced by external circumstances such as social isolation and the changes experienced in the context of COVID-19 (Archibong et al., 2021; Busch, 2009).

Another domain, in addition to anger, that was related to depression among graduate students was mania, manifested with variations between euphoric symptoms of mania and depressive symptoms (APA, 2013; Bosaipo, Borges, & Juruena, 2017). Research from Qatar found that the pandemic was a risk factor for mania in its population, especially due to the psychosocial stress related to coping with COVID-19, and that the increase in manic conditions was also related to sleep disorders, severe anxiety, and depression (Iqbal et al., 2021). It is noteworthy that the concept of the bipolar spectrum comprises people with severe recurrent depression and moderate anxiety, whose mania can be induced by the use of antidepressants, as well as by a series of other characteristics of bipolarity related to the presence of depressive symptoms and generalized anxiety (APA, 2013; Bosaipo et al., 2017).

Another symptom that is usually described in parallel to depression is anxiety, which is characterized as a natural and fundamental reaction to self-preservation; however, in its pathological condition, it presents more frequently and intensely, with symptoms that can cause suffering and damage to everyday life (Alves, 2014; Leão, Gomes, Ferreira, & Cavalcanti, 2018). Archibong et al. (2021) observed that among the young population, anxiety was a factor associated with depressive disorders during the pandemic. Furthermore, in research from the Philippines, in addition to the association between anxiety and depression, individuals who had a higher level of education, such as a master's/doctoral degree, were at greater risk of developing these mental disorders (Tee et al., 2020). Yu et al. (2021) demonstrated that social isolation together with the suspension of academic/professional activities, reduced social interaction, and prolonged exposure to online teaching generated psychological stress and made depression and anxiety during the pandemic more likely.

Additionally, the changes generated by the pandemic were stressful enough to induce negative affective states among postgraduate students, especially among those who worked as health professionals. Having to deal with changes in shift patterns, care responsibilities and academic activities during the pandemic, was enough to cause a mental overload, which was subsequently reflected in their physical health through the manifestation of psychosomatic symptoms (Zancan, Machado, Boff, & Oliveira, 2021).

This somatization of psychological and physical symptoms is characterized by headaches to muscle pain, fatigue, abdominal complaints, chronic pain, physical tiredness, and even sleep disorders. Somatic symptoms can be characteristic of several clinical conditions, including depressive disorders. A result similar to the one described here is described in a population-based study in South Korea, where the authors observed that among the young population, the most prevalent complaints regarding depression were physical and somatic complaints (Donnelly, Richardson, & Solberg, 2021), as well as in a systematic review that showed that during the pandemic, there was an increase in the prevalence of somatic symptoms in the population (Nguyen et al., 2022). The manifestation of somatic symptoms among graduate students who are also health professionals stems from increased levels of stress and physical/emotional wear and tear experienced in everyday life. It is noteworthy that somatic complaints are a risk to both physical and mental health, and can lead to suicidal ideation (Donnelly et al., 2021; Li et al., 2020).

The manifestation of physical symptoms resulting from this mental exhaustion can be a precursor to feelings of discontent and displeasure with life, as well as risk behaviours associated with suicide (Durkheim, 2000; Sousa et al., 2022). Abreu et al. (2021) found a positive association between suicidal ideation and depression among graduate students. A similar result was found by Sousa et al. (2022), where the working conditions of students, the high levels of stress of higher education and the high demands of teaching and research changed the affective and behavioural dimensions of students. Archibong et al. (2021) also found that during the pandemic, the high levels of emotional and psychological changes in the population, are associated with anxiety and depression, which are risk factors for suicidal ideation and behaviour in the population.

A potentiator of other mental symptoms, sleep disorder, was self-reported by 38.5% of the participants in this study and is a known factor associated with depression. The restrictions imposed by the pandemic directly affected the quality of sleep, as the psychological suffering related to social isolation, the adaptation difficulties, and concerns about health and well-being caused an increase in sleep disturbances which are all associated with the development of depressive symptoms (Alqahtani et al., 2022; Moreno et al., 2022). The prevalence of sleep disorders among graduate students was already a reality before the pandemic; however, in the context of COVID-19, this problem has intensified, especially among those who work as health professionals, as academic and work routines in health services accumulate, which compromises mental well-being and sleep regulation, as well as attention and other fundamental cognitive activities for these students (Medeiros, Roma, & Matos, 2021; Viana & Souza, 2021).

The alteration in the sleep cycle associated with mental disorders alters normal psychological mechanisms, thus

generating a cyclical process of mental degradation, with damage to cognitive functions such as memory (Alqahtani et al., 2022). In the United Kingdom, Hampshire et al. (2021) observed the direct and indirect impacts of COVID-19 on the memory of the population, where the deficits were characterized by a decrease in cognitive functions, reasoning, problem-solving, difficulty concentrating, and activities of daily living. In addition, there was also a relationship between memory problems and depression, similar to our findings, which is explained by the sum of the neurobiological changes that come with depression together with the psychological responses related to coping with COVID-19 (Hampshire et al., 2021).

The pandemic control strategies influenced dysfunctional mental responses in the population, where the excess of information, concerns about everyday life, isolation, and the feeling of loneliness led to an increase in constant negative repetitive thoughts associated with depressive symptoms during this period (Hager, Judah, & Milam, 2022). Cross-sectional studies carried out in the United States observed that during the pandemic, there was an increase in negative repetitive thinking among graduate students and that this is directly related to depression in this population (Dial et al., 2021; Hager et al., 2022).

Another relevant symptom associated with depression was dissociation, which is associated with preexisting comorbidities and mental disorders, including depressive disorder, whose clinical manifestations perpetuate throughout life and represent a risk to both physical and mental integrity (Mohajerin, Lynn, Bakhtiyari, & Dolatshah, 2020). A population-based study by Fung, Chan, Ross, and Choi (2020) noted that depression is associated with dissociative symptoms as well as personality disorder symptoms. The disassociation symptoms in depression can be brought on by high levels of preexisting trauma, comorbidities, suicidal ideation, and resistance to treatment, especially among professionals and health researchers, who, by acquiring knowledge of the symptoms and aetiology of these mental disorders, resist the diagnosis and the search for professional help for meaningful treatment (Rodrigues, 2021).

Nevertheless, personality disorders are a common disorder with high prevalence among the general population and are characterized by a combination of low self-esteem and a generalized pattern of withdrawal or social phobia, which predispose people to psychosocial and occupational impairment (Cramer, Torgersen, & Kringlen, 2007; Kvarstein, Antonsen, Klungsøyr, Pedersen, & Wilberg, 2021). Within the context of the pandemic, personality disorders may have intensified, especially among those postgraduate students who are health professionals, due to the intense changes caused by social isolation and the mental overload caused by the constant demands of work and postgraduate studies. In addition, in individuals with depression, there is an association with personality functioning, where the more pathological personality traits there are, the lower the levels of hope and quality of life and the higher the levels of depression (Gonçalves, Pimentel, & Carvalho, 2020).

The last DSM-5 domain associated with depressive symptoms was substance use. Higher education students commonly have high levels of stress, a high prevalence of mental disorders and risk behaviours in part due to the use of both licit and illicit substances (Beneton, Schmitt, & Andretta, 2021). On the other hand, Fernandes et al. (2017) state the increase in the consumption of illicit psychoactive substances by postgraduate students; in some cases, aims to improve academic performance or escape mechanisms for well-being and leisure in this population.

In the United States, individuals with depression before the pandemic had higher levels of substance use, whose consumption was aggravated by depressive symptoms such as loneliness, discouragement, and isolation (Fitzke, Wang, Davis, & Pedersen, 2021). Archibong et al (2021) state that mental disorders and substance abuse are common consequences during outbreaks of infectious diseases due to the psychological distress, frustration, and by adaptation difficulties experienced.

The importance of mental health promotion among postgraduate healthcare students emerges is a priority that needs to be established by public policies to face the pandemic and its consequences, given the numerous vulnerabilities experienced during the pandemic, both in the clinical arena and in the postgraduate environment. The association of depression with other mental disorders reflects the need to implement protective actions in postgraduate courses to provide psychological support and favourable working/research conditions for the mental well-being of students. In doing so, postgraduate healthcare students may be better able to maintain the quality of their teaching and research activities, within the lived social context.

The main limitation of the study is that its design does not allow causal conclusions between predictors and depression; however, it explores the relationship between the variables, with results consistent with those found in longitudinal studies. In addition, there was still the risk of memory bias and desirability bias related to mental health issues (responses to socially accepted standards).

In this study, depression was associated with several factors, such as anger, mania, anxiety, somatic symptoms, suicidal ideation, sleep disturbance, memory, repetitive thinking, dissociation, personality functioning, and substance use. Identifying these factors demonstrates the mental health and the psychological/emotional states that students were facing during the pandemic, from which institutions will be better able to develop strategies and policies to address their postgraduate students' needs. Due to the incomplete knowledge of the repercussions of the pandemic on postgraduate students, further studies should continue to investigate the impact of the pandemic and how

postgraduate healthcare students can be best supported. We must continue to recognise the unique vulnerabilities of postgraduate healthcare students to create spaces, resources, and healthier academic life conditions.

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Conflict of interest

The authors declare they have no conflicts of interest.

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