ORIGINAL RESEARCH

The Effect of Sleep Quality on Students' Academic Achievement

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Background: Sleep is an inseparable part of human health and life, which is crucial in learning, practice, as well as physical and mental health. It affects the capacity of individual learning, academic performance, and neural-behavioral functions. This study aimed to determine the relationship between sleep quality and students' academic achievement among students at Kermanshah University of Medical Sciences.

Methods: In this cross-sectional study, 102 medical students from different fields, with maximum variation sampling, completed Pittsburgh Sleep Quality Index (PSQI). For data analysis, SPSS 19 was used through which Pearson correlation test, Spearman test, and *t*-test were employed.

Results: Based on the quality of sleep questionnaire scores, the results indicated no significant difference between students with high grades and those with low grades. However, there were moderate and sometimes severe sleep disturbances in both groups.

Conclusion: The results showed no significant difference between sleep quality and academic achievement. Nevertheless, longitudinal study should be performed to control for confounding factors.

Keywords: quality of sleep, the academic achievement, students

Background

Sleep is an inseparable part of human health and life, and is pivotal to learning and practice as well as physical and mental health.[1] Studies have suggested that insufficient sleep, increased frequency of short-term sleep, and going to sleep late and getting up early affect the learning capacity, academic performance, and neurobehavioral functions.[2,3] Previous studies have indicated that the quantity of sleep reported by individuals as delayed or inappropriate sleep, waking up too late, especially at weekends and daytime sleepiness is associated with compromised academic performance in children and adults.[2] Some studies have emphasized the relationship between delayed starting time of classes and academic success.[4] Reduced overnight sleep or altered sleep patterns has been associated with severe drowsiness and failure in academic success.[5] In a study, people who had enough sleep compared to their sleep-deprived individuals used innovative solutions twice as often when confronted with complex mathematical problems.[6] The chance of academic failure was as long as one or more than 1 year in students with inadequate sleep compared to those with proper sleep.[7] People who sleep less and sleep during the day are more prone to vehicle and work accidents.[8] In some studies, sleep efficiency has been considered as essential for recovery, cognitive processing, and memory integration.[9] On the other hand, lack of sleep has been associated with

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emotional instability and impaired concentration.[10] In this regard, students are particularly at risk of developing sleep disorders and development of the disorder among them has a negative effect on their academic performance across different grades,[11–13] However, there is no consensus in this case and not all studies state that sleep disorders yield a negative effect on academic performance. Eliasson (2010) believes that the time it takes to fall asleep and waking up affect academic performance more than duration of sleep does.[14] Sweileh and colleagues (2011) also believe that there is no relationship between sleep quality and academic success.[15] Similarly, it is claimed there is no relationship between the night sleep before the exam and test scores either.[16]

In another study, the author believes stress from lack of sleep causes poor school performance.[17] On the other hand, in a systematic review, the authors could not establish a cause and effect relationship between sleep quality and academic performance.[2] In their meta-analysis study, Dewald and colleagues (2010) emphasized that because of the diversity of the methodology of studies, it is impossible to definitely derive a relationship between sleep quality and academic performance, and thus more longitudinal intervention studies are warranted.[1] According to different conclusions in this respect, the researchers decided to determine the relationship between sleep quality and academic performance among students at Kermanshah University of Medical Sciences.

Methods

In this cross-sectional study, through maximum variation sampling, the first three students with highest scores and three last students with lowest scores were selected, and the Pittsburgh Sleep Quality Index (PSQI) was completed for them.

The study population consisted of students of Kermanshah University of Medical Sciences. The samples were also students at each school with the highest GPA (first three high scores) and the lowest GPA (last three lowest scores). The sampling was purposeful sampling with maximum variation. The sample covered a number of disciplines in the third semester and above (Figures 1 & 2). After determining the target students, the questionnaire was given to them and then returned to the researcher after completion.

The data collection instruments were demographic form (including age, gender, place of residence, grade, rank in the class, discipline) and Pittsburgh Sleep Quality

Index (PSQI). PSQI is a self-report questionnaire which examines the quality of sleep. It has 18 questions which are classified into seven components: the first component is the subjective sleep quality which is determined with Question 9. The second component is related to delays in falling asleep, where the score is calculated by two questions, the mean score of Question 2 and part of Question 5. The third component deals with sleep duration and is determined by Question 4. The fourth component is related to the efficiency and effectiveness of sleeping in patients. Its score is calculated via dividing the total hours of sleep by total hours in the bed multiplied by 100. Then, the fifth component deals with sleep disorders and is achieved by calculating the mean value of Question 5. The sixth component is related to hypnotic drugs and is determined based on Question 6. Finally, the seventh component captures inadequate performance throughout the day and is determined by two questions (mean scores of Questions 7 and 8). Each question is rated between 0 and 3 points where maximum score for each component is 3. The total scores range of the seven components making up the total score range from 0 to 21. Higher scores represent a lower sleep quality, where a score above 6 indicates poor sleep quality. The reliability and validity of this inventory have also been approved in Iran, where the Cronbach's alpha coefficient of the questionnaire was 0.78 to 0.82.[18] In another study, Cronbach's alpha for the Persian version was 0.77. In cut-off point 5, the sensitivity and specificity were 94% and 72%, and in cut-off point 6, they were 85% and 84%, respectively.[19]

After collecting the questionnaires and introducing students' demographic data to a computer using SPSS version 16, the relationship between sleep quality scores and grade point average (GPA high and low) was calculated.

Results

The results indicated that 34 cases (33.3%) of the subjects were male. The mean age of the sample 23.10 ± 3.25, where the mean age for females was 22.46± 2.44 and for males was 24.38± 4.19. The participants in the study came from various disciplines including laboratory science, medicine, pharmacology, emergency medicine, obstetrics, radiology, operating room, health technology, and nursing.

Most students lived in dormitories (50%) and 46.1% at home, with 3.9% living in rental houses. The students' educational level ranged between the third semester and twelfth semester.
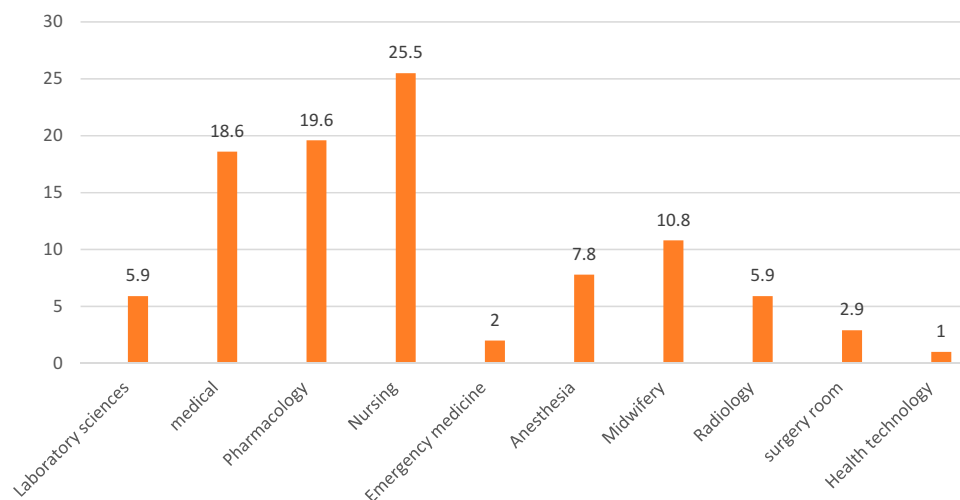
Figure 1 Abundant distribution of students by field of study.
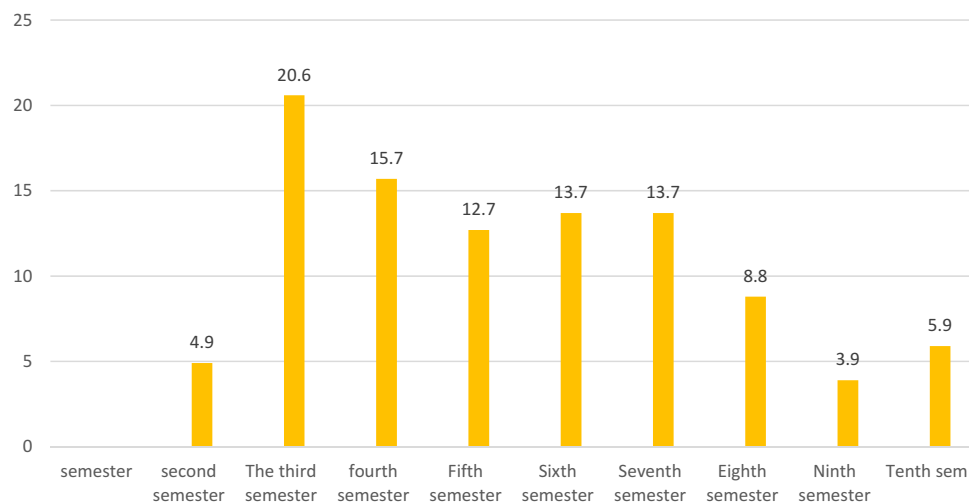
Figure 2 Frequency distribution of students by semester.

Among those participating in the study, 67 patients (65.7%) consumed coffee, 90 cases (88.2%) used tea, and 1 (1%) took a drug.

For comparing the mean scores of students and the component of sleep, Spearman test (non-normal data) was employed, where a significant correlation was observed between GPA and hours taking to fall asleep (Table 1).

Similarly, there was a relationship between sleep components and tea, coffee, hypnotic drugs, and drug (Table 2).

On the other hand, independent *t*-test between Pittsburgh scores in the two groups did not show any significant differences. Nevertheless, impaired sleep quality was moderate to severe in both groups (Table 3).

Discussion

The results indicated that impaired sleep quality between the two groups was not statistically significant. Although the relationship between sleeping and academic success has been introduced in medical literature since a long time, there still no definitive answer in this case. In a meta-analysis study conducted to examine the impact of sleep quality, sleep duration, and sleepiness on adolescents' academic performance, although all three variables were related to academic achievement (positive relationship between sleep quality and duration of sleep and negative association with sleepiness), this relationship was very trivial.[1]

On the other hand, another systematic review study of descriptive studies concluded that sleep disturbance adversely

Table 1 The Relationship Between Sleep Components and GPA in KUMS Students

Sleep Components	p value	Correlation Coefficient
Fall asleep	0.001	0.35
Minutes to fall asleep	0.008	−0.27
Real sleep	0.045	0.21
Hypnotic	0.008	−0.26
Place of life	0.015	0.24
Wake up time	0.696	−0.04
Efficient sleep	0.4	−
Sleep disorder	0.44	−
Subjective sleep quality	0.37	−
Inappropriate performance	0.16	−
Coffee	0.74	−
Tea	0.43	−
Drugs	0.38	−

Table 2 The Relationship Between Sleep Components and Type of Drink or Drug in KUMS Students Kermanshah

Sleep Components	Type of Use	p value	Correlation Coefficient
Sleep components	Tea Coffee Drugs	0.81 0.88 0.64	−
Fall asleep	Tea Coffee Drugs	0.14 0.99 1	−
Minutes to fall asleep	Tea Coffee Drugs	0.1 0.001 0.69	−
Wake up time	Tea Coffee Drugs	0.38 0.14 0.33	0.32
Real sleep	Tea Coffee Drugs	0.61 0.31 0.72	−
Subjective sleep	Tea Coffee Drugs	0.13 0.001 0.16	−
Hypnotic	Tea Coffee Drugs	0.46 0.9 0.66	−0.36
Efficient sleep	Tea Coffee Drugs	0.47 0.96 0.71	−
Sleep disorder	Tea Coffee Drugs	0.27 0.75 0.14	−
Appropriate performance	Tea Coffee Drugs	0.81 0.88 0.64	−

affects different areas such as general health, social status, and academic performance. However, longitudinal studies are required for a more accurate examination.[20,21] In an another systematic review of other authors, the authors concluded that under-sleeping would have an impact on learning of some students, and could have a detrimental effect on academic achievement.[22] Further, another review study also suggests a conclusive recommendation which has to be done to modify sleep so that it can be used for academic success.[23]

The present study was conducted to explore whether sleep disorder can influence academic achievement or not. Accordingly, a specific sample of accomplished or unachieved students were selected to compare the quality and quantity of sleep. However, no significant difference was between the two groups. Other studies have reached similar conclusions.

Sweileh and his colleagues in a study on 400 Palestinian students concluded that academic achievement was not correlated with sleep quality.[15] In another study on 189 medical students in Pakistan, there was no significant association between lack of sleep and test scores.[16] In this regard, there is a possibility of sleep disorder in students, and this possibility has been expressed for the lack of academic achievement, but it has not been clearly explained.[11] In another study, sleepiness during the day (not the quality and quantity of sleep) was identified as an independent predictor of academic success.[5] In a similar study again the time it takes to fall sleep and the wake-up time (not the total amount of sleep) were associated with academic success,[14] where the total amount of sleep in adolescents with a dynamic mind was not related to their academic achievement.[24] In contrast to such studies that emphasize lack of association or low association, there are

other studies that have observed an inverse relationship between sleep disturbance and academic achievement. In a study on 491 first-, second-, and third-year medical students, there was a correlation between academic performance and the amount of nighttime sleep as well as daytime sleepiness.[25] In a similar study on medical students, lack of sleep at night, late going to bed, and daytime sleepiness had a negative effect on the academic performance of the students.[26] Notably, sleep disturbances are likely to yield a negative impact on academic performance, thereby causing a vicious cycle.[25,27] Taken together, the studies suggest that most studies have mentioned poor quality sleep among the majority of students.[3,26,27]

Table 3 The Difference Between the Mean Pittsburg Scores in Two Groups (Students with High and Low GPA)

No		Total Pittsburg Scores				Total	Mean	Standard Deviation	p value
		Normal	Weak	Moderate	Severe				
Group	Low	4	9	10	21	44	13.5	6.808	0.875
	High	0	9	22	27	58	13.28	4.319	
Total		4	18	32	48	102			

Accordingly, concluding the relationship between common sleep disturbance and academic performance should be done with caution. The reason is that academic success can be affected by different factors including the level of family income, the evolutionary process, intake of supplements and vitamins, family size, social media dependency, addiction to social networks, and social issues. In studies these extraneous factors are not under control, thus emphasizing the fact that the presence or absence of correlation between sleep quality and academic performance should be done with caution and using longitudinal studies.

Limitations

The main limitation of this study was the small sample size, but a specific sampling method was chosen to overcome this shortcoming. Another limitation of the study was not controlling for confounding factors in the study. Based on the results of this study and similar studies, further research should be conducted with a better design.

Conclusion

The results indicated no significant difference between sleep quality in achieved and unachieved academic performance. Nevertheless, to conclude with more certainty, longitudinal studies should be performed to control confounding factors.

Data Sharing Statement

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate

Informed consent obtained from all participants in the study and this study conducted by the Sleep Disorders Research Center. Identity letter obtained from deputy of research and technology to collecting data. Ethics approval was received from the ethics committee of deputy of

research and technology – Kermanshah University of Medical Sciences, number 93026 on 6 April 2013.

Disclosure

The authors declare that they have no conflict of interest.

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