Original Research Article

MENTAL HEALTH AND QUALITY SLEEP AMONG BRAZILIAN MEDICAL STUDENTS DURING COVID-19 PANDEMIC: PREVALENCE AND ASSOCIATED FACTORS

ABSTRACT

Aims: Due the pandemic of the new coronavirus (COVID-19), stricter measures to limit unessential interactions were adopted, including the suspension of classroom lessons and the implementation of the distance learning regime. As these restrictions change lifestyles, this study aimed to assess the impacts of social distancing on mental health and sleep quality in medical students during the COVID-19 pandemic.
Study design: Cross-sectional study.
Place and Duration of Study: Medical school in Goiânia, Goiás, Brazil.Data collection took place from June 1 to July 1, 2020.
Methodology: This study used self-administered questionnaires answered by students from a Public University in Brazil. The collection instrument consisted of four parts: socioeconomic variables, self-perception of health, Self-Report Questionnaire (SRQ-20), and Pittsburgh Sleep Quality Index (PSQI).
Results: Of the 210 participants, 138 students (65.7%) had scores suggestive of mental distress by the SRQ-20; women had a higher risk when compared to men (women 67.7% vs. men 49%, $p < .001$). 186 students (88.6%) had poor sleep quality according to the PSQI; women also had higher sleep disturbance (women 1.26 ± 0.06 vs. men 1.35 ± 0.04, $p < .05$). Mental distress measures were positively correlated with sleep quality ($r = 0.611$, $p < .001$).
Conclusion: The strict preventive measures, and the radical changes in the lifestyle of medical students had a negative impact on the quality of their sleep and mental state. The students showed high levels of mental distress and poor sleep quality, and women appear to be an important risk factor. Implementation of interventions for well-being in pandemic condition by universities, and special focus to the most affected groups (such as women), should be stimulated.

Keywords: Coronavirus, Medicine, Quarantine, PSQI, SRQ-20.

1. INTRODUCTION

Coronavirus Disease 19 (COVID-19) pandemic, caused by the new coronavirus related to the severe acute respiratory syndrome (SARS-CoV-2), has resulted in an ongoing global public health crisis [1]. First detected in Wuhan, China, in December 2019, the World Health Organization declared the COVID-19 outbreak a public health emergency of international concern on January 30, 2020, and officially characterized it as a pandemic on March 11, 2020 [2].

SARS-CoV-2 is highly transmissible, spreading primarily through direct contact or respiratory droplets from an infected individual [1]. Common symptoms include a runny nose, cough, sore throat, body aches, nausea, vomiting, diarrhea, fever, and breathing difficulties [3]. To contain further spread and prevent healthcare system collapse, many governments implemented stringent measures such as social distancing, movement

restrictions, curfews, mask mandates, contact tracing, virus detection tests, and quarantine [4]. On 15th March 2020, Brazil declared a strict nationwide quarantine.

While these measures limited non-essential interactions, movement, and work activities to control disease transmission, they also increased risk factors for non-communicable diseases [5]. These restrictions significantly altered lifestyles and social relationship, leading to increased psychological distress and mental health issues, including sadness, fear, anger, anxiety, depression, and sleep disorders [6].

University students, particularly medical students, were significantly affected by these measures. Most universities worldwide suspended face-to-face learning, transitioning to remote classes and exams [7]. For medical students, clinical practice and laboratory exercises were paused, causing major disruptions in their education and daily life [8].

Medical students are particularly vulnerable to poor mental well-being and sleep quality, experiencing higher rates of mental illness and psychological distress compared to the general student population [9-11]. Contributing factors include adjustment to the medical school environment, ethical conflicts, and exposure to death, human suffering [12, 13].

Studies examining the impact of COVID-19 on the quality of life of the Brazilian population remain scarce. Therefore, this study aimed to assess mental health distress and sleep quality among medical students at a public University in Goiás, Brazil, and to identify sociodemographic variables associated with psychological distress.

2. MATERIAL AND METHODS

2.1 – Study Design and Participants

This cross-sectional study aimed to evaluate the mental health and sleep quality among medical student during the COVID-19 pandemic and identify associated factors.

The participants were undergraduate students enrolled at a medical school in Goiânia, Goiás, Brazil. In Brazil, medical school consists of 12 periods (semesters), classified as follows: from the 1st to the 4th (Basic Course) and from the 5th semester onwards (Professional Cycle). All students from the first to the fourth year who were 18 years or older were invited to participate. The students were contacted via their mobile numbers due to the strict social distancing measures during the COVID-19 pandemic. Informed consent and the questionnaires were provided online through the Google Forms platform and could be accessed via a link sent to all participants. The students first accessed the informed consent form on the initial screen of the electronic questionnaire and could only proceed after consenting. The questionnaires were available only in Portuguese. Participation was entirely voluntary, with no incentives provided, and individuals were not identifiable in the research.

The COVID-19 pandemic was officially declared in Brazil on 15th March of 2020; the campus was closed, and most of the curriculum was offered remotely. Data collection took place from June 1 to July 1, 2020, immediately after the first wave of COVID-19 pandemic in Brazil.

The sample size calculation was based on the population of approximately 480 students enrolled from the first to the fourth year. With a margin of error of 5% and a confidence interval of 95%, it was determined that 218 volunteers needed to be interviewed.

The experimental protocol was approved by the National Research Ethics Commission of Brazil Platform (CAAE 32563220.0.0000.0008).

2.2 – Data collection and questionnaires

The participants answered four questionnaires: sociodemographic information, self-perception of health (SPH), the self-reporting questionnaire (SRQ-20), and the Pittsburgh sleep quality index (PSQI).

Sociodemographic information. Adapted from the Brazilian Institute of Geography and Statistics, this section included questions about gender, age, skin color,religion,marital status, family income, academic level, and housing information.

Self-perception of health (SPH). Developed by the researchers, this questionnaire asked students to assess their own health, report any pre-existing disease or disorders that impair their well-being, and indicate if they were currently receiving treatments or support for a mental health concern.

Self-reporting questionnaire (SRQ-20). Mental distress was evaluated using the Brazilian validated version of SRQ-20 [14], a questionnaire developed by the World Health Organization to investigate non-psychotic psychiatric disorders. Originally, SRQ was constructed to screen psychotic (4 items) and non-psychotic (20 items) disorders; because of the low sensitivity and unreliability of the 4 psychotic items, the 20 items are widely used in epidemiologic studies, hence referred as SRQ-20 [15]. SRQ-20 aims to evaluate symptoms and screens for common mental disorders. It comprises 20 items evaluating depressive/anxious and somatic symptoms, reduced vital energy, and depressive thoughts over the past month. The possible answers are 'yes/no', with each affirmative answer equating to one point in the final score. The cut-off point for significant symptom severity are ≥ 8 for women and ≥ 6 for men [14].

Pittsburgh Sleep Quality Index (PSQI). Sleep quality was assessed using the PSQI, a self-administered questionnaire evaluating sleep quality over the past month. It includes 24 items grouped into 7 components: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction. Each component is scored from 0 to 3, with a total score ranging from 0 to 21 points. The lower the score, the better the quality of sleep. A score > 5 indicates poor sleep quality [16]. The Brazilian validated version of PSQI was used in this study [17].

A pilot study with a small numerous of students was previously conducted to assess the reliability and validity of the questionnaires, especially the first two which are not officially standardized. The construction and content aspects were validated by a healthcare professional, while clarity was assessed with students. Participants were invited to participate voluntarily and provide feedback on the clarity, readability, and comprehensibility of the questionnaire. Feedback was analyzed, and a finalized version was created. Participants reported that the questionnaire were clear and easy to complete. Data from the pilot study were not included in the current study.

2.3 – Statistical analysis

Variables were created for each questionnaire based on the total score: presence (MD+) or absence (MD-) of mental distress (SRQ-20), and good (SQ+) and poor (SQ-) sleep quality (PSQI), according to the specified cut-off points. Initially, a descriptive analysis of the population was performed according to the variables (sleep quality and mental distress, sociodemographic variables, and self-perception of health). Categorical variables were represented by their absolute frequencies and percentages. Responses scores for the SRQ-20 and PSQI are reported as mean ± standard errors of the mean. To evaluate the outcome variable (presence or absence of mental distress or good or poor sleep quality) and possible exposures (presence or absence of each predictive factor), the Chi-square test was used. Pearson's correlation analysis was used to establish the relationship between PSQI and SRQ-20 scores. Comparisons between sociodemographic characteristics (between sexes and need for mental health support) and scores on the SRQ-20 and PSQI were made using the two-tailed Student's t-test. The significance level was set at $P < .05$.

3. RESULTS AND DISCUSSION

The present study evaluated the effects of COVID-19 pandemic restrictive measures on sleep quality and mental health among university medical students. Additionally,

demographic and socioeconomic variables, and perceived stress related to school and the COVID-19 pandemic were assessed to identify potential influencing factors.

A total of 210 undergraduate students participated in the study, with a uniform distribution across different periods of their medical education. The participants were predominantly women (76.7%) and men comprised 23.3%. The ages ranged from 18 to 60 years, with the majority (73.4%) aged between 20 to 25 years. Most participants were single (91.4%), identified as Catholic (41.4%), had a normal body mass index (67.7%), and identified their skin color as white (72.4%). Regarding living conditions, most reported a family income between 4 and 10 minimum wages (34.3%), lived with their family (83.3%), and belonged to a family group of 3 to 5 people (78.1%). A majority (57.6%) claimed to be in good health and had not sought support or treatment for mental disorders (69.1%) (Table 1).

Our findings provide new evidence that the Brazilian lockdown significantly impacted both sleep and psycho-emotional well-being among medical students.

In the assessment of mental health, 133 out of the 210 students (63.3%) had scores suggesting mental distress according to the SRQ-20 questionnaire. A significant difference was observed in relation to gender, with women showing higher mental distress scores compared to men (women: 9.87 ± 0.37 vs. men: 5.98 ± 0.62; *P*< .001). The proportion of women experiencing mental distress was 67.7%, compared to 49% among men (*P*< .001). As expected, mental distress was higher among those who reported poor health in the SPH questionnaire (*P*< .001). Additionally, students receiving treatments or support for mental health concerns had higher distress scores, with 86.1% of them showing mental distress compared to 56.1% of those not receiving any treatment (*P*< .001) (Table 1).

The PSQI questionnaire revealed that 186 out of the 210 students (88.6%) had poor sleep quality. No significant differences were found between the sociodemographic variables evaluated (Table 1).

Table 1. Distribution of students according to demographic and socioeconomic variables, and prevalence of mental distress and poor sleep quality

VARIABLE	N (210)	%	% MD+	*P*	% SQ-	*P*
Gender						
Men	49	23.3	49.0	< 0.001	91.8	0.57
Women	161	76.7	67.7		87.6	
Age (years)						
< 19	24	11.4	54.2	0.13	79.2	0.28
20-22	80	38.1	71.2		87.5	
23-25	74	35.3	68.9		93.2	
> 26	32	15.2	53.1		87.5	
Course period						
1º	12	5.7	83.3	0.64	91.7	0.58
2º	20	9.5	70.0		80.0	
3º	25	11.9	60.0		84.0	
4º	30	14.3	63.3		93.3	
5º	33	15.7	75.8		97.0	
6º	27	12.9	55.6		88.9	
7º	32	15.2	62.5		88.9	
8º	31	14.8	64.5		87.1	
Body mass index						

Underweight (< 18.5)	7	3.3	85.7	0.46	87.5	0.68
Normal (18.5-24.9)	142	67.7	63.4		87.2	
Overweight (25.0-29.9)	53	25.2	67.9		90.6	
Obese (> 30.0)	8	3.8	75.0		100.0	
Ethnicity						
White	152	72.4	65.8		87.5	
Brown	52	24.8	69.2		92.3	
Black	3	1.4	33.3	0.46	66.7	0.61
Yellow	2	0.9	0.0		100.0	
Indigenous	1	0.5	100.0		100.0	
Religion						
Catholic	87	41.4	63.2		86.2	
Evangelical	50	23.8	74.0		84.0	
Sspiritist	25	11.9	64.0	0.47	88.0	0.13
No religion	43	20.5	65.1		100.0	
Other	5	2.4	40.0		80.0	
Marital status						
Single	192	91.4	67.7		88.5	
Maried	15	7.1	53.3	0.03	86.7	0.93
Other	3	1.5	0.0		100.0	
Family income						
< 2 minimum wages	4	1.9	50.0		100.0	
2-4 minimum wages	20	9.5	70.0		95.0	
4-10 minimum wages	72	34.3	70.8	0.72	87.5	0.71
10-20 minimum wages	68	32.4	63.2		89.7	
> 20 minimum wages	46	21.9	60.9		84.8	
Living condition						
With family members	175	83.3	66.3		90.3	
Friends	3	1.4	66.7	0.92	81.3	0.16
Alone	32	15.3	62.5		66.7	
Number of people in the residence						
I live alone	8	3.8	87.5		100.0	
< 2 people	34	16.2	61.8	0.55	88.2	0.65
3-5 people	164	78,1	65.2		87.8	
> 5 people	4	1.9	75.0		100.0	
Health self-perception						
Too bad	2	0.9	100.0		100.0	
Bad	3	1.4	100.0		100.0	
Regular	43	20.6	81.4	< 0.001	90.7	0.70
Good	121	57.6	66.9		89.3	
Very good	41	19.5	41.5		82.9	
Treatment/support for a mental health concern						
Yes	65	30.9	86.1	< 0.001	93.8	0.17

No	145	69.1	56.5	86.2

Although the overall PSQI scores did not differ between men and women, gender was significantly associated with mental health as assessed by the SRQ-20. Therefore, PSQI component scores were also compared between genders (Table 2). Differences were found only in sleep disturbances, with women reporting greater sleep disturbances compared to men (women: 1.35 ± 0.04 vs. men: 1.26 ± 0.06; *P*< .05).

Table 2. Comparative scores obtained for each component of the PSQI between men and women students

PSQI	MALE (n = 49)	FEMALE (n = 161)	*P*
Sleep quality	1.33 ± 0.12	1.44 ± 0.06	0.39
Sleep latency	1,55 ± 0.14	1.55 ± 0.07	0.55
Sleep duration	1.06 ± 0.16	1.14 ± 0.09	0.55
Sleep efficiency	2.43 ± 0.16	2.20 ± 0.10	0.41
Sleep disturbances	1.26 ± 0.06	1.35 ± 0.04	<0.05
Sleeping medications	0.45 ± 0.13	0.37 ± 0.07	0.72
Daytime dysfuncion	1.53 ± 0.11	1.61 ± 0.06	0.10
Global score	9.17 ± 0.49	9.32 ± 0.24	0.24

A significant positive correlation was found between the PSQI and SRQ-20 scores (r = 0.611, *P*< .001) (Figure 1).

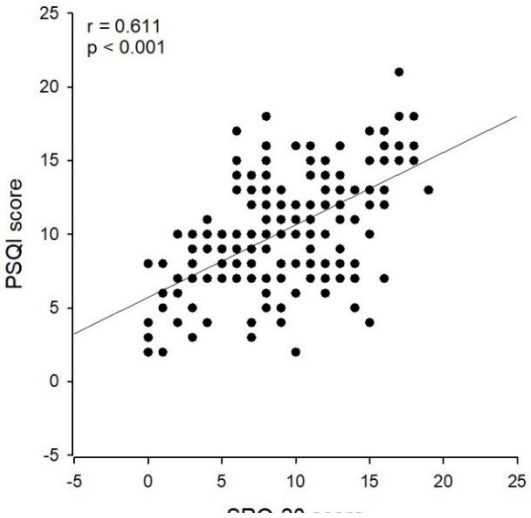

Figure 1. The relationship between sleep quality (PSQI scores) and mental distress (SRQ-20 scores)

In summary, the prevalence of common mental disorders reached 63% of students, while poor sleep quality affected nearly 90% of them, with a greater impact observed in female students compared to males.

Common mental disorders, as evaluated by the SRQ-20, include minor psychiatric disorders such as anxiety, depressive, and somatoform disorders, characterized by symptoms like insomnia, fatigue, irritability, forgetfulness, difficulty concentrating, and

somatic issues [14]. Previous studies using the same questionnaire estimated the prevalence of common mental disorders in the Brazilian population to be between 22% and 35% [18-21]; however, our results showed a prevalence of 63% among medical students, exceeding the national average.

The medicine course itself appears to be a significant risk factor for developing mental disorders, with prevalence rates higher than the national average [9, 10, 22]. This higher prevalence is also observed when comparing medical students to those in other health-related fields, such as dentistry, nursing, and physical education [23]. The stressful situations to which medical students are exposed during their course may contribute to the higher prevalence of mental distress among them [9, 10, 22]. Consequently, it is expected that the current pandemic would exacerbate their mental health issues, given the direct exposure of medical students to changes in health care systems during the COVID-19 pandemic.

A key limitation of our study is the absence of pre-pandemic records for comparison. However, we observed that the prevalence of mental distress is significantly higher compared to previous studies that used the same SRQ-20 among medical students before the pandemic, where the prevalence ranged between 34 and 45% [23-25]. The COVID-19 pandemic has heightened the prevalence of mental disorders in the general population, with factors such as decreased social interactions, income reduction, economic stress, the threat of contracting the virus, and uncertainty about the future contributing to increased stress, depression, and anxiety. These factors, coupled with social distancing and confinement, have intensified these symptoms [5, 6, 26, 27]. Considering that medical students already represent a higher risk group for mental disorders, these factors strengthen the hypothesis that social isolation during the pandemic has been crucial in increasing mental disorders cases among these students.

Female students in our study exhibited higher SRQ-20 scores than their male counterparts, with 68% of women affected compared to 49% of the men. Extensive literature indicates that women generally have higher rates of stress and mental disorders, both in the general population and among medical students [28-35]. Traditional gender roles may lead to differences in how attitudes and emotions towards life experiences are expressed, with women more likely to report higher levels of anxiety and being more affected by traumatic events [28-30]. Additionality, sex hormones may play a role in the higher prevalence of depression, anxiety stress-related disorders among women [36, 37]. It is also plausible that the SRQ-20 measures symptoms more commonly experienced by women, leading to higher scores among them. Using a scale more focused on men's health issues might reveal different patterns [38].

Sleep is a crucial mechanism for regulating and recovering biological and cognitive functions. Poor sleep quality or lack of sleep affects the quality of life at any age, negatively impacting cognitive performance, mood, memory, concentration, learning, logical reasoning, and creativity [39]. This underscores the importance of assessing the sleep quality among university students, especially during the stressful situation of the COVID-19 pandemic [40].

Our study found that 88.6% of students had poor sleep quality, with a mean PSQI global score of 9.245. These findings align with a previous study conducted with medical students in Saudi Arabia, where 85.5% reported poor sleep quality with a mean PSQI score of 8.356 [41]. In 2012, another study in the same college found that only 36.3% of students had poor sleep quality, highlighting a significant increase during the pandemic [41, 42]. This alarming trend emphasizes the severe impact of the pandemic on sleep quality among medical students, who were already vulnerable to poor sleep quality compared to general population [43-46]. Similar studies using PSQI questionnaire to evaluate sleep quality found a prevalence between 44% and 72% to poor quality sleep among undergraduate medical students [47-51].

Several studies have cited reasons for the high prevalence of sleep disorders during the pandemic period, beyond psychological stress. These include adjustment to modified

teaching-learning formats, loss of social connectedness, increased smartphone and social media use close to bedtime, and circadian misalignment [48, 52-54]. Studies have shown that insomnia prevalence increased significantly during the lockdown, with university students reporting longer sleep times and more time in bed [53, 55-58]. Factors such as online lessons and the elimination of commuting times to clinical, university, and hospitals, may have allowed for more flexible schedules and additional sleep time [55, 57, 58].

In summary, sleep disturbances among university students present an alarming trend with significant consequences on their mental health. Our results showed a significant correlation between sleep quality and common mental disorders, reinforcing the relationship between sleep and emotions well-being [47, 59-62].

Women, in addition to having a higher prevalence of common mental disorders, also reported more sleep disturbances, consistent with literature findings that female students are more likely to be poor sleepers compared to their men counterparts [33, 50, 63-66]. Studies conducted in the general population also report that sleep problems are more common in women [67, 68].

Usually, self-assessing and reporting health problems are more frequent among females than males; therefore, they use health services more often; thus, this result confirms information of a recent study that points to this population as one of the most affected by these conditions during the pandemic [63]. These findings highlight the need for sleep awareness programs with gender-specific approaches.

Still in this regard, interesting results were found by Fowler and colleagues (2022); before the stay-at-home order, women reported significantly lower sleep quality than men, but post-order, men reported significantly worse sleep quality, reaching levels similar to women [48].

It is important to acknowledge the limitations of this study. First, the cross-sectional design limits our ability to establish causal relationships between sleep quality and mental health issues. Longitudinal data are needed to better define these relationships throughout the pandemic. Second, our data relied on subjective self-reported information without clinical or instrumental examinations, which may introduce recall bias. Future research should include objective measures of sleep and structured interviews to investigate mental health problems for confirmation of our findings. Lastly, data collection occurred during the pandemic, preventing inferences about post-pandemic associations.

4. CONCLUSION

In conclusion, this study has provided insights into the impact of COVID-19 on medical students' well-being and provided an opportunity to address their concerns. The strict preventive measures, and the radical changes in the lifestyle of medical students due COVID-19 pandemic had a negative impact on the quality of their sleep and on their mental state. Medical students showed alarming levels of poor sleep quality and psychiatric disorders during the COVID-19 pandemic, with women being more affected than men. The findings could be helpful in designing appropriate implementation of some interventions for well-being in pandemic condition, and a special focus must be given to the most affected groups (such as female students).

CONSENT

All authors declare that online informed consent was obtained from the voluntaries.The students first accessed the informed consent form on the initial screen of the electronic questionnaire and could only proceed after consenting.A copy of informed consent is available for review by the Editorial Board members of this journal.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.All experimental procedures received approval from the National Research Ethics Commission of Brazil Platform (CAAE 32563220.0.0000.0008).

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