



ORIGINAL ARTICLE

Association of Sleep Disorder with Academic Performance of High School Students of Taft in the Academic Year 2014-2015

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ABSTRACT

Background and Objectives: Academic underachievement, in the sense of students performing below the desired academic level, is one of the major problems of education systems. Part of the poor academic performance of adolescent students can be attributed to their poor sleep habits and behaviors. This study investigate the relationship of sleep quality indices with the academic performance of high school students of Taft County, Yazd, Iran, in the academic year 2014-2015. **Methods:** This analytical cross-sectional study was conducted on male and female students in the public high schools of Taft County in the academic year 2014-2015. Sample population consisted of 100 boys and 100 girls. Data was collected by Pittsburgh Sleep Quality Index (PSQI) and analyzed by T-test, ANOVA and Chi Square, and Spearman correlation tests conducted in SPSS ver.18. In all statistical analyses, P-values < 0.05 was considered to denote statistical significance. **Results:** Overall, sleep quality was worse among boys than among girls, and a higher percentage of boys (48%) were suffering from poor sleep. Among the sleep quality indices, subjective sleep quality, habitual sleep efficiency, sleep disturbances, and use of sleeping medications were significantly correlated with the students' academic performance (p-value=0.000). **Conclusion:** The results demonstrated the significant relationship of academic performance with sleep quality in its different dimensions. The findings underscore the necessity of taking appropriate measures and making necessary adjustments in the sleeping behavior of adolescent students to control the implications of sleep disorders for academic performance.

INTRODUCTION

Academic underachievement, in the sense of students performing below the desired academic level, is one of the major problems of education systems. This issue has immense cost implications and can obscure national economic, social and cultural development prospects. Academic underachievement consists of multiple dimensions organized on the basis of association with the individual, family, school, and community, each with their own potential to expose students to high-risk behaviors (1). Part of the poor academic performance of adolescent students can be attributed to poor sleep. In general, the causes of insufficient sleep among adolescents are the early school start times and the impacts on falling asleep. On this basis, various movements across the United States has called for later school start times to improve the students' academic performance. However, later school start times has great financial and nonfinancial implications for both family and education system, so this deci-

sion should not be taken lightly (2). Sleep is a dynamic and highly organized biological process that constitutes an important part of life, and the quality of sleep is known to be associated with the quality of social interaction (3). Insufficient sleep may cause daytime problems such as tiredness, lack of energy, difficulty in concentration, and irritability (4). The notable factors affecting sleep quality include age, psychological factors, habits and lifestyle, repeated irregular changes in sleep hours, environmental factors, physical factors, medicines, adolescence, and the hormone melatonin (5-7). The normal biological, psychological and social changes occurring during the process of puberty are associated with the length of sleep, insufficient sleep, irregular sleep schedule, and insomnia during adolescence. Such negative changes in the sleep structure can have psychosocial consequences such as depressed mood, behavioral problems, and academic underperformance. Although the need for sleep does not decrease through adolescence, adolescents generally sleep 2.9

hours less than what they really need (8). It has been suggested that sleep quality involves seven criteria: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, sleeping medications, and daytime dysfunction. Another important factor associated with sleep is the sleep-wake cycle, which is a biological cycle affected by the physiological function, lightness and darkness, work schedules, care and other activities, as well as the body clock (9-11). In some studies, researchers have managed to actively manipulate sleep and observe the behavioral and neurological outcomes such as learning performance, memory capacity, and academic performance. Studies also suggest that the students at different stages of education (from school to university) have chronic sleep deprivation or suffer from low sleep quality and daytime sleepiness. The quality and quantity of sleep are closely associated with learning capacity and academic performance. Persistent sleep deprivation is associated with reduced declarative and procedural learning power in students. It has also been shown that active optimization of sleep improves the academic and neuro-cognitive performance and active limitation of sleep yields the opposite result (12).

Academic performance and progress can also be affected by mental health problems. When not properly diagnosed and treated, psychological problems can severely undermine the student's ability to achieve their academic goals. School health instructors have a critical role in providing clinical services necessary to detect and resolve the students' mental health problems, thus enabling them to realize their academic potentials (13). Research has shown that mental and emotional disorders have a significant relationship with academic underachievement, as the students with more severe mental health and depression issues tend to have lower GPAs (14). Considering the limited number of studies on the relationship between academic implications and psychological functions of sleep, and the increasing complaints about sleep problems of adolescents, especially insomnia, poor sleep quality, and daytime sleepiness, and their impacts on academic performance, the present study evaluated the severity of insomnia, sleep quality, sleepiness and mental health and academic performance of adolescent boy and girl students in Taft (Yazd, Iran) to determine whether there is a relationship between the aforementioned sleep pathologies and academic underachievement in the studied population.

METHODS

This analytical cross-sectional study was conducted on male and female students in the public high schools of Taft County (Yazd, Iran) in the academic year 2014-2015, which consisted of 627 students in 9 all-girls high schools and 632 students in 7 all-boys high schools. The target population was selected by multistage random sampling. After providing a brief explanation about research objectives, personal consent form and questionnaires were distributed among the selected students. The questionnaires completed by students and their parents were collected one week later. To evaluate the academic performance, semester grades and GPAs were collected from the school administration. For the individu-

al courses, grade of 17 or more (out of 20) was considered to signify excellent academic performance, grades of 15-17 were considered as sign of moderate academic performance, and grades of less than 15 were considered to imply poor academic performance. The questionnaire was administered through face-to-face interviews conducted by a trained assistant. The data collection instrument was the Pittsburgh Sleep Quality Index (PSQI), which is an internationally accepted instrument for assessing the respondents view about their sleep quality during the past 4 weeks. PSQI gives 7 scores for the following components: 1- subjective sleep quality, 2- sleep latency, 3- sleep duration, 4- habitual sleep efficiency, 5- sleep disturbance, 6- use of sleeping medications, and 6- daytime dysfunction. Each component can be assigned a score from 0 to 3, with the score 0 representing the absence of any problem and the scores 1, 2, and 3 representing, respectively, the presence of mild problem, moderate problem, and severe problem in the respective item (15). A total score of greater than 5 is indicative of the respondent's poor sleep quality and the presence of severe problems in 2 aspects or moderate problems in more than 3 aspects of sleeping. In other words, the higher is the PSQI score, the lower is the respondent's sleep quality. PSQI can be filled in about 5 to 10 minutes. This instrument has a validity of 86.5 and a reliability of 89.5 (16). In this study, reliability coefficient of PSQI was calculated using Cronbach's alpha and split-half method. Once collected and organized, data was imported into SPSS ver.18, tabulated based on mean-standard deviation and frequency, and analyzed by T-test, ANOVA and Chi Square, and Spearman correlation tests. In all statistical analyses, P-values of less than 0.05 were considered statistically significant.

RESULTS

The sample population consisted of 200 students, of which, 50% (100) were male and 50% (100) were female. The population had a mean age of 15.735 ± 0.645 and a mean GPA of 17.31 ± 1.407 . The mean hour of sleep (going to bed) was 22.71 ± 0.65 for males and 22.67 ± 0.71 for females. The mean sleep latency was 25.1 ± 16.28 minutes for males, 21.41 ± 15.19 minutes for females, and 23.26 ± 15.81 for the entire group in general.

The results obtained from PSQI indicated that 62.8% of the subjects had a normal sleep and the rest had at least one sleep disorder. About 46% of boys and 28.3% of girls had sleep disorder, which shows that boys had a significantly lower sleep quality than girls. The results concerning the relationship of gender with study variables revealed the existence of a statistically significant relationship between gender and sleep quality (P-value=0.010). The relationships of other variables with gender are listed in Table 1. The results also showed a significant relationship between sleep quality and age group of the students (P-value=0.000). In other words, the students who were at later stages of adolescence were more likely to have sleep disorder. The analysis of PSQI component scores and GPAs showed that academic performance had significant relationships with subjective sleep quality (P-value=0.018), habitual sleep efficiency

(P-value=0.012), sleep disturbances (P-value=0.017), and use of sleeping medications (P-value=0.007). Overall, the computed Pearson correlation coefficient ($r=-0.085$) implied a negative correlation between the total PSQI score and academic performance, but since P-value was 0.231, this relationship was not statistically significant (Table 2). According to the results presented in Table 2, subjective sleep quality, habitual sleep efficiency, sleep disturbances, and use of sleeping medications have significant implications for academic performance. The results concerning the relationship of different sleep quality dimensions with gender showed a significant relationship between gender and sleep duration, habitual sleep efficiency, and sleep disturbances (P-value <0.05). The relationships of gender with other dimensions of sleep quality are listed in Table 3. As shown in this table, boys had a lower mean sleep duration score and a higher mean sleep disturbance score, but in return, girls had a lower habitual sleep efficiency score. The results on the relationship of age (three age groups of 15, 16 and 17 years) with PSQI dimension scores revealed a relationship between age and subjective sleep quality, sleep latency, sleep disturbances, and daytime dysfunction (P-value <0.05). The relationships of other dimensions of sleep quality with age are given in Table 4. According to Table 4, older adolescents had a higher mean sleep quality score, higher mean sleep latency score, and higher mean sleep disturbance score than their younger counterparts, but the mean daytime dysfunction score was highest in the age group of 16.

DISCUSSION

The results of our research indicate that sleep disorder has a significant relationship with students' academic performance, especially in male and older adolescents. In contrast, Ajumi et al. (2009) has reported that variety of sleep disorders cause personal dissatisfaction with the one's performance and feeling of fatigue during daytime, especially in women. They have also reported a higher incidence of insomnia in women and a significant relationship between the incidence of insomnia and the person's fatigue due to sleep disorders (17). In the present study, boys had a higher mean total sleep disorder score, indicating that they are more likely to have a poor sleep. Likewise, the study of Modarresi et al. (2008) have reported that Isfahani students (Isfahan, Iran) with sleep disorders had poorer academic performance; but they found sleepiness and need for sleep to be more prevalent among girls than boys (18). There are also other studies that have not found any difference in this respect (19). Our findings were consistent with the results of a study by Stanley et al. (2011) in Portugal, where it was found that sleep disorder generally causes extensive daytime sleepiness, which can affect the person's daytime mood, consciousness, memory, safety, and performance (20). Research has shown that sleep latency of more than 30 minutes and interrupted nightly sleep (waking up more than once during the night) is likely to undermine academic performance (21). This report was also confirmed by our results, as sleep disturbances were found to have a significant relationship with academic performance (p-value = 0.000). Our results also

show that student's academic performance has a significant relationship with subjective sleep quality, habitual sleep efficiency, sleep disturbances, and use of sleeping medications (p-value = 0.000) but not with other components of sleep quality. In a study by Wolfson et al. (2006) in UK, it was found that high school students who have better academic performance sleep earlier and have a longer sleep. This study also reported that longer sleep time improves and shorter sleep time weakens the neurobehavioral performance (22). Similarly, our results showed a significant relationship between efficient sleep and academic performance (p-value = 0.000). We found inter-gender differences in all sleep quality scores, but the only components where this differences were significant were objective sleep quality, sleep latency, use of sleeping medications, and daytime dysfunction. Also, male and older students were found to have a generally higher sleep disturbance score. But age was not significantly associated with habitual sleep efficiency, sleep duration, or use of sleeping medications. Overall, analysis of subjects' total sleep quality score showed that older students had significantly poorer sleep quality (P-value = 0.000), and that boys were significantly more likely to have sleep disturbances and thus lower sleep quality (P-value = 0.001).

CONCLUSION

The present study found a statistically significant relationship between academic performance and sleep disorder in general and subjective sleep quality, habitual sleep efficiency, sleep disturbances and use of sleeping medications in particular. The observed association of sleep disorder with academic performance highlights the necessity of taking appropriate measures and making necessary adjustments in our approach toward sleeping behavior and pathologies in adolescent students to reduce the adverse effects of sleep disorders on academic progress of our children.

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APPENDIX

Table 1. Relationship of gender with study variables

	Variables	P-value
Gender	Hour of sleep (going to bed)	0.665
	Sleep latency	0.121
	Sleep quality	0.010

Table 2. Coefficients of correlation between academic performance and sleep quality dimensions

Variable	Sleep quality dimensions	r	P-value
Academic performance score	Subjective sleep quality	-0.168	0.018
	Sleep latency	-0.029	0.684
	Sleep duration	-0.053	0.457
	Habitual sleep efficiency	-0.178	0.012
	Sleep disturbances	0.169	0.017
	Use of sleeping medications	-0.191	0.007
	Daytime dysfunction	0.014	0.844
	Total	-0.085	0.231

Table 3. Mean sleep disorder scores by gender

Gender sleep quality dimensions	Mean±SD			P-value
	Male n=100	Female n=100	Total n=200	
Subjective sleep quality	1.1±0.643	0.95±0.687	1.025±0.668	0.113
Sleep latency	1.85±1.52	1.45±1.452	1.65±1.496	0.059
Sleep duration	0.29±0.624	0.11±0.3144	0.2±0.501	0.011
Habitual sleep efficiency	0.17±0.532	0.05±0.262	0.11±0.423	0.046
Sleep disturbances	1.19±0.525	0.87±0.544	11.03±0.557	0.000
Use of sleeping medications	0.15±0.479	0.1±0.301	0.125±0.4	0.378
Daytime dysfunction	0.56±0.686	0.48±0.643	0.52±0.664	0.096

Table 4. Mean sleep disorder scores by age

Age sleep quality dimensions	Mean±SD				P-value
	15 yr. n=71	16 yr. n=109	17 yr. n=20	Total n=200	
Subjective sleep quality	0.929±0.639	0.972±0.584	1.65±0.875	1.025±0.668	0.000
Sleep latency	1.084±0.967	1.834±1.635	2.65±1.531	1.65±1.496	0.000
Sleep duration	0.197±0.496	0.211±0.528	0.15±0.366	0.2±0.501	0.882
Habitual sleep efficiency	0.154±0.551	0.083±0.309	0.1±0.447	0.11±0.423	0.541
Sleep disturbances	0.845±0.576	1.091±0.5	1.35±0.587	1.03±0.557	0.000
Use of sleeping medications	0.126±0.475	0.119±0.352	0.15±0.366	0.125±0.4	0.951
Daytime dysfunction	0.422±0.601	0.632±0.717	0.3±0.47	0.52±0.664	0.04