ASSESSMENT OF SLEEP QUALITY DURING WINTER SEMESTER IN UNDERGRADUATE MEDICAL STUDENTS ENROLLED AT UKIM, FACULTY OF MEDICINE, SKOPJE, REPUBLIC OF NORTH MACEDONIA

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Abstract

The aim of the study was to assess sleep quality in medical students from all study years enrolled at Faculty of Medicine, UKIM, Skopje during winter semester of the academic year 2022/23. An online survey including the Pittsburgh Sleep Quality Index (PSQI) and a questionnaire regarding demographic variables (age and gender) was available via Google Forms to a cohort of students at three time points (the beginning, the middle and the end) of the winter semester. A total of 113 students from all years, aged 18-28, responded. Eighty percent of them were female and 20% were male.

The PSQI is a self-report questionnaire that assesses overall sleep quality during an one month time interval. It consists of 19 questions regarding subjective sleep quality, the latency, duration, efficiency of sleep, sleep disorders, the use of sleep medications and daytime dysfunction. A total PSQI score can be calculated and it ranges from 0 to 21 with a higher score indicating poorer sleep quality.

The mean value of the total PSQI score increased from the first to the third time point of the study (7.8 ±3.3; 8.1±3.4; 8.4±3.5 respectively) (p=0.172). More than 60% of the students (62.2%; 63.7%; 64.1% respectively) showed poor sleep quality (PSQI >5), with 31% using sleeping medication. Sleep duration in 75% of students was shorter than 7 hours, with 11% sleeping less than five hours.

A reduction in overall sleep quality can be observed in medical students during the winter semester.

Key words: sleep quality, PSQI, medical studen

Introduction

Sleep is well-controlled physiological state of unconsciousness, from which the person can be awakened by sensory or other stimuli [1].

It is one of the most important functions of the human body and it is essential to maintaining overall health and well-being. According to both the National Sleep Foundation and the American Academy of Sleep Medicine, it is recommended that adults should obtain 7–9 hours of sleep every night, while the recommendation for school-aged children and teens is up to 11 hours [2].

Insomnia has been defined as dissatisfaction with the quality or quantity of sleep, in addition to other its' more precise clinical definitions [3].

Inadequate sleep has negative efects on cardiovascular diseases, neurocognitive function, psychological disorders, metabolic abnormalities, immunological response and academic performance [2].

Studies have demonstrated that sleep disturbances are more frequent than we realize. Approximately 30 to 75 % of the adult population from diverse age span suffers from insomnia, with the highest prevalence in senior (up to 75%) and young adults (50%) [4,5].
Between 40 and 70 % of university students have sleep disturbances which include habitual poor sleep quality, short sleep duration, use of sleeping medicine and daytime sleepiness associated with poor sleep hygiene, high levels of anxiety and poor academic performance. This has been reported by different large scale research projects conducted in different parts of the world [6-8].

To the high academic demands, and in order to fulfill their obligations, students often adapt by reducing sleep, with no regard to possible negative effects of sleep deprivation on their health [9].
Medical students constantly face numerous demands during their studies. Regularity of lectures and exercises, continuous heavy workload connected to many subjects and frequent testing of their knowledge, all together represent an own kind of stress. Sleep disruption, therefore is described as a

pandemic in the population of medical students compared to general population [9], with a world estimated pooled prevalence of poor sleep quality of 57% [2].

Across continents, suboptimal sleep quality in medical students exhibits the highest occurrence in Europe, followed by the Americas, Africa, Asia, and Oceania [10].

There are many particular reports on medical students falling asleep late and having dificulty initiating sleep, as well as sleeping fewer hours, all together followed by considerable daytime dysfunctions [2,11,12].

Insomnia has been shown to be a prominent public health problem with higher prevalence in medical college students compared to undergraduates in other programs, too [13].

Studies suggest that its' prevalence is the highest in medical students in higher study years (clinical internship), with older age and female sex positively associated with insomnia, suggesting that age is an important risk factor. Nevertheless, other studies report on the poorest sleep quality in final-year and first year students compared to other classes with an increased prevalence of sleep medicine utilization towards the end of the academic year [14,15].

Earlier research has shown that insomnia may be signifcantly related to memory reduction and decreased learning abilities, ultimately leading to a decline in academic performance as a result of decreased alertness and focus in medical students [16].

Sleep deprivation can significantly impact medical students' professional development, too. Studies have found that medical students who experience insuficient sleep are more likely to experience burnout and lack of motivation which can lead to decreased job satisfaction, greater risk of medical school dropout and increased likelihood of development of anxiety disorders and depression with suicidal behavior [17-20].

In our country, up to our current best knowledge, there is a lack of necessary data on the quality of sleep, as opposed to sufficient data on the prevalence of high anxiety, depression and stress in medical students [21].

Therefore, the aim of this study was to assess the sleep quality in medical students from all study years enrolled at UKIM, Faculty of Medicine, Skopje during winter semester of the academic year 2022/23.

Materials and Methods

The study was performed at the University "Ss. Cyril and Methodius", Faculty of Medicine in Skopje.The activities were undertaken at the Student Counseling Service within the Institute of Physiology and Anthropology during the first (winter) semester of 2022/2023 study year. The research was designed as a prospective observational study with three cross-sectional points. The first time point (T1) was at the beginning of the new academic year during October 2022, the second time point (T2) was after the second mid-term exam week, and the third time point (T3) was at the end of the winter semester (after January exam session). During the study a total of 327 responses to an online survey, available via Google Forms, were collected. The survey consisted of participant information regarding age, sex, informed consent and the Pittsburgh Sleep Quality Index (PSQI). In the first time point, a total of 111 students aged 18-27, out of whom 85.6% were female and 14.4% were males, participated in the study. In the second time point, a total of 113 subjects aged 18-28 years took part in the study. Eighty percent of them were female and 19.5% were male. In the third time point, 103 subjects aged 19-28 years, of which 81.6% were female and 18.4% were male.

For the purpose of the study the participants were divided into three groups depending on the current stage of medical education and their reported age. The "Preclinical" group included students from the first and second study year, aged 18-20 years, mean age 19.5 ± 0.6 years, who attended basic science courses. Out of 105 answers obtained in the study from this group, 41 were collected at the first time point, 37 at the second time point and 27 at the third time point (total of 41 students with 105 total answers). The "Clinical clerkship" group was comprised of students from the third and forth study year, aged 21-23 years, with mean age of 21.9 ± 0.8 years. A total of 169 answers were collected from the second group at the three time points of the study (51, 59, and 59 respectively). The "Clinical internship" group included students from the fifth and the sixth study year, who were engaged in clinical internship aged 24-28 years, with mean age of 24.9 ± 1.2 years. A total of 59 answers were collected during the study from the Clinical internship group at three time points (19, 17, and 17 respectively).

The PSQI instrument consists of 19 self-reported items, which can indicate how frequently the respondents have experienced certain sleep difficulties over the past month and it enables them to rate their overall sleep quality. Each item belongs to one of seven subcategories: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, the use of sleep medications and daytime dysfunction [22]. Scores to each question range from 0 to 3. Higher scores indicate more acute sleep disturbances. The total PSQI score can range from 0 to 21. The instrument aims to differentiate good sleepers from poor sleepers, with a cutoff score of 5 [22]. As proposed by Buysse et al.,1989, we categorized the results into two groups: good quality of sleep (total PSQI score≤5) and poor quality of sleep (total PSQI score > 5).

For statistical evaluation of the data, SPSS 16 software (SPSS Inc., Chicago, IL) was used. The results are represented by mean values and their standard deviations as measures of central tendency; the analysis was performed with the Student t test, one way ANOVA and chi-square test. The level of significance was $p < 0.05$.

Results

The mean value of the total PSQI score obtained from the undergraduate medical students' sample (total of 327 responses) was 8.1±3.4. At the first time point the mean PSQI score was 7.8±3.3, (111 answers), at the second time point it was 8.1±3.4, (113 responders) and at the third time point it was 8.4±3.5 (103 responders) (ANOVA (F=0.9148, df=2, p= 0.3884).

As can be seen from table 1, the mean PSQI score obtained from the "Preclinical" group was 9.3 ± 3.7, while students from the "Clinical clerkship" group showed mean PSQI score of 7.8±3.3. The students from "Clinical internship" group showed mean PSQI score of 8.1± 3.1. The mean PSQI score in junior medical students was significantly higher than the ones obtained in other two groups (ANOVA (F=6.0910, df=2, p=0.002534)).

The highest value of the mean PSQI score was obtained at the second time point (T2) in the "Preclinical" group and it was 9.5 ± 3.5. It was significantly higher than the one obtained at the first time point (T1) in the same group (p=0.016) and the highest of all obtained in the second time point (p=0.0079).

Table1. Mean values of PSQI scores obtained in undergraduate medical students in three time points during winter semester

Subjects Time point	Preclinical (M1+M2) N=41	Clinical clerkship (M3+M4) N=51	Clinical internship (M5+M6) N=19	Total
T1(beginning)	7.5 ± 3.3	7.5 ± 3.3	8.9 ± 2.9	7.8 ± 3.3
T2 (mid-term)	9.5 ± 3.5**	7.5 ± 3.2	7.2 ± 2.8	8.1 ± 3.4
T3 (end of term)	8.8 ± 4.1	8.3 ± 3.3	8.2 ± 3.4	8.4 ± 3.5
Total PSQI score	9.3 ± 3.7*	7.8 ± 3.3	8.1± 3.1	8.1 ± 3.4

*(ANOVA (F=6.0910, df=2, p=0.002534)).

** p<0.05

Based on the results obtained from the PSQI assessment, approximately 36.7% of the participants demonstrated good sleep quality (PSQI score lower than 6 points), while 63.3% showed poor sleep quality. At the first time point 37.8% of the participants were identified as good sleepers, at the second time point 36.3% showed PSQI scores lower than 6, while at the third time point 35.9% of the subjects had good sleep quality (p>0.05).

As can be seen from table 2, the overall prevalence of poor sleep quality in "Preclinical" group was 68.6%, while in "Clinical" clerkship group it was 58.6% and in the "Clinical internship" group it

was 67.9% (chi square = 3.368, df=2, p= 0.1859). The highest prevalence of poor sleep was noticed during the second time point (T2) compared to the prevalence during T1 and during T3 in subjects from "Preclinical" group (chi square =1.492, df=2, p=0.492).

Table 2. The prevalence of poor sleep quality (PSQI>5) score in undergraduate medical students in three time points during winter semester

Subjects Time point	Preclinical (M1+M2) N (%)	Clinical clerkship (M3+M4) N (%)	Clinical internship (M5+M6) N (%)	Total
T1(beginning)	26 (63.4)	28 (54.9)	15 (66.7)	69 (62.2)
T2 (mid-term)	28 (75.7)	36 (61)	8 (59.3)	72 (63.7)
T3 (end of term)	18 (66.7)	35 (59.3)	13 (76.5)	66 (64.1)
Total	72 (68.6)	99 (58.6)	36 (67.9)	207(63.3)

The prevalence of sleep difficulties (short duration of sleep - less than five hours at night, frequent use of sleep medication – once to three or more times per week and the subjective estimation of bad sleep quality) in undergraduate students during the three time points in winter semester is shown on table 3. As can be seen, approximately 11 % spent less than five hours in bed at the beginning of the semester, while the majority of the students (64%) spent five to seven hours in bed. One quarter (25.2%) of the subjects reported that they had slept more than 7 hours at night during past month at the first time point. Sixty seven percent of the students reported that they had slept five to seven hours at night at the third time point.

Thirty one percent of the participants responded that they had used sleeping medicine (prescribed or "over the counter") during the past month. Approximately 23% of the participants used it once to three times per week to help them sleep at the beginning of the semester. At the third time point 19% of students used sleep medicine. There was no significant difference in the percentage of students that used sleep medicine between the three time points (chi square=3.3594, df=5p=0.1864).

Table 3. The prevalence of sleep difficulties in undergraduate medical students in three time points during winter semester

Subjects Time point	Duration of time spent in bed %	Use of sleep medication %	Subjective estimate of bad sleep quality %
T1(beginning)	10.8	23	30
T2 (mid-term)	7	11	37
T3 (end of term)	8	19	48*

*p<0.05

As can be seen, 48% of the subjects estimated their sleep quality as "fairly bad" to "very bad" at the third time point, while at the first and the second time point the percentage was 30% and 37% respectively (chi square = 7.1307 df=2 p=0.02). Only 9 % of the participants rated their sleep quality as "very good" at the end of the winter semester.

Discussion

The data obtained in this study, to our present best knowledge, represent the first results on the assessment of sleep quality in undergraduate medical students enrolled at UKIM, Faculty of Medicine, Skopje during winter semester of the academic year. The educational workload for students at medical faculties in our country is unevenly distributed between winter and summer semester. Medical students perceive the winter term as more difficult, more demanding and more stressful compared to summer semester, due to the larger number of exams, more difficult subjects and more difficult curricular demands for progress. The winter terms of the first, second and the third school year are considered to be most demanding of all compared to the ones from the clinical part of the curriculum.

The mean value of the total PSQI score was 8.1±3.4. It is in accordance with the report of Shafiee et al, 2024, who found an average PSQI score of 7.95 (SD=3.76) in iranian medical students [23]. Other reports also show average PSQI scores higher than 5, yet much lower than our result [24-26]. The mean PSQI score increased insignificantly during the winter term (p=0.172).

Junior medical students (from preclinical group) showed the highest mean value of PSQI score (9.3 ± 3.7) compared to older students (p=0.002534). During the mid-term exams time point their mean PSQI score was 9.5 ± 3.5 and it was the highest reported. These findings are in accordance with the reports from studies in Rwanda, India and Brazil on the poorest sleep quality in final-year and in first year medical students [14,27,29], yet much higher. Other researchers report higher PSQI scores in clinical students [28] or no effect of the study year on the quality of sleep [23].

Approximately 63% of the students in our study (68.6% of junior medical students and 67.9 % of the students from clinical internship group) showed poor sleep quality (PSQI >5). Junior students showed the highest prevalence of poor sleep quality (75.7%) in the mid-term time point (T2). These results are higher than the ones reported from the recent meta-analysis on worldwide estimated pooled prevalence of poor sleep quality of 57% in medical students [2].

Nevertheless, they are in accordance with many reports from all over the world on the prevalence of poor sleep quality in the range of 60% to 95,1% in medical students [14, 15, 23-29]. Data regarding sleep difficulties, such as short duration of sleep (less than five hours at night), showed that approximately 11% spent less than five hours in bed. The majority of the students (64%) spent five to seven hours in bed. One quarter (25.2%) of the subjects reported that they had slept more than 7 hours at night during past month at the first time point. Sixty seven percent of the students reported that they had slept five to seven hours at night at the third time point. Approximately 75% of students in our study had suboptimal sleep duration (less or equal to 7 hours per night) which is in accordance with other reports [23, 29].

A total of 31% of the participants responded that they had used sleeping medicine (prescribed or "over the counter") during the past month. A total of 23% used it once to three times per week to help them sleep. These findings are much higher than the ones (6.6%, 8.6% and 17%) reported in the literature [14,29,30].

This fact indicates a serious need for early intervention programs targeting poor lifestyle habits in medical students. Sleeping medications have been shown to impair sleep structure and both physical and psychological dependence often follow the use of sleeping medication.

At the end-term time point, 48% of the participants classified their sleep quality as either bad or very bad compared to 30% at the beginning of the winter semester (p=0.02). This finding is in line with similar reports [29].

Our study revealed alarming results regarding sleep quality in medical (especially junior) students in our country. There is an urgent need for an implementation of permanent serious preventive and educative programs which aim to promote healthy sleep and good mental health at our university in order to address the factors that contribute to poor sleep quality. Various campaigns, workshops and individual psychological counseling for healthy sleep hygiene, time-management, effective learning strategies, different techniques for coping with stress can be applied. The engagement of junior students in mild to moderate physical activities and the use of different relaxation techniques such as meditation and progressive muscle relaxation should be encouraged. A change in the distribution of academic workload during the study years and an implementation of mentoring programs for students within the

medical faculty curricula could also be part of these strategies. This is important, because sleep disorders are inseparable from impaired mental and physical health and lower productivity. Anxiety is associated with less sleep, while depression with excessive sleep, dominated by the REM-phase with early morning awakenings. Though factors linked to modern technologies like the use of social media or more time spent on screens are globally known as the main factors leading to poor sleep quality among medical students, future studies should consider psychosocial, and environmental factors that contribute to poor sleep quality among medical students, as well as conduct a prospective study to determine the cause-effect relationship of risk and protective factors for poor sleep quality.

This study was the first of its kind conducted to our best knowledge. It was conducted at the largest university, and as such it could presents a general picture of the sleep quality among medical students in our country. However, there are some limitations that we are aware of. We used a self-reported scale measuring sleep quality that is psychometric sound as well as fitting well with our context; the participants might give socially desired answers on sensitive questions or not correctly respond some questions as they might not understand.

During this study, the education sector was recovering from delays caused by lockdowns of COVID-19, thus medical students had both online and virtual classes that could affect their sleep quality and the response rate, which was fairly low. This study did not examine the factors that might contribute to poor sleep quality among medical students. Therefore, more research is needed to examine these factors among medical students in North Macedonia.

Conclusions

There was an alarming prevalence of increasingly poor sleep quality during the winter semester in junior students and clinical interns, with the highest numbers in junior students at the mid-term period. Most medical students had less than recommended hours of sleep. The clinical interns and junior students experienced worse sleep quality that clinical clerkship students. Along with overall poor sleep quality, an upsetting prevalence of sleep medication use, especially at the beginning of the winter semester was noted.

A significant increase in the subjective perception of the deleterious effects on sleep quality was noted during the course of winter semester.
Based on these findings, intervention methods such as sleep education, behavioural changes, and relaxation techniques are highly needed and suggested to address the factors that contribute to poor sleep quality. To address this sleep issue, it is also critical that health promotion policies and strategies, particularly those focusing on healthy sleep hygiene, can be implemented.

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