

Original Article

The relationship between sleep quality with fatigue severity and academic performance of nursing students

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ABSTRACT

Background & Aim: Increasing students' academic stress especially during taking final exams may result in sleep disorders, fatigue, poor academic performance and low functional efficiency. The aim of this study was to determine the relationship between sleep quality with fatigue severity and academic performance of nursing students.

Methods & Materials: In a cross-sectional study, the sleep quality and fatigue of nursing students (n=138) of AJA University of Medical Sciences in Tehran, Iran were assessed using Pittsburgh Sleep Quality Index and Fatigue Severity Scale within last week of exams of second semester in 2013. Subjects filled demographic questionnaires and the response rate was 86.8%. The data were analyzed using SPSS software with descriptive and analytic statistics including Chi square, Pearson and Spearman's rho correlation coefficients.

Results: Sleep quality in 64.4% of students was poor. About 77% of students suffered from fatigue in moderate to severe levels. The mean of total scores of lessens was 16.16. Chi-square test and Pearson correlation coefficient did not indicate significant relationship between sleep quality and age, gender, education semester and educational level, material status, habitancy location, caffeine consuming, smoking, experience of suffering from chronic and psychological diseases, working and also experience of major stress ($p>0.05$). Spearman's rho correlation coefficient indicated significant relationship between sleep quality and fatigue severity ($p\leq 0.0000$), whereas Pearson correlation coefficient did not show significant relationship between sleep quality and academic performance and also between fatigue severity and academic performance ($p>0.05$).

Conclusion: Prevalence of poor sleep quality and fatigue during final exams in nursing students is high. Considering importance of sleep quality and quantity and its effect on academic performances, creating suitable conditions for improving sleep quality is suggested.

Introduction

Sleep is one of basic needs of human and has important role in individual's health and life (1,2). The studies indicate that one-third of adults suffer from sleep disorders and 5% of general population have come up with daily periods of taking nap (3). Mortality rate in people who sleep more than 8.5 hours or less

than 3.5 hours at nights is 15% more than people who sleep 7 hours in average ever y night (4). Between 43% to 88% of students of medical sciences suffer from poor sleep quality (3,5-9). In sleep disorder, pattern sleep is disordered (10). This problem can be the result of physical, mental or environmental factors such as age, gender, job, life style, emotional tension and physical environment (11). It seems the students sleep little compared to general population; maybe because of stress and anxiety of studying, (3) being responsible for themselves, new schedules, unfamiliar

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environment, social obligation, as well as academic tension (1,3). In fact, students' life is a new social situation with new educational activities, change of sleep location, accepting hospital shifts for better clinical training and earning in nursing MSc students. These situations may result in disorder in individuals' sleep habits and related complications (9). Adverse effects on endocrine functions, metabolic and inflammatory responses, increased risk of cardiovascular morbidity and mortality, effect on the brain ability to process information and behavioral and emotional problems reported as effects of sleep deprivation (1). Sleep restriction can also result in educational failure, weak daily performance in class by students through health threat, irritability, depression, disorder in concentration and attention and weak academic performance (12-15). Therefore it can influence on students' academic status (16). In this regard, one of important outcomes of privation from sleep is fatigue which as an unpleasant and ambiguous symptom (17) affects negatively on individual life by influencing on individual ability in performing activities and important roles of life (18). Few studies have compared fatigue in people who suffer from insomnia with general population. In some research there has been observed a significant relationship between fatigue and insomnia (14,19,20). Fatigue signs are different for every person. Studies showed that alertness, vigilance, concentration, judgment, mood and performance affected by fatigue, with memory impairment, problem solving and decision making leading to decreases in work productivity and performance (2). Other effects of fatigue are slow thinking and reaction, incomplete receipt of information and response to stimuli, damage in reasoning and judgment, inattention, increasing memory errors including amnesia, decreasing awareness and motivation (21) which can effect on academic performance noticeably (3,20-23). Wherefore, sleep studies are relatively new in Iran. Due to different criteria for entering students in AJA University of Medical Sciences (AJAUMS), nature of students' job in the future, and passing additional courses rather than students in other universities of Iran and selection working place according to academic performance in this university, finding from other population might not necessarily be true for this population. Also, considering high prevalence of poor sleep quality and fatigue in

nursing students and its significant effect on their health and performance and intensification of these problems during final exams, the researchers decided to study relationship between sleep quality with fatigue severity and academic performance of nursing students of AJAUMS during final exams.

Methods

In this cross-sectional study which was performed during last week of final exams in second semester in 2013, all nursing students of AJAUMS in Tehran, Iran were recruited. Inclusion criteria were baccalaureate (B.A) (from first to 6th semester) and M.A students of AJAUMS. Considering type one error ($\alpha=0.05$), estimated error ($d=0.06$), and according to prevalence of sleep disorder in a previous study⁸ and using sampling formula (24) [$n=(Z^2_{1-\alpha/2} \times pq)/d^2=((1.96)^2 \times 0.86 \times 0.14)/(0.06)^2=128$], the number of subjects was estimated to be 128 students. The response rate was 86.8%. Finally, 138 nursing students were studied. Collecting data tools were demographic questionnaires, Pittsburgh Sleep Quality Index (PSQI) and Fatigue Severity Scale (FSS). Demographic questionnaire included age, gender, marital status, habitancy location, educational level, current semester, consuming caffeine in morning and at night, smoking, having experience of psychological or chronic diseases, consuming sedative medications, having second job and major stress within previous month. To assess sleep quality, PSQI was used which has been designed and revised by Carol Smith in 2007 (25). The PSQI specifies appropriate and inappropriate sleep within previous month by evaluating seven components of sleep (subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sedative medications, and daytime dysfunction). The PSQI includes 4 questions and 5 items. Questions number 1 to 4 were explanatory and items 5 to 9 were in Likert scale type and the scoring of these frequencies varied from 0-3 (never, once a week, twice a week, three time in a week) (3,25). The total score is the sum of seven-component scores which is between 0 and 21. A total PSQI score of more than 5 has been shown to discriminate poor from good sleepers (15,25,26). The PSQI is a standard tool and has high reliability and validity (25-27). Also validity of Persian version of PSQI has been

confirmed by Tehran Psychiatric Institute (28) and its Cronbach's alpha coefficient has been reported as 0.89 (3). The FSS which has been designed by Krupp in 1998, is a standard tool with high validity and able to differentiated depression and sleep disorder from fatigue (17). It is a useful tool for evaluating changes of fatigue severity and also receiving the effect of treatment interventions on fatigue severity (29). The FSS has been known as one of the best and most practical fatigue scales. It includes 9 items in the Likert scale and the scoring of these frequencies varied from 1-7. Total score, which is indicator of fatigue severity, is calculated through dividing sum of scores into 9 that this score is also between 1 and 7. Scores 5 and higher, between 2 and 4, and 1 are the indicators of severe, moderate fatigue and fatigueless, respectively. Reliability of Persian version of FSS is confirmed in studies with Cronbach's alpha coefficient between 0.83 and 0.94 (18). Its content and face validities have been confirmed in various studies (17, 18, 29).

In this study, the mean score of all theoretical and clinical lessons at the end of semester was considered as academic performance. It is necessary to mention that in education system of Iran, the result of evaluation of student's performance is determined by scoring and mean score of 12-20 and 14-20 is acceptable for BS and MSc students, respectively.

This research was confirmed by the Ethical Committee in the Research Department of AJAUMS and researchers promised to observe the stated ethical considerations in the Declaration of Helsinki (30). Ethical basics such as obtaining informed consent, protecting anonymity, confidentiality of the information, the right of refuse to participate in the research for the subjects, and respecting the rights of the authors were considered in this research.

Finally, the data were analyzed using SPSS, v.21. Descriptive statistics were used to summarize the data. The Chi square (Fisher's exact test where necessary) were used to analyze categorical data. The relationship between global PSQI scores and scores on the FSS with continuous and interval variables were conducted using Pearson and Spearman's rho correlation coefficients. Level of significance was set at $p < 0.05$.

Results

The mean age of the subjects was 22.29 ± 4.41 ; 50.7% of the subjects were female; 76.1% single. Other individual characteristics are shown in Table 1.

Sleep quality in 64.4% of students was poor. Subjects' scores for the seven sub scales of the PSQI are shown in Table 2.

Table 1. Individual characteristics of students

Variable	Frequency	%
Sex		
Male	68	49.3
Female	70	50.7
Marital status		
Single	105	76.1
Married	33	23.9
Educational level		
Bachelor	119	86.2
Masters	19	13.8
Habitancy location		
Dormitory	90	65.2
Native	42	30.4
Leased	5	3.6
Governmental	1	0.7
Caffeine consumption		
Yes	44	31.9
No	94	68.1
Smoking		
Yes	3	2.2
No	135	97.8
Psychological disorder		
Yes	3	2.2
No	135	97.8
Chronic disease		
Yes	2	1.4
No	136	98.6
Working		
Yes	21	15.2
No	116	84.1
Missing	1	0.7
Major stress type		
Death of relatives	8	5.8
Bankruptcy	6	4.3
None	124	89.9

Table 2. Students' scores for the seven scales of the Pittsburgh Sleep Quality Index

Subscale	Mean	STD
Subjective sleep quality	1.32	0.95
Seep latency	1.15	0.99
Sleep duration	1.33	1.18
Sleep efficiency	0.34	0.75
Sleep disturbance	1.07	0.51
Sedative medication use	0.30	0.75
Daytime dysfunction	0.95	0.89
Total PSQI Score	6.47	3.56

Table 3. The correlation between individual characteristics with sleep quality

Variable	Good		Poor		Test	P value
	f	%	f	%		
Sex					Fisher's Exact Test	0.71
Male	23	35.4	42	64.6		
Female	22	31.9	47	68.1		
Marital status					Fisher's Exact Test	0.38
Single	37	35.9	66	64.1		
Married	8	25.8	23	74.2		
Educational level					Fisher's Exact Test	0.78
Bachelor	40	34.2	77	65.8		
Masters	5	29.4	12	70.6		
Habitancy location					Fisher's Exact Test	0.04
Dormitory	25	28.4	63	71.6		
Native	20	48.8	21	51.2		
Leased	0	0.0	4	100.0		
Governmental	0	0.0	1	100.0		
Caffeine consumption					Fisher's Exact Test	0.56
Yes	13	29.5	31	70.5		
No	32	35.6	58	64.4		
Smoking					Fisher's Exact Test	1.00
Yes	1	33.3	2	66.7		
No	44	33.6	87	66.4		
Psychological disorder					Fisher's Exact Test	0.26
Yes	2	66.7	1	33.3		
No	43	32.8	88	67.2		
Chronic disease					Fisher's Exact Test	1.00
Yes	1	50.0	1	50.0		
No	44	33.3	88	66.7		
Working					Fisher's Exact Test	0.53
Yes	6	30.0	14	70.0		
No	39	34.5	74	65.5		
Major stress type					Fisher's Exact Test	0.18
Death of relatives	2	25.0	6	75.0		
Bankruptcy	0	0.0	6	100.0		
None	43	35.8	77	64.2		
Total	45	33.6	89	66.4		

The mean of fatigue score was 2.06±0.72 indicating moderate fatigue. Totally, 29% of students reported severe fatigue, 47.8% moderate fatigue. The mean of total scores of lessons was 16.16±1.20.

Pearson correlation coefficient did not show significant relationship between total score of sleep quality with age ($r=-0.07$, $p=0.44$), hours working ($r=0.02$, $p=0.85$) and academic performance of students ($r=0.07$, $p=0.39$). Also, there was not significant relationship between sleep quality with other individual characteristics ($p>0.05$), except habitancy location ($p=0.04$) (Table 3).

Spearman's rho correlation coefficient indicated significant relationship between sleep quality and fatigue severity ($r=0.43$, $p\leq 0.000$). Also, this test showed significant relationship between total score of fatigue severity with age ($r=0.268$, $p=0.003$). This test indicate no

significant relationship between total score of fatigue severity with hours working ($r=0.07$, $p=0.41$) and academic performance ($r=0.07$, $p=0.38$). Chi-square test indicated significant relationship between academic semester and fatigue severity ($\chi^2=491$, $p=0.002$, $df=405$). There was not significant relationship between other individual characteristics and fatigue severity ($p>0.05$) (Table 4).

Pearson correlation coefficient showed significant relationship between academic performance with age ($r=0.55$, $p\leq 0.000$) and working hours ($r=0.17$, $p=0.05$). Also, Spearman's rho correlation coefficient indicated a significant relationship between academic performance with sex ($r=-0.37$, $p\leq 0.000$), marital status ($r=0.32$, $p\leq 0.000$), educational level ($r=0.54$, $p\leq 0.000$) and working ($r=0.313$, $p\leq 0.000$). Other individual variables had not significant relationship with academic

Table 4. The correlation between individual characteristics with fatigue severity

Variable	Without		Moderate		High		Test	P value
	f	%	f	%	f	%		
Sex							Chi-Square Test	0.35
Male	19	27.9	32	47.1	17	25.0		
Female	13	18.6	34	48.6	23	32.9		
Marital status							Chi-Square Test	0.65
Single	29	27.6	49	46.7	27	25.7		
Married	3	9.1	17	51.5	13	39.4		
Educational level							Chi-Square Test	0.35
Bachelor	30	25.2	56	47.1	33	27.7		
Masters	2	10.5	10	52.6	7	36.8		
Habitancy location							Fisher's Exact Test	0.98
Dormitory	22	24.4	43	47.8	25	27.8		
Native	9	21.4	20	47.6	13	31.0		
Leased	1	20.0	2	40.0	2	40.0		
Governmental	0	0.0	1	100.0	0	0.0		
Caffeine consumption							Chi-Square Test	0.82
Yes	9	20.5	21	47.7	14	31.8		
No	23	24.5	45	47.9	26	27.7		
Smoking							Fisher's Exact Test	0.21
Yes	2	66.7	1	33.3	0	0.0		
No	30	22.2	65	48.1	40	29.6		
Psychological disorder							Fisher's Exact Test	1.00
Yes	0	0.0	2	66.7	1	33.3		
No	32	23.7	64	47.4	39	28.9		
Chronic disease							Fisher's Exact Test	1.00
Yes	0	0.0	1	50.0	1	50.0		
No	32	23.5	65	47.8	39	28.7		
Working							Chi-Square Test	0.34
Yes	3	14.3	12	57.1	6	28.6		
No	28	24.1	54	46.6	34	29.3		
Major stress type							Fisher's Exact Test	0.78
Death of relatives	2	25.0	5	62.5	1	12.5		
Bankruptcy	1	16.7	4	66.7	1	16.7		
None	29	23.4	57	46.0	38	30.6		
Total	32	23.2	66	47.8	40	29.0		

performance.

Discussion

In the present study, the mean scores for the PSQI and FSS were 6.47 ± 3.56 and 2.06 ± 0.72 , respectively and sleep quality in most students (64.4%) was poor. In different studies, it has been reported that 32.5%-88% of medical students suffer from poor sleep quality (1,3,5-9,31,32). In a study in Taiwan the mean scores for the PSQI and FSS were reported as 4.9 ± 2.4 and 38.2 ± 8.9 (equivalent= 5.45 ± 1.27), respectively (32). Studies indicate when students confront with educational tensions, their sleep duration decreases. Also, sleep deprivation is impacting adolescent's physical and mental health and functioning adequately during the daytime (1). It also increases feeling asleep, fatigue, and impatience of student in a day and being awakened in the morning (7). In

this way, in a study it has been shown that the most complication of sleep disorders of medical students was fatigue and not feeling good during day (48.8%).⁹ In the present study, 76% of students experienced different degrees of fatigue which is in agreement with the results of some studies (75.7%) (14), and disassociated with others (83.5%) (33). We reported severe fatigue present in 29% of subjects, whereas in Taiwan's study it was reported in 37.5% subjects (32).

In the present study, there was no significant relationship between sleep quality and individual characteristics of students ($p > 0.05$) except habitancy location. Several studies reported no significant relationship between students' sleep quality with gender (8,31), marital status (3,8,31), smoking (3,8,31) caffeine use (3,31), use of sleep medications (3) and alcohol ($p > 0.05$) (3), which are associated with our results. However, several studies indicated no significant relationship between

sleep quality with habitancy location ($p>0.05$) (3,8). Other studies reported a significant relationship between sleep quality with age, depression, anxiety, experiencing major stress (3), history of chronic illness, and use of sleep medications (31), caffeine (8) and alcohol (31) ($p<0.05$), which are different from the results of present study.

In the present study a significant relationship was observed between sleep quality and fatigue severity ($p\leq 0.0000$) which is in line with other studies (14,19,20). Results showed that in spite of poor sleep quality in most students; their academic performance has been partly pleasant. However, there was no significant relationship between sleep quality and academic performance ($p=0.39$). In a research it was reported that 47.5% of students with mean total scores less than 16 and 32% of them with mean more than 16 had poor sleep quality ($p=0.047$) (3). Another study indicated that 69.7% of students with low mean of total scores of lessons had problem to sleep and 72.7% of students who had low sleep quality, had difficulty in attention and concentration (23). In a research it was reported a significant relationship between night sleep and mean of total scores of lessons of students, in a way that by increasing sleep hours, scores mean increased (22). The reason of difference between the results of mentioned studies and the results of this study can be seen in the difference between research populations and academic environments. It is necessary to mention that besides qualification in competitive National Higher Education Entrance Examination enrolled students at AJAUMS are subjected to be physically and psychologically healthy (34). Also, due to the nature of their job in future, in addition to passing routine educational courses, they should pass special courses to increase their adaptation in difficult conditions. Moreover, since working place for these students after graduation is based on their academic performance, students try hard to show their best performance during each semester which can lead to higher mean of total scores of lessons.

Physical, psychological and mental status of subjects, in recent weeks was a limitation of this study which was out of control of the researchers. Also fatigue and sleep quality of students was measured only based on self-reported questionnaires. Thus, evaluation by other than current method is suggested for

future studies. Although researchers used census method to recruit subjects, the small population was another limitation of this research.

Conclusion

Prevalence of poor sleep quality and fatigue during final exams is high. According to the importance of sleep quality and quantity and its effect on academic and non-academic performance of students, creating ideal conditions for observing good sleep health is suggested. Since most students live in dormitory, it is often accompanied with issues such as noise, different sleep pattern of students, being away from family, and welfare problems which lead to disorder in sleep pattern. Since current participants self-reported sources for their sleep disorders and mentioned the type of sleep disorder, this research could be a suitable source of information to develop effective strategies to deal with students' sleep quality and related problems. Having effective and healthy sleep influences directly on learning and educational progress of students.

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Conflict of interest

None declared

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