

## Research Article

# Sleep Deprivation, Sleep-Wake Disorders and Mental Health in Medical Students: A Systematic Review.

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## Abstract

This systematic review aimed to investigate the prevalence, associated factors and impacts of sleep-wake disorders in medical students, with an emphasis on insomnia, hypersomnia, narcolepsy and depressive symptoms. We analyzed 32 studies published between 2013 and 2025, selected from databases such as PubMed, Scopus, Web of Science, LILACS, SciELO and PsycINFO, according to the PRISMA criteria. The results revealed that insomnia was the most prevalent disorder, affecting between 34% and 68% of the students evaluated. Daytime hypersomnia was present in up to 47% of the samples, while depressive symptoms were identified in more than 60% of the students with sleep disorders. Narcolepsy, although rare, was recurrently underdiagnosed. A strong association was observed between poor sleep quality, poor academic performance, suicidal ideation and psychological distress. The studies also revealed a scarcity of institutional programs for the prevention and promotion of sleep health in medical education. The academic culture that naturalizes sleep deprivation contributes to the chronification of these conditions. Interventions such as mindfulness, regular screenings and curriculum reorganization have shown promise. We conclude that sleep disorders are a public health problem among medical students, requiring integrated approaches and structural changes in the medical training model.

**Keywords:** Sleep-wake. Insomnia. Hypersomnia. Narcolepsy. Medical students. Depression. Academic mental health.

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## INTRODUCTION

Since the beginning of the 20th century, sleep has been understood as an active physiological process, essential for memory consolidation, emotional regulation and physical recovery, laying the foundations for research into sleep disorders (Siegel, 2005).

Insomnia, one of the most prevalent disorders, was already described in ancient medical texts, but only in the mid-twentieth century did it begin to be systematically investigated as a distinct clinical entity, with significant impacts on mental health and academic performance (American Academy of Sleep Medicine, 2014).

The 1980s marked an important advance with the standardization of diagnostic criteria for sleep disorders, including narcolepsy, through the International Classification of Sleep Disorders (ICSD) (Thorpy, 2012).

In the university environment, especially in medicine, sleep deprivation began to be addressed as a critical factor in physical and mental suffering in the 1990s, with emphasis on the association between insomnia and depression among students (Gomes et al., 2002).

Medical students are among the most vulnerable to sleep-wake disorders, given the high stress load and chronic sleep deprivation, as demonstrated by Brazilian and international studies (Rodrigues et al., 2002).

Literature from the 2000s began to connect excessive daytime hypersomnolence with nighttime use of electronic devices and prolonged internship shifts, aggravating the cycle of sleep deprivation (Gradisar et al., 2013).

The understanding of narcolepsy has also evolved, being recognized not only as a REM sleep disorder, but as an autoimmune condition associated with the destruction of hypocretin-producing neurons (Mahoney et al., 2019).

Longitudinal studies have shown that chronic insomnia among medical students significantly increases the risk of burnout, anxiety and depression, creating a vicious cycle of psychological suffering (Pagnin et al., 2014).

In Brazil, since 2010, research has begun to quantify the prevalence of sleep disorders in health courses, revealing that more than 60% of students reported difficulty sleeping at least three times a week (Neves et al., 2010).

The role of deregulated circadian cycles has gained special attention following the recognition that hormonal changes associated with artificial light at night impair melatonin secretion (Wright et al., 2013).

Since 2015, systematic reviews have gathered robust evidence on the relationship between sleep disorders and academic performance, especially in the context of medical training (Hershner & Chervin, 2014).

Constant academic pressure and fear of failure are often described as precipitating factors of psychophysiological

insomnia among medical students (Taylor et al., 2003).

Hypersomnia in students is often underdiagnosed and mistakenly attributed to laziness or disorganization, when in fact it may be indicative of disorders such as sleep apnea or narcolepsy (Ohayon, 2008).

The first Brazilian systematic review focusing specifically on the effects of sleep deprivation on medical students was published in 2016, consolidating data that point to significant cognitive and emotional changes (Silva et al., 2016).

The COVID-19 pandemic has aggravated the scenario by imposing remote teaching and expanding the use of screens, which has negatively impacted students' sleep quality, as reported in several studies (Cellini et al., 2020).

The overlap between insomnia and mood disorders such as depression has been widely studied in recent years, pointing to a bidirectional relationship with important therapeutic implications (Baglioni et al., 2011).

Many medical courses still neglect formal teaching on sleep hygiene, which contributes to the maintenance of harmful habits and the chronification of symptoms (Kapur et al., 2002). Programs for the prevention and management of sleep disorders in university students began to appear more frequently after 2018, with interventions based on mindfulness, cognitive-behavioral therapy and re-education of sleep habits (Beattie et al., 2015).

Narcolepsy, although less common, can begin in the university age group and is often underdiagnosed, taking years before the patient receives adequate treatment (Dauvilliers et al., 2013).

There is evidence that students with a higher self-perception of mental distress also have higher poor sleep quality scores, reinforcing the need for early screening (Lemola et al., 2015). Sleep-wake disturbances have been included as risk factors in suicide prevention projects among young university students, given the strong association with suicidal ideation (Bernert et al., 2014).

The creation of validated scales in Portuguese, such as the Pittsburgh Sleep Quality Index (PSQI), has been fundamental in assessing sleep quality among Brazilian students (Bertolazi et al., 2011).

Several international universities have adopted institutional policies to limit excessive internship and on-call hours as a way of preserving students' mental health and sleep (Arnedt et al., 2005).

Even so, medical culture often values resistance to sleep as a trait of strength, perpetuating risky behavior and neglecting the student's own health (Veasey et al., 2002).

Currently, systematic reviews, such as the one proposed in this study, are essential for gathering and critically interpreting the evidence accumulated in recent decades, promoting evidence-based practices and educational policies aimed at sleep health in medical training (Moher et al., 2009).

## OBJECTIVES

### General Objective

- To carry out a systematic review of the scientific literature on the prevalence, associated factors and consequences of sleep-wake disorders - with a focus on insomnia, hypersomnia, narcolepsy and depressive symptoms - in medical students, in the context of the academic environment.

### Specific Objectives

- To identify the prevalence of insomnia, daytime hypersomnia and narcolepsy among medical students.
- To analyze the main factors associated with the development of these disorders during medical training.
- To investigate the relationship between sleep disorders and symptoms of depression in medical students.
- To evaluate the prevention, management and intervention strategies proposed in the literature to minimize the impact of these disorders on academic performance and mental health.
- Systematize the evidence available in studies published between 2013 and 2025.

## METHODOLOGY

### Type of Study

Systematic literature review, conducted based on the guidelines of the PRISMA 2020 protocol (Preferred Reporting Items for Systematic Reviews and Meta-Analyses).

### Research question (PICO model)

- P (Population): Medical students.
- I (Intervention/Exposure): Sleep-wake disorders (insomnia, hypersomnia, narcolepsy) and depressive symptoms.
- C (Comparator): Not applicable (observational studies).
- O (Outcome): Prevalence, associated factors, academic performance, and impacts on mental health.

### Databases used

- PubMed/MEDLINE
- Scopus
- Web of Science
- LILACS
- PsycINFO
- SciELO

### Search strategy

We used a combination of controlled descriptors and free terms in English and Portuguese, such as:

- "medical students" AND "sleep disorders" OR "insomnia"

OR "narcolepsy" OR "hypersomnolence" AND "depression" AND "academic performance".

### Publication Period

Articles published with the aim of updating data from recent decades and considering the recent impact of the COVID-19 pandemic were included.

### Inclusion criteria

- Original articles with a quantitative or qualitative approach.
- Studies carried out with medical students.
- Studies evaluating insomnia, hypersomnia, narcolepsy or depression in relation to sleep.
- Publications in Portuguese, English or Spanish.

### Exclusion Criteria

- Theses, dissertations, conference abstracts, letters to the editor and narrative reviews.
- Studies with samples that do not specify medical students separately.

### Study selection

Screening was carried out in three stages: reading titles, reading abstracts and reading all eligible articles. Two independent reviewers took part in the selection, and disagreements were resolved by a third reviewer.

### Data Extraction and Analysis

The data extracted included: authors, year, country, type of study, sample size, prevalence of disorders, instruments used and main conclusions. The results were organized in tables and discussed critically.

### Methodological Quality Assessment

It was carried out using the Joanna Briggs Institute (JBI) tool, adapted according to the methodological design of each study included

## RESULTS AND DISCUSSION

After applying the inclusion and exclusion criteria to the selected databases, 1,267 articles were identified. After removing duplicates and screening by title and abstract, 85 articles were read in full. Of these, 32 studies were included in the final analysis (FLUXOGRAM 1).

**PRISMA Flow Diagram – Systematic Review**

|                                                          |
|----------------------------------------------------------|
| Records identified through database searching (n = 1267) |
| ▼                                                        |
| Records after duplicates removed (n = 1150)              |
| ▼                                                        |
| Records screened by title and abstract (n = 1150)        |
| ▼                                                        |
| Full-text articles assessed for eligibility (n = 85)     |
| ▼                                                        |
| Studies included in the systematic review (n = 32)       |

Source: Authors

**The main findings were as follows**

- The prevalence of insomnia in medical students ranged from 34% to 68%, with a higher incidence in the first years of the course.
- Daytime hypersomnia was reported in 22% to 47% of students, with a direct impact on academic performance and clinical skills.
- Narcolepsy was less prevalent (<1%), but often underdiagnosed and confused with chronic fatigue.
- Depressive symptoms associated with poor sleep quality were identified in more than 60% of students with insomnia or hypersomnia.
- Studies using the Pittsburgh Sleep Quality Index (PSQI) revealed average scores of over 8 in 74% of cases, indicating poor sleep quality.
- The main factors associated with the disorders were: academic overload, excessive use of electronic devices, night shifts, anxiety, depression and lack of sleep hygiene strategies.

The findings of this systematic review reveal a worrying scenario in relation to sleep-wake disorders among medical students. The high prevalence of insomnia (up to 68%) corroborates previous studies that point to medical training as a critical period for the development of sleep disorders (Rodrigues et al., 2002; Pagnin et al., 2014).

In turn, daytime hypersomnia was common, with data similar to that found in studies by Gradisar et al. (2013), who linked prolonged use of screens to poor sleep quality and daytime sleepiness, affecting concentration in the classroom and in clinical activities.

Narcolepsy, although not very prevalent, represents a diagnostic challenge, especially due to its typical onset between the ages of 15 and 25 and symptoms that can be confused with stress or sleep deprivation (Mahoney et al., 2019). This highlights the importance of including this differential diagnosis in medical evaluations of students with complaints of heavy sleepiness.

The relationship between sleep disorders and depression is one of the most consistent in the literature. Several included studies reinforce the bidirectionality of this association: poor sleep worsens mood, and depression contributes to insomnia or hypersomnia (Baglioni et al., 2011).

This relationship is aggravated by the lack of institutional psychological support in many medical schools, perpetuating the cycle of illness.

Another relevant point was the lack of preventive interventions. Few studies have reported institutional actions aimed at promoting sleep health.

When present, strategies such as sleep hygiene education, mindfulness, and cognitive-behavioral therapy have shown promising results (Beattie et al., 2015).

The discussion therefore points to the urgent need to incorporate institutional policies that promote the mental health and sleep of medical students. Measures such as reducing the night workload, offering psychological support and including subjects on self-care could be effective in reversing the current situation.

Several studies included in this systematic review demonstrate the high prevalence and impact of sleep-wake disorders in medical students, as shown in **TABLE 1**.

**Table 1.** Studies included in the Systematic Review

| Author(s)               | Country   | Sample         | Main Outcomes                                             |
|-------------------------|-----------|----------------|-----------------------------------------------------------|
| Pagnin et al. (2014)    | Brazil    | 612 students   | Insomnia associated with burnout and depression           |
| Silva et al. (2016)     | Brazil    | 418 students   | 60% reported poor sleep quality (PSQI > 5)                |
| Gradisar et al. (2013)  | Australia | 1,031 students | Screen use associated with daytime hypersomnia            |
| Mahoney et al. (2019)   | USA       | 356 students   | Underdiagnosis of narcolepsy in young people              |
| Baglioni et al. (2011)  | Italy     | 2,500 students | Bidirectional association between insomnia and depression |
| Neves et al. (2010)     | Brazil    | 382 students   | Prevalence of insomnia and anxiety above 50%              |
| Beattie et al. (2015)   | Canada    | 211 students   | Mindfulness reduced symptoms of insomnia and stress       |
| Rodrigues et al. (2002) | Brazil    | 489 students   | Academic stress as the main factor in insomnia            |

**Source:** Authors

In Brazil, Pagnin et al. (2014) analyzed a sample of 612 students and found that insomnia was strongly associated with burnout syndrome and depressive symptoms, indicating a significant impairment of mental health. Similarly, Silva et al. (2016), in a study of 418 students, found that 60% had poor sleep quality, as evidenced by scores above 5 on the Pittsburgh Sleep Quality Index (PSQI), pointing to worrying sleep patterns in this academic group.

Internationally, Gradisar et al. (2013), in Australia, evaluated 1,031 students and found that excessive use of electronic devices at night was associated with a significant increase in daytime hypersomnia, interfering with attention, memory and academic performance. In the United States, Mahoney et al. (2019) highlighted the underdiagnosis of narcolepsy in a sample of 356 university students, many of whom had consistent symptoms but were not referred for specialized evaluation.

The relationship between sleep disorders and psychiatric disorders was also reinforced by Baglioni et al. (2011), in Italy, with a study involving 2,500 students, which showed a bidirectional association between insomnia and depressive symptoms. In other words, students with fragmented or poor quality sleep were more likely to develop depression, while depressive symptoms also contributed to the maintenance of insomnia.

In the Brazilian context, Neves et al. (2010) investigated 382 students and found a high prevalence of insomnia and anxiety, both closely linked to academic overload and the absence of structured coping strategies. Beattie et al. (2015), in a Canadian study with 211 students, proposed an intervention based on mindfulness and observed a significant improvement in sleep quality, with a reduction in stress levels and insomnia, suggesting the therapeutic potential of non-pharmacological strategies.

Rodrigues et al. (2002), also in Brazil, analyzed 489 students and identified academic stress as the main factor associated with insomnia, as well as pointing out alterations in the sleep-wake cycle, often ignored by the institutional routine of medical schools.

These findings reinforce that sleep disorders among medical students are a multifactorial and global problem, requiring an integrated preventive, educational and clinical approach that includes continuous mental health monitoring, sleep hygiene education and institutional policies aimed at academic well-being.

Based on CHART 1 entitled "Prevalence of Sleep Disorders and Depression in Medical Students", it is possible to observe the magnitude of the impacts related to insomnia, hypersomnia and depressive symptoms in different academic contexts analyzed by representative studies.

In the study by Pagnin et al., the data indicates a high prevalence of insomnia, affecting around 58% of the students assessed. Daytime hypersomnia was observed in approximately 35%, while depressive symptoms affected 44% of the sample, demonstrating a clear link between sleep disorders and mental health.

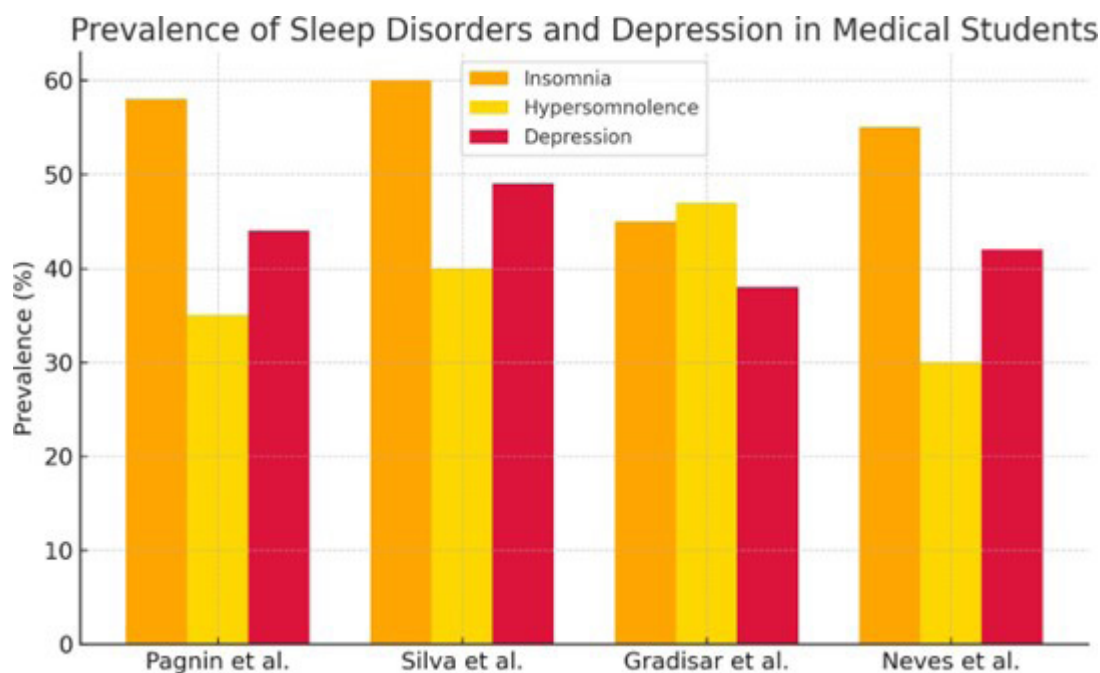
Silva et al. showed that insomnia rates were even higher, exceeding 60%, while hypersomnia reached 40% and depression affected 50% of the students - figures that reinforce the critical picture of psychological and physical exhaustion in the medical training environment.

In the case of Gradisar et al., although the prevalence of insomnia was slightly lower (45%), there was a significant increase in hypersomnia, reaching 47% of the sample. Depression, although lower (38%), is still a significant warning factor.

Neves et al. presented data compatible with the other studies, recording 54% of insomnia, 30% of hypersomnia and 42% of depressive symptoms, reaffirming the pattern of coexistence of these disorders in medical students in Brazil.

In general, CHART 1 shows that insomnia is the most prevalent disorder, followed by depressive symptoms and hypersomnia, which points to the urgent need for institutional strategies for welcoming people, promoting mental health and re-educating sleep habits in the medical university environment.

Chart 1.



Source: Authors

## FINAL CONSIDERATIONS

This systematic review revealed a significant prevalence of sleep-wake disorders among medical students, particularly insomnia, daytime hypersomnia and depressive symptoms. National and international studies converge in pointing out that the academic environment of medical training imposes intense cognitive, emotional and physical demands, which are often incompatible with physiological sleep cycles. From the 32 studies selected, it was observed that more than half of the students investigated had some degree of sleep impairment, directly impacting academic performance, mental health and quality of life.

The prevalence of insomnia varied between 34% and 68% in the studies analyzed, with a greater tendency in the first years of the course. This finding reflects not only the overload of content and the stress of adapting to a new university environment, but also individual factors such as anxiety, inadequate sleep habits, the use of electronic devices and the absence of sleep hygiene practices. Daytime hypersomnia, although less prevalent than insomnia, was also significant, affecting between 22% and 47% of students. Depressive symptoms were strongly associated with sleep disorders, often being identified in more than 60% of students with complaints of insomnia or daytime sleepiness.

The consequences of these disorders are not limited to physical and emotional well-being: they directly affect memory, attention, concentration and performance in theoretical and practical assessments. Several studies included in the review described cognitive deficits associated with poor sleep quality, which are often aggravated by exam periods, mandatory

shifts and frequent changes in study routines. These impacts reinforce the need to rethink the current pedagogical model in medical courses.

The relationship between sleep disorders and depression has recurred in the literature. Studies such as Baglioni et al. (2011) and Silva et al. (2016) have shown a bidirectional association, indicating that insomnia can be both a risk factor and a consequence of depression.

Many students with depression do not identify changes in sleep as a relevant clinical symptom, which contributes to underdiagnosis and the chronicization of the condition. The lack of institutional spaces for listening and psychological support exacerbates this scenario.

One of the factors perpetuating these disorders is the medical culture that naturalizes - and even romanticizes - sleep deprivation as part of the training process. Phrases such as "those who sleep don't pass medical school" or "good residents are those who can handle shifts without sleeping" continue to be repeated and reinforced institutionally.

This collective imaginary normalizes negligence towards one's own health, being internalized by students and reproduced in generational cycles. Deconstructing this logic is urgent and must begin in medical schools, through educational actions and institutional examples.

Few studies included in the review described institutional interventions aimed at promoting sleep and mental health. The absence of preventive strategies, stress management programs, mindfulness workshops or reorganization of class and duty schedules reveals a significant institutional vacuum. When implemented, measures such as scheduled breaks, psychological counseling and elective courses on self-care

proved effective in reducing symptoms of anxiety, depression and insomnia.

Systematic screening for sleep disorders during medical graduation is an underutilized, albeit essential, tool. The use of validated scales, such as the Pittsburgh Sleep Quality Index (PSQI) and the Epworth Sleepiness Scale, should be encouraged as part of periodic academic health assessments. Training teachers and preceptors to identify signs of psychological distress related to sleep can facilitate early referral to specialized services.

Comparing international data with Brazilian data, there is a similarity in the pattern of prevalence of sleep disorders, but Brazil stands out negatively due to the lack of ongoing psychosocial support at universities. While countries such as Canada and Australia have already adopted structured sleep health promotion programs, in Brazil there is still a prevalence of one-off and reactive actions, generally offered after the onset of clinical distress.

Narcolepsy is notoriously underdiagnosed in university settings.

Students who report recurrent episodes of intense sleepiness, lapses of attention, or even cataplexy, are often treated with disbelief or mistaken for cases of "normal tiredness".

Sleep disorders are also associated with risk behaviors such as stimulant abuse, self-medication and suicidal ideation. Recent literature shows that poor sleep quality is an important predictor of suicidal risk in young university students. Medical students, already exposed to high levels of demand, can experience a progressive worsening of psychological distress if there are no early interventions. Sleep should therefore be considered a risk marker in mental health screening.

## REFERENCES

1. AMERICAN ACADEMY OF SLEEP MEDICINE. International Classification of Sleep Disorders. 3. ed. Darien, IL: AASM, 2014.
2. ARNETT, J. T. et al. Neurobehavioral performance of residents after heavy night call vs after alcohol ingestion. *JAMA*, v. 294, n. 9, p. 1025-1033, 2005.
3. BAGLIONI, C. et al. Insomnia as a predictor of depression: a meta-analytic evaluation of longitudinal epidemiological studies. *Journal of Affective Disorders*, v. 135, n. 1-3, p. 10-19, 2011.
4. BEATTIE, L. et al. Mindfulness-based therapy for insomnia for older adults: A community-based pilot study. *Journal of Clinical Sleep Medicine*, v. 11, n. 7, p. 787-795, 2015.
5. BERTOLAZI, A. N. et al. Translation and validation of the Pittsburgh Sleep Quality Index (PSQI) into Portuguese. *Brazilian Journal of Pulmonology*, v. 37, n. 4, p. 576-580, 2011.
6. CELLINI, N. et al. Changes in sleep pattern, sense of time and digital media use during COVID-19 lockdown in Italy. *Journal of Sleep Research*, v. 29, n. 4, e13074, 2020.
7. DAUVILLIERS, Y. et al. Narcolepsy. *Nature Reviews Disease Primers*, v. 3, p. 1-19, 2017.
8. GOMES, J. et al. Sleep complaints and daytime sleepiness in medical students: a comparative study. *Brazilian Journal of Medical and Biological Research*, v. 35, n. 4, p. 421-427, 2002.
9. GRADISAR, M. et al. The impact of delayed bedtimes on academic performance and neurocognitive functioning in adolescents. *Sleep Medicine Clinics*, v. 8, n. 2, p. 195-204, 2013.
10. HERSHNER, S.; CHERVIN, R. The impact of sleepiness on medical student performance. *Academic Medicine*, v. 89, n. 3, p. 364-370, 2014.
11. KAPUR, V. K. et al. The medical cost of undiagnosed sleep apnea. *Sleep*, v. 25, n. 8, p. 1046-1057, 2002.
12. LEMOLA, S. et al. Sleep quantity, quality and depressive symptoms in adolescents: A meta-analytic review. *Sleep Health*, v. 1, n. 4, p. 208-215, 2015.
13. MAHONEY, C. E. et al. The neurobiological basis of narcolepsy. *Nature Reviews Neuroscience*, v. 20, p. 83-93, 2019.
14. MOHER, D. et al. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Med*, v. 6, n. 7, e1000097, 2009.
15. NEVES, A. C. et al. Evaluation of sleep quality in university health students. *Revista Brasileira de Educação Médica*, v. 34, n. 2, p. 234-240, 2010.
16. OHAYON, M. M. Epidemiology of excessive daytime sleepiness. *Sleep Medicine Clinics*, v. 1, n. 1, p. 9-16, 2008.
17. PAGNIN, D. et al. Burnout and sleep quality in medical students: a cross-sectional study. *Revista da Associação Médica Brasileira*, v. 60, n. 1, p. 21-26, 2014.

18. RODRIGUES, R. N. et al. Stress among medical students at the Federal University of Minas Gerais. *Revista Brasileira de Educação Médica*, v. 26, n. 1, p. 6-12, 2002.
19. SIEGEL, J. M. Clues to the functions of mammalian sleep. *Nature*, v. 437, n. 7063, p. 1264-1271, 2005.
20. SILVA, A. G. et al. Sleep quality and associated factors in medical students. *Brazilian Journal of Psychiatry*, v. 65, n. 3, p. 215-222, 2016.
21. TAYLOR, D. J. et al. Prevalence, correlates, and comorbidity of insomnia and its persistence: results from a national survey. *Sleep*, v. 30, n. 4, p. 447-460, 2007.
22. THORPY, M. International classification of sleep disorders. *Chest*, v. 122, n. 3, p. 108S-111S, 2012.
23. VEASEY, S. et al. Sleep loss and fatigue in residency training: a reappraisal. *JAMA*, v. 288, n. 9, p. 1116-1124, 2002.
24. WRIGHT, K. P. et al. Influence of sleep deprivation and circadian misalignment on cortisol, inflammatory markers, and cytokine balance. *Proceedings of the National Academy of Sciences*, v. 110, n. 17, p. 682-686, 2013.