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Original Paper: Comparison of Sleep Quality between Senior Medical and Dental Students and Its Association with Academic Achievement

Maryam Basirat[1], Ideh Dadgaran[2], Mahnaz Fallahi Khesht Masjedi[3], Ali Abidrahmani[4*]

1. Department of Oral and Maxillofacial medicine, Dental Sciences Research Center, School of Dentistry, Guilan University of Medical Sciences, Rasht, Iran
2. Medical Education Research Center, Education Development Centre, Guilan University of Medical Sciences, Rasht, Iran
3. Raz Counseling and Psychological Services Center, Rasht, Iran
4. School of Dentistry, Anzali International Campus, Guilan University of Medical Sciences, Rasht, Iran

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ABSTRACT

Introduction: Many factors influence academic achievement. Identifying these factors and ameliorating associated problems can improve students' performance. Sleep is one of the main factors that may affect the academic achievement. We conducted this study to assess sleep quality in dental and medical students and its relationship with academic achievement.

Materials and Methods: This Analytic-cross-sectional study was conducted on 96 senior dental and medical students at Guilan University of Medical Sciences in Rasht, Iran, using Pittsburgh Sleep Quality Index standard questionnaire between December 2021 and March 2022. Data analysis was conducted using SPSS version 28 and Amos version 26 (α=0.05).

Results: Seventy-eight percent of senior year medical students and Seventy-six percent of senior year dental students had poor quality of sleep. No significant correlation was found between the overall sleep quality index and academic achievement in either dental or medical students. However, an inverse relationship was found between academic achievement in dental students and sleep disturbances component of Pittsburgh Sleep Quality Index (P = 0.015). In comparison with dental students, medical students had significantly worse scores in the sleep duration component (P = 0.028) but no difference in overall sleep quality was observed.

Conclusion: While no statistically significant relationship was found between sleep quality of students and their academic achievement, it was noticed that a significant group of both medical and dental students have poor quality of sleep which is unknown to them. Therefore, we recommend sleep counseling during the course of their studies to improve their condition.

**** Corresponding Authors:***
Ali Abidrahmani
Address: *Dentist, School of Dentistry, Anzali International Campus, Guilan University of Medical Sciences, Rasht, Iran*
Tel: *+989334440358*
E-mail: *abidrahmani@outlook.com*

1. Introduction

Academic achievement is one of the most important factors in assessing the ability of a student to complete their studies. Determining factors that influence the academic achievement of students and considering them during the development of academic programs and schedules leads to better results for both students and academic institutions (1). One of the factors that might influence academic achievement is sleep quality (2).

Sleep is a normal and reversible state during which the response to outside stimuli decreases. Sleep is considered to be a way to conserve energy, promote cell repair, control body temperature, control metabolism and affect the immunological response. Sleep is an opportunity for brain that provides optimal conditions for consolidation processes that integrate newly encoded memory into long-term memory (3). Sleep allows the brain to better process experiences and new information which in turn improves the ability of the brain to comprehend and store information.

Sleep disorders are a group of conditions that disturb normal sleep patterns and cause problems in social and occupational functions. Sleep disorders include insomnia, circadian rhythm disorders, sleep apnea, narcolepsy, parasomnia and Periodic limb movement disorder (4). Sleep disorders are associated with physiological, mental and ecological factors such as age, gender, lifestyle, environmental noise and stress (2). The prevalence of sleep disorders is estimated to be between 22 and 65 percent of the population. Bad or unacceptable quality of sleep is seen in 7 percent of medical students and insomnia is seen in 28 percent of them (5)

Poor quality of sleep might impair educational performance by affecting both cognitive and psychomotor functions (2). Low sleep quality is often associated with worse results in exams (6). Studies demonstrate that various factors might affect the quality of sleep, including the duration of sleep. The quality of sleep, however, must not be considered to be synonymous with the duration of sleep. The association between sleep duration and educational performance is controversial and there are contradictory results in the literature (6, 7, 8, 9).

To increase medical and dental students' educational accomplishments and to decrease their mistakes in clinical settings as well as in their midterm and final exams, it is necessary to know the factors that negatively impact these students and to formulate plans to control and moderate them. Therefore, we conducted this study to ascertain and compare the frequency of sleep disorders in medical and dental students and to determine its association with academic achievement.

2. Materials and Methods

This cross-sectional analytical study was conducted on 96 students from all enrolled senior students (medical and dental) of Guilan University of Medical Sciences (46 medical students and 50 dental students) between December 2021 and March 2022. The inclusion criteria were being a last-year student and providing informed consent. The exclusion criteria were unfilled questionnaires and incompletely filled ones.

In this study, the minimum sample size was calculated to be 35 according to a previous study (11) considering the study power of 0.8, error level of 0.05, and a standard deviation of 2.67 for medical students and 2.18 for dental students.

The Persian version of the PSQI (Pittsburgh Sleep Quality Index) was administered to conduct the study. The questionnaire consists of 7 components, including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, the use of sleep medication, and daytime dysfunction. The Persian version of PSQI was tested for validity and reliability on a population of 1115 Iranian people (9). The content validity index (CVI) is equal to or greater than 0.78 and the content validity ratio (CVR) is equal to or greater than 0.9 and reliability (Cronbach's alpha) is 0.65. All 7 components must be considered in scoring the PSQI. The maximum score for each factor is 3 for an extreme problem, and the minimum score is 0 for no problem. The final PSQI score which ranges from 0 to 21 is calculated by adding up the scores from all components. A higher score in each component indicates greater dysfunction or disturbances in that component, and a higher overall PSQI score shows worse quality of sleep. A total score exceeding 5 indicates poor sleep quality (10).

After ethical approval by the Ethics Committee of Guilan University of Medical Sciences, the questionnaire, which was designed on the Porsline (Porsline.ir) platform, was delivered through social media to senior medical and dental students of Guilan University of Medical Sciences. Before posting the link of the questionnaire, the goals of the research and the privacy policy were explained to them. The Students took part in the research of their own accord. Certain demographic information including students' field of study, age, gender and variables such as Grade Point Average (GPA), time spent behind a computer or using a smartphone in hours, use of a smartphone just before going to sleep, and the existence or non-existence of snoring in sleep at the time of study were also collected. Students were also categorized as daytime sleepers or nighttime sleepers (those who went to bed between 7:00 and 20:59 were considered daytime sleepers, and those who went to bed between 21:00 and 6:59 were categorized as nighttime sleepers).

2.1. Sample size calculation

In the present study, the minimum sample size was calculated to be 35, for each group, according to a previous study (11) considering the study power of 0.8, error level of 0.05, and a standard deviation of 2.67 for medical students and 2.18 for dental students.

2.2. Statistical analysis

Descriptive statistical methods (including frequency, percentage, mean and standard deviation) were used to describe the obtained data. The assumptions of parametric tests were evaluated to examine the research goals. Accordingly, the normality of the variances was examined using the Shapiro-Wilk test and Kurtosis and skewness indices. The homogeneity of groups was reviewed using Levene's test. In cases where the assumptions were confirmed, the Independent t-test, ANCOVA, Linear regression and Chi-square tests were used. In cases where the assumptions were not confirmed, the Spearman Correlation test was used. Data analysis was conducted using SPSS version 28 and Amos version 26 and at a $P<0.05$ level of significance.

3. Results

Average age of all participants was 26.11 ± 3.75 years. Eighteen medical students (34% of medical students) and 35 dental students (66% of dental students) were 25 years old or younger.

Fifty-eight participants (60.4%) were female (63 percent of medical students and 58 percent of dental students) and the rest were male. The mean Grade Point Average (GPA) score for Medical students and Dental students was 16.43 and 16.51, respectively (Table 1).

Seventy six percent of senior dental students and Seventy-eight percent of senior medical students had low quality of sleep. Field of study has no significant impact on the frequency of having low quality of sleep (Pearson chi-square) (Table 2).

No significant relationship was found between the overall PSQI (Pittsburgh Sleep Quality Index) score and field of study (ANCOVA) but medical students had significantly worse scores in the "duration of sleep" component compared to dental students ($P = 0.028$) (Table 3).

The PSQI components' scores significantly differed from each other in both medical and dental students. In Medical students, the most frequent score was "1" for subjective sleep quality, sleep latency, sleep duration, sleep disturbances and daytime dysfunction components. Scores of "0" were most frequent in in habitual sleep efficiency and use of sleep medication.

Table 1. Demographic Data

Category	Dental Students (n=50)	Medical Students (n=46)	Overall (n=96)
Field of Study (%)	52.1	47.9	100
Age (Mean ± SD)	24.84 ± 1.89	27.50 ± 4.70	26.11 ± 3.75
Gender	29 F, 21 M	29 F, 17 M	58 F, 38 M
GPA (Mean ± SD)	16.51 ± 1.08	16.43 ± 1.20	16.47 ± 1.13

F= Female, M= Male, SD= Standard Deviation

Table 2. Comparison of Frequency of Good and Poor Sleep Quality Between Dental and Medical Students

Variables	Sleep Quality; No. (%)		Test Statistic	Significance (P Value)
	Good	Poor		
Medical student	10 (21.7)	36 (78.3)	0.07	0.792
Dental student	12 (24)	38 (76)		

Pearson Chi-square

Table 3. Comparison of the Mean Overall PSQI Score and Its Subcomponents Between Dental and Medical Students

Component	Groups		Test Statistic	P Value
	Dental Student (Mean ± SD)	Medical Student (Mean ± SD)		
Subjective sleep quality	1.12 ± 0.77	1.20 ± 0.72	0.30	0.583
Sleep latency	1.22 ± 0.89	1.02 ± 0.86	1.10	0.297
Sleep duration	1.08 ± 0.92	1.52 ± 0.81	4.98	0.028
Habitual sleep efficiency	0.42 ± 0.76	0.5 ± 0.94	0.15	0.703
Sleep disturbances	1.26 ± 0.60	1.15 ± 0.63	1.28	0.260
Use of sleep medication	0.08 ± 0.34	0.26 ± 0.68	3.59	0.061
Daytime dysfunction	1.22 ± 0.81	1.17 ± 0.80	0.003	0.959
PSQI Score	6.40 ± 3.17	6.83 ± 3.10	0.45	0.503

ANCOVA

Table 4. Comparison of PSQI Component Scores and Their Distributions Within Medical and Dental Students

Component	Score; No. (%)				P Value
	0	1	2	3	
Subjective Sleep Quality					
Dental student	9 (18)	29 (58)	9 (18)	3 (6)	< 0.001(30.96)
Medical student	6 (13)	27 (58.7)	11 (23.9)	2 (4.3)	< 0.001(31.39)
Sleep latency					
Dental student	12 (24)	18 (36)	17 (34)	3 (6)	< 0.010(11.28)
Medical student	13 (28.3)	22 (47.8)	8 (17.4)	3 (6.5)	< 0.001(17.13)
Sleep duration					
Dental student	14 (28)	23 (46)	8 (16)	5 (10)	< 0.001(15.12)
Medical student	3 (6.5)	22 (47.8)	15 (32.6)	6 (13)	< 0.001(19.57)
Habitual sleep efficiency					
Dental student	36 (72)	8 (16)	5 (10)	1 (2)	< 0.001(60.88)
Medical student	33 (71.7)	7 (15.2)	2 (4.3)	4 (8.7)	< 0.001(54.70)
Sleep disturbances					
Dental student	2 (4)	35 (70)	11 (22)	2 (4)	< 0.001(58.32)
Medical student	5 (10.9)	30 (65.2)	10 (21.7)	1 (2.2)	< 0.001(43.22)
Use of sleep medication					
Dental student	47 (94)	2 (4)	1 (2)	0 (0)	< 0.001(82.84)
Medical student	38 (82.6)	6 (13)	0 (0)	2 (4.3)	< 0.001(50.78)
Daytime dysfunction					
Dental student	9 (18)	24 (48)	14 (28)	3 (6)	< 0.001(18.96)
Medical student	9 (19.6)	22 (47.8)	13 (28.3)	2 (4.3)	< 0.001(18.17)

Chi-square.

In dental students, the score of "1" was most frequent in subjective sleep quality, sleep latency, sleep duration, sleep disturbances, daytime dysfunction, while the score of "0" was most frequent in habitual sleep efficiency and use of sleep medication (Table 4).

Overall PSQI score had no significant relationship with academic achievement in either medical students or dental students (Table 5).

None of PSQI components had any significant relationship with academic achievement in medical students. In Dental students, however, a significant inverse relationship was observed between the sleep disturbances component and academic achievement. (P = 0.015) Higher score in sleep disturbances component led to worse academic achievement (Table 5).

No significant relationship was found using

Spearman's correlation between hours spent behind a computer or duration of smartphone use in hours in either dental or medical students (r=0.072 and p=0.636 for medical students; r=0.192 p=0.183 for dental students). Additionally, there was no significant relationship between smartphone use immediately before sleep, the presence or absence of snoring, and academic achievement in either dental or medical students (P<0.05) (Table 6).

Table 5. Correlation Between Overall PSQI Score and Its Components and Academic Achievement in Dental and Medical Students

Variables	Subjective Sleep Quality	Sleep Latency	Sleep Duration	Habitual Sleep Efficiency	Sleep Disturbances	Use of Sleep Medication	Daytime Dysfunction	Total Score
Medical students' Academic Achievement	r = -0.011 P = 0.943	r = -0.069 P = 0.646	r = 0.026 P = 0.866	r = 0.028 P = 0.856	r = -0.185 P = 0.220	r = -0.076 P = 0.617	r = -0.251 P = 0.093	r = -0.150 P = 0.318
Dental students' Academic achievement	r = 0.095 P = 0.512	r = 0.141 P = 0.329	r = 0.093 P = 0.519	r = -0.097 P = 0.503	r = -0.341 P = 0.015	r = 0.002 P = 0.990	r = -0.029 P = 0.840	r = 0.032 P = 0.825

Spearman Correlation

Table 6. Relationship between GPA and some Lifestyle Factors (Smartphone Usage before Sleep, Computer/Smartphone Usage, Snoring)

Group	Factor	Variable	Mean GPA ± SD	Statistical Test	Test Statistic (p-value)
Medical Students	Smartphone Usage Before Sleep	Immediately before sleep	16.65 ± 1.30	ANCOVA	F = 1.43 (p = 0.25)
		1–30 minutes before sleep	16.40 ± 1.19		
		More than 30 minutes before sleep	15.72 ± 0.57		
Dental Students		Immediately before sleep	16.57 ± 1.00	ANCOVA	F = 0.63 (p = 0.537)
		1–30 minutes before sleep	16.56 ± 1.23		
		More than 30 minutes before sleep	15.92 ± 0.64		
Medical Students	Snoring	No	16.45 ± 1.22	Independent Samples Test	t = 0.21 (p = 0.837)
		Yes	16.37 ± 1.20		
Dental Students		No	16.57 ± 1.08	Independent Samples Test	t = 0.88 (p = 0.381)
		Yes	16.18 ± 1.12		

GPA: Grade Point Average

4. Discussion

This research was conducted to compare sleep disorder in senior medical and dental students and its association with academic achievement during the Covid-19 pandemic.

In this research, approximately 78% of senior medical students and 75% of senior dental students suffered from poor quality of sleep. Our data shows a higher frequency of poor sleep quality than previous studies in Iran and globally (7, 12, 13). There can be several reasons as to why this has occurred including differences in climate, the time period in which the study was conducted (such as season) and university specific condition. The importance of Covid-19 should not be understated as students had faced myriad challenges during the pandemic, such as adjustment to modified teaching formats, loss of social connectedness and lifestyle changes which might have had negatively impacted the quality of their sleep (14). Lastly, differences may be due to the sample size.

Total PSQI (Pittsburgh Sleep Quality Index) score had no significant difference between dental and medical students (ANCOVA) but medical students had a higher score in the sleep duration component compared to dental students. Our results match those of Lima et al. in both of the aforementioned findings (15).

There was a significant difference in the frequency of scores in different PSQI components between medical and dental students. Highest frequency of score "0" (which corresponds to not having any problems) was seen in "habitual sleep efficiency" and "use of sleep medication" components, aligning with results from Becker et al (16).

Subjective sleep quality component of PSQI represents a person's sleep quality from his or her

point of view. About 28 percent of medical students and 25 percent of dental students scored 2 or 3 in this component which means that they have subjectively evaluated their sleep quality as "fairly bad" or "very bad" and the rest have evaluated their sleep quality as "very good" or "fairly good". This difference between subjective evaluations of sleep quality with PSQI's score was also seen in Elagra et al.'s research (17). This means that a significant portion of students who suffer from poor sleep quality are not aware of the problem and consider their quality of sleep to be better than what it really is.

Research conducted by Jalali et al. (18) on 102 medical students showed that no significant relationship was found between academic achievement and sleep quality. A study by Sweileh et al. (19) also demonstrated that there was no significant relationship between sleep quality and academic achievement. Nevertheless, Seoane et al. (7) analyzed 41 articles regarding sleep quality, and discovered that sleep quality and academic achievement have a significant relationship. Ahrberg et al.'s research shows that among medical students it is not the "generally poor sleepers" who perform worse in the medical board exams, Rather, students who anticipate poor results tend to experience higher levels of stress, which is associated with poorer sleep quality. It is worth noting that, students' stress level during Covid-19 pandemic could be a reason for this discrepancy between study results as the global event provoked a general sense of anxiety, which had no relationship with how the student felt about his or her future exam. Other variables that may influence academic achievement and hence the results include student's family socioeconomic status, diet, addiction to social network and etc. which could not be controlled in our cross-sectional study (18).

Our study's results are in line with a review article by Seoane et al. and in contrast with a study conducted by Okano et al., as we found no significant relationship between duration of sleep and academic achievement. It is believed that discovery of significant relationship between sleep duration and academic achievement in articles with less than 150 subjects might have been due to publication bias (7, 20).

Another limitation of this study is that quality of sleep is subjective to some extent while academic achievement is measured objectively.

This research was conducted during the Covid-19 pandemic and higher stress levels in students could have resulted in higher frequency of poor quality of sleep (the pandemic could have also changed student behavior, for example, a high Grade Point Average (GPA) student with no sleep problems may have started to exhibit the problem after experiencing a period of stress). Furthermore, the university's assessment of academic achievement was no longer done in person and instead was done online which may have contributed to higher levels of cheating and closer average score therefore it may have influencing the variable of academic achievement.

This is a cross-sectional study and therefore cannot establish causality between sleep quality and socio-demographic factors. Moreover, the study uses self-reported sleep data, which is subject to recall bias. Given the high prevalence of sleep disorders in this population, further research in other groups and longitudinal studies are recommended to confirm findings and identify factors contributing to these disorders.

5. Conclusion

Based on our results more than 70% of senior dental and medical students of Guilan University of medical sciences suffered from poor quality of sleep and yet, a significant portion of them remained unaware of their poor sleep quality. Medical students exhibited more problems than dental students in the "sleep duration" component. While no statistically significant relationship was found between sleep quality and academic achievement, dental students showed an inverse relationship between the sleep disturbances component and academic performance.

While a high percentage of students grapple with an inadequate quality of sleep, many of them are unaware of this problem, highlighting the need for counselor service to be made available to them. Workshops can also be planned to assist students by teaching them sleep hygiene.

5.1. Limitations

1. This is a cross-sectional study and therefore cannot establish causality between sleep quality and socio-demographic factors.

2. The study uses self-reported sleep data, which is

subject to recall bias.

5.2. Suggestions for further studies

Given the high prevalence of sleep disorders in this population, further research in other groups and longitudinal studies are recommended to confirm findings and identify factors contributing to these disorders.

Ethical Considerations

Compliance with ethical guidelines

The study has been approved by the Ethics Committee of the Research and Technology Vice-Chancellor of Guilan Faculty of Medical Sciences and Health Services (Ethics code: IR.GUMS.REC.1400.460)

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Author Contribution

Maryam Basirat: Conceptualization, Data curation, Methodology, Writing – Original Draft, Writing- Review & Editing, Supervision, Project Administration
Ideh Dadgaran: Conceptualization, Supervision, Writing- Review & Editing
Mahnaz Fallahi Khesht Masjedi: Conceptualization, Methodology, Resources
Ali Abidrahmani: Conceptualization, Data Curation, Methodology, Investigation, Writing – Original Draft, Writing – Review & Editing

Conflict of Interests

The authors declare no conflict of interest.

Availability of data and material

The data (related to the statistical analysis) is available on request.

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