Original Research

Profile of healthcare students with poor sleep quality: a cross-sectional study

Pablo Ferronato Zanetti[1] , Giordana Picolo Furini[1] ,
Ariane Pacheco Morin[2] , Lilian Rigo[1*]

[1] ATITUS, Passo Fundo, Rio Grande do Sul, Brazil.

[2] University Passo Fundo, Passo Fundo, Rio Grande do Sul, Brazil.

Corresponding author:
Lilian Rigo
Phone: +55 (54)99927-0441
304, Senador Pinheiro Street, Passo Fundo, Brazil
Graduate Program in Dentistry – ATITUS, Brazil
lilian.rigo@atitus.edu.br

Aim: To verify the relationship between poor quality of self-perceived sleep with determinates, among higher education students from four faculties in the health care field. **Methods:** This cross-sectional study obtained a sample of 295 students from Nursing, Medicine, Dentistry, and Psychology courses. Data collection was performed online, using a self-administered questionnaire to assess sleep, signs and symptoms of anxiety, presence of temporomandibular disorders, in addition to sociodemographic data and aspects of daily routine. The frequencies of the variables were determined. **Results:** In the multivariate analysis, crude and adjusted binary logistic regression was used to obtain the odds ratios (OR) and respective 95% confidence intervals (95% CI). Among the individuals, 25.8% classified their sleep as poor, and 15.3% reported insufficient sleep duration, with close to three times more chances of poor sleep quality when compared to those with adequate sleep time (OR=2.922; 95% CI, 1,420-6.014). Students with anxiety symptoms were almost four times more likely to have poor sleep quality than those who did not present with anxiety (OR=3.739; 95% CI, 2.049-6.822). Students who had a higher number of class shifts were twice as likely to have poor sleep quality (OR=2.280; 95% CI, 1,196-4.289). Students who attended college and work concomitantly present above 1.5 times the odds of having poor sleep quality (OR=1.787; 95% CI, 1.029-3.105). **Conclusion:** An increased frequency of class shifts, inadequate sleep duration, concurrent work commitments alongside undergraduate studies, and the presence of symptoms indicative of anxiety collectively contribute to a heightened susceptibility to diminished sleep quality in individuals.

Keywords: Academic performance. Sleep deprivation. Sleep. Students.

Introduction

Sleep plays a fundamental role in body functions, as it acts in the processes of thermoregulation, restoration of brain metabolism, and cognitive and psychological functions[1,2]. Poor sleep quality and sleep deprivation impair physical and mental well-being as well as daily functionality, individual productivity, and quality of life, and may be associated with a higher risk of mortality[3,4].

Sleep is highly influenced by socio-environmental factors experienced by an individual, such as stress, light and noise, ambient temperature, amount of activity during the previous day[5], family environments[6,7], pain conditions (especially chronic ones) like temporomandibular disorders[8], and an unhealthy lifestyle[9]. Some individuals, such as university students, obtain a high prevalence of poor sleep quality mainly due to high academic loads, emotional stress, and a hectic routine, in an attempt to reconcile studies, work, and leisure[10,11]. For young adults, the average recommended sleep duration is 7–9 hours daily[12]. However, a survey of Japanese university students showed that about 38.2% of the students slept less than six hours during the week, which was directly related to poor school performance[13].

Research worldwide describes associations between sleep and daily activities of students; however, lifestyle, habits, and culture differ between groups in society as well as among students worldwide[14,15]. In addition, studies should be conducted to associate daily effects with the quality of sleep of university students in the healthcare field, who will be future professionals guiding communities regarding healthcare[16]. Therefore, knowing the particularities and regional habits of students is of fundamental importance. Creating strategies to help solve sleep problems affects a significant proportion of higher education students.

The objective of this study was to verify the relationship between the poor self-perceived sleep quality of higher education students enrolled in healthcare courses at a University in the south of Brazil, with sociodemographic characteristics (sex, age, skin color, course, and shift of the undergraduate course), alcohol and coffee consumption, aspects of daily routine (work and study hours, people sleeping in the same room), sleep duration, anxiety symptoms, and temporomandibular disorders (TMD).

Materials and Methods

This research was submitted and approved by the Research Ethics Committee of ATITUS, under opinion number 2,014,448, CAAE 6373317.6.0000.5319, on 04/12/2017.

Study design and participants

This study used a quantitative approach, whose design was of the transversal type. Students enrolled in nursing, medicine, dentistry, and psychology courses at University ATITUS, who were ≥17 years of age and eligible to participate in the research were included. The total number of students in these courses was 1,139, with 113 nursing, 335 medicine, 209 dentistry, and 482 psychology students. Per-

forming the sample calculation with a margin of error of 5%, confidence level of 90%, and 50% prevalence of the outcome, adding 15% for possible losses, results in a calculated sample size of 252 students. However, in this study, the final sample consisted of 295 students, that is, 43 (17%) more students in addition to the calculated sample.

Data collection was carried out using an online and anonymous format between March and September 2021 through a questionnaire made available on the Google Forms platform. An invitation with a brief explanation of the research and its objectives, together with the link to the online questionnaire, was sent to the coordinators of the nursing, medicine, dentistry, and psychology courses so that they could share it with the groups of students in their course, either by e-mail and WhatsApp (Meta, Inc., Santa Clara, CA, EUA), Facebook (Meta, Inc., Menlo Park, CA, EUA), thus enabling full coverage of students. Respondents completed the survey approximately 30 minutes after consent.

Outcome variable

The outcome variable was 'self-perceived sleep quality' obtained from a stage of the validated Munich ChronoType Questionnaire (MCTQ[PT])[17], covering the question: "In general, how do you assess sleep quality? Your sleep in the last month (30 days)?" with responses from the Likert scale (very good, good, fair, bad, and very bad). Subsequently, for statistical analysis, the answers were grouped into two groups: the answers "regular, very good, and good" were the better sleep quality group (group 1), while the answers "bad and terrible" were the poor sleep quality group (group 2).

Exposure Variables

Sociodemographic characteristics, substance consumption, and aspects of daily routine

Subsequently, the following information was obtained from the study participants: sociodemographic factors such as age (17-20 years/21-57 years), marital status (married/stable union/single), sex (male/female), skin color (whites/non-whites), course (nursing/medicine/dentistry/psychology), class shifts (morning or afternoon or evening-two shifts/morning, afternoon, and evening-three shifts), people sharing the same room (none/one or more), working in addition to studying (yes/no), consumption of alcoholic beverages (never or a few times a month/2-4 times a week), consumption of coffee (never or at most 1 times a day/more than twice per day).

Sleep duration on weekdays and weekends

The instrument used for sleep assessment was the MCTQ[PT] validated for the Portuguese language. The choice of the research instrument MCTQ[PT] was based on the fact that it is a complete instrument, which has illustrations that help the respondent to identify the meaning of the questions more clearly and makes the questionnaire more visually attractive[17]. The questionnaire instructs the interviewee that answers must refer to the last four weeks, and although it can be used to define chronotype

(biological clock about the light-dark cycle), the questions were only used to characterize the duration and time of sleep latency[17].

MCTQ core module asks 17 simple questions about sleep and wake behavior, carefully distinguishing between bedtimes and sleep times. These questions address i) bedtime, ii) time spent in bed awake before deciding to turn off the lights (prepare for sleep), iii) how long it takes to fall asleep (sleep latency), iv) wake-up (sleep offset) time, and v) get-up time. The questions are accompanied by iconic drawings that represent each of these stages. Sleep onset is calculated by adding sleep latency to the time of sleep preparation. This set of questions is asked separately for workdays and work-free days. This separation is unique to the MCTQ and turned out to be one of the questionnaire's most useful characteristics. The MCTQ provides a quantitative measure of chronotype, based on the sleep phase assessed with a quantitative measure of average sleep time corrected between workdays and work-free days (MSFsc). Scores do not define the result but by a continuous distribution approximating a normal curve. The morning and afternoon chronotypes are distributed at the extremes of this curve and intermediate values are used for the intermediate chronotype[17].

The duration of sleep on school days or weekends was obtained from five questions: "On school days, what time are you really ready to sleep?". The number of hours of sleep was calculated as the difference between the time when the individual wakes up and the time when he or she is really ready to sleep, subtracting the minutes he or she needs to fall asleep (latency time). Sleep duration was classified as insufficient in periods of less than 6 h/day for adults aged 18-64 years and less than 5 h/day for individuals aged ≥65 years. The responses were categorized as insufficient duration (up to 6 h) and sufficient duration (≥6 h or more). Latency time was obtained from the question, "How many minutes do I need to fall asleep?", with the following response options: "less than 5 minutes", "10 minutes", "30 minutes", "1 hour or more", considering times over 30 minutes as long latency.

Temporomandibular Disorder (TMD)

The anamnestic questionnaire of Fonseca et al. (1994), available in Portuguese, was used to classify the presence of TMD[18]. This questionnaire consists of a set of questions to categorize the severity of TMD symptoms. The Simplified Anamnesis Index, elaborated and validated by Fonseca et al.[18], it is used to assess a patient´s TMD degrees, based on the most common symptoms, consisting of 10 questions: 1- Difficulty in the opening of the mouth; 2- Difficulty moving the mandible to the sides; 3- Tiredness or muscle pain when chewing; 4- Frequent headaches; 5- Pain at the nape or torticollis; 6-Ear pain or in the region of the joints 7- Noticed sounds in join region when chewing or during mouth opening 8- Noticed the habit of tightening and/or grinding of the teeth 9- Feel that the teeth do not articulate well 10- Consider yourself a tense or nervous person. For each of Fonseca's questionnaire questions, three answers are possible for which three scores are pre-established: Yes (10), No (0), and Sometimes (5). Thus, the sum of the assigned points and an index was obtained, allowing the answers to be classified into the following categories of symptom severity: no TMD (0−15 points), mild TMD (20−45 points), moderate TMD (50−65), and

severe TMD (70–100 points). The answers were categorized as absence of TMD and presence of TMD (mild, moderate, or severe TMD). However, as no clinical examination was performed, the questions only check signs and/or symptoms of TMD but do not make an accurate diagnosis.

Anxiety symptoms

The evaluation of anxiety symptoms was performed using the Anxiety Inventory[19], which consists of a set of 21 symptoms: "unable to relax," with responses indicating how much the individual was bothered by any of these symptoms during the last week on a 4-point scale ranging from 0-3, where "Not at all" is equivalent to 0 points, "Slightly (did not bother me much)" is equivalent to 1 point, "Moderately (it was very unpleasant, but I could endure)" equals 2 points, and "Severely (I could hardly stand)" equals 3 points. The items added together result in a score that ranges from 0-63, where 0-10 is considered the minimum degree of anxiety, 11-19 mild anxiety, 20-30 moderate anxiety, and 31-63 severe anxiety. The responses were categorized as 'no anxiety symptoms' (no or minimal anxiety) and the 'presence of anxiety symptoms' (mild, moderate, and severe anxiety).

Data analysis

The data were organized in a database using Microsoft Office Excel 2016 software and later exported and analyzed using IBM SPSS® software (Statistical Package for the Social Sciences), Armonk, New York version 20.0.

The relative and absolute frequencies of the variables were analyzed. Pearson's chi-square test was used in the bivariate analysis, and in the multivariate analysis, crude and adjusted binary logistic regression was used to obtain the odds ratios (OR) and respective 95% confidence intervals (95% CI). For confounding adjustment, all exploratory variables that had a p-value of <0.10 entered the raw model, and only those that presented a p-value of <0.05 remained in the adjusted model.

Results

All 295 participants completed all questionnaires. The mean age of the students was 22.95 years (± 6.14), with a sociodemographic profile formed mostly by women, whites, and singles (82.7%, 90.8%, and 86.6%, respectively). Of these, 72.9% attended five or more days of classes per week, 33.9% had three shifts, 15.3% had insufficient sleep duration (fewer periods or up to 6 hours/day), and 25.8% classified their sleep as "poor" (Table 1).

Table 1. Descriptive results of the variables of the students of the University XXX of XX, XX (n=295).

Variables	N	%
Age group		
17 a 20 years	119	40.3
21 a 57 years	176	59.7

Continuation

Sex		
Feminine	244	82.7
Masculine	51	17.3
Course		
Nursing	74	25.1
Medicine	80	27.1
Dentistry	79	26,8
Psychology	62	21
Study and work		
Yes	172	58,3
No	123	41.7
Marital status		
Married / stable union	39	13.2
Not married	256	86.8
Etnich		
Whites	268	90.8
Non-whites	27	9.2
Class days per week		
1 to 4 days	80	27.1
5 days or more	215	72.9
Class shifts		
1 or 2 shifts	195	66.1
3 shifts	100	33.9
Consumption of alcohol drink		
Never or a few times a month	209	70.8
2 to 4 times a week	57	19.3
No reply	29	9.8
Coffee consumption		
Never or at most once a day	176	59.7
More than 2 times a day	119	40.3
People sharing a bedroom		
None	197	66.8
One or more people	98	33.2
Sleep quality		
Fair, good and very good	219	74.2
Poor	76	25.8
TMD symptoms		
Absence	53	18
Presence	242	82

Continuation

Sleep duration on weekdays		
Up to 6 hours	45	15.3
More than 6 hours	250	84.7
Sleep duration rest days		
Up to 6 hours	3	1%
More than 6 hours	292	99
Anxiety symptoms		
No	146	49.5
Presence	149	50.5

All the following variables were tested with "self-perceived sleep quality" in the bivariate analysis using Pearson's chi-square test: "marital status", "age", "skin color", "sex", "course", "alcohol consumption", "sleep duration on weekdays", "sleep duration on weekends", "number of class shifts", "frequency of coffee intake per day", "people sleeping in the same room", "study and work", "TMD symptoms", and "presence of anxiety". However, only the variables with a p-value of <0.10 were included in the multivariate model: "duration of sleep on weekdays", "number of class shifts", "frequency of coffee intake per day", "people sleeping in the same room", "study and work", and "presence of anxiety". However, after adjusting for confounding factors in the adjusted regression analysis, some variables lost the association between the outcome variable (sleep quality): "frequency of coffee intake per day", "people sleeping in the same room", and "TMD symptoms", and were excluded from the model (p>0.05).

In the final adjusted model, there was a greater probability of poor sleep quality. Students who had anxiety symptoms (mild, moderate, and severe) were almost four times more likely to have poor sleep quality when compared to students without anxiety symptoms (OR = 3.739; 95% CI, 2.049-6.822). Students with shorter sleep duration than recommended were nearly three times more likely to have poor sleep quality when compared to those who had adequate sleep duration (OR = 2.922; 95% CI, 1.420-6.014). Students who had more shifts (three shifts) of classes during the week were twice as likely to have poor sleep quality (OR = 2.280; 95% CI, 1.196-4.289). Students who worked and attended college concurrently during the week were more than 1.5 times more likely to have poor sleep quality (OR = 1.787; 95% CI, 1.029-3.105) (Table 2).

Table 2. Odds ratio (OR) and confidence intervals (95% CI) between exposure variables and the outcome "self-perceived poor sleep quality". Binary logistic regression model.

Variables	Poor sleep quality			
	Crude OR (95% CI)	p*	Adjusted OR (95% CI)	p*
Sleep duration/Working days				
Enough	1	0.001*	1	0.004*
Insufficient	3.102 (1.607-5.988)		29.22 (1.420 − 6.014)	
Number of class shifts				
1 or 2 shifts	1	0.095	1	0.012*
3 shifts	1.498 (0.974-2.567)		2.280 (1.196-4.289)	
Coffee intake/day				
Maximum 1 time	1	0.100	1	0.2492
2 or more times	1.475 (0.871-2.497)		1.126 (0.686-2.189)	
People in the same room				
None	1	0.058	1	0.145
One or more people	1.686 (0.983-2.891)		1,553 (0.859-2.807)	
Anxiety symptoms				
No	1	<0.001*	1	<0.001*
Yes	3.483 (1.971-1.156)		3.739 (2.049-6.822)	
Work and study				
No	1	0.039	1	0.022*
Yes	1.684 (1.971-1.156)		1.787 (1.029-3.105)	

* Wald test, p-value of p<0.05, statistically significant.
OR- odds ratio; 95% CI - 95% confidence interval.
Adjusted for sleep duration on working days, number of class shifts, people in the same room, anxiety, work, and study.

Discussion

In our findings, 15.3% of the students reported nighttime sleep deprivation (periods <6 hours/day), and in the regression model, an insufficient amount of sleep was three times more likely to influence poor sleep quality. These data corroborate results of previous literature, such as in medical students (15.5%)[2], reaching up to 58.7%[10]. In this scenario, it can be seen that a few hours of sleep contribute to fatigue in students, worsening their academic performance, and causing a higher prevalence of depressive symptoms[1,15,20]. Thus, it is suggested that students need to sleep the number of hours recommended in the literature to maintain a healthy lifestyle and avoid problems that affect sleep quality and mental health. Currently, there is no single physiological role for sleep, but it is evident that sleep is vital to humans[21].

This study showed that 25.8% of the students described their sleep as "poor or terrible". When assessing sleep quality, the worst global scenarios are in medical students, 41% of participating students in Iran, 70% in Hong Kong, 72% in Brazil, and 90% in China[3,22,23]. However, in this study, we did not only consider medical students, but also several courses in health sciences were considered as a parameter. When evaluating university students in general, poor sleep quality was reported in Lebanon with a frequency of 37%[24], in Brazil at 30%[25], in the United States at 27%[14], approaching the data of this work. Therefore, we suggest that students need a better quality of sleep by establishing routines that allow them to be more efficient, including quality sleep as one of the priorities of their day along with working and studying.

Furthermore, having three class shifts during the day and working, in addition to studying, were associated with poor sleep quality, with odds of twice and 1.5 times as likely, respectively. This fact may indicate that having a double or even triple shift during the day, having a stressful routine, and having multiple responsibilities impairs sleep. High academic workload and demands have been identified as causal factors for poor sleep[22]. Previous studies have reported that sleep quality is a significant indicator of students' physical and/or psychological well-being, as well as their ability to deal with stressful situations and multiple tasks[2,4,11].

Another determinant associated with poor sleep quality was the presence of anxiety symptoms (mild, moderate, and severe), with four times more chances of association. Currently, much effort is given to the importance of mental health about a better quality of life[9,23]. A study by Choueiry et al.[24] showed that half of the students had moderate to severe anxiety, making them more prone to poor sleep quality than those with less anxiety. Becker et al.[14] found associations between anxiety symptoms, poor sleep quality, and the use of sleeping pills. In the mental health scenario, other predictors of poor sleep quality are alerts, such as family history of suicide attempts, hopelessness, pre-sleep cognitions, preoccupation, racing thoughts at bedtime, hypervigilance, fear-associated situations, and other psychiatric disorders[2,26,27]. Therefore, feelings of anxiety are a portrait of the constant worries and hectic routine of students, leading them to be at high risk for sleep disorders.

This study found no differences in sleep quality between sociodemographic aspects (sex, skin color, age), alcohol and coffee consumption, and TMD symptoms. Some studies have highlighted the quality of sleep associated with alcohol consumption[7,25], black or brown skin color[25], and female[7]. Furthermore, several studies have evaluated the relationship between the MDD variables and sleep quality and found a strong association between them, such as the report of a systematic review, in which eight case-control studies were included, and of these, seven studies reported a significant association between the presence of painful TMD and sleep quality[8]. These different results may be because this research was carried out with students from different courses in the areas of health, medicine, nursing, dentistry, and psychology, and not just from one course or the general population.

This study had some limitations. As this was a cross-sectional study, causal conclusions between the exposure variables and the outcome could not be made,

thus making it impossible to assess sleep quality and its impact over a period. Furthermore, as no clinical examinations have been conducted, the questions only address signs and/or symptoms of TMD, not allowing for a precise diagnosis. We admit that, although the selected instruments have been widely used and validated, no tool is without limitations. Individual variations in the interpretation of questions or specific nuances not captured by the questionnaires may have contributed to the apparent lack of relationship between poor sleep quality and TMD symptoms. Therefore, we recognize the importance of a critical analysis of the instruments used, considering the possibility that other methods could provide more comprehensive insights.

However, the study did not aim to identify the causes of poor sleep quality in students but rather to associate quality with some characteristics of their sociodemographic profiles and behaviors. For the questions on sleep quality and duration, the choice of the research instrument (MCTQ[PT]) was because it is a complete instrument, which has figures that help the respondent to identify the meaning of the questions and make the questionnaire more visually attractive in the scenario in which it was applied online more clearly[17].

It is noteworthy that strategies that improve sleep quality in academics should be adopted by university members. It should also be considered that most people are unaware of the impacts of poor-quality sleep on health. This reinforces the need for a discussion on this topic. The collection of this information can be useful for the improvement of higher education curricula (e.g., disciplines offered), in addition to policies that benefit the students and their daily routines, to increase the quality of sleep, quality of life, and academic performance.

In conclusion, it is concluded that there was an association between sleep quality and anxiety symptoms, but there was no association with individuals with TMD. Thus, the results of this study indicate that students who experience symptoms of anxiety are more likely to have lower sleep quality compared to those who do not have anxiety. Moreover, external factors such as longer class hours and overlapping work responsibilities with health-related undergraduate studies are significant contributors to poor sleep quality among students.

The study also highlights the importance of getting enough sleep throughout the week to maintain good sleep quality.

Ethics

This study was approved by the Ethics and Research Committee, Passo Fundo, Brazil – n. 2,014,448, CAAE 6373317.6.0000.5319, on 04/12/2017.

Financial Disclosure

The authors declare no have financial support.

Conflict of Interest

The authors declare no conflicts of interest.

Author Contribution

Pablo Ferronato Zanetti: Conceptualization, Investigation, Project administration, Methodology, Visualization, Supervision, Validation, Writing-review & editing. **Giordana Picolo Furini**: Methodology, Visualization**,** Formal analysis, Validation. **Ariane Ricci** – Formal analysis, Validation. **Lilian Rigo:** Conceptualization, Investigation, Project administration, Supervision, Validation, Writing-review & editing. All authors actively revised and approved the final version of the manuscript.

References

1. Ayala EE, Berry R, Winseman JS, Mason HRC. A cross-sectional snapshot of sleep quality and quantity among US medical students. Acad Psychiatry. 2017 Oct;41(5):664-8. doi: 10.1007/s40596-016-0653-5.

2. Saguem BN, Nakhli J, Romdhane I, Nasr SB. Predictors of sleep quality in medical students during COVID-19 confinement. Encephale. 2022 Feb;48(1):3-12. doi: 10.1016/j.encep.2021.03.001. Epub 2021 Mar 18.

3. Attal BA, Bezdan M, Abdulqader A. Quality of sleep and its correlates among yemeni medical students: a cross-sectional study. Sleep Disord. 2021 Jan 18;2021:8887870. doi: 10.1155/2021/8887870.

4. Kaneita Y, Yokoyama E, Harano S, Tamaki T, Suzuki H, Munezawa T, et al. Associations between sleep disturbance and mental health status: a longitudinal study of Japanese junior high school students. Sleep Med. 2009 Aug;10(7):780-6. doi: 10.1016/j.sleep.2008.06.014.

5. Daley M, Morin CM, LeBlanc M, Grégoire JP, Savard J, Baillargeon L. Insomnia and its relationship to health-care utilization, work absenteeism, productivity and accidents. Sleep Med. 2009 Apr;10(4):427-38. doi: 10.1016/j.sleep.2008.04.005. Epub 2008 Aug 26.

6. Daley M, Morin CM, LeBlanc M, Grégoire JP, Savard J. The economic burden of insomnia: direct and indirect costs for individuals with insomnia syndrome, insomnia symptoms, and good sleepers. Sleep. 2009 Jan;32(1):55-64.

7. Romero-Blanco C, Rodríguez-Almagro J, Onieva-Zafra MD, Parra-Fernández ML, Prado-Laguna MDC, Hernández-Martínez A. Sleep pattern changes in nursing students during the COVID-19 lockdown. Int J Environ Res Public Health. 2020 Jul;17(14):5222. doi: 10.3390/ijerph17145222.

8. Dreweck FDS, Soares S, Duarte J, Conti PCR, De Luca Canto G, Luís Porporatti A. Association between painful temporomandibular disorders and sleep quality: a systematic review. J Oral Rehabil. 2020 Aug;47(8):1041-51. doi: 10.1111/joor.12993.

9. Alghwiri AA, Almomani F, Alghwiri AA, Whitney SL. Predictors of sleep quality among university students: the use of advanced machine learning techniques. Sleep Breath. 2021 Jun;25(2):1119-26. doi: 10.1007/s11325-020-02150-w. Epub 2020 Jul 23.

10. Rao WW, Li W, Qi H, Hong L, Chen C, Li CY, et al. Sleep quality in medical students: a comprehensive meta-analysis of observational studies. Sleep Breath. 2020 Sep;24(3):1151-65. doi: 10.1007/s11325-020-02020-5.

11. Lund HG, Reider BD, Whiting AB, Prichard JR. Sleep patterns and predictors of disturbed sleep in a large population of college students. J Adolesc Health. 2010 Feb;46(2):124-32. doi: 10.1016/j.jadohealth.2009.06.016. Epub 2009 Aug 3.

12. Hirshkowitz M, Whiton K, Albert SM, Alessi C, Bruni O, DonCarlos L, et al. National sleep foundation's sleep time duration recommendations: methodology and results summary. Sleep Health. 2015 Mar;1(1):40-3. doi: 10.1016/j.sleh.2014.12.010.

13. Kayaba M, Matsushita T, Enomoto M, Kanai C, Katayama N, Inoue Y, et al. Impact of sleep problems on daytime function in school life: a cross-sectional study involving Japanese university students. BMC Public Health. 2020 Mar;20(1):371. doi: 10.1186/s12889-020-08483-1.

14. Becker SP, Jarrett MA, Luebbe AM, Garner AA, Burns GL, Kofler MJ. Sleep in a large, multi-university sample of college students: sleep problem prevalence, sex differences, and mental health correlates. Sleep Health. 2018 Apr;4(2):174-81. doi: 10.1016/j.sleh.2018.01.001.

15. Li W, Yin, Cai X, Cheng X, Wang Y. Association between sleep duration and quality and depressive symptoms among university students: a cross-sectional study. PLoS One. 2020 Sep;15(9):e0238811. doi: 10.1371/journal.pone.0238811.

16. Souza MCMC, Leite HM, Silva RCD, Pattussi MP, Olinto MTA. [Sleep quality and associated factors in university students in the Midwest of Brazil]. Rev Bras Neurol. 2021;57(4):9-15. Portuguese.

17. Reis C, Madeira SG, Lopes LV, Paiva T, Roenneberg T. Validation of the Portuguese variant of the Munich chronotype questionnaire (MCTQ[PT]). Front Physiol. 2020 Jul 14;11:795. doi: 10.3389/fphys.2020.00795.

18. Fonseca DM, Bonfante G, Valle AL, Freitas SFT. [Diagnosis of the craniomandibular disfunction through anamnesis]. RGO. 1994;42(1):23-8. Portuguese.

19. Beck AI, Steer RA, Carbin MG. Psychometric properties of the beck depression inventory: twenty-five years of evaluation. Clin Psychol Rev. 1988;8(1):77-100. doi: 10.1016/0272-7358(88)90050-5

20. Bahammam AS, Alaseem AM, Alzakri AA, Almeneessier AS, Sharif MM. The relationship between sleep and wake habits and academic performance in medical students: a cross-sectional study. BMC Med Educ. 2012 Aug;12:61. doi: 10.1186/1472-6920-12-61.

21. Zielinski M, McKenna J, McCarley R. Functions and mechanisms of sleep. AIMS Neurosci. 2016;3(1):67-104. doi: 10.3934/Neuroscience.2016.1.67.

22. Azad MC, Fraser K, Rumana N, Abdullah AF, Shahana N, Hanly PJ, et al. Sleep disturbances among medical students: a global perspective. J Clin Sleep Med. 2015 Jan;11(1):69-74. doi: 10.5664/jcsm.4370.

23. Segundo LVG, Cavalcanti Neto BF, Paz DA, Holanda MMA. [Features related to quality of sleep in medical students]. Rev Bras Neurol Psiquiatr. 2017;21(3):213-23. Portuguese.

24. Choueiry N, Salamoun T, Jabbour H, El Osta N, Hajj A, Rabbaa Khabbaz L. Insomnia and relationship with anxiety in university students: a cross-sectional designed study. PLoS One. 2016 Feb;11(2):e0149643. doi: 10.1371/journal.pone.0149643.

25. Carone CMM, Silva BDPD, Rodrigues LT, Tavares PS, Carpena MX, Santos IS. [Factors associated with sleep disorders in university students]. Cad Saude Publica. 2020 Mar;36(3):e00074919. Portuguese. doi: 10.1590/0102-311X00074919.

26. Khurshid KA. Comorbid insomnia and psychiatric disorders: an update. Innov Clin Neurosci. 2018 Apr;15(3-4):28-32.

27. Stranges S, Tigbe W, Gómez-Olivé FX, Thorogood M, Kandala NB. Sleep problems: An emerging global epidemic? Findings from the INDEPTH WHO-SAGE study among more than 40,000 older adults from 8 countries across Africa and Asia. Sleep. 2012 Aug;35(8):1173-81. doi: 10.5665/sleep.2012.