

Evaluation of Sleep Quality in Undergraduated Medical Students

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Abstract

Objective: The aim of this study was to evaluate the sleep quality of medical students to identify the main factors that affect sleep patterns. **Methods:** According to the methodology, 154 students participated in the research, attending from the first to the sixth year of the course. The Pittsburgh Sleep Quality Index questionnaire and the Epworth sleepiness scale were applied. Descriptive statistics techniques were applied and demonstrated in the form of tables and graphs. The comparison of variables was carried out using statistical tests. **Results:** The results showed that most students do not sleep very well. It was observed that 68.83% of a total of 106 students are bad sleepers. **Conclusion:** It is concluded that medical students sleep a low number of hours by period, which could interfere in impairment of attention, learning and memory formation, interfering in academic performance. On the other hand, they showed greater daytime sleepiness compared to the general population.

Keywords

Sleep Quality, Daytime Sleepiness, Medical Students

1. Introduction

There have already been several interpretations about sleep and its role throughout human history. In ancient times, it was believed that during sleep, people's souls would leave their bodies, leaving them in an inactive state. Sleep can be defined as an unconscious state in which the human being can be awakened through a sensory stimulus or through some other stimulus [1]. Additionally, it is a biological function that alternates with the wakefulness cycle, and which is necessary for all

animals as it helps the organism to recover and rest [2].

There is controversy in the literature as to whether sleep has a strong relationship with memory consolidation. On the one hand, authors argue that consolidation during sleep promotes quantitative and qualitative changes in memory representations, that memory cannot be formed without sleep, and that sleep facilitates creativity, which promotes learning. On the other hand, some authors claim that the important role of sleep in memory consolidation has not been proven. Sleeping disorders, however, can impair the reorganization of memories and contribute to the emergence of disorders related to mental health [3]-[6].

Like many other species, humans organize their activities within a 24-hour cycle. This temporal organization is the result of the interaction of endogenous and environmental factors among them. The social factor seems to be the most important [7]. Its importance can evidently be seen in the observations of deprivation and the negative effects it causes, such as stress, fatigue, anxiety and cognitive impairment [8].

There is a direct relationship between poor sleep and human life quality, as it appears to be involved with increased morbidity due to psychiatric disorders, premature aging, kidney failure, automobile and work accidents, autonomic dysfunction, glucose intolerance, depression, hypercortisolemia and decreased work efficiency, etc. [9]-[15].

In contemporary society, sleep disorders, especially insomnia and excessive daytime sleepiness, are common complaints in the general population. It is estimated that the prevalence of insomnia in populations varies from 30 to 50% whereas the prevalence of chronic insomnia is around 10% [16].

Generally, university students change their sleep schedules during the weekends as they sleep and wake up later compared to their usual times on other weekdays, in which they usually present an irregular sleep pattern. The study on poor sleep quality among university students is relevant as it affects a significant number of individuals regardless of their nationality (5% - 71%) [17]. The topic of sleep quality in university students is widely publicized in the world's scientific literature. There are several publications that refer to this problem in this population group throughout the world. However, in Brazil, only small samples of research on this topic were found [9] [18]-[20].

Human beings under normal circumstances need a certain regularity in their sleep-wake pattern, but there are factors that act in the opposite way in the synchronization cycle process, especially for medical students' academic and hospital demands, which definitely tend to reduce their sleep pattern ([9]: p. 9). This opposition creates a conflict situation, as students need to decide between responding to academic and hospital schedules and obligations or satisfying their sleep pattern needs and the regularity of the sleep-wake cycle.

Recent studies suggest that chronic stress alone may not affect memory, so medical school experience may not necessarily result in sleep loss or cognitive stress [21]. Medical students form a group vulnerable to sleep disorders due to the high full-time course load, high pressure and stress, numerous activities beyond

the curriculum, in addition to the requirement for high performance and time required for studies. The objective of this work was to evaluate the sleeping habits of undergraduate medical students at a higher education institution in the north-east in order to identify the main factors that affect their sleep quality.

2. Methods

This was an observational and cross-sectional study. Individuals of both sexes and medical students participated in it. Individuals who refused to sign the informed consent form were excluded. The sample size was defined as 148 using the electronic spreadsheet www.estadistica.bauru.usp.br. It used the following parameters: 95% confidence level; sampling error 5%; estimated proportion 25% [19] and 300 finite population corresponding to all students enrolled in the Medicine course at a higher education institution in Maceió/AL. The sampling process was by draw, taking into account the proportion by sex and year of graduation.

The present study was approved by the ethics committee under number CAAE 27835114.7.0000.5011 and opinion number 741.575. Research participants were recruited following the inclusion and exclusion criteria through direct contact in the classroom after permission from the responsible teacher. A clear explanation was made of what would be carried out during the research and the application of free and informed consent. Students from all years of the course were included.

Each individual participating in the research was submitted to two questionnaires. The first is the Epworth Sleepiness Scale (ESS), and the second is the Pittsburgh Sleep Quality Index (PSQI).

The Epworth Sleepiness Scale (ESS) was published in 1991 by Johns MW [22] and validated in its Brazilian version by Bertolazi *et al.* (2009) [23] through a study involving healthy individuals with sleep difficulties. It is a questionnaire that is also answered by the individual himself/herself. It is easy and quick to fill in and covers 8 daily moments in which a nap may occur. To scale the possibility of dozing off, the person uses a scale from 0 (zero) to 3 (three), where 0 corresponds to none and 3 represents a high probability of dozing off. Thus, it is possible that individuals with a high probability of Excessive Daytime Sleepiness (EDS) are identified using a total score > 10 as a cutoff point [24]. Suspected severe drowsiness, very common in patients with moderate or severe Obstructive Sleep Apnea-Hypopnea Syndrome (OSAS), narcolepsy or idiopathic hypersomnia, may appear in scores greater than 16 (sixteen). When patients have a low disposition to sleep, this will be compatible with the low scores observed in patients with both psychophysiological and idiopathic insomnia. It is capable of detecting variations in EDS in patients undergoing treatment, particularly in patients with OSAHS [22] [25] [26].

The Pittsburgh Sleep Quality Index (PSQI), created in 1989 by Buysse DJ [27] and validated by Bertolazi *et al.* (2011) [28] through a study with adult individuals, analyzes the quality of sleep in relation to the month before. Quantitative and qualitative sleep information is combined in this questionnaire. Patients are divided into groups “good-quality sleepers” and “bad-quality sleepers” using a

standardized sleep quality measure offered by the patient. The use of this questionnaire helps in the assessment of various disorders that may affect sleep quality therefore, its interpretation and resolution is made easy. The questionnaire consists of 19 (nineteen) questions administered by the patients themselves and 5 (five) questions answered by those who share the same room. The latter are used only for clinical knowledge. With these 19 (nineteen) questions, 7 (seven) components are formed, which have values distributed on a scale of 0 to 3. These components of the PSQI are the subjective quality of sleep, sleep latency, sleep duration, efficiency of habitual sleep patterns, sleep disorders, use of sleeping medications and daytime dysfunction. A global score is then produced with the sum of the scores of these components, which ranges from 0 to 21 in which the higher the score, the worse the quality of sleep. A global PSQI score > 5 corresponds to a great difficulty that the individual is having in at least 2 components or moderate difficulties in more than 3 components [20].

Since it was developed, the PSQI has been greatly appreciated for its efficacy in measuring sleep quality in various groups of patients such as: those with chronic kidney disease, kidney transplant recipients, diabetics, chronic pain sufferers, Parkinson's disease, inflammatory bowel disease, asthma and cancer [29]-[31]. Recently, the validity and reliability of the Brazilian version of this questionnaire were evaluated by Passos *et al.* [32] in a study carried out with adolescents, which obtained high internal consistency and moderate reliability.

Descriptive statistical techniques were applied, including tables and graphs. Quantitative variables were presented as mean, median and standard deviation. Qualitative variables were presented in frequency tables. The comparison of quantitative variables between the 2 groups of sleepers was carried out using the Students' T-Test when the data had a normal distribution. Otherwise, the Mann-Whitney Test was used. The comparison of qualitative variables between the two groups was carried out using the Chi-square Test. A significance level of 0.05 was accepted to reject the null hypothesis.

3. Results

The study population consisted of 154 university students distributed from the 1st to the 6th year of medical graduation. In the researched group, a predominance of men was identified (57.8%) and a mean age of 24.82 years old ($SD \pm 5.40$ years, median 24 years) (Table 1). The sample of students analyzed had an average number of hours slept per night of 6.24 hours.

It was observed that 9.74% ($n = 15$) of the students classified the quality of their sleep over the previous month as very good and that 49.35% ($n = 76$) classified it as good, 36.36% ($n = 56$) as bad and 4.54% ($n = 7$) as very bad. Analysis of the PSQI components demonstrated that 68.83% ($n = 106$) of this sample had poor-quality sleep patterns with different prevalence rates depending on the student's year of medical training. No statistically significant differences were observed in sleep quality between the sexes ($p = 0.9326$). Among students from the first to the

sixth year of their undergraduate studies, there was a significant difference ($p = 0.0007$), with the ratio of good and bad sleepers being inverted among sixth-year students, with a greater number of good sleepers 69.56% ($n = 16$) when compared with the pattern of the rest of the group (**Table 2**).

Table 1. General description of the sample.

Variables						
Gender	Male	Female	Total			
	89	65	154			
Age range	≤20 years	21 - 25 years	26 - 30 years	≥30 years		
	21	84	34	11		
Graduation year	1 st year	2 nd year	3 rd year	4 th year	5 th year	6 th year
	25	22	25	31	28	23

Table 2. PSQI results based on socio-demographic variables.

Variables	PSQI		PSQI	
	Good sleeper		Bad sleeper	
	n	%	n	%
Gender	48		106	
Male	28	31.46%	61	68.54%
Female	20	30.77%	45	69.23%
Age range	47		103	
≤20 years	4	19.04%	17	80.96%
21 - 25 years	28	33.33%	56	66.67%
26 - 30 years	10	29.41%	24	70.59%
>30 years	5	45.45%	6	54.55%
Graduation Year	48		106	
1 st year	3	12.00%	22	88.00%
2 nd year	5	22.73%	17	77.27%
3 rd year	8	32.00%	17	68.00%
4 th year	8	25.80%	23	74.20%
5 th year	8	28.57%	20	71.43%
6 th year	16	69.56%	7	7

The analysis of the ESS components demonstrated that women are drowsier than men ($p = 0.0130$). However, when it comes to age, the difference was not significant ($p = 0.1566$). It was also observed that the difference was not significant between the years of graduation from the first to the sixth year, as well as between

normal ones and those with some degree of drowsiness ($p = 0.3804$), as shown in **Table 3**.

Table 3. ESS results based on socio-demographic variables.

Variables	ESS		ESS		ESS	
	Normal		Excessive daytime sleepiness		Severe drowsiness	
	n	%	n	%	n	%
Gender	91		53		10	
Male	60	61.18%	27	30.68%	1	1.14%
Female	31	46.97%	26	39.39%	9*	13.64%
Age range	89		51		10	
≤20 years	8	38.09%	9	42.86%	4	19.04%
21 - 25 years	51	60.71%	31	36.90%	2	2.38%
26 - 30 years	22	64.70%	9	26.47%	3	8.82%
>30 years	8	72.72%	2	18.18%	1	9.09%
Graduation year	91		53		10	
1 st year	12	48.00%	9	36.00%	4	16.00%
2 nd year	14	63.64%	8	36.36%	0	
3 rd year	16	64.00%	9	36.00%	0	
4 th year	15	48.38%	14	45.16%	2	6.45%
5 th year	17	60.71%	9	32.14%	2	7.14%
6 th year	17	73.91%	4	17.39%	2	8.69%
Agreement with PSQI	91		63			
Good sleeper	34	37.36%	14	22.22%		
Bad sleeper	57	62.64%	48	76.19%		

* < 0.05.

The concomitant analysis of the PSQI and ESS questionnaires revealed that there is no statistically significant association between excessive daytime sleepiness and sleep quality ($p = 0.0789$).

4. Discussion

The sample of students analyzed had an average number of hours slept per night of 6.24 hours. This data is lower than the average found in other studies in the Brazilian adult population (7 - 9 hours) and worldwide (6.5 - 8.5) [33]. On the other hand, this result is similar to that found by Araújo and collaborators. In this study, Sleep Quality was evaluated in university students only in Fortaleza-CE, where an average of 6.3 hours of sleep per day was observed [34]. It was also similar to the result found by Cardoso, in which medical students from the federal

university of Goiás were evaluated, and the average number of hours slept per day was 6.13 hours [19]. Studies carried out in Portugal and China with health sciences students where university students slept 7 hours a day were also found [11] [35]. This reduction in the number of hours slept per night may explain the result found, in which 40.9% of students experience daytime sleepiness [9] [19] [33] [34] [36]. Some studies have linked fewer hours of sleep to a decrease in academic performance [18] [37].

In this study, the poor sleep rate was 68.83%. This result was very high when compared to the studies by Cardoso, 14.9% [19] and Furlani and collaborators, 38.6% [38]. When analyzing the quality of sleep according to the period of training in the medical field, a higher prevalence of poor sleepers was observed in the first-year group, 88%. This difference was more pronounced when compared to the quality standard of poor sleepers in the group of sixth-year undergraduate students, 30.44%. This finding does not corroborate the studies by Cardoso *et al.* (2009) [19], who in his work observed a low prevalence of university students with poor sleep quality in the first period of their medical degree, 6.8%. As there was no randomization in the selection of participants, it is possible that those who somehow knew they had difficulties with sleep were more interested in participating in the study. In any case, the majority of research participants have impaired sleep quality and are prone to various health problems related to sleep difficulties.

In the sample of students evaluated, there was a low prevalence of drug use for hypnotic purposes, only 4.54% (7) in the month prior to the study. This value is below those found in the study Pascotto AC and Santos BRM (2013) [35], the Assessment of sleep quality in health science students from the first to the fourth year of graduation at the Municipal University of São Caetano do Sul was 10.3% and in the works conducted by Medeiros ALD it was 8.7% [37] and by Souza JC 18% [39] in medical students at the federal university of Rio Grande do Norte and the State University of Campinas, respectively. This rate is lower than those presented by similar studies in the general population of Brazil (6.9%) [39] and in the United States (7.1%) [40], in which these authors concluded that there was an excessive use of sedative-hypnotic drugs. Studies carried out in the USA and Argentina indicate that such an attitude is not uncommon among medical students and freshmen, as their college activities and the time they choose to study are often at bedtime [41].

Excessive daytime sleepiness or severe sleepiness was found in 40.9% (63) of the studied sample. This result was similar to that presented by academics at the Federal University of Acre 34.3% ([42]: p. 42), by medical students at the Federal University of Pernambuco 39.3% ([39]: p. 39) and by medical students at the University of Brasília 39.53% ([43]: p. 43), however, these results were higher than those observed in the general population 21.5%. The most common cause of excessive daytime sleepiness is chronic sleep deprivation. The required amount of sleep has individual variations and appears to be genetically determined [9] ([38]: p. 9, p. 38).

In the sample studied, statistically significant differences were observed in the

prevalence of EDS between the sexes. In this study, women were drowsier and there is also a tendency for EDS to decrease in individuals who are subjected to work in the same environment and with the same obligations as observed among medical students ([9]: p. 9).

The high prevalence of poor-quality sleep and the high prevalence of EDS may be due to the academic and social demands imposed on students. In this way, medical teachers are encouraged to consider, as far as it is possible, periods of daytime drowsiness and periods in which not only are students more alert to plan their classes and extracurricular activities and also provide them moments to guide the students regarding the importance of quality and ways to ensure good sleep. Adopting these practices can contribute to better use of the time available for sleep and contribute to better academic performance.

The research has some limitations, such as the lack of randomization, the PSQI data being self-reported, which makes it susceptible to errors in filling out itself due to lack of accuracy in its content or memory problems. The study did not take into account school issues such as exam periods, seminars, internships and extra-curricular work, which may have interfered with the students' responses. Therefore, it is proposed that other studies related to the topic be carried out in other Brazilian universities so that a more consistent national scenario on this subject can be constructed.

5. Conclusions

After evaluating the research results of medical students at different stages, it is concluded that a substantial number of students had poor-quality sleep quality predominant in women with a higher prevalence among first-year undergraduate students and the lowest prevalence existing among students in the last year of the undergraduate course.

This group sleeps fewer hours on average and is sleepier during the day. The most affected by excessive daytime sleepiness and also by severe sleepiness are young people under 25.

Finally, the group of university students in this study do not use drugs for hypnotic purposes when compared to medical students from other institutions who participated in studies similar to the present study and the adult population in general.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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