ORIGINAL ARTICLE

Prevalence and factors associated with depression and anxiety among medical students in an inland university in Brazil

Prevalência e fatores associados à depressão e ansiedade entre estudantes de medicina de uma universidade do interior do Brasil

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ABSTRACT

Medical schools are known to be stressful environments for students, and hence medical students have been believed to experience greater incidences of depression and anxiety than the general population or students from other specialties. The present study investigates the prevalence of anxiety and depressive symptoms together with factors associated with them among medical students in a federal public university in the south of Brazil. A descriptive study was performed using self-administered questionnaires to access socio-demographic, institutional, and health variables in association with two scales - Beck's Depression Inventory (BDI) and State-Trait Anxiety Inventory (STAI) - designed to assess depressive and anxiety symptoms, respectively. The research sample consisted of 152 subjects. The depressive symptoms prevalence was 65.1% (BDI > 9), state-anxiety was 98.6%, and trait-anxiety was 97.4% (STAI > 33). Among women, 37.8% demonstrated moderate/severe depressive symptoms. High levels of state-anxiety symptoms and trait-anxiety symptoms were found in 44.7% of students under the age of 20. In the group with the lowest monthly income, it was observed the highest distributions for moderate/severe depressive symptoms, high state and high trait-anxiety symptoms, corresponding to 47.4%, 57.9%, and 47.4%, respectively. Students attending the third term of medical school had the highest percentage of moderate/severe depressive symptoms (62.5%) and high state-anxiety symptoms (50%). In addition, students who had both financial aid programs presented the highest percentages of moderate/severe depressive symptoms (46.2%), highstate-anxiety symptoms (61.5%), and high trait-anxiety symptoms (46.2%). We also observed a correlationbetween depression and trait-anxiety symptoms (P = 0.037). In conclusion, it was identified as risk factors for depressive symptoms the previous depression diagnosis, previous search for health service due to psychological symptoms, being in financial aid programs, dissatisfaction with the medical school, and inadequate psychological help offered by it. For state-anxiety symptoms and trait-anxiety outcome, there is an increased risk among low-income or students who have financial help from financial aid programs and younger age students.

Keywords: Student health, Schools, Medical, Mental health, Stress, Psychological.

RESUMO

Objetivo: Investigar a prevalência de sintomas de ansiedade e depressão e fatores associados a eles entre estudantes de medicina de uma universidade pública do sul do Brasil. **Métodos:** Foi realizado um estudo descritivo através de questionários autoaplicáveis para avaliar variáveis sociodemográficas, institucionais e de saúde, associadas a duas escalas - Inventário de Depressão de Beck (BDI) e Inventário de Traço-Estado de Ansiedade (STAI) - para avaliar os sintomas de depressão e ansiedade, respectivamente. **Resultados:** A prevalência de sintomas depressivos foi de 65,1% (BDI > 9), estado de ansiedade foi de 98,6% e traço de ansiedade de 97,4% (STAI > 33). Uma correlação significativa foi encontrada entre depressão e traço de ansiedade. Diagnóstico prévio de depressão, busca prévia por serviços de saúde, insatisfação com o curso de medicina e ter auxílio de baixa renda e bolsa de iniciação científica foram identificados como fatores de risco para depressão. Estudantes com baixa renda mensal e menores de 25 anos apresentaram maior risco para estado de ansiedade. Idade, ano da faculdade de medicina e programa de ajuda financeira provaram ser um fator de risco para traço de ansiedade. **Conclusão:** Esses resultados mostram fatores significativos relacionados à saúde mental de estudantes de uma faculdade de medicina recém-fundada no interior do Brasil.

Palavras-chave: Estudantes da saúde, Escola de medicina, Saúde mental, Estresse psicológico.

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1 INTRODUCTION

Depression and anxiety are the most common mental health disorders experienced by the world population, where approximately 322 million people suffer from depression and 264 million from anxiety[1]. Brazil has the second highest prevalence (5.8%) of people with depression and it is at the top of the list of people living with anxiety (9.3%)[1]. The onset of such disorders is reported in a very early stage of life, especially during adolescence. The age of 18–25 is related to a susceptible period to develop symptoms, which may coincide with university life[2].

Historically, medical schools are highly challenging and are considered stressful environments for students and may have a negative effect on students' mental health[3]. Studies have shown that depression and anxiety are frequent among medical graduates worldwide, affecting learning, physical health, and psychosocial wellbeing[4,5,6]. Recently, a meta-analysis estimated the global prevalence of depression among medical students at 28.0%[5]. It is observed a higher prevalence of anxiety and depression among medical students when they are compared with age-matched peers in the general population and non-medical students[4].

Several factors contribute to the impairment of medical students' mental health and its consequences. The high daily workload, academic, and emotional pressure, high competitiveness, sleep deprivation, financial fragility, and exposure to patients' suffering and deaths are anxiogenic factors found in such context[6]. Some studies have suggested possible consequences of anxiety and depression symptoms include low academic performance, high dropout rate, alcohol and substance abuse, suicide, and decreased empathy[7,8]. In addition, poor mental health during medical school has also been recognized as a predictor of later distress in the physician's life[8].

A recent Brazilian systematic review[9] indicated that most national studies focused on a statistical mapping of anxiety and depression in medical students. However, there are few investigations emphasizing the characterization of factors associated with these conditions. In addition, based on new regulatory landmarks in medical education, aiming to reorganize the process of opening Medical Schools based on social accountability criteria, new medical courses were created in regions with a weak relation between places and doctors per capita, mainly in inland areas[10]. Such context brings a new overview regarding the medical education reality in Brazil, as well as implications related to students' mental health, factors that have not been under investigation so far. In this sense, this study aimed to investigate the prevalence of anxiety and depressive symptoms among medical students in an inland public federal university in Rio Grande do Sul state, Brazil, and the factors associated with these disorders.

2 METHODS

2.1 Study design and sampling

A cross-sectional study involving a Brazilian public medical school, a multicampi educational institution located in the south of Brazil. The focus of this study was the medical school founded in 2016 that relied on 176 students enrolled in the course when this research was carried out.

2.2 Data collection

The survey instruments application was performed in seven meetings between 11-27 June 2019. The survey was personally offered to all medical students enrolled at the time. All data collection process was conducted by two trained researchers and took place in periods previously scheduled during academic activities in the classrooms. The participants were guided on the correct method to fill in the survey instruments. The researchers were in the room to answer questions and provide clarifications during the application of the forms. In addition, the participants had the opportunity to contact the researchers to receive feedback on their scores after data analysis.

2.3 Participants

All medical graduates on campus were invited to participate. To be included, it was necessary to be regularly enrolled in the course and be present in the class periods in which the research forms were applied. The students who were not present were excluded from the research.

2.4 Instruments and variables

All data were collected using three paper-printed forms. The first instrument devised specifically for this study is a 20-item questionnaire to access socio-demographic variables (age, sex, marital status, place of origin, housing, work situation, monthly income), institutional variables (medical school semester, financial aid program, satisfaction with medical school, teaching methodology, and infrastructure), and health variables (search for health care due to anxious and/or depressive symptoms, previous anxiety and/or depressive diagnosis, use of antidepressants or anxiolytics, and psychological support at university).

The second instrument was Beck's Depression Inventory (BDI), a 21-item psychometric scale used to measure depression symptoms. Each score varies from 0 to 3 according to increased symptom intensity[11]. To classify the numeric results into categories, cut-off points were established for BDI scores: no depression (0 to 9 points), mild (10 to 17 points), moderate (18 to 29 points), and severe depression (30 to 63 points). This scale was translated into Brazilian Portuguese and demonstrates adequate reliability and validity[12,13].

The third instrument was State-Trait Anxiety Inventory (STAI), a two-component psychometric scale used to measure the state-anxiety intensity and trait-anxiety frequency. Trait-anxiety refers to an individual tendency to develop anxiety symptoms in stressful situations, while state-anxiety assesses how the person is feeling at a specific time, characterized by unpleasant feelings of tension and somatic symptoms such as tachycardia, sweating, and increased blood pressure[14]. Each psychometric scale component has 20 items with scores varying from 1 to 4 according to increased symptom intensity. To classify the numeric results into categories, cut-off points were established for STAI scores: low (<33 points), medium (33-49 points), and high (>49 points). This scale was translated into Brazilian Portuguese and demonstrates adequate reliability and validity[13,15].

The outcomes variables selected were the three studied disorders - depression, state-anxiety disorder, and trait-anxiety disorder. The variables were obtained using psychometric scales and were categorized as depression symptoms levels (none, mild, or moderate/severe), state-anxiety levels (none to low, moderate, or high), and trait-anxiety levels (none to low, moderate, or high).

2.5 Statistical analysis

A descriptive statistical analysis was performed to identify the frequency distribution of categorical and numerical variables. Numerical ones are presented as mean ± standard deviation and categorical ones are presented as proportions. The chi-square test was applied in bivariate analysis. Cramer's V test was used to verify the correlation of depression with state-anxiety disorder and depression with trait-anxiety disorder. Multivariate analysis (Poisson regression) was developed to study the association among socio-demographic, institutional, and health variables with the outcomes of depressive symptoms, state-anxiety disorder, or trait-anxiety disorder. Some characteristics, defined according to the scientific literature review, were included in all models as independent variables, which means that all results are adjusted for these potential confounding variables. Statistical analysis was performed on the software SPSS 19.0. The significance level was $P<0.05$.

2.6 Ethical aspects

Participation in the study was voluntary without any financial compensation. All participants signed an informed consent form in which confidentiality was guaranteed. This research was approved by the UNIPAMPA Research Ethics Committee (number 3.103.155).

3 RESULTS

The research sample comprised 152 subjects, representing 86% of the medical students enrolled in June 2019. Among the 149 respondents of BDI, 99 (65.1%) scored above 10, characterizing the presence of depressive symptoms. The STAI instrument was completed by 151 subjects to measure the intensity of state-anxiety disorder and 148 individuals to evaluate the frequency of trait-anxiety disorder. No student presented low levels of trait-anxiety symptoms and only one had

low levels of state-anxiety symptoms. High levels of state- and trait-anxiety symptoms were found in 42.1% and 30.3% of students, respectively.

Sample distributions of BDI and STAI scores according to socio-demographic variables are shown in Table 1. Among women, 31 (37.8%) demonstrated moderate/severe depressive symptoms. High levels of state-anxiety symptoms and trait-anxiety symptoms were found in 44.7% of students under the age of 20. Moderate to severe depressive symptoms and elevated trait-anxiety symptoms were observed in 50% and 66.7% of students who reported being born in the city where the university is located, respectively. About 50% of the subjects living alone presented high state-anxiety symptoms. In the group with the lowest monthly income, it was observed the highest distributions for moderate/severe depressive symptoms, high state, and high trait-anxiety symptoms, corresponding to 47.4%, 57.9%, and 47.4%, respectively. Only the variable gender presented statistical significance related to the outcome levels of depression symptoms ($P = 0.047$).

Table 1

Sociodemographic characteristics according to depressive and anxious symptoms levels.

	Total (%)	Depressive symptoms (n=149)			State-anxious symptoms (n=151)		Trait-anxious symptoms (n=148)	
		None	Mild	Moderate/ severe	Moderate	High	Moderate	High
All subjects		50 (32.9%)	54 (35.5%)	45 (29.6%)	86 (56.5%)	62 (42.1%)	102 (67.1%)	46 (30.3%)
Gender								
Male	70 (46.1%)	28 (40%)	26 (37.1%)	14 (20%)	39 (55.7%)	31 (44.3%)	50 (71.4%)	19 (27.1%)
Female*	82 (53.9%)	22 (26.8%)	28 (34.1%)	31 (37.8%)	47 (57.3%)	33 (40.2%)	52 (63.4%)	27 (32.9%)
Age (mean ±SD)	23 (4)	23 (4)	23 (4)	23 (4)	23 (4)	23 (3)	24 (4)	22 (3)
Age range								
<20*	38 (25%)	16 (42.1%)	10 (26.3%)	11 (28.9%)	21 (55.3%)	17 (44.7%)	20 (52.6%)	17 (44.7%)
21-25	86 (56.6%)	28 (32.6%)	34 (39.5%)	23 (26.7%)	47 (54.7%)	37 (43%)	59 (68.6%)	24 (27.9%)
26-30	17 (11.2%)	2 (11.8%)	8 (47.1%)	7 (41.2%)	11 (64.7%)	6 (35.3%)	14 (82.4%)	3 (17.6%)
>31	10 (6.6%)	4 (40%)	2 (20%)	3 (30%)	7 (77.7%)	3 (33.3%)	9 (90%)	1 (10%)
Marital status								
Single*	137 (90.1%)	47 (34.3%)	49 (35.8%)	39 (28.3%)	76 (55.5%)	60 (43.8%)	89 (65%)	44 (32.1%)
Married	9 (5.9%)	2 (22.2%)	3 (33.3%)	3 (33.3%)	5 (55.6%)	3 (33.3%)	9 (100%)	-
Common-law marriage	5 (3.3%)	-	2 (40%)	-	4 (80%)	1 (20%)	3 (60%)	2 (40%)
Place of origin								
Uruguaiana	6 (3.9%)	1 (16.7%)	1 (16.7%)	4 (66.7%)	5 (83.3%)	1 (16.7%)	3 (50%)	3 (50%)
Rio Grande do Sul*	68 (44.7%)	23 (33.8%)	25 (36.7%)	19 (27.9%)	33 (48.5%)	34 (50%)	45 (66.1%)	21 (30.8%)
Santa Catarina or Paraná	21 (13.8%)	7 (33.3%)	9 (42.9%)	5 (23.8%)	13 (61.9%)	8 (38.1%)	17 (81%)	4 (19%)
Southeast of Brazil	41 (27%)	14 (34.1%)	16 (39%)	11 (26.8%)	27 (65.9%)	13 (31.7%)	29 (70.7%)	11 (26.8%)
Other Brazilian regions	15 (9.9%)	5 (33.3%)	3 (20%)	5 (33.3%)	8 (53.3%)	7 (46.7%)	8 (53.3%)	6 (40%)
Housing								
Alone	59 (38.8%)	25 (42.2%)	18 (30.5%)	15 (25.3%)	29 (49.2%)	30 (50.8%)	41 (69.5%)	16 (27.1%)
With family	18 (11.8%)	5 (27.8%)	7 (38.9%)	5 (27.8%)	10 (55.6%)	8 (44.4%)	12 (66.7%)	6 (33.3%)
With partner	15 (9.9%)	4 (26.7%)	5 (33.3%)	-	10 (66.7%)	4 (26.7%)	13 (86.7%)	2 (13.3%)
With friends*	60 (39.5%)	16 (26.7%)	24 (40%)	19 (31.7%)	37 (61.7%)	22 (36.7%)	36 (60%)	6 (40%)
Work status								
Just studying*	136 (89.5%)	45 (33.1%)	47 (34.6%)	41 (30.1%)	78 (57.4%)	57 (41.9%)	89 (65.4%)	43 (31.6%)
Study and work	6 (3.9%)	1 (16.7%)	5 (83.3%)	-	4 (66.7%)	2 (33.3%)	5 (83.3%)	1 (16.7%)
Financially independent	7 (4.6%)	3 (42.9%)	1 (14.3%)	3 (42.9%)	3 (42.9%)	3 (42.9%)	6 (85.7%)	1 (14.3%)
Monthly income ($)**								
< $ 260	19 (12.5%)	7 (36.8%)	3 (15.8%)	9 (47.4%)	8 (42.1%)	11 (57.9%)	10 (52.6%)	9 (47.4%)
$ 260-521	76 (50%)	22 (28.9%)	32 (42.1%)	21 (27.6%)	44 (57.9%)	32 (42.1%)	52 (68.4%)	22 (28.9%)
$ 522-782	37 (24.3%)	14 (37.8%)	13 (35.1%)	8 (21.6%)	19 (51.4%)	17 (45.9%)	25 (67.6%)	10 (27%)
> $ 782	20 (13.1%)	7 (35%)	6 (30%)	7 (35%)	15 (75%)	4 (20%)	15 (75%)	5 (25%)

*Represents the category that includes the only participant whose STAI indicated low levels of state-anxiety symptoms.
**Values based on the quotation of the US dollar in June 2019.

Sample distributions of BDI and STAI scores according to institutional variables are shown in Table 2. Students attending the third term of medical school had the highest percentage of moderate/severe depressive symptoms (62.5%) and high state-anxiety symptoms (50%). Students who had both financial aid programs (low-income support and research scholarship) presented the highest percentages in the categories moderate/severe depressive symptoms (46.2%), high state-anxiety symptoms (61.5%) and high trait-anxiety symptoms (46.2%). Forty percent of students with moderate/severe depressive symptoms are dissatisfied/very dissatisfied with medical school. The variable satisfaction with medical school demonstrated a statistical significance with the outcome levels of depression symptoms (P = 0.020), while the satisfaction with university infrastructure presented a statistical significance with state-anxiety levels (P = 0.008).

Table 2

Institutional characteristics according to depressive and anxious symptoms levels.

	Total (%)	Depressive symptoms (n=149)			State-anxious symptoms (n=151)		Trait-anxious symptoms (n=148)	
		None	Mild	Moderate/ severe	Moderate	High	Moderate	High
Semester of medical school								
1st	25 (16.4%)	9 (36%)	8 (32%)	8 (32%)	13 (52%)	11 (44%)	16 (64%)	9 (36%)
2nd	25 (16.4%)	7 (28%)	10 (40%)	7 (28%)	15 (60%)	10 (40%)	13 (52%)	11 (44%)
3rd	16 (10.5%)	3 (18.8%)	3 (18.8%)	10 (62.5%)	8 (50%)	8 (50%)	12 (75%)	4 (25%)
4th	17 (11.2%)	8 (47.1%)	7 (41.2%)	2 (11.8%)	10 (58.8%)	7 (41.2%)	13 (76.5%)	4 (23.5%)
5th*	29 (19.1%)	11 (37.9%)	11 (37.9%)	7 (24.1%)	15 (51.7%)	13 (44.8%)	20 (69%)	8 (27.6%)
6th	20 (13.2%)	9 (45%)	6 (30%)	5 (25%)	14 (70%)	6 (30%)	18 (90%)	2 (10%)
7th	20 (13.2%)	3 (15%)	9 (45%)	6 (30%)	11 (55%)	9 (45%)	10 (50%)	8 (40%)
Financial aid program								
None*	102 (67.1%)	31 (30.4%)	38 (37.3%)	32 (31.4%)	61 (59.8%)	39 (38.2%)	73 (71.6%)	26 (25.5%)
PDA/CNPq/FAPERGS	16 (10.5%)	9 (56.3%)	4 (25%)	2 (12.5%)	11 (68.8%)	5 (31.3%)	12 (75%)	4 (25%)
Low-income aid	21 (13.8%)	9 (42.9%)	7 (33.3%)	5 (23.8%)	9 (42.9%)	12 (57.1%)	11 (52.4%)	10 (47.6%)
Both	13 (8.6%)	1 (7.7%)	5 (38.5%)	6 (46.2%)	5 (38.5%)	8 (61.5%)	6 (46.2%)	6 (46.2%)
Satisfaction with medical school								
Very satisfied	19 (12.5%)	9 (47.4%)	8 (42.1%)	1 (5.3%)	8 (42.1%)	11 (57.9%)	11 (57.9%)	6 (31.6%)
Satisfied*	76 (50%)	30 (39.5%)	21 (27.6%)	24 (31.6%)	44 (57.9%)	31 (40.8%)	52 (68.4%)	24 (31.6%)
Neutral	47 (30.9%)	11 (23.4%)	19 (40.4%)	16 (34%)	27 (57.4%)	19 (40.4%)	31 (66%)	14 (29.8%)
Dissatisfied or very dissatisfied	10 (6.6%)	-	6 (60%)	4 (40%)	7 (70%)	3 (30%)	8 (80%)	2 (20%)
Satisfaction with teaching methodology								
Very satisfied	26 (17.1%)	12 (46.2%)	9 (34.6%)	4 (15.3%)	10 (38.5%)	15 (57.7%)	14 (53.8%)	12 (46.2%)
Satisfied	53 (34.9%)	20 (37.7%)	13 (24.5%)	18 (34%)	30 (56.6%)	22 (41.5%)	37 (69.8%)	13 (24.5%)
Neutral	46 (30.3%)	12 (26.1%)	20 (43.5%)	14 (30.4%)	28 (60.9%)	18 (39.1%)	33 (71.7%)	12 (26.1%)
Dissatisfied or very dissatisfied*	27 (17.7%)	6 (22.2%)	12 (44.4%)	9 (33.3%)	18 (66.6%)	9 (33.3%)	18 (66.6%)	9 (33.3%)
Satisfaction with university infrastructure								
Satisfied or very satisfied	22 (14.5%)	9 (40.9%)	8 (36.3%)	4 (18.1%)	6 (27.2%)	16 (72.7%)	16 (72.7%)	5 (22.7%)
Neutral*	66 (43.4%)	26 (39.4%)	22 (33.3%)	18 (27.3%)	40 (60.6%)	25 (37.9%)	45 (68.2%)	21 (31.8%)
Dissatisfied or very dissatisfied	64 (42.2%)	15 (23.4%)	24 (37.5%)	23 (35.9%)	40 (62.5%)	23 (35.9%)	41 (64%)	20 (31.2%)

*Represents the category that includes the only participant whose STAI indicated low levels of state-anxiety symptoms.

Regarding health characteristics, 25% reported a previous depression diagnosis and 37.5% reported a previous anxiety diagnosis (Table 3). About 22% of subjects looked for health care for psychological and psychiatric help. Considering the psychological support at university, 116 students (76.3%) referred to it as not adequate. Depression and anxiety symptoms coexistence is shown in Table 4. We observed a correlation between depression and trait-anxiety symptoms (P = 0.037; Cramer's V coefficient = 0.213).

Table 3

Health characteristics.

	Total (%)
Previous depression diagnosis	
Yes	38 (25%)
No	114 (75%)
Previous anxiety diagnosis	
Yes	57 (37.5%)
No	95 (62.5%)
Looked for health care due to anxious and/ or depressive symptoms	
Never	78 (51.3%)
Sought psychological help only	22 (14.5%)
Sought psychiatric help only	19 (12.5%)
Sought for both	33 (21.7%)
Use of antidepressants	
Never	95 (62.5%)
In the past	18 (11.8%)
Current use with medical monitoring	33 (21.7%)
Current use without medical monitoring	6 (3.9%)
Use of anxiolytics	
Never	110 (72.4%)
In the past	25 (16.4%)
Current use with medical monitoring	14 (9.2%)
Current use without medical monitoring	3 (2%)
Is there adequate psychological support at the university?	
Yes	36 (23.7%)
No	116 (76.3%)

Table 4

Correlation between depressive and anxious symptoms.

	Anxiety-state symptoms		Anxiety-trait symptoms	
	Moderate	High	Moderate	High
Depressive symptoms				
None*	28 (56%)	21 (42%)	35 (70%)	15 (30%)
Mild	31 (57.4%)	23 (42.6%)	41 (75.9%)	11 (20.4%)
Moderate/ severe	26 (59.1%)	18 (40.9%)	24 (54.5%)	20 (45.4%)

*Represents the category that includes the only participant whose STAI indicated low levels of state-anxiety symptoms.

Table 5 contains the univariate models, and multivariate-analysis for each outcome analyzed. The variables gender and year of medical school were included in all multivariate models to adjust for potential confounders. The variable "previous diagnosis of anxiety" was not included in multivariate models because there were no individuals classified as "no anxiety" according to STAI. We included only the financial variable ("monthly income" or "low income support") with the most significant results for each outcome because there was collinearity between these factors.

For the outcome of depressive symptoms, students who had both scientific initiation grants and low-income aid showed higher risk (P = 0.019 PR = 1.23). Dissatisfaction (P = 0.001) or neutrality (P < 0.001) related to medical school, compared to the very satisfied category, denotes a risk higher than 40% for the outcome. Inadequate psychological support at university (P = 0.017 PR = 1.23) and previous depression diagnosis (P = 0.001 PR = 1.24) showed a statistical association with depressive symptoms. Besides, students who looked for psychological help associated (P = 0.046 PR = 1.17) or not (P = 0.005 PR = 1.21) with psychiatric help are at high risk compared to those who never looked for assistance.

In multivariate regression considering the outcomes related to anxiety symptoms, we included only the severity categories "moderate" and "high", excluding the "none to low" category because of the low number of individuals. For the state-anxiety outcome, all categories of monthly income showed statistical significance when compared to the highest income and the lowest income category showed the most expressive ratio (P = 0.013 PR = 1.27). The age range under 25 years old was also found to be a risk factor of outcome (P = 0.049 PR = 1.30 at age < 20 and P = 0.03 PR = 1.27 at age between 21-25 years old).

Age range was also significant in trait-anxiety outcome analysis showing a prevalence ratio that decreases with increasing age. When compared to older students (age > 40), the group below 20 years old showed a 33% higher risk (P < 0.001) while the group with 31-40 years old demonstrated a risk 16% higher (P = 0.037). Participation in low-income aid programs also proved to be a risk factor (P = 0.019 RP 1.12). Finally, attending the third year of the medical school indicated protection for this outcome compared to the fourth year (P = 0.035 RP 0.89).

Table 5

Univariate models and multivariate analysis.

	Depressive symptoms (n=149)						State-anxious symptoms (n=151)						Trait-anxious symptoms (n=147)					
	Univariate			Multivariate LR= -204.17			Univariate			Multivariate LR= -181.332			Univariate			Multivariate LR= -206.122		
	CI=95%			CI=95%			CI=95%			CI=95%			CI=95%			CI=95%		
Variables	PR	Lower	Upper	PR	Lower	Upper	PR	Lower	Upper	PR	Lower	Upper	PR	Lower	Upper	PR	Lower	Upper
Gender																		
Female	1.177	1.033	1.34	1.065	0.951	1.192	0.975	1.331	1.564	1.006	0.9	1.123	1.029	0.965	1.098	1.044	0.979	1.112
Male	1	-	-	1	-	-	1	-	-	1	-	-	1	-	-	1	-	-
Age range																		
< 20 years old	0.932	0.806	1.079	-	-	-	1.447	1.298	1.614	1.3	1.001	1.688	1.23	1.152	1.313	1.336	1.177	1.518
21-25 years old	0.971	0.892	1.056	-	-	-	1.435	1.334	1.545	1.279	1.024	1.596	1.145	1.097	1.194	1.235	1.109	1.375
26-30 years old	1.147	0.999	1.317				1.353	1.144	1.6	1.23	0.983	1.539	1.088	1.001	1.183	1.201	1.063	1.357
31-40 years old	0.938	0.666	1.321				1.333	1.058	1.68	1.242	0.94	1.64	1.056	0.958	1.163	1.162	1.009	1.338
> 40 years old	1	-	-	1	-	-	1	-	-	1	-	-	1	-	-	1	-	-
Monthly income ($)**																		
< $260	1.053	0.806	1.375	-	-	-	1.304	1.061	1.604	1.276	1.053	1.546	1.099	0.971	1.244	-	-	-
$260-521	0.993	0.811	1.216	-	-	-	1.174	0.99	1.392	1.179	1.002	1.387	1.021	0.928	1.124	-	-	-
$ 521-782	0.914	0.726	1.152	-	-	-	1.206	1	1.454	1.239	1.041	1.475	1.016	0.913	1.13	-	-	-
> $ 782	1	-	-	-	-	-	1	-	-	1	-	-	1	-	-	-	-	-
Financial aid program																		
Scientific initiation grant	0.763	0.595	0.979	0.817	0.666	1.002	0.947	0.786	1.141	-	-	-	0.994	0.898	1.101	0.988	0.888	1.098
Low-income aid	0.9	0.735	1.103	0.942	0.797	1.112	1.134	0.975	1.319	-	-	-	1.094	0.996	1.203	1.12	1.019	1.232
Both	1.202	1.016	1.423	1.23	1.035	1.462	1.165	0.976	1.392	-	-	-	1.105	0.98	1.245	1.103	0.982	1.239
None	1	-	-	1	-	-	1	-	-	-	-	-	1	-	-	1	-	-
Year of medical school																		
1st year	0.914	0.76	1.099	0.974	0.843	1.125	0.985	0.824	1.178	0.984	0.828	1.168	0.985	0.883	1.1	0.933	0.831	1.047
2nd year	0.937	0.765	1.148	0.9	0.765	1.059	1.003	0.829	1.214	1.006	0.843	1.199	0.917	0.818	1.028	0.895	0.8	1.002
3rd year	0.848	0.701	1.025	0.893	0.773	1.032	0.957	0.8	1.145	0.951	0.809	1.117	0.903	0.811	1.006	0.89	0.798	0.992
4th year	1	-	-	1	-	-	1	-	-	1	-	-	1	-	-	1	-	-
Satisfaction with medical school																		
Dissatisfied or very dissatisfied	1.543	1.24	1.919	1.413	1.151	1.734	0.823	0.635	1.068	-	-	-	0.935	0.806	1.085	-	-	-
Neutral	1.356	1.103	1.665	1.414	1.183	1.691	0.895	0.753	1.064	-	-	-	0.982	0.877	1.1	-	-	-
Satisfied	1.234	1.007	1.513	1.201	1.011	1.427	0.892	0.759	1.047	-	-	-	0.984	0.885	1.095	-	-	-
Very satisfied	1	-	-	1	-	-	1	-	-	-	-	-	1	-	-	-	-	-
Previous depression diagnosis																		
Yes	1.386	1.231	1.559	1.246	1.089	1.427	0.973	0.856	1.106	-	-	-	1.054	0.986	1.128	-	-	-
No	1	-	-	1	-	-	1	-	-	-	-	-	1	-	-	-	-	-
Looked for health care due to anxiety and/or depression symptoms																		
Looked for psychiatric help	1.286	1.072	1.543	1.051	0.892	1.238	1.092	0.925	1.29	-	-	-	1.047	0.943	1.161	-	-	-
Looked for psychological help	1.379	1.184	1.606	1.217	1.061	1.396	1.09	0.929	1.28	-	-	-	1.03	0.933	1.137	-	-	-
Looked for both	1.343	1.147	1.572	1.177	1.003	1.38	0.976	0.846	1.126	-	-	-	1.013	0.933	1.1	-	-	-
Never	1	-	-	1	-	-	1	-	-	-	-	-	1	-	-	-	-	-
Is there adequate psychological support at university?																		
No	1.348	1.149	1.582	1.231	1.038	1.458	1.007	0.884	1.147	-	-	-	0.967	0.895	1.044	-	-	-
Yes	1	-	-	1	-	-	1	-	-	-	-	-	1	-	-	-	-	-

**Values based on the quotation of the US dollar in June 2019; LR – Likelihood Ratio; PR - Prevalence Ratio; CI - Confidence Interval.

4 DISCUSSION

The present study evaluated indicative scores of depression and anxiety symptoms in students of a Medical School in the south of Brazil and investigated associated factors. To the best of our knowledge, this is the first study evaluating the relation between anxiety and depression in the context of inland medical schools in Brazil recently founded to meet local health needs.

The results revealed a high prevalence of depressive symptoms (65.1%). Some previous studies have demonstrated similar high depression rates among medical students[16,17], but our result is higher than that obtained in recent Brazilian research (30.6%)[18] and global (28%)[5] meta-analysis. State and trait-anxiety symptoms were found in almost all students in the sample. This result is in accordance with the VERAS study, which demonstrated a relevant prevalence (> 80%) in Brazilian students of both analyzed anxiety parameters[4]. Similar to the results found for depression, results for anxiety are greater than the global prevalence (33.8%) estimated by a meta-analysis of 40,348 medical students[19]. In addition, the prevalence of anxiety in the sample of this study was higher than that found in medical students in China (30.8%)[20], Pakistan (43.7%)[21], and Malaysia (44%)[22].

In addition, data shows elevated frequency and higher severity of depressive symptoms in women. In fact, the female gender is recognized by other studies as an important risk factor for depressive symptoms[23,24]. Some authors have associated high levels of depression in females with the fact that female medical students are more competitive, tend to try harder to get higher scores on exams and are more concerned about their performance[16,25]. Besides, this is possible because they are more likely to report stress, which makes them identify earlier depressive symptoms[25] and are more liable to complaint about physical and psychological symptoms[26].

After descriptive data analysis, it became evident the high prevalence of anxious symptoms - trait and state - in young adult students, especially those aged < 20. In the multivariate analysis, this age group showed a higher risk for both anxiety outcomes. This result is in accordance with Shawahna et al.,[27] whose results of anxiety symptoms were higher in students under 20 years old. DSM-V does not describe a higher prevalence of anxiety disorders in younger age groups, but it points out that young adults tend to experience more severe symptoms, considering the concern for school and academic life as the main stressor[28]. Furthermore, young university students also deal with the adversities inherent to the transition from adolescence to adulthood often characterized by the demands to adapt to university life[4,29]. In fact, entering higher education institutions is a significant event in the lives of young people and traditionally coincides with the period of psychosocial development process marked by important changes[30], which may explain the higher levels of anxiety in this age group in our sample.

There is considerable evidence that lower socio-economic position and financial fragility are important stress events with a negative impact on mental health[27,31]. In our study, an increase was identified in anxiety and depressive symptoms among students with the lowest income range and those with low-income support and research scholarships from financial aid programs. In multivariate analysis, it was observed a higher risk for trait-anxiety and depressive symptoms among students who have low-income support. In the regression model of the state-anxiety outcome, all income ranges showed risk when compared to the highest range. According to Shawahna et al.,[27] higher depression scores were identified among students who negatively self-rated their financial status and higher anxiety rates among those with lower income. Other studies also show connections between poor financial conditions and the impairment in mental health in medical students[32,33]. Regarding this, it is worth mentioning the results of a study that identified the majority of participants with persistent depression and high levels of trait-anxiety symptoms that first referred to income and social prestige as crucial factors to choose medicine, underlining the potential existing relation among vulnerable socio-economic backgrounds and the development of anxiety and depressive symptoms[34].

In this study, students who have already looked for health care due to anxious or depressive

symptoms are at greater risk for depression outcomes. A history of psychiatric/psychological treatment before entering university was also identified as a risk factor for depression in another multivariate model[24]. Besides that, Costa et al.,[35] associated previous psychological care with the presence of anxious symptoms in greater severity. A considerable percentage of prior diagnosis of anxiety and depression was found in our sample, but only the previous diagnosis of depression was identified as a risk factor. The findings of this study were consistent with those reported by Pillay et al.,[36] in which depressive and anxiety symptoms were significantly present in medical students with a history of poor mental health. This may be related to the fact that, to some students, the university environment can be seen as a new stress factor that negatively impacts previous mental health problems, relapsing or aggravating them[3,9].

Concerning institutional factors associated with anxiety and depression prevalence, it was found a higher predominance of depressive and state-anxious symptoms in the third and increased trait-anxious symptoms in the second term. In multivariate analysis, the referred variables did not present statistical significance with the studied outcomes. The scientific literature presented heterogeneous results about the referred issue in medical students. Some studies have reported that students in their first year show higher levels of depression and anxiety compared to students in later years[16,37], and hypothesize that this is because the early years mainly focus on an extensive teaching curriculum. In contrast, other authors suggest that students in clinical periods exhibit higher levels of depression than students in the preclinical period[17,23]. According to Rezende et al.,[29] 79% of medical students presented some depressive symptoms, and the amount of these symptoms increased as they progressed in the course, possibly due to overwork in clinical periods.

Another institutional factor investigated was access to psychological support. In our sample, those students who consider that the university does not offer adequate psychological support showed greater depressive symptoms scores. VERAS study found a similar association between the intensity of depressive and anxious symptoms - state and trait - and students who declare that there is no access to psychological support or program to relieve stress symptoms in their medical schools[4]. A Brazilian systematic review on depression in medical students highlighted the benefits of psychological help provided by the institution to address the adversities brought by the university environment[9], emphasizing the importance of the university in promoting strategies to reduce common mental disorders among students.

A risk relation between dissatisfaction with medical school and depressive symptoms was also identified. Similarly, Rezende et al.,[29] found a negative correlation between the degree of satisfaction of medical students with their course and the score obtained with the BDI. One possible explanation for these results is that the greater the student's satisfaction with their course or institution, the greater the degree of involvement and engagement with academic life, reducing depressive symptoms and improving performance. This result is relevant considering the particularities of the medical school evaluated in our study. As previously reported, the medical school on focus was founded to meet healthcare needs in regions where access to health services is difficult. Thus, the city context where the school is located implies a series of constraints related to the living conditions and the functioning of the institution itself, which does not have the prestige of other Brazilian universities. Altogether, we hypothesize that these factors may contribute to greater dissatisfaction among our students and high rates of depressive symptoms.

It is worth mentioning that despite not presenting statistical significance in research, the variables gender and year of medical school were included in all multivariate analyses to control possible confounders since other studies have recognized their influence on outcomes[23,27,31]. These findings do not mean the factors listed above are not associated with the studied outcomes, only that the present research could not characterize them as such predictors.

Finally, it was observed a statistically significant correlation between trait-anxiety and depressive symptoms. In a longitudinal study, Silva et al.[34] found high levels of trait-anxiety symptoms in a sample of undergraduate students with persistent depressive symptoms. Other epidemiological

studies also have shown that major depressive disorder has high comorbidity with numerous anxiety disorders in the population in general[38]. This relation between the presence of depression and anxiety syndrome is consistent with another study that indicates that 85% of depressed people also experience pathological anxiety symptoms, just as 90% of people who suffer anxiety disorders present depression symptoms[39].

The study has some limitations and the findings should be interpreted considering certain shortcomings inherent to its design and sampling. Using a cross-sectional study, collecting all data on a single occasion, does not allow any longitudinal evaluation of symptoms, such as changes in intensity at different times. Moreover, until the time of the research, the most advanced class was attending the 7th academic term, and there was no student enrolled in the internship to evaluate, a period already recognized in the literature as a risk factor for depressive symptoms[23,29,31]. Few individuals were classified in the "none to low" category according to STAI, so our multivariable models show predictors for the development of severe anxiety and not for the appearance of symptoms. Verifying possible associations between previous diagnosis of anxiety and the outcomes was limited for the same reason.

5 CONCLUSION

In this study, we found a high prevalence of anxiety and depressive symptoms in study participants. The factors associated with the increase in medical students' depression and/or anxiety symptoms were previous depression diagnosis, previous search for health service due to psychological symptoms, being in financial aid programs, dissatisfaction with the medical school, and low-income and younger age students. According to students' perceptions, access to psychological care and support is not sufficient. We believe that knowing the main factors involved in the onset and development of anxious and depressive symptoms is relevant to understand the local context and planning strategies to promote the mental health of this vulnerable group of students. Although future research is needed to understand the complexity of factors underlying the influence of medical schools contexts on mental health, our study is unprecedented in the research of depression, anxiety and associated risk factors at a newly founded medical school located in an inland area of the country, and planned to meet health needs of a socially and economically vulnerable population.

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TGC: Conceptualization, Formal analysis, Investigation; Writing - Original Draft; LS: Formal analysis, Investigation; Writing - Original Draft; LPM: Formal analysis, Writing - Original Draft, Writing - Review & Editing; SHW: Writing - Review & Editing; CSP: Conceptualization, Formal analysis, Resources, Writing - Review & Editing, Project administration and Funding acquisition.

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