

CLINICAL SCIENCE

Burnout Syndrome and associated factors among medical students: a cross-sectional study

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OBJECTIVES: To assess the prevalence and levels of burnout syndrome among medical students at the Universidade Federal de Sergipe-Brazil and to identify associated factors.

METHODS: A cross-sectional study was performed with randomly selected students in 2009. The Maslach Burnout Inventory/Student Survey (MBI-SS) and a structured questionnaire on socio-demographic characteristics, the educational process, and individual aspects were used. Statistical evaluation of multiple variables was performed through backward stepwise logistic regression analysis.

RESULTS: The prevalence of burnout was 10.3% (n = 369). The prevalence was higher among those who did not have confidence in their clinical skills (Odds Ratio-OR=6.47), those who felt uncomfortable with course activities (OR = 5.76), and those who did not see the coursework as a source of pleasure (OR = 4.68).

CONCLUSION: There was a significant prevalence of burnout among the medical students studied. Three variables, in particular, were associated with burnout and were directly related to the medical education process. Preventive and intervention measures must be adopted, and longitudinal studies should be conducted.

KEYWORDS: Burnout Syndrome; Medical Students; Mental Disorder; Medical Education; Occupational Disorder.

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INTRODUCTION

Medical students are continuously exposed to psychosocial stressors throughout training that, if persistent, can lead to Burnout Syndrome (1). Burnout is a syndrome of emotional exhaustion, cynicism, and low professional efficacy that occurs frequently among individuals who do 'people work' of some kind (2).

Burnout is defined as a response, which may be inappropriate, to chronic emotional and interpersonal stressors in the workplace. The term may be applied to individuals who engage in activities that are psychologically similar to work, such as students (3,4). Burnout Syndrome among students has the following three dimensions: 1) emotional exhaustion (due to educational demands), 2) cynicism (indifference/apathetic attitude toward academic

activities), and 3) low professional efficacy (perception of incompetence as a student) (5).

Researchers have described stressful moments in the academic life of medical students, and medical training is considered to have high psychological toxicity (6,7). Factors that contribute to significant stress among students in medical schools that follow a traditional model include adaptation difficulties at the beginning of coursework due to competitive entrance exams, leaving high school for the realities of greater autonomy and responsibility, and the frustration caused by a Basic Sciences Cycle that does not match the expectations of freshmen who want immediate contact with specific medical disciplines.

The transition from the Introductory Clinical Cycle to the Clerkship Cycle presents another occasion for intense anxiety, uncertainty, expectations and fears caused by: their feeling of limitations regarding the scientific knowledge their changes from one stage to another, and the direct contact with seriously ill people who have hopeless prognoses.

The excessive workload and educational content, combined with the high level of educational demands, a lack of time for leisure, family and friends, studying for residency exams, the choice of a specialty and the delayed income also

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contribute to stress among medical students (1,6,8). In addition to these aspects, personality traits inherent to medical students include obsessiveness, perfectionism and self-exigency (7,9).

These factors are potentially responsible for the high prevalence of suicide, depression, use of psychoactive substances, marital problems, stress, burnout, and professional dysfunction in doctors and medical students (10,11).

Previous studies on Burnout Syndrome in medical students have reported a prevalence from 10% to over 45% (10,12-15). This large variability reflects the use of various criteria by researchers for the diagnosis of the syndrome, such as bi-dimensionality and the use of nonspecific instruments with students (12). Thus, additional research using diagnostic criteria and standardized instruments with scientific rigor is necessary for this population.

Mental disorders among medical students have been reported more frequently in recent years, although few studies have described Burnout Syndrome (6,8,15-17). Burnout Syndrome has been well researched among physicians and residents and is believed to be influenced by adverse conditions in medical school training (5,6, 12,13,18). In our institution, psychiatric morbidity has been studied among medical students, but Burnout Syndrome has not (19).

Burnout Syndrome affects work performance, self-esteem, and psychological health, and it may progress to other mental disorders. Thus, research that enables early detection of Burnout Syndrome is needed to encourage the adoption of preventive measures to be shared with the scientific community. This study aimed to estimate the prevalence of Burnout Syndrome and to identify associated factors among medical students at Universidade Federal de Sergipe - Brazil.

METHODS AND MATERIALS

Design and data collection

An exploratory, analytical, cross-sectional study with medical students was performed from October to December 2009.

Data collection occurred in the classrooms. A letter was sent to teachers requesting their cooperation in using a few minutes of class time to explain the research to the students and to administer the questionnaires.

A diligent search was made for the few students who were absent on the data collection days. We excluded only those students who refused to take part in the survey even after its importance had been explained to them.

Setting

The Universidade Federal de Sergipe – Brazil, the only institution in Sergipe State until 2009, has offered medical school courses since 1961, training a large number of surgeons. Sergipe was North-Northeast Brazil's first state to perform living-donor kidney transplants (1985), cardiac transplants (1987), and deceased-donor kidney transplants (2003). However, until now, there has been no psycho-educational service support for medical students. The medical education at this university is based on a traditional model of 12 semesters, which is divided into the following three cycles: Basic Sciences Cycle (1st to 4th semesters), Introductory Clinical Cycle (5th to 9th semesters), and Clerkship (10th to 12th semesters).

Participants

The medical students (534) were distributed in each class as follows: 50 students in the 1st to the 6th semesters, 40 students in the 7th to the 9th semesters, and 114 students in the 10th to the 12th semesters.

We calculated the representative sample size for a finite population based on the 45% prevalence rate found in past literature (12) with a power of 0.8, which took into account a 10% loss. We did not select the 9.1% prevalence of the Colombian study (20) because it would have resulted in a much smaller sample size. Of the 534 enrolled students, 406 were randomly selected for the study (76%). Students who did not answer all of the questionnaire items or who refused to take part in the survey were excluded (n = 37).

Research instruments

Study participants responded to two self-administered, closed-format questionnaires. One of the questionnaires was prepared by the authors and consisted of 35 pre-coded closed-format questions. The questionnaire included some of the following variables, which are in tables of this paper: socioeconomic and demographic characteristics (sex, presence of a steady partner, religion, family income), the educational process and professional choice (satisfaction with career choice, thoughts about dropping out of the course, acquisition of skills, satisfaction with teaching strategies, feelings about course activities, coursework as a source of pleasure), personal aspects, and psychological and emotional experiences (presence of mental disorder with prior diagnosis by a psychiatrist, emotions, physical activity, expectations for the future and feeling happy).

We previously used this questionnaire in a pilot study in 2005 with fifth-semester medical students (n = 40). The pilot study aimed to train volunteers in data acquisition, to refine the instrument that would be later used in the research and to evaluate students' receptiveness to this study. The pilot study also aimed to identify the average time for questionnaire completion (approximately 15 minutes), questions that were frequently not answered due to comprehension difficulties, and questions with doubtful answers. These issues were discussed in a focus group with participants. We improved the current questionnaire by removing some questions and rewording others that the students had considered difficult to understand (21).

The second questionnaire was the MBI-SS (Maslach Burnout Inventory-Student Survey), an adapted self-administered inventory, which has been validated by Schaufeli (4) and validated in Brazil by Carlotto (5). The MBI-SS consists of 15 questions subdivided into the following three subscales: emotional exhaustion (5 items), cynicism (4 items), and professional efficacy (6 items). All items were assessed by frequency using the following Likert scale (0-6): 0 (never), 1 (once a year or less), 2 (once a month or less), 3 (a few times a month), 4 (once a week), 5 (a few times a week), and 6 (every day).

A Portuguese-translation MBI-SS study classified individuals as having burnout when their scores were high for exhaustion (score greater than 14) and cynicism (score greater than 6) and low for professional efficacy (score less than 23) (22). These scores corresponded to the 66th percentile of exhaustion and cynicism and to the 33rd percentile of efficacy. Low simultaneous scores corresponded to exhaustion (scores less than 10), cynicism (scores less than 2) and efficacy (scores greater than 27).

Thus, the scale is inverted when we refer to this last dimension (professional efficacy). The lower the score, the lower the efficacy, and the greater the chance of characterizing Burnout Syndrome if the score of the two other dimensions is high. The average levels of burnout are between these results (22). In our study, we used the same score to classify burnout. Thus, we identified burnout at a low level based on the following scores: emotional exhaustion (0-9), cynicism (0-1) and professional efficacy >27. Burnout was identified at a moderate level based on the following scores: emotional exhaustion (10-14), cynicism (2-6) and professional efficacy (23-27). Burnout was identified at a high level based on the following scores: emotional exhaustion >14, cynicism >6, and professional efficacy <23.

A study by Carlotto (5) presented the following values of Cronbach's alpha for each factor: emotional exhaustion (0.81), cynicism (0.59), and professional efficacy (0.74). In contrast, in a study by Schaufeli (4), Cronbach's alpha for each of the following factors among Spanish, Portuguese and Dutch students, respectively, was as follows: emotional exhaustion (0.74, 0.79, 0.80), cynicism (0.76, 0.82, 0.86), and professional efficacy (0.79, 0.69, 0.67). Alpha scores greater than 0.50 indicate moderate internal consistency, and alpha scores greater than 0.70 indicate good internal consistency. Based on their results, these authors concluded that each of the Burnout Inventory sub-scales had internal reliability according to acceptable standards.

Data analysis

Statistical analysis was performed with SPSS software, version 16.0. Categorical variables were analyzed by simple frequency format. Standard deviation was applied to percentages and quantitative and numerical variables. To quantify possible associations between explanatory variables (no principal independent variable) and dependent variables, we calculated crude and adjusted odds ratios.

We included significant variables, as determined by bivariate analysis ($p < 0.25$), into the backward stepwise logistic regression model, aiming to identify factors associated with Burnout Syndrome. The final model contained only the independent variables that maintained a significant association with the outcome after adjustment ($p \leq 0.05$), according to the likelihood ratio test. Moreover, we completed the final model validation by the bootstrap technique. We used a simple sample number of 5000 with $CI = 95\%$, and the residue analysis was beyond the interaction verification.

The stage of interaction verification was completed according to the recommendation of parsimony with the aim of avoiding numerical instability in the model. Therefore, only the first-rate interaction terms were tested from the variables present in the final logistic regression model, and they were tested only when the potential interaction among them was considered clinically and epidemiologically plausible. For the potential removal of an interaction, we used a significance level of $p < 0.05$.

The variables used to adjust the initial model were as follows: sex, satisfaction with career choice, thoughts of dropping out of the course, acquisition of skills necessary to become a doctor, satisfaction with teaching strategies, feelings about course activities, coursework as a source of pleasure, emotional self-assessment, physical activity, expectations for the future, and a general feeling of happiness. Eight stages followed for the removal of

variables that did not reach statistical significance, until the final model was obtained.

Ethical considerations

This study was approved by our institutional ethics committee (CAAE-0018.0.107.000-06), and we conducted our study in adherence with ethical policies. Study participants signed a confidentiality agreement authorizing disclosure of data. Their identities were concealed throughout the study period, including during the completion of the questionnaires.

RESULTS

The study included 69.1% of the students ($n = 369$). Among this sample, 10.3% of the students fit the tridimensional diagnosis criteria for Burnout Syndrome (95% CI 7.0-13.3). However, analyzing each subscale separately, we verified that a greater part of our sample had high averages in the following three dimensions: high emotional exhaustion (16.3 ± 6.5 ; $\alpha = 0.83$), high cynicism (7.4 ± 5.7 ; $\alpha = 0.78$), and high professional efficacy (27.9 ± 5.6 ; $\alpha = 0.80$). If we had used the diagnosis criteria for bi-dimensional Burnout Syndrome, which are less strict (with only high emotional exhaustion and high cynicism), our prevalence would have been much greater (37.4% CI 32.2-42.3). The reliability of this study, assessed by Cronbach's alpha, verified that the subscales of emotional exhaustion (0.83), cynicism (0.78) and professional efficacy (0.80) presented good internal consistency ($\alpha > 0.70$) (Table 1).

There were no significant differences related to burnout prevalence among the three course cycles (8.9%, 11.9%, and 9.3% for Basic Sciences, Introductory Clinical Cycle, and Clerkship, respectively; $p = 0.66$).

In the studied sample, the average age was 22.43 ± 2.56 years; 49.6% were female, and most lived with their parents (93.4%). More than half reported having a steady partner (56.5%), being a practitioner of any religion (61.3%) and having a doctor in their family (51.5%). The distribution of family income (FI) was 40.4% with 6-10 times minimum wage, 14.5% with 1-5 times minimum wage, 18.4% with 11-15 times minimum wage, and 26.7% with more than 15 times minimum wage.

Table 1 - Prevalence of Burnout Syndrome (BS), subscales, levels, and scores among medical students at UFS. Aracaju-SE-Brazil, 2009.

	n = 369	%	IC 95%
BS prevalence, subscales and levels with scores*	38	10.3	7.3 a 13.3
Emotional Exhaustion			
Low (0-9)	61	16.5	12.7 a 20.6
Moderate (10-14)	77	20.9	16.8 a 24.9
High (>14)	231	62.6	57.7 a 67.5
Cynicism			
Low (0-1)	52	14.1	10.6 a 17.6
Moderate (2-6)	142	38.5	33.1 a 43.1
High (>6)	175	47.4	42.3 a 52.0
Professional Efficacy			
Low (>27)	64	60.2	13.3 a 21.1
Moderate (23-27)	83	22.5	18.4 a 27.1
High (<23)	222	17.3	53.3 a 64.8

*Scores based on Maroco J, Tecedeiro M. (2009).

Concerning variables related to the educational process, 86.6% of the students considered coursework to be a source of pleasure. Although 75.6% of the students believed that they were acquiring the skills necessary to become good professionals, only 29.4% were satisfied with the teaching strategies used. In total, 96.4% of the students were satisfied with their career choice, but 66.6% were uncomfortable with course activities, and 26.8% had thoughts about dropping out of the course.

Regarding personal issues, 52.2% of the students performed regular physical exercise, and only 9.3% slept less than 5 hours a day. Furthermore, 30.6% of the students dedicated less than 8 hours a week to leisure, 41.2% considered themselves emotionally tense, 49.2% reported alcohol use in the previous year, and 94.1% denied the use of illicit drugs.

Regarding a personal support network, 77% of the students reported that they were receiving the emotional support they needed, 86.4% had high expectations for the future and 93.7% reported feeling happy.

Using bivariate analysis, we did not find a significant association between demographic and socioeconomic variables with Burnout Syndrome, except for sex (Table 2). The following educational process factors were more significantly associated with burnout: dissatisfaction with the course choice (crude OR = 9.17, 95% CI 2.9-29.05), thoughts of dropping out of the course (crude OR = 3.14, 95% CI 1.58-6.22), lack of confidence in acquisition of skills (crude OR = 9.46, 95% CI 4.42-20.25), dissatisfaction with teaching strategies (crude OR = 3.92, 95% CI 1.36-11.35), feeling uncomfortable in academic activities (crude OR = 12.41, 95% CI 4.98-30.89), and not seeing the coursework as a source of pleasure (crude OR = 6.81, 95% CI 3.24-14.32) (Table 3).

Regarding personal aspects, there was an association between low expectations for the future and burnout (crude OR = 4.75 95% CI 2.26-10.00) (Table 3).

The logistic regression model was conducted in nine steps by backward stepwise analysis. In the initial stage, 11

variables were introduced. In the following eight stages, the sequence of variables that were removed because they did not reach statistical significance at each stage was as follows: emotional self-assessment, expectations for the future, physical activity, dropping out of the course, general feeling of happiness, satisfaction with career choice, satisfaction with teaching strategies, and sex. We continued removing variables until we reached the validated final model, with no residue, no interactions and only three variables.

After adjusting for multiple variables in the logistic regression analysis, the following findings were associated with burnout: lack of confidence in acquisition of skills (adjusted OR = 6.47, 95% CI 2.63-15.91), not seeing the coursework as a source of pleasure (adjusted OR = 4.68, 95% CI 1.81-15.43), and feeling uncomfortable in academic activities (adjusted OR = 5.76, 95% CI 2.15-12.11). This discomfort was due to an excess of student activities, which may have included jobs that must be performed by the institution staff (Table 4).

The interaction terms tested were as follows: acquisition of skills necessary to become a doctor with coursework as a source of pleasure, acquisition of skills necessary to become a doctor with feelings about course activities and coursework as a source of pleasure with feelings about course activities. However, the interactions tested were not statistically significant, meaning that there were no interactions between the variables tested in this population.

A test by Hosmer and Lemeshow (23) presented $\chi^2 = 1.967$ with 3 degrees of freedom and $p = 0.579$, indicating a good adjustment of the final model. The residue analysis found seven cases that were less adjusted to the model, but an examination of the influences of these cases did not indicate the necessity of their removal from the model. Furthermore, the bootstrap technique validated the model, demonstrating that the final model presented in Table 4 was the most consistent model.

DISCUSSION

Although the prevalence of Burnout Syndrome in our study is meaningful, it is lower than that reported in previous research, where the level of Burnout Syndrome reached values higher than 45% (10,12,13). However, the criteria used in these studies (two-dimensional characterization) were less strict than the criteria in our study (three-dimensional characterization). We used the criteria recommended by the researcher who developed the assessment instrument for Burnout Syndrome (2). In studies with stricter criteria, the prevalence was also low (14,15). Among Colombian students (20), the prevalence was 9.1%. Among pediatrics clerkship students from Universidade Federal da Bahia-Brazil, the prevalence was 14% (24).

When subscales were analyzed separately, medical students were more exhausted and cynical, although they considered themselves efficacious. The findings of this research did not match previous studies of Brazilian university students in other health (8) and psychology (1) fields, which reported low levels of emotional exhaustion and cynicism and high professional efficacy. Medical school has unique stressors beyond those of university education (1,25).

Moreover, the presence of a particular dimension may have precipitated the development of the other two dimensions. For example, high emotional exhaustion, a

Table 2 - Distribution of students from Universidade Federal de Sergipe (UFS) medicine course according to demographic and socioeconomic variables and prevalence of Burnout Syndrome (Aracaju-SE-Brazil, 2009).

Variables	n	%	Burnout		
			(%)	Crude OR	OR IC 95% p-value
Total	369	100.0	10.3		
Sex					
Male	186	50.4	13.4	2.03	1.004 - 4.10 0.045
Female	183	49.6	7.1	1	
Steady Partner					
Yes	204	56.5	10.3	1	
No	157	43.5	10.8	1.06	0.54 - 2.08 0.87
Missing	08				
Religion					
Yes	255	61.3	10.2	1	
No	112	38.7	10.6	1.04	0.52 - 2.06 0.92
Missing	2				
Family Income (Minimum Wage)					
1 to 5	37	14.5	26.9	2.94	0.86 - 10.0 0.08
6 to 10	113	40.4	30.8	1.06	0.33 - 3.39 0.92
11 to 15	47	18.4	23.1	1.84	0.53 - 6.43 0.34
More than 15	68	26.7	19.2	1	
Missing	114				

Table 3 - Distribution of students from UFS medical course according to variables related to professional choice, educational process, personal aspects and prevalence of burnout syndrome (Aracaju-SE-Brazil, 2009).

Variables	n	%	Burnout (%)	Crude OR	OR IC 95%	p-value
Total	369	100.0	10.3			
Satisfaction with career choice						
Yes	351	96.4	8.5	1		
No	13	3.6	46.2	9.17	2.90 - 29.05	0.0002
Missing	05					
Have you ever considered dropping out of the course?						
Yes	99	26.8	19.2	3.14	1.58 - 6.22	0.01
No	270	73.2	7.0	1		
Acquisition of skills						
Yes	269	75.6	4.1	1		
No	87	24.4	28.7	9.46	4.42 - 20.25	<0.00001
Missing	13					
Satisfaction with teaching strategies						
Yes	106	29.4	3.8	1		
No	255	70.6	13.3	3.92	1.36 - 11.35	0.01
Missing	08					
Feelings about course activities						
Comfortable	237	66.6	2.5	1		
Uncomfortable	119	33.4	24.4	12.41	4.98 - 30.89	<0.00001
Missing	13					
Coursework as a source of pleasure						
Yes	316	86.6	6.6	1		
No	49	13.4	32.7	6.81	3.24 - 14.32	<0.00001
Missing	04					
Presence of mental disorder with prior diagnosis						
Yes	31	8.5	12.9	1.31	0.43 - 3.96	0.64
No	334	91.5	10.2	1		
Missing	04					
How do you consider yourself emotionally?						
Calm	213	58.8	8.0	1		
Tense	149	41.2	12.8	1.69	0.84 - 3.36	0.14
Missing	07					
Physical activity						
Yes	192	52.2	8.3	1		
No	176	47.8	12.5	1.57	0.80 - 3.10	0.19
Missing	01					
Expectations for the future						
Good	317	86.4	7.6	1		
Not so good	50	13.6	28.0	4.75	2.26 - 10.00	0.00004
Missing	02					
Do you feel happy?						
Yes	341	93.7	9.1	1		
No	23	6.3	21.7	2.78	0.96 - 8.00	0.06
Missing	05					

form of inadequate adaptation to difficulties, may progress to attitudes of indifference and impersonality, which are attempts to minimize this exhaustion. This progression may culminate in a sense of failure, as activities lose their *raison d'être* and become causes of dissatisfaction. Exhaustion and cynicism suggest that the progression of symptoms may occur and precipitate low professional efficacy (the last dimension), consequently completing the triad characteristic of Burnout Syndrome. High levels of professional efficacy may be protective against burnout, as observed in the majority of students in our research.

The literature has described predictive factors for high levels of the three dimensions that characterize Burnout Syndrome (25,26). Emotional exhaustion and cynicism appear to be associated with the following factors: male sex, intention of dropping out of the course, younger age,

enrollment in a higher number of disciplines, lack of leisure time, dissatisfaction with the course, advanced semesters, attending complementary courses, and lack of professional experience. High levels of professional efficacy appear to be associated with intention to stay in the course, good academic performance, expectations of success, adequate leisure time, professional experience, and satisfaction with the course.

We did not find significant differences in the prevalence of Burnout Syndrome with course cycle, although levels were higher in the introductory clinical cycle. Other studies have reported a deterioration in students' mental health as the course progresses (27), and burnout increases as students enter more advanced periods (8,12,25).

Another study confirmed our findings of a higher prevalence of burnout in the introductory clinical cycle (6).

Table 4 - Outcome of the logistic regression analysis for related variables and burnout syndrome in medical students (Aracaju-SE-Brazil, 2009).

Variables	Crude OR	OR IC 95%	Adjusted OR	OR IC 95%	p-value
Total n = 339					
Acquisition of skills					
Yes	1				
No	9.46	4.42 - 20.25	6.47	2.63 - 15.91	0.00005
Feelings about course activities					
Comfortable	1				
Uncomfortable	12.41	4.98 - 30.89	5.76	2.15 - 12.11	0.001
Coursework as a source of pleasure					
Yes	1				
No	6.81	3.24 - 14.32	4.68	1.81 - 15.43	0.001

We believe that this burnout occurs when students begin direct contact with patients because the students experience a time of transition, uncertainty, and greater responsibility.

Using logistic regression analysis, we found that three variables directly related to the education process were strongly associated with Burnout Syndrome. This finding supports the occupational nature of this disorder, which has previously been recognized by health and welfare social institutions (28,29).

Among the variables related to the educational process, students who reported a lack of confidence in their acquisition of the skills necessary to become a doctor may have experienced intense discomfort regarding course activities because they did not feel efficacious. This discomfort may have culminated in feelings of intense displeasure, anxiety, and hopelessness. Thus, students may begin to view academic activities as stressful, often without seeing meaning or gratification in their efforts. Consequently, these students feel less efficacious. In a previous study, lack of skill development and discomfort in relation to course activities were reported to be associated with mental disorders (19).

Regarding socio-demographic variables, Burnout Syndrome was associated primarily with the male sex, a finding that differs from other studies that have associated the female sex with burnout and other psychiatric disorders (26). We found no association with age, unlike some studies that have reported a higher prevalence in younger students (8,25).

As far as personal aspects were concerned, Burnout Syndrome was associated with low expectations of the future. These low expectations may continue among these individuals after graduation, which may worsen stress during their residency and professional life (30).

In this study, students were disappointed by the high volume of activities and school evaluations, which, when combined with the high responsibility inherent in medical education, may have contributed to their feelings of unpreparedness for their future profession and their discomfort in relation to course activities.

Dissatisfaction with coursework and teaching strategies may be related to the traditional medical education model, including a high workload, delayed patient contact, and excessive emphasis on test performance, leading some students to consider dropping out of the program (1,25). We emphasize that a lack of support from the college itself has been strongly related to burnout (29).

There are limitations to our study. The cross-sectional design is a limitation because we could not establish a causal relationship among the associations we identified.

Additionally, although dropout rates and withdrawal from the course at the studied institution were low, the loss of those students who refused to participate in the study or who provided incomplete data requires us to consider the possibility that the most serious cases of burnout may have been among these students. Thus, we may have underestimated of the prevalence of individuals with burnout in this research.

Despite these limitations, we have presented new data suggesting that the mental health of medical professionals may begin deteriorating early in their medical training. Empathy, altruism, and professionalism with patients may also decrease after this time (13,31).

These results indicate the need for psychological support for students and for longitudinal studies on this topic in our institution and in other institutions with similar profiles.

The prevalence of Burnout Syndrome among medical students in our institution, based on tri-dimensional diagnosis criteria, was significant. If we had used bi-dimensional diagnosis criteria, the prevalence would have been significantly larger.

We demonstrated that the majority of participants showed high levels of emotional exhaustion, cynicism and professional efficacy (rather than low professional efficacy). This finding suggests that if preventive measures are not adopted, a progression of symptoms may occur and precipitate low professional efficacy (the last dimension), consequently completing the triad characteristic of burnout syndrome and increasing its prevalence in the studied population.

In the final logistic regression analysis, potential associations were verified between the three variables related to the educational process (lack of confidence in acquisition of skills, feeling uncomfortable in academic activities and not seeing coursework as a source of pleasure). All other variables related to this process (dissatisfaction with career choice, thoughts about dropping out of the course, dissatisfaction with teaching strategies) showed associations with Burnout Syndrome in the bivariate analysis, corroborating the hypothesis that this disorder has its greatest influence in the occupational sphere.

Because our study had a cross-sectional design, we could not establish causal relationships between the associations we observed. Therefore, longitudinal studies are necessary to establish which variables show true causal relationships with Burnout Syndrome in this population. In addition, there has been no standardization of the MBI-SS questionnaire diagnostic criteria in other studies. This lack of standardization, combined with the differences inherent in the infrastructure and medical course models in different

countries, make it difficult to translate these results into other contexts.

AUTHOR CONTRIBUTIONS

Costa EFO was responsible for the conception and design of the manuscript, the acquisition, analysis and interpretation of data, and writing and reviewing the draft of the manuscript. Santos SA was responsible for the acquisition, analysis and interpretation of data and writing and reviewing the draft of the manuscript. Santos ATRA was responsible for the analysis and interpretation of data and for writing and reviewing the draft of the manuscript. Melo EV was responsible for the analysis and interpretation of data and for writing and reviewing the draft of the manuscript. Andrade TM was responsible for the conception and design of the paper, the analysis and interpretation of data, and for writing and reviewing the draft of the manuscript. All authors approved the final version of the manuscript.

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