

# Prevalence of common mental disorders among medical students during the Covid-19 pandemic

*Prevalência de transtornos mentais comuns entre estudantes de Medicina durante a pandemia de Covid-19*

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## ABSTRACT

**Introduction:** Common mental disorders (CMD) have been frequently identified among university students in the health area, especially in Medicine. It is believed that characteristics inherent to the course have a potential influence on the student's mental health. When adding the pandemic context, with its inherent social restrictions, the psychological determinants related to the unknown pathology and the fear of the rapid spread of the new coronavirus, there is the possibility of increasing the risk factors for psychological distress in this population.

**Objective:** To estimate the prevalence of CMD among medical students during the COVID-19 pandemic, analyzing its main determinants in the academic, social and economic spheres.

**Method:** Cross-sectional study, carried out with 388 medical students in Salvador/BA., Data on sociodemographic and academic aspects, life habits, comorbidities and symptoms of non-psychotic disorders were collected using the Google Forms platform, measured by the Self-Reporting Questionnaire (SRQ-20).

**Results:** The prevalence of CMD was 39.7% among medical students, with 47.4% in the basic cycle, 40.3% in the clinical cycle and 12.3% in the internship period. Among the factors associated with the emergence of CMD are sedentary lifestyle, smoking, use of substances that enhance academic performance, dissatisfaction with one's academic performance, poor sleep quality, lack of appetite, frequent headaches, poor digestion, suicidal ideation and sadness. There was a higher rate of non-psychotic mental disorders among women, with no difference regarding the academic cycle and the administrative type of the educational institution.

**Conclusion:** During the COVID-19 pandemic, a significant prevalence of CMD was demonstrated among female, white, single medical students who live with family members and do not have their own income. Although studies suggest an increase in the prevalence among university students at the present time, the data from the present study remain in agreement with the literature data prior to the pandemic, showing that the medical course itself is the main risk factor for higher rates of CMD in this population. However, further studies on the long-term impact of the pandemic on the mental health of university students are still necessary.

**Keywords:** Medical Students; Mental Disorders; COVID-19; Pandemics; Medical Education.

## RESUMO

**Introdução:** Transtornos mentais comuns (TMC) têm sido frequentemente identificados entre universitários na área de saúde, especialmente em Medicina. Acredita-se que características inerentes ao curso exerçam potencial influência na saúde mental do estudante. Quando se adiciona o contexto de pandemia com as restrições sociais inerentes, os determinantes psicológicos relacionados à desconhecida patologia e o temor do rápido alastramento do novo coronavírus, existe a possibilidade de potencialização dos fatores de riscos para o sofrimento psíquico nessa população.

**Objetivo:** Este estudo teve como objetivo estimar a prevalência de TMC entre estudantes de Medicina durante a pandemia da Covid-19, analisando seus principais determinantes nos âmbitos acadêmico, social e econômico.

**Método:** Trata-se de estudo transversal, realizado com 388 estudantes de Medicina em Salvador, na Bahia. Por meio da plataforma Google Forms, coletaram-se dados sociodemográficos e acadêmicos, sobre hábitos de vida, comorbidades e sintomas de transtornos não psicóticos mensurados pelo Self-Reporting Questionnaire (SRQ-20).

**Resultado:** A prevalência de TMC foi de 39,7% entre os estudantes de Medicina, sendo de 47,4% no ciclo básico, 40,3% no ciclo clínico e 12,3% no internato. Entre os fatores associados ao surgimento de TMC, estão sedentarismo, tabagismo, uso de substâncias que favoreçam o desempenho acadêmico, insatisfação com o próprio rendimento acadêmico, má qualidade de sono, falta de apetite, cefaleia frequente, má digestão, ideação suicida e tristeza. Observou-se maior índice de transtornos mentais não psicóticos entre as mulheres, não havendo diferença quanto ao ciclo acadêmico e à natureza administrativa da instituição de ensino.

**Conclusão:** Durante a pandemia de Covid-19, demonstrou-se uma expressiva prevalência de TMC entre estudantes de Medicina do sexo feminino, brancos, solteiros, que residem com familiares e não possuem renda própria. Apesar de estudos sugerirem aumento da prevalência nos universitários no momento atual, os dados deste estudo permaneceram concordantes com a literatura anterior à pandemia, configurando o próprio curso de Medicina como principal fator de risco para taxas superiores de TMC nessa população. Entretanto, novos estudos acerca do impacto em longo prazo da pandemia na saúde mental dos universitários ainda são necessários.

**Palavras-chave:** Estudantes de Medicina; Transtornos Mentais; Covid-19; Pandemias; Educação Médica.

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## INTRODUCTION

In December 2019, the respiratory syndrome caused by the SARS-CoV-2 (COVID-19) was identified in Wuhan, China and spread rapidly throughout the world, culminating in the pandemic decree by the World Health Organization on March 11, 2020<sup>1,2</sup>. Its accelerated spread, the prediction of the collapse of health systems, as well as the absence of specific treatment determined radical Public Health measures around the world – such as the quarantine and social isolation – in an attempt to minimize the impacts of this disease, especially in risk groups<sup>3</sup>.

In this context, the current coronavirus pandemic has become the main focus of national and international collective health, enforcing new habits and routines in several countries simultaneously<sup>3-5</sup>. One of the measures with the greatest impact on the population's lifestyle and mental health was social distancing, which affected the social and economic sectors through the modification of the way we work, study and experience leisure. The migration to the virtual environment was the solution found for the maintenance of several activities that were henceforth restricted by political decisions. Thus, educational models, including undergraduate courses, also needed to reinvent themselves, compulsorily migrating to the digital format<sup>6,7</sup>.

In Brazil, the replacement of in-person classes by remote classes during the pandemic was determined by the Ministry of Education<sup>8</sup>, resulting in the interruption of the physical operation of schools and universities and, consequently, in a new form of study. The sudden changes required immediate and compulsory adaptation by the students, which could predispose future physicians to psychological distress<sup>3</sup>.

Additionally, factors inherent to the rapid spread of an unknown virus, the fear of being infected, the depiction of the dissemination capacity by the media and the possibility of fatal disease cause anxiety and fear in most individuals, directly interfering with their psychological well-being<sup>3</sup>. This fact is demonstrated by the exponential increases in the statistics of mental symptoms in several nations during this period, such as feelings of guilt, sleep disturbances, generalized sadness, changes in eating patterns, lack of concentration, irritability, memory difficulties, fatigue and somatic complaints, characterizing the Common Mental Disorders (CMD)<sup>9,10</sup>, a set of somatic, anxiety and depressive (SAD) symptoms that can be triggered by stressful factors<sup>11</sup>.

It is known that, during epidemics, the individuals' mental health impairments tend to be greater than the number of infected people, a fact that can be maximized with the increase in the pandemic dimension<sup>9</sup>. Therefore, mental symptoms can be triggered in healthy individuals and intensified in patients

with previous mental comorbidities, including crises related to CMDs and an increase in the suicide rate<sup>12</sup>.

Medical students, even without a pandemic, are prone to factors that impact their quality of life and mental health, including CMD symptoms, which are quite prevalent among university students<sup>2,13,14</sup>. It is believed that the changes in lifestyle and in the educational system required by the current context have amplified the psychological distress of these students<sup>15</sup>, increasing the chance of the association of psychological determinants, with the restrictive measures imposed in the pandemic acting as risk factors (independent or cumulative ones) for mental disorders in this population. Therefore, the aim of this study was to estimate the prevalence of CMD among medical students during the current pandemic, analyzing the main determinants of this vulnerability in the academic, social and economic spheres.

## METHOD

An analytical, observational, quantitative, cross-sectional study was carried out with medical students aged > 18 years of age and regularly enrolled in Higher Education Institutions (HEI) in the city of Salvador, state of Bahia, Brazil, between July and October 2020.

The sample consisted of medical students recruited using the Snowball<sup>16</sup> method – a non-probabilistic sampling technique based on references from the same category. The sample number of 238 individuals was calculated using the *Commentto* tool, considering a total population of 7,140 medical students in the city of Salvador, Bahia, according to data made available by the Ministry of Education, through the e-MEC system. When considering the reliability of 95%, a margin of error of 5% and the addition of 10% of individuals due to the possibility of losses, the minimum number of 262 participants for this study was obtained. University students who had not completed their semesters or those with incomplete data were excluded.

A structured questionnaire was applied for data collection using the Google Forms platform, of which link was sent electronically to specific groups of medical students by e-mail, instant messaging applications and social networks. The first part consisted of 24 multiple-choice questions, covering sociodemographic aspects (age, gender, ethnicity, marital status, degree of religious involvement, who they lived with, socioeconomic conditions), academic data (educational institution, period of the course and satisfaction with academic performance), lifestyle habits (leisure activities, physical activity, sleep time, consumption of substances such as alcohol, tobacco products and psychostimulants for cognitive neuroenhancement purposes) and comorbidities.

The CMDs were screened using the Self-Reporting Questionnaire (SRQ-20), an instrument developed by the World Health Organization for this purpose and validated in Brazil<sup>17,18</sup>. The instrument consists of 20 items with dichotomous answers (yes or no). Each positive answer corresponds to 1 point and the sum of the points totals the final score<sup>19-21</sup>, which is related to the probability of non-psychotic disorders: 0 points corresponds to zero probability and 20 points suggests a significant probability. A result  $\geq 7$  indicates mental suffering<sup>22,23</sup>.

Data analysis was performed using the IBM SPSS statistical software, version 26.0. Frequency and percentage were used for the analysis of categorical variables; arithmetic average and standard deviation for numerical variables with normal distribution; median and interquartile range for numerical data with asymmetric distribution. Statistical associations were performed using the Kruskal-Wallis Test for continuous variables and the Chi-Square Test for categorical variables. The Relative Risk (RR) and the Odds ratio (OR) were calculated considering the 95% confidence interval. To analyze the relationship between the variables, the contingency coefficients were measured. The dependence between variables was classified as weak (from 0 to 0.29), moderate (from 0.3 to 0.69) or strong (above 0.7). Values of  $p < 0.05$  were considered statistically significant.

The research project was approved by the Research Ethics Committee of *Centro Universitário de Tecnologia e Ciências*, through the Certificate of Presentation for Ethical Appreciation (CAAE) number 32928620.2.0000.5032, Opinion number 4.304,278, in compliance with Resolutions 466/12 and 510 /16 of the National Health Council. The participants' agreement with the Free and Informed Consent Form (FICF) was a prerequisite for completing the questionnaire.

## RESULTS

A total of 388 students participated in this study, mostly female (75.8%), from private educational institutions (89.9%), self-declared white (51.8%), single (92.3%), who lived with parents/relatives (76.3%) and do not have financial independence (91.0%). Students from all cycles of the medical course answered the questionnaire, predominantly those attending the clinical cycle (45.6%). The mean age was 23.8+4.8 years (Table 1).

Among the participating students, 39.7% were classified as suspected CMD cases, with higher scores among women ( $p=0.007$ ). Academic characteristics such as the period of the course and the administrative type of the educational institution (public vs. private) were not correlated with psychological distress.

On the other hand, some individual aspects were considered as possible risk factors for the development of CMD,

such as not practicing physical activity ( $p=0.009$ ) and using substances that enhance academic performance ( $p=0.003$ ). Additionally, smoking, dissatisfaction with one's academic performance, inadequate sleep, lack of appetite, frequent headaches, perception of poor digestion, suicidal ideation and feeling of sadness (all with a  $p$  value  $< 0.001$ ) were associated with higher scores on the SRQ-20 ( $> 7$ ) (Table 2).

When performing the bivariate analysis between CMD and factors associated with psychological symptoms, an association was found between them in all the performed cross-checking of these data, except for gender, nature of the HEI, physical activity practice and consumption of alcoholic beverages. Among the factors that demonstrated dependence,

**Table 1.** Sociodemographic characteristics of the medical students, considering the total group and distribution by academic cycles. Salvador, Bahia, Brazil (n=388).

Characteristics	ALL (n=388)	ACADEMIC CYCLE		
		BASIC (n=165)	CLINICAL (n=177)	INTERNSHIP (n=46)
Age, AA+SD (years)	23.8+4.8	22.9+4.8	24.0+4.6	26.1+4.5
<i>Gender, n (%)</i>				
Female	294 (75.8)	126 (76.4)	136 (76.8)	32 (69.6)
Male	94 (24.2)	39 (23.6)	41 (23.2)	14 (30.4)
<i>Ethnicity, n (%)</i>				
Yellow	3 (0.8)	2 (1.2)	1 (0.6)	---
White	201 (51.8)	79 (47.9)	98 (55.4)	24 (52.2)
Brown	161 (41.5)	74 (44.8)	70 (39.5)	17 (37.0)
Black	23 (5.9)	10 (6.1)	8 (4.5)	5 (10.8)
Indigenous	---	---	---	---
<i>Marital Status, n (%)</i>				
Married	22 (5.7)	10 (6.1)	11 (6.2)	1 (2.2)
Divorced	7 (1.8)	---	5 (2.8)	2 (4.3)
Single	358 (92.3)	154 (93.3)	161 (91.0)	43 (93.5)
Widowed	1 (0.3)	1 (0.6)	---	---
<i>With whom the student lives, n (%)</i>				
Friends/ Acquaintances	28 (7.2)	9 (5.4)	11 (6.3)	8 (17.3)
Relatives	296 (76.3)	132 (80.0)	136 (76.8)	28 (60.9)
Alone	64 (16.5)	24 (14.6)	30 (16.9)	10 (21.8)
<i>Financial independence, n (%)</i>				
Yes	35 (9.0)	21 (12.7)	13 (7.3)	1 (2.2)
No	353 (91.0)	144 (87.3)	164 (92.7)	45 (97.8)
<i>Type of HEI, n (%)</i>				
Private	349 (89.9)	146 (88.5)	165 (93.2)	38 (82.6)
Public	39 (10.1)	19 (11.5)	12 (6.8)	8 (17.4)

n: absolute number; %: percentage; AA: arithmetic average; SD: standard deviation; HEI: Higher education institution; CMD: Common Mental Disorders.

the analysis of contingency coefficients showed a moderate association between CMD and appetite [OR 7.05 (95%CI 3.94-12.6)], sleep [OR 5.07 (95%CI 3, 24-7.96)], digestion [OR 6.73 (95%CI 4.19-10.8)] and sadness [OR 14.3 (95%CI 8.54-23.9)]. On the other hand, physical activity practice [OR 0.57 (95%CI 0.37-0.87)], smoking [OR 6.84 (95%CI 2.51-18.6)], use of substances to improve academic performance [OR 2.24 (CI95 1.31-3.82)], satisfaction with one's academic performance [OR 0.28 (95%CI 0.18-0.43)], headaches [OR 3.61 (CI95 % 2.35-5.53)] and suicidal ideation [OR 79.6 (95%CI 4.79-1.324)] were weakly associated with CMD (Table 3).

**Table 2.** Correlation between the presence or absence of Common Mental Disorders and the characteristics of medical students. Salvador, Bahia, Brazil (n=388).

Variable, n (%)	CMD (SRQ-20 > 7) (n=154)	No CMD (SRQ-20 ≤ 7) (n=234)	p-value <sup>†</sup>
<i>Gender</i>			
Female	112 (72.7)	182 (77.8)	0.256
Male	42 (27.3)	52 (22.2)	
<i>Ethnicity, n (%)</i>			
Yellow	2 (1.3)	1 (0.4)	0.423
White	82 (53.2)	121 (51.7)	
Brown	58 (37.7)	101 (43.2)	
Black	12 (7.8)	11 (4.7)	
Indigenous	---	---	
<i>Marital Status, n (%)</i>			
Married	9 (5.8)	13 (5.6)	0.757
Divorced	2 (1.3)	5 (2.1)	
Single	143 (92.9)	215 (91.9)	
Widowed	---	1 (0.4)	
<i>Academic cycles</i>			
Basic cycle	73 (47.4)	92 (39.3)	0.224
Clinical cycle	62 (40.3)	115 (49.1)	
Internship	19 (12.3)	27 (11.6)	
<i>Administrative Type of the HEI</i>			
Public	19 (12.3)	20 (8.5)	0.214
Private	135 (87.7)	214 (91.5)	
<i>With whom the student lives, n (%)</i>			
Friends/ Acquaintances	9 (5.8)	19 (8.1)	0.426
Relatives	116 (75.4)	180 (76.9)	
Alone	29 (18.8)	35 (15.0)	
<i>Financial independence, n (%)</i>			
Yes	13 (8.4)	22 (9.4)	0.747
No	141 (91.6)	212 (90.6)	

Continue...

**Table 2.** (Continuation) Correlation between the presence or absence of Common Mental Disorders and the characteristics of medical students. Salvador, Bahia, Brazil (n=388).

Variable, n (%)	CMD (SRQ-20 > 7) (n=154)	No CMD (SRQ-20 ≤ 7) (n=234)	p-value <sup>†</sup>
<i>Religious Involvement</i>			
Yes	139 (90.3)	213 (91.0)	0.799
No	15 (9.7)	21 (9.0)	
<i>Performs Leisure Activities</i>			
Yes	139 (90.3)	217 (92.7)	0.386
No	15 (9.7)	17 (7.3)	
<i>Performs Physical Activities</i>			
Yes	91 (59.1)	168 (71.8)	<b>0.009</b>
No	63 (40.9)	66 (28.2)	
<i>Drinks Alcohol</i>			
Yes	106 (68.8)	162 (69.2)	0.934
No	48 (31.2)	72 (30.8)	
<i>Smokes</i>			
Yes	20 (13.0)	5 (2.1)	<b>&lt;0.001</b>
No	134 (87.0)	229 (97.9)	
<i>Substances to enhance Academic Performance</i>			
Yes	37 (24.0)	29 (12.4)	<b>0.003</b>
No	117 (76.0)	205 (87.6)	
<i>Satisfaction with Academic Achievements</i>			
Yes	51 (33.1)	149 (63.7)	<b>&lt;0.001</b>
No	103 (66.9)	85 (36.3)	
<i>Lack of appetite</i>			
Yes	57 (37.0)	18 (7.7)	<b>&lt;0.001</b>
No	97 (63.0)	216 (92.3)	
<i>Frequent headaches</i>			
Yes	97 (63.0)	75 (32.1)	<b>&lt;0.001</b>
No	57 (37.0)	159 (67.9)	
<i>Poor Sleeps</i>			
Yes	115 (74.7)	86 (36.8)	<b>&lt;0.001</b>
No	39 (25.3)	148 (63.2)	
<i>Indigestion</i>			
Yes	86 (55.8)	37 (15.8)	<b>&lt;0.001</b>
No	68 (44.2)	197 (84.2)	
<i>Suicidal Ideation</i>			
Yes	22 (14.3)	0	<b>&lt;0.001</b>
No	132 (85.7)	234 (100.0)	
<i>Sadness</i>			
Yes	128 (83.1)	60 (25.6)	<b>&lt;0.001</b>
No	26 (16.9)	174 (74.4)	

HEI: Higher education institution; CMD: Common Mental Disorders; †Chi-square test.

**Table 3.** Analysis of factors associated with Common Mental Disorders among medical students. Salvador, Bahia, Brazil (n=154).

	Cross-checking of data	OR (95%CI)	RR	Coefficient of Contingency	p-value*
CMD	Gender	1.31 (0.82-2.10)	1.07 (0.95-1.20)	0.06	0.256
	Type of HEI	1.51 (0.78-2.92)	1.04 (0.97-1.12)	0.06	0.224
	Leisure	0.73 (0.35-1.50)	0.75 (0.38-1.45)	0.04	0.386
	Physical activity	0.57 (0.37-0.87)	0.69 (0.52-0.91)	0.13	<b>0.009</b>
	Alcohol Consumption	0.98 (0.63-1.52)	0.99 (0.73-1.34)	0.004	0.934
	Tobacco Use	6.84 (2.51-18.6)	1.16 (1.06-1.20)	0.21	<b>&lt;0.001</b>
	Substance Use for Academic Performance	2.24 (1.31-3.82)	1.15 (1.04-1.28)	0.15	<b>0.003</b>
	Satisfaction with Academic Achievements	0.28 (0.18-0.43)	0.54 (0.44-0.67)	0.29	<b>&lt;0.001</b>
	Headaches	3.61 (2.35-5.53)	1.84 (1.47-2.30)	0.29	<b>&lt;0.001</b>
	Appetite	7.05 (3.94-12.6)	1.47 (1.29-1.66)	0.34	<b>&lt;0.001</b>
	Sleep	5.07 (3.24-7.96)	2.50 (1.87-3.33)	0.35	<b>&lt;0.001</b>
	Digestion	6.73 (4.19-10.8)	1.91 (1.58-2.30)	0.39	<b>&lt;0.001</b>
	Suicidal Ideation	79.6 (4.79-1324)	1.17 (1.09-1.24)	0.29	<b>&lt;0.001</b>
	Sadness	14.3 (8.54-23.9)	4.40 (3.08-6.30)	0.49	<b>&lt;0.001</b>

OR (95% CI): Odds ratio with 95% confidence interval; RR: Relative Risk; CMD: Common Mental Disorders; HEI: Higher Education Institution; \*Chi-square test for analysis of independence between variables; Dependence/Weak Association: between 0 and 0.29; Dependence / Moderate Association: between 0.3 and 0.69; Dependence / Strong Association: > 0.7.

Another evaluated factor was the influence of the social isolation experienced during the Covid-19 pandemic on the participants' responses to the SRQ-20 questionnaire. Regarding this aspect, most students, regardless of whether they had CMD or not, fully or partially agreed that the current context influenced their responses, demonstrating the impact of the restrictive measures of the pandemic on this study results (Table 4).

## DISCUSSION

The present study disclosed a significant prevalence of CMD among medical students in the city of Salvador, Bahia, during the COVID-19 pandemic, which was more prevalent among female, white, single students, those who lived with their relatives and those who did not have their own income, a scenario that corroborates the national profile described by other studies<sup>10,14,15,24</sup>.

In the overall population, the prevalence of CMD has been described as 31.5% in primary care<sup>25</sup>, decreasing to 19.7% when analyzing only the urban population<sup>26</sup>. In turn, the prevalence of CMD among medical students shows higher rates in several studies, ranging from 22 to 51%<sup>10,27-30</sup>. However, even with the currently experienced pandemic context, the prevalence rates demonstrated in this study corroborate those previously described in the literature.

Regarding the profile of medical students with CMD, the overall prevalence found in this study was higher among

**Table 4.** Interference of the social isolation imposed by the Covid-19 pandemic on the responses of medical students to the Self-Reporting Questionnaire. Salvador, Bahia, Brazil (n=388).

Did the social isolation imposed by the Covid-19 pandemic influence your responses?*	Students	
	With CMD (n=154)	Without CMD (n=234)
I totally agree	48 (31.2)	70 (29.9)
I partially agree	67 (43.5)	99 (42.3)
I neither agree nor disagree	14 (9.1)	36 (15.4)
I partially disagree	15 (9.7)	14 (6.0)
I strongly disagree	10 (6.5)	15 (6.4)

\* Results presented in absolute numbers and percentages – n (%); CMD: Common Mental Disorders.

female university students, a fact also demonstrated by other studies in the literature<sup>31-34</sup>. It is important to emphasize that the studied sample mainly consisted of female students, which is in agreement with the phenomenon of feminization of Medicine<sup>32</sup>. It is possible that the number of female students is still influenced by the cultural context, when the former meaning of women's role strongly reflected the act of caring, influencing their choice for the health area. In addition, historically, men seek less medical help and report fewer health symptoms, a fact that may influence the lower frequency of CMD among them in this population<sup>32,35,36</sup>.

Regarding the academic cycle, the most significant prevalence of CMD occurred in the basic cycle, followed by the clinical and internship cycles. This scenario may be associated with a greater degree of stress among freshman students<sup>37</sup>, since at the beginning of the course, all students, and potentially all medical students, are required to adapt to university life, new responsibilities and psychological pressure for academic success. Specifically, in the current context, freshman students also needed to adapt to remote academic activities, as they had the opportunity to experience only a few months of in-person classes prior to the decree of social isolation in the country. Additionally, the target audience of this study has an intense academic routine, causing: a) conflicting feelings and emotions inherent to the challenges of the future responsibility for the lives of others, b) difficulties in reconciling personal with academic demands, and c) increased anxiety and expectations. All of them are factors that can interfere with the students' mental health<sup>38</sup>.

A noteworthy issue is the high percentage of participants who live with their families, which may reflect the social isolation imposed by the pandemic context and the consequent replacement of face-to-face activities by online classes, allowing students who lived alone in the capital city to return to their hometowns, going back to living with family members during this period<sup>39,40</sup>. This factor may have contributed to minimize the effects of the pandemic on the triggering or worsening of CMD in this study, as the individual susceptibility of each student can be aggravated by the physical distance from the family, generating a feeling of loneliness, especially in the beginning of medical undergraduate school<sup>13</sup>.

When analyzing income, a higher prevalence of CMD was observed among students who do not have financial independence, corroborating the study by Fiorotti et al.<sup>41</sup>, who demonstrated an association between the presence of CMD and the absence of their own income among medical students. However, as the curriculum matrix of the medical course has an extensive workload, in general more extensive than most other undergraduate courses, the possibility of having a paid job is limited, as the students often need to dedicate themselves fully to the demands of undergraduate school<sup>42</sup>.

Regarding the psychosomatic symptoms, such as headaches, changes in appetite, sleep and digestion, this research demonstrated the existence of a correlation with the development of CMD, corroborating previous studies<sup>43</sup>. Specifically, regarding sleep, studies show that two factors influence the sleep-wake cycle disorder in these students: the endogenous-hormonal factors, present in the light-dark cycle, contrasting with the numerous tasks and demands of undergraduate medical school. As a consequence, there is a

predominance of a sleep-wake cycle that is different from the natural light-dark cycle, modifying the students' functional capacity and sleep<sup>44,45</sup>.

Regarding the life habits, the factors associated with CMD were: sedentary lifestyle, smoking, use of substances that enhance academic performance, dissatisfaction with one's academic performance, inadequate sleep, lack of appetite, frequent headaches, poor digestion, suicidal ideation and sadness. Sadness may be related to the abdication of leisure, physical activity and social interaction due to the high workload and the time required for extra-class studies, favoring depressive and anxiety symptoms<sup>46</sup>. These symptoms can cause Parasympathetic Nervous System dysfunction, decreasing its action and resulting in changes in appetite and digestion, with a moderate correlation<sup>47</sup>. The association with physical activity, albeit a weak one, corroborates the literature due to its importance in health promotion and non-pharmacological prevention of diseases<sup>30,48</sup>.

The results associated to smoking are also in agreement with what has been shown in the literature. Grether et al.<sup>27</sup>, after evaluating 340 students, did not demonstrate a strong association between tobacco and marijuana consumption and the development of psychological symptoms. It should be noted that most students evaluated in this study did not report the habit of smoking cigarettes, a situation that contrasts with that of previous studies, which showed a high prevalence both in experimenting and the continuous use of tobacco by university students<sup>49,50</sup>.

The consumption of substances to optimize and enhance academic performance is part of the routine of many medical students and, in this study, it was shown to have a weak correlation with the development of the assessed psychological symptoms. Although studies have shown an increase in the use of psychoactive substances by medical students nationwide<sup>44,51</sup>, in the present study, the vast majority of students stated they did not use such substances, even with several reasons being reported in the literature to justify their consumption, such as high pressure from medical undergraduate school, deprivation of family life, strenuous workload, abdication of leisure time, marked competitiveness, concerns for the future and personal demands<sup>45,52</sup>.

The association between CMD and suicidal ideation was considered weak for the development of disorders in this population. However, the literature suggests that external factors, such as psychological vulnerability raised by the medical undergraduate environment and knowledge about drugs and the human body physiology culminate in psychological suffering and an increase in the occurrence of suicide<sup>43,53</sup>. Moreover, studies show the progressive increase

in the number of professionals unable to accept and face their anxieties. This fact favors the development of mental disorders and psychological suffering<sup>53,54</sup>.

Despite evidence that changes in lifestyle and uncertainties about COVID-19 have increased stress levels in the population<sup>55</sup>, this study did not show such consequences among medical students. It is known that the pandemic can induce psychological symptoms such as anxiety, depression and distress in university students<sup>7,56</sup>. However, the suspected increase in the prevalence of CMD due to the influence of the students' answers regarding the current period did not result in higher numbers than those already reported in the literature, even with the substitution of face-to-face and real-life activities - strongly present in this course - by remote ones that do not reflect the expectations of these students<sup>56</sup>.

Finally, one must consider the impossibility of a comparative analysis due to the lack of registration of the SRQ-20 prior to the COVID-19 pandemic. Furthermore, the assessed sample showed a greater participation of students from private HEIs, a fact that can be attributed to two factors: (i) the suspension of academic activities in most public HEIs during the initial pandemic period in the state of Bahia; and (ii) the fact that private HEIs in the city of Salvador, Bahia, are responsible for 85% of the vacancies available for the medical course. In the present study, the distribution of students from public and private HEIs corroborates this proportion. It is important to emphasize that these potential limitations do not compromise the critical analysis of the obtained results and the importance of the conclusions of the present study.

## CONCLUSION

During the COVID-19 pandemic, a significant prevalence of CMD was demonstrated among medical students, predominantly among female, White, single students living with their families and who did not have their own income. Although studies suggest an increase in the prevalence among university students at the present time, the data from the present study remain in agreement with the literature data prior to the pandemic, showing that the medical course itself is the main risk factor for higher rates of CMD in this population. Appetite, sleep, digestion disorders and sadness were moderately associated with the development of CMD in these students. In addition, medical students naturally have a higher prevalence of CMD than the general population, being necessary to identify the associated factors to allow the implementation of psychopedagogical measures aiming to improve their mental health. Longitudinal post-pandemic studies are necessary to attribute a causal relationship between the analyzed factors and allow future

reflections regarding the impact of the COVID-19 pandemic on the mental health of medical students.

## AUTHORS' CONTRIBUTION

Ane Caroline Cavalcante Cardoso contributed to the conception and design of the study, data collection, the writing of the manuscript and its critical review. Larissa Almeida de Oliveira Barbosa and Luiz Fernando Quintanilha contributed to the writing of the manuscript and its critical review. Kátia de Miranda Avena contributed to the conception and design of the study, data collection, analysis and interpretation, the writing of the manuscript and its critical review.

## CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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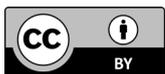
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