Anxiety and depression in medical students: a cross-sectional study

Ansiedade e depressão em estudantes de medicina: estudo transversal

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ABSTRACT: *Introduction:* The prevalence of depression and anxiety among university students is increasing in medical schools, and the female sex is indicated as a possible factor predisposing to mental exhaustion. In addition, the female sex is pointed out as a possible predisposing factor to mental exhaustion. The study aims to elucidate associated factors, as well as the prevalence of depressive and anxiety symptoms in medical students, to contribute to the establishment of prevention and treatment measures for future doctors. *Methods:* It was a cross-sectional study involving 812 medical students. A questionnaire on sociodemographic data, the Beck Depression Inventory - (BDI-II) and the Beck Anxiety Inventory - (BAI), were applied. Statistical analysis was performed using the SPSS 22 program. Normality was tested by the Shapiro-Wilk and correlations were evaluated by the Spearman correlation test. *Results:* A prevalence of 34.2% of depression was observed among students, considering mild, moderate, and severe symptoms. Regarding anxiety, our study observed a prevalence of 46.3%. Among the participants with anxiety, 56.4% had symptoms of depression: 22.6% were women; 50.3% of the students with depression had symptoms of anxiety, and 19.6% were women. After logistic regression analysis, symptoms of depression were related to anxiety (OR: 4.3; 95%CI: 2.6-6.8; p < 0.001) and female sex (OR: 1.7; 95%CI: 1.04-2.6; p = 0.0320). Anxiety symptoms, after logistic regression analysis, were associated with depression (OR: 4.3; 95%CI: 2.7-6.8; p < 0.001) and female sex (OR: 1.6; 95%CI: 1.04-2.4; p = 0.039). *Conclusion:* In this study, female students were more likely to develop anxiety and depression. However, further studies are needed to determine whether this phenomenon is due to female physiological mechanisms or social and cultural factors of patriarchal society.

Keywords: Anxiety; Depression; Students, medicine; Women.

RESUMO*: Introdução:* A prevalência de depressão e ansiedade entre universitários vem aumentando nas faculdades de medicina, e o sexo feminino é apontado como um possível fator predisponente ao esgotamento mental. Este estudo visa elucidar fatores associados, bem como a prevalência de sintomas depressivos e ansiosos em estudantes de medicina, contribuindo

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no estabelecimento de medidas de prevenção e tratamento para futuros médicos. *Métodos:* Estudo transversal envolvendo 812 estudantes de medicina. Foram aplicados questionários sobre dados sociodemográficos, o Inventário de Depressão de Beck - (BDI-II) e o Inventário de Ansiedade de Beck – (BAI). A análise estatística foi realizada no programa SPSS 22. A normalidade foi testada pelo teste de Shapiro-Wilk e as correlações foram avaliadas pelo teste de correlação de Spearman. *Resultados:* Foi observada uma prevalência de 34,2% de depressão entre os estudantes, considerando sintomas leves, moderados e graves. Em relação à ansiedade, o nosso estudo observou a prevalência de 46,3%. Entre os participantes com ansiedade, 56,4% apresentaram sintomas de depressão, sendo 22,6% mulheres; 50,3% dos alunos com depressão apresentaram sintomas de ansiedade, sendo 19,6%

mulheres. Após análise com regressão logística, os sintomas de depressão estiveram relacionados à ansiedade (OR: 4,3; IC95%: 2,6-6,8; p < 0,001) e ao sexo feminino (OR: 1,7; IC95%: 1,04-2,6; p = 0,0320). Os sintomas de ansiedade, após ajuste de regressão logística, estiveram associados à depressão (OR: 4,3; IC95%: 2,7-6,8; p < 0,001) e ao sexo feminino (OR: 1,6; IC95%: 1,04-2,4; p = 0,039). *Conclusão:* Neste estudo as estudantes do sexo feminino, foram mais propensas a desenvolver ansiedade e depressão. No entanto, mais estudos são necessários para determinar se esse fenômeno se deve a mecanismos fisiológicos femininos ou a fatores sociais e culturais da sociedade patriarcal.

Palavras-chave: Ansiedade; Depressão, Estudantes de medicina; Mulheres.

INTRODUCTION

Mental disorders can be divided according to their symptoms and diagnostic criteria. For the formal diagnosis of depression and anxiety, the classifications of the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5, 2014)[1] and the International Classification of Diseases (ICD-10, 1994) are used[2].

The common feature of depressive disorders is the presence of depressed mood, sadness, loss of interest or pleasure, significant weight loss or gain, insomnia (early, mid-sleep, or late-sleep) or hypersomnia, psychomotor agitation or retardation, fatigue or loss of energy, feelings of worthlessness or excessive or inadequate guilt, indecision or diminished ability to think or concentrate, and recurrent thoughts of death[1].

Anxiety Disorders include disorders that share characteristics of excessive fear and anxiety and related behavioral disturbances (DSM-V, 2014)[1]. Anxiety disorders differ in the types of objects or situations that induce fear, anxiety, or avoidance behavior and in the associated cognitive ideation. (DSM-V, 2014)[1].

Common mental disorders correspond to clinical conditions in which the individual may present different symptoms, including anxiety, depression, sadness, fatigue, and stress, among other symptoms..[3,4]

The intensity and frequency of symptoms are capable of implying psychological distress for individuals, in order to interfere with their daily activities, interpersonal relationships, and quality of life.[3]

The estimated global prevalence of the major depressive disorder in 2020 was approximately 193 million people, and that of anxiety, 298 million people.[5]

Depression is a significant and highly prevalent medical problem in the general population. The lifetime prevalence of depression in Brazil is around 15.5%[6]. Brazil is the country with the highest prevalence of depression in Latin America, and this disease occupies the 4th place among the main causes of burden during life and 1st place in time lived with disability[3].

Brazil is also highlighted concerning Anxiety, being ranked as the country with the most anxious individuals, which also directly impacts people's quality of life[3].

Within the university environment, the prevalence of anxiety and depression is increasing. This phenomenon is more evident in medical schools, known for being environments that negatively impact the mental health of students[7].

It is estimated that the prevalence of symptoms of depression in this group is considerably higher than among their peers in the same age group[8]. This is because, in addition to possible social and family problems for the student, graduation in medicine is marked by great academic demand, lack of time for leisure, competition with colleagues, and difficulties inherent at the beginning of the doctor-patient relationship[9].

These mental disorders, when they are not diagnosed and properly treated, can generate undesirable impacts such as professional exhaustion, social isolation, impairment of the individual's health, and, when present in trained professionals, even an increase in the number of medical errors[10,11,12].

In addition, they can generate harmful coping mechanisms, such as illicit substance abuse, alcohol consumption, smoking, and suicidal ideation[13]. According to the WHO[3], mental disorders are risk factors for suicide, and this is the second leading cause of death for young people between 15 and 29 years old.

In the scenario among medical students, some studies have already evaluated the prevalence of suicidal ideation, and this was estimated at 11.1% and ranged from 7. 4% to 24.2%[8,14,15].

Despite the increase in the incidence of depression and anxiety among medical students and its consequences, the factors associated with the deterioration of students' mental health are little explored in research. Some social, demographic, behavioral, and academic aspects such as sex, age, residence, loneliness, insomnia, financial difficulties, and chronic diseases are correlated with these problems in the literature, but still with divergent results[16].

Regarding sex, some studies are divergent and

inconclusive. However, many studies report a higher prevalence of these pathologies in women, even showing a significant statistical correlation. However, behind the data, there is the bias of a view of the female sex as more fragile or emotional, when, in fact, this stereotype is a result of gender roles and the patriarchal cultural context.

Many studies on the prevalence of anxiety and depression symptoms among medical students did not have a large enough sample and/or focused only on prevalence rates without relating to the possible causal factors of these pathologies. In this sense, the present study aims to elucidate the related aspects, as well as the prevalence of depressive and anxiety symptoms in medical students, thus corroborating for future measures of prevention and treatment of future doctors.

OBJECTIVE

The present study aimed to elucidate associated factors, as well as the prevalence of depressive and anxiety symptoms in medical students, to contribute to the establishment of prevention and treatment measures for future doctors.

MATERIALS AND METHODS

An analytical, cross-sectional study involving students from CEUMA University and from the Federal University of Maranhão (UFMA), São Luís, Maranhão, Brazil. The two universities mentioned are private and public respectively. In addition, they were the only institutions that offer graduation in Medicine, in São Luís – MA, by the time.

Participants and sample

Students enrolled in the first to sixth year of undergraduate medicine courses were invited to participate in the study, irrespective of sex. The minimum age was 18 years.

For sample size calculation, all students of the two universities enrolled in 2016 (n = 1230) were considered. Assuming a statistical power of 95% and a sampling error of 5%, the minimum number was 214 medical students from CEUMA University and 208 from UFMA. The final sample consisted of 812 students, 406 students from CEUMA University, and 406 from UFMA.

Data collection

Data were collected in the classrooms using questionnaires that were answered from February to December 2017. Students who were absent on the day of data collection and those who did not agree to sign the free informed consent form were excluded. A sociodemographic questionnaire, the Beck Depression Inventory, and the Beck Anxiety Inventory were applied.

The sociodemographic questionnaire addressed questions regarding sex, age, marital status (single and married/stable union), self-reported skin color (white, brown, black, indigenous, and yellow) according to the Brazilian Institute of Geography and Statistics (IBGE), lifestyle, presence or absence of smoking, alcohol consumption, and physical activity.

Depression and anxiety score

The Beck Depression Inventory-Second Edition (BDI-II) was used for the assessment of symptoms suggestive of depression[17]. The BDI-II is a self-administered instrument that measures the intensity of depression in adults and adolescents older than 13 years by evaluating symptoms corresponding to the diagnostic criteria of depressive disorders. Each item was scored, with scores ranging from 0-13 (minimal), 14-19 (mild); 20-28 (moderate), and 29-63 (severe). The total BDI-II score provides an estimate of the overall severity of depression. A cut-off point of 13 was defined. For this study, score representing minimal symptoms of depression indicated as no depressive symptoms present.

The Beck Anxiety Inventory (BAI) was used for the assessment of anxiety.[18] This self-reported scale measures the intensity of anxiety symptoms that are minimally shared with depression. The instrument reflects the level of increasing severity of each symptom. The scores range from zero to seven (minimal), 8 to 15 (mild), 16 to 25 (moderate), and 26 to 63 (severe). A cut-off point of 7 was defined. For this study, score representing minimal symptoms of anxiety, indicated as no anxiety symptoms present.

Ethical considerations

The study was approved by the Research Ethics Committee of the University Hospital of UFMA (Approval number 1.900.196/2017).

Statistical analysis

The data were tabulated in Microsoft Excel 2013® and the SPSS 22 program was used for statistical analysis. Normality was tested by the Shapiro-Wilk test and correlations were evaluated using Spearman's correlation test. Unadjusted and adjusted logistic regression models between the associated variables and the outcomes (presence or absence of symptoms of depression and anxiety) were constructed using backward selection. The alpha level of significance was less than 5%.

RESULTS

Of the 812 students evaluated, 60.5% were women, 75.9% were in the 18 to 24-year age range, 45.9% were

white, 65.3% were from the capital and metropolitan region, and 93.8% were single. There were 31.9% sedentary subjects, 2.7% were smokers, and 80.2% reported alcohol consumption (Table 1).

Table 1. Demographic characteristics and life habits of medical students. São Luís, Maranhão, Brazil, 2018

Variable	n	%
Sex		
Female	491	60.5
Male	321	39.5
Age (years)		
18 to 24	616	75.9
25 to 31	155	19.1
≥ 32	41	5.0
Skin color		
White	373	45.9
Brown	352	43.4
Black	73	9.0
Indigenous	8	1.0
Yellow	6	0.7
Origin		
Capital and metropolitan region	531	65.3
Interior of the state	137	16.9
Other state	141	17.4
Other country	3	0.4
Marital status		
Single	761	93.8
Married	49	6.0
Widowed	2	0.2
Physical activity		
Yes	553	68.1
No	259	31.9
Smoking		
Yes	22	2.7
No	790	97.3
Alcohol consumption		
Yes	651	80.2
No	161	19.8
Total	**812**	**100**

Among the participants, the prevalence of depression was 34,2%; and 18.4% were classified as having moderate to severe symptoms of depression. The prevalence of anxiety was 46,3%; and 20.6% were classified as having moderate to severe anxiety symptoms (Table 2).

Table 2. Classification of depression and anxiety in medical students. São Luís, Maranhão, Brazil, 2018

Variable	n	%
Beck Depression Inventory		
Minimal (0 to 13)	535	65.8
Mild (14 to 19)	128	15.8
Moderate (20 to 28)	112	13.8
Severe (29 to 63)	37	4.6
Beck Anxiety Inventory		
Minimal (0 to 7)	436	53.7
Mild (8 to 15)	209	25.7
Moderate (16 to 25)	111	13.7
Severe (26 to 63)	56	6.9
Total	**812**	**100.0**

Logistic regression analysis showed that symptoms of depression were associated with anxiety (OR: 4.3; 95%CI: 2.6-6.8; $p < 0.001$) and female sex (OR: 1.7; 95%CI: 1.04-2.6; $p = 0.032$) (Table 3). Anxiety symptoms were associated with depression (OR: 4.3; 95%CI: 2.7-6.8; $p < 0.001$) and female sex (OR: 1.6; 95%CI: 1.04-2.4; $p = 0.039$) in the adjusted logistic regression model (Table 4).

In the present study, 56.4% of students with anxiety had symptoms of depression; of these, 22.6% were women. Among students with depressive symptoms, 50.3% had anxiety symptoms, and 19.6% were women.

Table 3. Factors associated with depression in medical students: unadjusted and adjusted logistic regression. São Luís, Maranhão, Brazil, 2018

Variable	Depressive symptoms[1]	Logistic regression model					
		Unadjusted			Adjusted		
	n (%)	OR	95% CI	p	OR	95% CI	P
Anxiety symptoms[2]	84 (50.3)	4.2	2.6; 7.0	<0.001	4.3	2.6; 6.8	<0.001
Female sex	96 (19.6)	1.9	1.1; 3.0	0.014	1.7	1.04; 2.6	0.032

[1] Depressive symptoms (Beck Depression Inventory – BDI): depression – BDI ≥ 13 points; no depression – BDI < 13 points. [2] Anxiety symptoms (Beck Anxiety Inventory – BAI): anxiety – BAI ≥ 07 points; no anxiety – BAI < 07 points. OR, odds ratio; CI, confidence interval.

Table 4. Factors associated with anxiety in medical students: unadjusted and adjusted logistic regression. São Luís, Maranhão, Brazil, 2018

| Variable | Anxiety symptoms[1] | Logistic regression model | | | | | |
| | | Unadjusted | | | Adjusted | | |
	n (%)	OR	95% CI	p	OR	95% CI	P
Depressive symptoms[2]	84 (56.4)	4.1	2.5; 6.7	<0.001	4.3	2.7; 6.8	<0.001
Female sex	111 (22.6)	1.7	1.0; 2.6	0.031	1.6	1.0; 2.4	0.039

[1] Anxiety symptoms (Beck Anxiety Inventory – BAI): anxiety – BAI ≥ 07 points; no anxiety – BAI < 07 points. [2] Depressive symptoms (Beck Depression Inventory – BDI-II): depression – BDI-II ≥ 13 points; no depression – BDI-II < 13 points. OR, odds ratio; CI, confidence interval.

DISCUSSION

The results of this study show a prevalence of depression of 34.1% among medical students considering mild, moderate, and severe symptoms. This rate is similar to that reported in a Brazilian systematic review[19] of 59 studies on the mental health problems of medical students, in which the average prevalence was 30.6%. In addition, the prevalence found here is higher than that reported in a global meta-analysis[20] of 77 cross-sectional studies in which 28% of the undergraduate students had depression. The prevalence by continent was similar, with 30.3% in North America, 30.1% in Asia, 26.8% in South America, and 20% in Europe. Although these studies used different methodologies, different validated questionnaires, and different cut-off points, the differences were not statistically significant.

Different cutoff points for screening and classifying the severity of these mental problems deserve careful attention in prevalence studies. There is controversy in the literature about the cut-off point used to categorize mildly, moderately, and severely depressed individuals.[1]

Our cut-off point was 13 is similar to the Beck, with a sensitivity to 61.7% and the specificity to 87.7%, and positive predictive value 81.5% , and negative predictive value of 76.4%[17].

In our study, female sex was a factor associated with depression. This association is controversial in the literature. A systematic review[13] of Canadian and US medical students found a higher prevalence of depression and stress among female students. This phenomenon was attributed to the larger number of moments of anguish reported by female students during graduation, suggesting that the difference between sexes may have origins inherent to cultural sex roles and the challenges faced by students during their trajectory.

Other studies[21-24] demonstrated this correlation using logistic regression models. However, these findings may be due to the higher percentage of psychiatric disorders among women since psychiatric problems are also reported to be more prevalent among women in the general population[25]. In Pakistan[23], 53% of future female physicians had depression, while this percentage was 36% among men. In Bahrein[21], 43.9% of women and 32.1% of men had depressive symptoms and a higher prevalence among women was also observed for severe symptoms of depression.

A study[24] conducted in Brazil on healthcare students showed that common mental disorders were present in 43.5% of women and 17.2% of men. This finding was explained by the fact that female students more frequently report their problems and seek health services as a coping strategy, while male students usually do not seek help. Another explanation is the largest possible number of women in the sample, as was the case in the present study. In Brazil, the feminization of medicine is being experienced, as the proportion of female doctors is increasing. In 2019, women represented 60% of graduates, a percentage that has increased in recent years. In the younger groups, women are already the majority in 2020. They represent 58.5% among physicians up to 29 years old and 55.3% the 30-34 age group[26]. However, women are the world majority, although in schools and in the medical workforce, there is still professional inequality of opportunities in academia and the middle[27].

This phenomenon may be related to different factors, such as cultural factors typical of the patriarchal society, in which women assume different roles, combining the responsibilities of medical training and domestic work. The still existing social stigma and sex inequalities also provide a discouraging scenario for female students. In addition, biological and psychological factors related to the female sex, including complex hormonal interactions and perfectionist personality traits, are risk factors in a hostile and competitive environment such as medical schools[28,29].

One such example is a Brazilian multicenter study[30] focusing on the perception of the educational environment and quality of life in medical students. In that study, women in medical training felt more discouraged and tired than their male colleagues and reported a greater feeling of loneliness and a more negative perception of their social life.

A global meta-analysis[31] identified a significant correlation between the Sex Inequality Index (which

considers aspects of society in which women are negatively affected in terms of health, work, and political influence) and the prevalence of depression in the female population. In other words, the prevalence of depression increases with increasing sex inequality among female medical students; however, the same was not observed for male students. This corroborates the hypothesis that the cultural and social context, as well as female stereotypes are the main reasons for the higher prevalence of the disease in women. However, some data in the literature do not indicate a significant association between sex and depression. For example, a global meta-analysis[20] involving 62,728 medical students did not find significant differences between sexes despite a higher prevalence of depression among women (31.5%) compared to men (24.2%). This fact highlights the complexity of this correlation and the importance of analytical and not only descriptive epidemiological studies to assess whether a true cause-effect relationship exists between these variables.

The prevalence of anxiety was 46.3%, among medical students considering mild, moderate, and severe symptoms. This average is higher than that reported in a Brazilian meta-analysis[19], which found a prevalence of 32.9%, and also higher than the results of a cross-sectional study conducted on students from the federal medical school in Juíz de Fora, Brazil[31]. However, our result agrees with a cross-sectional study[32] conducted at a medical school in Turkey in which 47.8% of the students had anxiety (12% of them with severe or very severe anxiety).

Like studies[13,21-24] that indicated a correlation with depression, female sex was also associated with anxiety. In a systematic review involving Canadian and US medical students[13], five studies reported a higher prevalence of anxiety among female students. At a medical school in Pakistan[22], 52% of women and 35% of men had anxiety; these numbers were even higher in Bahrein[21], with 58.8% of women and 38.5% of men.

In a study involving students from the Federal University of Rio de Janeiro (UFRJ)[34], the bivariate analysis showed a 50% higher risk of anxiety among women compared to men; however, the study found no significant association between sex and depression. It should be noted that the study used the Hospital Anxiety and Depression Scale (HADS) to assess anxiety symptoms, a scale that is different from the instrument used in our study (BAI). This fact may explain the difference between results but also confirms that different validated questionnaires are able to demonstrate the relationship between sex and anxiety.

Another association demonstrated in the present study was that of anxiety with depressive symptoms and vice-versa. The coexistence of these disorders has been reported in a study on medical students in Bahrein[21] and in a Brazilian multicenter study[8] that examined the relationship of personal and institutional factors with depression and anxiety scores. In the latter study, high anxiety scores were

observed in 43.9% and 73.8% of the participants with mild and moderate/severe depression, respectively. In addition, 12.2% of the participants had simultaneously moderate to severe depressive symptoms and moderate to severe anxiety symptoms, and 12.7% had moderate to severe depressive symptoms and medium to high trait anxiety symptoms, in agreement with our study.

In the present study, there was no significant association of other factors with anxiety or depression. However, a recent Brazilian study[34] identified three risk factors for anxiety and depression in medical students: feeling alone, having a history of psychiatric or psychological treatment, and feeling morally harmed. Although indicated as causes, these factors have a complex cause-effect relationship, a fact that makes it difficult to distinguish whether they are, in fact, consequences of psychological disorders.

Studies investigating the factors associated with anxiety and depression are necessary. Sex, for example, cannot be restricted to the biological aspect since women assume responsibilities and have to withstand social pressures that differ from those men. Science cannot contribute to sex stereotypes without analyzing the sociocultural context of its object of study. In medicine, the so-called weaker sex is overburdened and yet dominates medical schools, takes on domestic duties, and expresses its emotional issues.

STRENGTHS AND LIMITATIONS

Some limitations of this study should be considerate.

Because of its cross-sectional design, no causal relationships between events could be established, as data on exposure and outcome were being collected concomitantly. However, this type of methodology has been previously used in many other studies on medical education. The results refer only to medical students in the State of Maranhão, and cannot be generalized. Due to logistical issues, we could neither collect data simultaneously.

On the other hand, the study also has strengths. The sample size was suitable for assessments we measure our outcome of interest (depression and anxiety) using standard and validated instrument used worldwide, easily applicable, and can be reproduced by other schools of medicine. We also estimated the prevalence of coexisting anxiety and depression among the study participants.

CONCLUSION

The challenge of the rising prevalence of depression and anxiety among medical students and the lack of other evidence regarding the factors associated with these disorders is a matter of concern worldwide. However, most studies indicate that female students are more likely

to develop anxiety and depression. It is necessary to analyze whether this phenomenon is the result of female physiological mechanisms or of a patriarchal culture in which men are taught not to express their emotional problems and women, despite gaining greater access to the job market, are still overburdened with domestic obligations.

The mental health of students, in general, must be a concern of all educational institutions. Thus, studies like the present one become increasingly necessary to identify the factors associated with mental disorders, as well as to encourage the elaboration of actions that promote students' health and well-being. Strong psychosocial support for students is important to help them cope with the difficulties encountered during a phase of life that is characterized by changes such as admission to the university.

Contribuição dos Autores: *Joana Katya Veras Rodrigues Sampaio Nunes* - participou do estudo e sua contribuição específica foi concepção e desenho da pesquisa, obtenção de dados, redação do manuscrito e revisão crítica do manuscrito quanto ao conteúdo intelectual. *Viviane Melo e Silva de Figueiredo* - participou do estudo análise e interpretação de dados, redação do manuscrito e revisão crítica do manuscrito quanto ao conteúdo intelectual. *João Vitor Soares Santos* - participou do estudo e sua contribuição específica foi obtenção de dados e análise e interpretação de dados. *Natale Maria Lindoso da Silva Mendes* - participou do estudo e sua contribuição específica foi redação do manuscrito e revisão crítica do manuscrito quanto ao conteúdo intelectual. *José Albuquerque de Figueiredo Neto* - participou do estudo e sua contribuição específica foi concepção e desenho da pesquisa, obtenção de dados, análise e interpretação dos dados, redação do manuscrito e revisão crítica do manuscrito quanto ao conteúdo intelectual.

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