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Sleep Quality among Medical Students of a Portuguese University Avaliação da Qualidade de Sono nos Estudantes de Medicina em Portugal

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RESUMO

Introdução: O sono é um processo fisiológico complexo presente na maioria dos seres vivos. As perturbações do sono têm vindo a aumentar exponencialmente. Os estudantes universitários, particularmente, os estudantes de medicina, são especialmente vulneráveis a esta problemática. Contudo, a literatura existente relativa ao tema é escassa, especialmente, em Portugal.

O objetivo deste estudo consiste em avaliar a qualidade de sono nos estudantes do curso Medicina da Universidade da Beira Interior, Covilhã, Portugal e analisar as diferenças e relações existentes de acordo com a idade, sexo, coabitação e ano de curso.

Métodos: Trata-se de um estudo transversal em que os estudantes envolvidos preencheram o Índice da Qualidade de Sono de Pittsburg (PSQI), previamente validado para a população portuguesa.

Os valores obtidos, para cada componente do PSQI, foram inicialmente analisados para a população global, e posteriormente relacionados com as variáveis sociodemográficas, visando a obtenção de relações estatisticamente significativas.

Resultados: Duzentos noventa seis estudantes responderam ao questionário. Destes, 62,2% consideraram o seu sono bom; 42,4% obtiveram 1 na componente latência do sono; 50% admitiu dormir entre 6 a 7 horas; 73,9% evidenciou uma eficiência de sono adequada; 85,5% relatou pouco ou nenhum distúrbio do sono; 83,8% referiu nunca ter usado medicação para dormir; e 60,8% mencionou pouca ou nenhuma disfunção diurna. Relativamente ao PSQI global, 73,1% dos estudantes obtiveram uma pontuação superior a 5, indicando uma má qualidade de sono. Das raparigas, 74,7% e dos rapazes, 67,7% revelaram uma pobre qualidade de sono. Dos estudantes, que vivem sozinhos, 91,3% também exibiram uma pobre qualidade de sono. Relativamente ao ano letivo do curso no qual o inquérito foi aplicado, 82,4% dos estudantes do 1º ano reportaram uma pobre qualidade de sono, assim como 77,5% do 2º ano, 72,1% do 3º, 77,8% do 4º, 65,8% do 5º e 71,4% do 6º ano do curso.

Conclusão: Globalmente, os estudantes que participaram neste estudo apresentaram má qualidade de sono, com uma classificação no PSQI superior 5. Contudo, as classificações em cada um dos componentes não são tão negativas. A maioria dos participantes classificam o seu sono como bom ou muito bom, quase metade dos participantes referiram dormir mais de 7 horas e a maioria apresentou uma eficiência de sono superior a 85%. De igual forma, 83,8% nunca usaram medicação para dormir. Não sendo um resultado robusto, torna-se imperioso a realização de mais estudos que o comprovem inequivocamente. Mais, tais estudos também serão imprescindíveis para identificar situações em que a intervenção terapêutica melhorará tais parâmetros.

ABSTRACT

Introduction: Sleep is a complex physiological process shared by most living beings. Sleep disorders have been increasing exponentially. University students, particularly medical students, are especially vulnerable to this problem. However, the existing literature on the subject is scarce, especially in Portugal.

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The aim of this study is to assess the quality of sleep among medical students attending the University of Beira Interior, Covilhã, Portugal and to analyse the differences and existing relationships according to age, gender, cohabitation status and academic year.

Method: This is a cross-sectional study in which the students completed the Pittsburgh Sleep Quality Index (PSQI) that was previously validated for the Portuguese population. The values obtained for each component of the PSQI were initially analysed for the total sample, and then coupled with sociodemographic variables, in order to obtain statistically significant relationships.

Results: Two hundred and ninety-six students completed the questionnaire. A percentage of 62.2% of them stated that their sleep was good; 42.4% scored 2 in the component 2; 50% admitted that they usually sleep between 6 and 7 hours; 73.9% of the participants showed adequate sleep efficiency; 85.5% reported little or no sleep disturbance; 83.8% reported never having used sleep medications; and 60.8% mentioned little or no daytime disturbance. As for global PSQI score, 72.6% of the students' scores were greater than 5, which indicates poor sleep quality. 74.7% of the female participants and 67.7% of the male respondents showed poor sleep quality. 91.3% of the students who were living alone at the time also revealed poor sleep quality. Of the 1st year students, 82.4% reported poor sleep quality, as did 77.5% of the 2nd year students, 72.1% of the 3rd year students, 77.8% of the 4th year students, 65.8% of the 5th year students, and 71.4% of those attending the 6th year.

Conclusion: Generally speaking, the students who took part in this study showed a poor sleep quality, with a PSQI score superior to 5. However, the ratings in each of the components are not so negative. Most of the participants rated their sleep as good or very good, almost half of the participants reported sleeping more than 7 hours and the majority had a sleep efficiency of more than 85%. Similarly, 83.8% had never used sleep medication. Since this is not a robust result, it is imperative to carry out more studies that unequivocally prove it. Moreover, such studies will also be essential to identify situations in which therapeutic intervention will improve such parameters.

Palavras-chave: Distúrbios do Início e da Manutenção do Sono; Estudantes de Medicina; Inquéritos e Questionários; Perturbações do Sono; Qualidade de Sono.

Keywords: Sleep Initiation and Maintenance Disorders; Sleep Quality; Sleep Wake Disorders; Students, Medical; Surveys and Questionnaires

INTRODUCTION

Sleep is a complex physiological process that is essential for the basic functions performed by sleep homeostasis in the body.¹ It appears that the sleep-wake cycle is regulated by a Two-Process Model that includes two separate biological mechanisms, the Process C (circadian rhythm) and S (sleep homeostasis).¹⁻⁴

Circadian rhythms are a series of endogenous autonomous oscillators affecting the physiological functions and that regulate, in a 24-hour cycle, the coordination of the body's internal clock with the external environment.² Process S represents the homeostasis of sleep or the drive for sleep that progressively increases in intensity during wakefulness.¹⁻⁵ Although they are closely interconnected, the two processes are independent, as proven by Trachsel *et al* (1992).⁶

Sleep is influenced by genetic and environmental or behavioural factors and the environment in which sleep happens plays a significant role in its objective and subjective quality.⁷⁻¹⁰

Sleep consists of a sequence of stages. Essentially, we can identify two: NREM sleep (non-rapid eye movement sleep), which constitutes about 75% to 80% of total time spent in sleep. This stage is subdivided into N1, N2 and N3; and REM sleep (rapid eye movement sleep), also known as paradoxical sleep, which accounts for approximately 20% to 25% of sleep time.^{11,12} These phases are

repeated throughout the night in cycles that tend to last 90-120 minutes.¹²⁻¹⁴

Sleep is closely tied to moments of decreased wakefulness and increased vulnerability, which make sleepers more vulnerable to attack by predators. While asleep, living beings do not feed, drink or reproduce, which are basic behaviours for the survival of the species.^{1,15} Its persistence throughout evolution, in spite of all the apparent disadvantages described above, suggests that this state may be of great importance to organismal homeostasis.¹⁶

In fact, sleep is a complex and multifactorial state connected to many vital functions that include the maintenance of wakefulness, psychomotor performance, thermoregulation, the regulation of metabolic processes, restoration of brain energy reserves, brain waste clearance, immune function and memory formation and consolidation.^{14,15,17-24}

The prevalence of sleep disorders has been increasing exponentially, as have studies focusing on sleep patterns among general population, with particular emphasis on students.^{25,26} College students are particularly vulnerable to decreased sleep quality. Entering higher education entails significant social, cognitive and behavioural changes that will have a clear impact on sleep.²⁷⁻²⁹ Medical students are among those most affected by sleep disturbance.³⁰ Azad *et al* (2015) showed that people working for the healthcare sector, including medical students, are those who have the highest prevalence of poor sleep and poorer associated

quality of life.³¹ A meta-analysis conducted by Jahrami *et al* (2020) showed that medical students sleep an average of 6.3 hours per night, an insufficient sleep duration. Similarly, medical students showed a poor sleep quality.³² Studies conducted in Saudi Arabia showed that about three-quarters of medical students are poor sleepers, i.e., that they tend to sleep less than they should.²⁵

These results have an impact on school performance. Al-saggaf *et al* (2016) claim that this situation is due to high levels of stress and to the pressure of obtaining better grade point average.³³ Ahrberg *et al* (2012) reported an inversely proportional relationship between academic performance and sleep quality associated with elevated stress levels.³⁴ In fact, there are moderate associations between sleep quality, insomnia and stress. The interaction between sleep and stress is bidirectional, with stress impairing the sleep process, and impaired sleep affecting daytime functioning, specifically the ability to cope with social, interpersonal, and academic stressors. As shown in a systematic review conducted by Gardani *et al* (2022), poor sleep quality and stress before exams leads to poorer academic performance.³⁵ Rathakrishnan *et al* (2021) also demonstrated that medical students have serious secondary health problems related to sleep deprivation associated with excessive use of cell phones and/or screen addiction.³⁶ In Asian medical students, the prevalence of smartphone addiction was 41.93%, as reported by Zhong *et al* (2022). This addiction was related with poor sleep quality, stress, anxiety and depression.³⁷ Still, the literature focusing on sleep quality among medical students is scarce, especially in the case of Portuguese students.

That way, the main aim set for this study was to assess sleep quality among medical students who were attending the Integrated Master's Degree in Medicine offered by the University of Beira Interior. Additionally, its intention was to investigate whether sleep quality is influenced by the students' gender, academic year and cohabitation arrangement. Finally, this study also aims to compare medical students' sleep quality throughout their academic career, in order to identify the need for therapeutic intervention.

METHODS

A cross-sectional, descriptive, quantitative and correlational study was conducted. We sought the voluntary participation of medical students over 18 years enrolled at the University of Beira Interior, regardless of their academic year.

A questionnaire was used to collect data. The PSQI, previously validated for the Portuguese population, was then applied between April 18 and June 3, 2022.^{38,39} This index assesses the sleep quality of the respondents over the last month and is made up of 19 questions. Five additional questions were added for individuals who share their bed with another person and/or who share the space where they use to sleep. The 19 items are grouped into 7 different components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction. The scores

obtained for each component are summed to yield a total score ranging from 0 to 21. The higher the score, the worse the sleep quality. The score of the different components and the overall score were obtained according to the scoring instructions for the PQSI.³⁸

A PSQI-PT score > 5 indicates poor sleep quality, i.e., the respondent showed major difficulties in at least 2 components, or moderate difficulties in more than 3 components. The questionnaires were shared via the students' institutional e-mail for 45 days, and were completed anonymously by each of the study participants. Subsequently, an alphanumeric code was attributed to each anonymous questionnaire.

Statistical analysis of the data collected was carried out using IBM SPSS Statistics version 23. The results are displayed in the form of frequency and percentage. Variables were crossed to confirm if any of them has a significant impact on the global PSQI score. The Chi-square test was used, since all the variables crossed were qualitative. A significance level of 5% ($=0.05$) was defined as a reasonable cut off for statistical significance, i.e., all hypothesis were regarded as statistically significant whenever $p < 0.05$. Confidence intervals were set at 95%.

RESULTS

a. Sociodemographic Characteristics of the Sample

Two hundred and ninety-six medical students took part in the study, which represents a participation rate of 37% (the total target population was composed of 800 medical students). The mean age of the participants was 22.83 (the participants' age ranged between 18 and 44 years), with a standard deviation of 3.764 years. Of the respondents, 14.9% were under 19 years of age, 36.5% were between 20 and 22 years old, 33.8% were between 23 and 25 years old, and 14.9% were over 25. As for their gender, 77.7% were female and 22.3% were male. Of the answers, 11.8% were provided by first-year students, 13.5% by second-year students, 14.5% by third-year students, 15.5% came from fourth-year students, 25.7% from fifth-year students, while 18.9% of the participants were sixth-year students. As for their marital status, 95.3% of the participants were single, 2.4% were in a consensual union, 1.7% were married, and 0.7% chose the option "other" (none of these participants gave any additional information on their marital status). A percentage of 68.6% of the participants were living with other students, 7.8% were living alone, and 23.6% were living with relatives or in other conditions.

b. PSQI Components Frequencies

The different scores obtained by the participants in the 7 components of the PSQI are shown in Table 1. A percentage of 62.2% of participants rated their sleep quality as good and 10.5% rated their sleep quality as very good. Regarding component 2, sleep latency, and according to the results, 19.7% of respondents have a score of 0, 42.4% of 1, 22.7% of 2, 19.6% have 0 and, finally, 15.3% have a

score of 3. In component 3, half of the respondents slept 6 to 7 hours and only 1.4% reported less than 5 hours of sleep per night. In component 4, sleep efficiency, it was observed that 73.9% of the participants had an efficiency of at least 85%. Regarding component 5, sleep disturbances, the vast majority of participants (78.4%) obtained a score of 1. In component 6, use of sleep medication, 83.8% of the study population did not use sleep medication. Component 7 analyzes daytime sleepiness and dysfunctions, with 45.3% of respondents obtaining a final score of 1 and

30.4% obtaining a value of 2. It is worth noting that, in the analysis of the results obtained for components 2 and 4, only 295 answers were taken into account, since participants had to provide an answer to all questions asked for us to obtain a valid result for all these components and to carry out the final calculations. As for global PSQI score, only the questionnaires fully completed were taken into account. That way, only 294 questionnaires were considered valid. 26.9% of the respondents showed good sleep quality, while 73.1% of them revealed poor sleep quality.

Table 1. Frequency distribution of scores obtained in the different components

Component	Frequency(n)	Rate (%)
Component 1 – Subjective Sleep Quality (Question 6)		
0 – Very good	31	10.5
1 – Good	184	62.2
2 – Bad	75	25.3
3 – Very bad	6	2.0
Component 2 – Sleep Latency (Question 2+5a)		
0	58	19.7
1	125	42.4
2	67	22.7
3	45	15.3
Component 3 – Sleep Duration (Question 4)		
0 - >7 hours	134	45.3
1 -between 6 and 7 hours	148	50.0
2 –between 5 and 6 hours	10	3.4
3 - <5 hours	4	1.4
Component 4 – Sleep Efficiency (Question 1+3+4)		
0 - >= 85%	218	73.9
1 – 75% a 84%	65	22.0
2 – 65% a 74%	8	2.7
3 - <65%	4	1.4
Component 5 – Sleep Disturbance (Question 5b+5c+5d+5e+5f+5g+5h+5i+5j)		
0	21	7.1
1 – 1 to 9	232	78.4
2 – 10 to 18	42	14.2
3 – 19 to 27	1	0.3
Component 6 – Use of Sleep Medication (Question 7)		
0 – Never	248	83.8
1 – Less than once a week	20	6.8
2 -Once or twice a week	13	4.4
3 –Three times a week or more	15	5.1

Component	Frequency(n)	Rate (%)
Component 7 – Daytime Disturbance (Question 8+9)		
0	46	15.5
1 – 1 to 2	134	45.3
2 – 3 to 4	90	30.4
3 – 5 to 6	26	8.8

c. Relation between Sleep Quality with Gender, Academic Year and Cohabitation Arrangement

Tests were then carried out to determine whether any of the variables had a significant impact on sleep quality. In this group of tests, qualitative variables were crossed, therefore the Chi-square test was used. The null hypothesis of this test is H0: “The variables are independent”. In this case, if the resulting p-value is less than the chosen significance level, the null hypothesis should be rejected and the variables are not independent. For all tests (these and the following), the significance threshold level set was 5% ($=0.05$).

For the gender, evidence showed that 25.3% of the female and that 32.3% of the male participants respondents have a good sleep quality. As it happened before, this relationship is not statistically significant according to the results of the Chi-square test ($p>0.05$) (Table 2).

The association between the respondents' sleep quality and the people they live with shows that, in the sample studied, 30.2% of the students who were living with other students had good sleep quality. On the other hand, only 8.7% of those who were living alone had good sleep quality. A percentage of 23.2% of those who were living with relatives or other people showed good sleep quality. However, according to the Chi-square test, and since the p-value is greater than 0.05, this relationship is not statistically significant (Table 2). As for the relationship between the students' sleep quality and the academic year they were attending, evidence shows that 28.6% of the participants who were attending the 6th year had a good sleep quality, that 34.2% of those attending the 5th year showed good sleep quality, and that 22.2% of the 4th year students had good sleep quality. Results also show that 17.6% of 1st year students and 22.5% of 2nd year students had good sleep quality. This relationship is not statistically significant according to the results of the Chi-square test ($p>0.05$) (Table 2).

DISCUSSION

Sleep is essential to maintain metabolic homeostasis. An adequate quantitative and qualitative sleep time contributes to the physical, mental and social well-being of human beings.⁴⁰ The importance of sleep was proven by Pavlova *et al*, (2019) when the authors showed that one-third of a human being's life is spent sleeping.⁴¹ Reis *et al* (2018) studied the consequences of sleep deprivation, and showed that in Portugal, as in the USA, there is a significant relationship between the prevalence of diseases such as diabetes and depression and short sleep duration.⁴² As a matter

of fact, sleep is related to different metabolic functions, such as the maintenance of homeostasis, and the regulation of several physiological processes and is vital to ensure many of the central nervous system cognitive functions.¹⁴ The literature shows that sleep disorders are quite common among college students. According to Gaultney *et al* (2010), 27% of students show poor sleep quality as assessed with the PSQI.⁴³ This situation is even more critical among medical students, according to Azad *et al* (2015). In the literature review they conducted, they found that poor sleep quality was a problem affecting 19% of the medical students from several Asian Universities, and that this problem was more prevalent in the first and last academic year.³¹

These findings are consistent with the review conducted by Wang & Biró (2021) who proved that more than half of the university students suffer from poor sleep quality.²⁸ In Portugal, a study conducted in 2021 by Reis M *et al* showed that a decrease in sleep quality is associated with poorer academic performance and with an increase in the prevalence of mental disorders among university students.³⁰

In this study, conducted with 296 medical students from the University of Beira Interior, we observed a participation rate of 37%. This rate was considered low compared to those recorded in similar studies conducted in Brazil or North India (68.9% and 66.7%, respectively).^{44,45} As it happened in the study conducted by Corrêa C *et al*, (2017), most participants in this study were between 20 and 25 years old and most of them were female. Once again, most respondents were single and shared a house with other fellow students.⁴⁴

As for the assessment of the first component, subjective quality of sleep, 62.2% of the surveyed students classified their sleep quality as good and only 27.3% of them admitted that their sleep quality was bad or very bad. These results are quite different from those obtained in a study conducted with Jordanian students, in which 2/3 of the participants rated their sleep as bad or very bad.⁸ On the other hand, in the studies conducted by Alsaggaf and Sweileh, 30% and 28% of the students, respectively, admitted that their quality of sleep was fairly poor or very poor, which is in line with the results obtained.^{33,46} The study carried out by Corrêa C *et al* (2017) also showed that 40% of the students' sleep quality was bad or very bad.⁴⁴

As for the second component, the intention was to assess the amount of time it takes students to fall asleep. According to the results, 38% of the respondents had a sleep latency greater than 30 minutes. This result is slightly higher than that obtained in studies carried out in Jordan and Brazil,

where the results were 20.4% and 29.5%, respectively, but lower than the results obtained in another study carried out in Ethiopia, where values rose to 48.6%.^{8,44,47}

As for the third component, sleep duration, 45.3% of the participants reported sleeping more than 7 hours and only 1.4% of them reported sleeping less than 5 hours a night. Taking into account that the American Academy of Sleep Medicine recommends seven hours of sleep a day, results clearly show that only a minority of the participants (4.8%) did not meet the recommended sleep schedule. These results seem to contradict those reported in some other studies: a study conducted in Saudi Arabia showed that approximately three quarters of medical students sleep less than the recommended amount of sleep; another study conducted in the USA reports that 29.4% of students sleep more than 8 hours a night; and the study conducted by Corrêa *C et al* (2017), carried out in Brazil, reports that only 15.9% of participants get enough sleep.^{25,44,48}

The results for the sleep efficiency component, assessed in the fourth component, showed that most participants (73.9%) had sleep efficiencies above 85%, which is coincident with the study conducted by Corrêa *C et al* (2017) in which those efficiency values were shared by 87.9% of the participants.⁴⁴

In this study, 78.4% of the participants scored 1 in the fifth component. This percentage is similar to that found in the study carried out by Corrêa *C et al* (2017) in which 79.8% of the individuals had the same score.⁴⁴

As for the sixth component, 5.1% of the study sample stated that they frequently use sleep medication (3 times or more a week). This result is lower than the results published in the study conducted by Corrêa *C et al* (2017) where such statement was shared by 8.6% of the participants.⁴⁴ This difference is even more pronounced when compared to the study conducted with Saudi Arabian medical students, where the percentage of sleep medication use rises to 17%.⁴⁹

As for the seventh component, daytime dysfunction was reported by 38.8% of the respondents. This fact is consistent with studies published in Brazil, in Botucatu and Paraíba, despite the slight variation in values, 36.9% and 42.1%, respectively.^{44,50}

The global PSQI scores obtained showed that most students who participated in the study (73.1%) have poor sleep quality. This percentage is much higher than the 40% obtained in a study conducted in Brazil.⁴⁴ Likewise, this percentage is also higher than that found in the meta-analysis by Jahrami *et al* (2020), in which 55% of medical students have poor sleep quality, with a PSQI score higher than 5.³² Indeed, the prevalence of subjective bad/very bad sleep (PSQI Component 1), is more in line with the prevalence of sleep disturbance in the general population often reported in the scientific literature.

There seems to be a discrepancy between the result obtained for the global PSQI score and the result obtained for each of the components. A percentage of 73.1% of the students evidenced poor sleep quality, i.e., their scores were equal to or higher than 5 in the sum of the different components. The analysis performed for each component demonstrated that: 98.2% of the students scored 1 or higher

in component 1; 93.5% scored 1 or higher in component 2; 64.7% used to sleep less than 7 hours, hence scoring 1 or higher in component 3; 31.2% had a sleep efficiency below 85% (scoring 1 or higher in component 4); 97.7% scored 1 or higher in component 5; 21.8% took sleeping medication at least once a week, hence scoring 1 or higher in component 6; in component 7, 93.5% of the students scored 1 or higher.

Since the global PSQI score is calculated by summing each of the component scores, the results obtained turn out to be compatible. In other words, the analysis performed for each component individually and the scores obtained for each of them, leads us to believe that the students do not suffer from sleep dysfunctions. On the other hand, when focusing on the global PSQI scores, that is, the sum of all the components, it became evident that the students exhibit poor sleep quality. Those are puzzling results that show the need for a new methodology to assess sleep quality, or at least, for a re-evaluation of the cut-off score of the scale tool used or a revalidation of PSQI total score for Portugal, in order to avoid such a significant discrepancy between the result of the individual components and the global score.

According to the results obtained, female participants present a slightly worse sleep quality than male respondents. According to the results obtained, 25.3% of the female respondents present good sleep quality. These results are more significant than those provided by study conducted by Al-Khani *et al* (2019) in which only 17.1% of the female participants showed good sleep quality.²⁵ However, a study conducted in Nepal concluded that 51.8% of the female respondents had good sleep quality, which is much higher than the percentage achieved in this study.⁵¹

These results may be explained by the existence of greater hormonal changes, namely related to the menstrual cycle. In addition, there is also a role of psychological factors. Some personality traits, such as neuroticism, perfectionism, and anxious concerns, seem to be related to sleep disturbances. Some of these negative personality traits seem to be more common in females. Similarly, there seems to be a greater vulnerability of females to stressful life events, and they also showed greater reactivity to stress and more depressive symptoms than males when undergoing similar levels of stress.⁵² In the study conducted by Amaral AP *et al* (2021), students with insomnia reported higher values of socially prescribed perfectionism and neuroticism. Likewise, the insomnia group perceive their life as more stressful, had greater doubts about their actions and their ability to cope with stress and presented higher levels of persevering thinking.⁵³ However, further studies are needed to investigate this possible relationship and the factors associated.

The analysis of the relationship between sleep quality and housing conditions, among medical students attending the University of Beira Interior, showed that only 8.7% of the surveyed students who lived alone presented good sleep quality, in clear contrast with the results obtained by those who were living with other students (30.2%) and by those who were living with relatives (23.2%). Similarly, research

conducted in Jordan showed that the place of residence influences the students' subjective sleep quality, and that, contrary to prior studies, sleep quality would be worse in students who used to live with relatives.⁸ The results obtained in our study are discrepant, since the students with worst sleep quality are those who were living alone. Sleep and depression have a bidirectional relationship. On the one hand, depression can lead to changes in sleep, and on the other hand, especially insomnia leads to an increased risk of depression.⁵⁴ Both sleep quality and psychiatric disorders can be triggered by psychosocial stressors including social isolation, which may explain the results obtained. Results also showed that sleep quality tends to improve with each passing year, i.e., sleep quality tends to be lower among first-year students and improves as they successively move into the next year. According to the answers provided, 28.6% of the 6th year students and 34.2% of the 5th year students have good sleep quality. On the other hand, only 17.6% and 22.5% of 1st and 2nd year students have good sleep quality. These results are in line with those provided in other studies, which report that the first and second years of medical school are those where students have the worst sleep quality.⁴⁴ The study conducted by Corrêa C *et al* (2017), also reached the same conclusions, in spite of its methodological differences. In their study, academic years were grouped by twos and the results were subsequently assessed. In our study, each school year was assessed individually.⁴⁴ One of the possible explanations for such results is that there are more extracurricular activities at the beginning of the first year, which may lead to later bedtimes, although students never skip classes and maintain their normal school schedule. On the other hand, adapting to a new social and academic reality, with a greater study load, responsibilities and major changes in their daily environment may lead to higher levels of anxiety and/or stress that will contribute to the aforementioned results.

a. Limitations

This study is not without limitations. First, a 37% of participation rate of 37% is considered low. The lack of adherence to the study can be explained by the students' overwork and little time available for response. Also contributing to this value is the fact that participation is voluntary and not face-to-face. Second, in Table 2, considering that one of the variables cells has less than 5 cases (currently living alone), the statistical validity of the Chi-square test might be compromised. Third, no other instruments were used, namely for the assessment of daytime dysfunction and even the presence of anxious and/or depressive symptoms. Lastly, this study did not examine the effects of specific events, such as exams or deadlines that could influence the sleep quality in this population.

CONCLUSION

In view of the results obtained in this study, one can conclude that the sample composed of medical students from the University of Beira Interior was found to have poor sleep quality, according to the Global PSQI. Sleep quality

seems to increase with each academic year and to be slightly higher in male participants. The environment in which students live can also influence sleep quality, and those who share their home with other students tend to have better sleep quality compared to those who live with family members or on their own. Nevertheless, the overwhelming majority of the students included in the sample do not use sleep medication and do not often suffer from sleep disorders, showing a sleep efficiency of 85% or above. Most of those involved in the study sleep at least 6 hours a night and have a sleep latency of 30 minutes.

Bearing in mind the results obtained, it may be necessary to implement interventions meant to promote good sleep hygiene habits. The monitoring the students' sleep quality, with subsequent diagnosis and timely treatment of dysfunctions, is essential for improving the students' physical and mental health. Knowing that the students attending the first years of the course are the most affected, programs to help develop and maintain sleep hygiene should be implemented at this very stage.

Since sleep is fundamental for the physical and mental well-being of human beings, it is essential to promote research and knowledge in that field, as a way to improve the population's health care.

Table 2. Relationship between global sleep quality and gender, cohabitation status and academic year

			GSQ	PSQ	Total	<i>p</i> value
Gender	Female	A.F.	58	171	229	0.263
		R.F.	25.3%	74.7%	100.0%	
	Male	A.F.	21	44	65	
		R.F.	32.3%	67.7%	100.0%	
Currently living with	Colleagues/ friends	A.F.	61	141	202	0.065
		R.F.	30.2%	69.8%	100.0%	
	Alone	A.F.	2	21	23	
		R.F.	8.7%	91.3%	100.0%	
	Relatives/ Others	A.F.	16	53	69	
		R.F.	23.2%	76.8%	100.0%	
Year	1th Year	A.F.	6	28	34	0.179
		R.F.	17.6%	82.4%	100.0%	
	2nd Year	A.F.	9	31	40	
		R.F.	22.5%	77.5%	100.0%	
	3rd Year	A.F.	12	31	43	
		R.F.	27.9%	72.1%	100.0%	
	4th Year	A.F.	10	35	45	
		R.F.	22.2%	77.8%	100.0%	
	5th Year	A.F.	26	50	76	
		R.F.	34.2%	65.8%	100.0%	
	6th Year	A.F.	16	40	56	
		R.F.	28.6%	71.4%	100.0%	
TOTAL	A.F.		79	215	294	
	R.F.		26.9%	73.1%	100.0%	

GSQ (good sleep quality), PSQ (poor sleep quality), A.F (absolute frequency); R.F (relative frequency)

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DECLARAÇÃO DE CONTRIBUIÇÃO

RF: Planeamento e conceção do trabalho, redação do texto

JB: Planeamento do trabalho, revisão do texto

JF e CP: Tratamento dos dados estatísticos, revisão do trabalho

Todos os autores aprovaram a versão final a ser publicada

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RF: Planning and design of the work, drafting of the text

JB: Work planning, revision of the text

JF and CP: Processing of statistical data, review of work

All authors have approved the final version to be published

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