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Original Article

Sleep Pattern in Medical Students and Residents

Marzieh Nojomi MD MPH•*, Mir Farhad Ghalhe Bandi MD**, Siyamak Kaffashi BS***

Background: Sleep disturbances is a distressing and disabling condition that affects many people, and can affect on quality of work and education of medical students and residents. The objective of this study was to determine the prevalence of sleep disorders in medical students and residents.

Methods: A representative sample of medical students and residents of Iran University of medical students in Tehran, Iran, were assessed by a self-administered questionnaire. This study covers 400 medical students from the first to seventh year and residents from the first to the last year between December 2007 and February 2008. The questionnaire includes questions on demographic characteristics (6 questions), sleep/wake habits (6 questions), insomnia-related symptoms (4 questions), symptoms of parasomnia (6 questions), cognitive and psychomotor behaviors (6 questions), lifestyle (4 questions), self-perception of sleep satisfaction, and use of sleeping pills (2 questions).

Results: The sample included 135 (33.8%) pre-internship students, 150 (37.5%) interns, and 115 (28.7%) medical residents. Sleep satisfaction was reported as "perfect" in only 14%. 44% and 30% reported "good" and "fair" satisfaction. The use of sleeping pills in the previous 30 days was reported by only 3.3% of respondents. One hundred and three (25.7%) participants reported working while studying (sometimes to full-time). Between 43% and 48% of participants had gone to bed later than usual one to three times a week. About 14% of subjects reported snoring. The mean±SD of insomnia and parasomnia scales were 7.0±2.3 and 6.8±1.2, respectively. The mean of insomnia were more among females, subjects with noise in their living place, and students who worked full-time while studying, and was less in person who did exercise ($P<0.05$).

Conclusion: Sleep disturbances are an important issue among medical students and residents and associated with age, gender, living conditions, doing exercise, and workload.

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Keywords: Insomnia • medical students and residents • parasomnia • workload

Introduction

Almost one-third of adults report difficulty in sleep.[1,2] In the last few years, there has been a growing attention to sleep and sleeplessness-related problems. This interest is mainly due to the recognition that sleepiness and fatigue are becoming endemic in the population.[3]

Epidemiological studies performed in Western Europe, the USA, and Japan have reported a prevalence of insomnia-related symptoms ranging from 10% to 48%.[4–14] The large variability in the prevalence of insomnia among the different studies is not only due to cultural differences, but is also attributed to how one defines "insomnia."

Sleep disorders are associated with an increased prevalence of various somatic and/or psychiatric disorders as well as social problems.[15–17]

During sleep, some behavioral physiological and neurocognitive processes occur: these processes may be impaired by lack of sleep.

Sleep deprivation has various consequences

Authors' affiliations: *Department of Community Medicine, School of Medicine, Iran University of Medical Sciences, **Department of Psychiatry, Tehran Psychiatric Institute, Mental Health Research Centre, ***University of Allameh Tabatabaee, Tehran, Iran.

•**Corresponding author and reprints:** Marzieh Nojomi MD MPH, Department of Community Medicine, School of Medicine, Iran University of Medical Sciences, Crossroads of Hemmat and Chamran Expressways, Tehran15875-6171, Iran
Tel: +98-218-860-2225, Fax: +98-218-860-2217
E-mail: drnojomi@iums.ac.ir
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including sleepiness and impairments in neuro-cognitive and psychomotor performance.[18,19]

Recent reviews now clearly identify a growing consensus that unrestricted hours-of-service adversely affect the performance of medical residents.[20–24] Numerous studies conducted within the past decade have analyzed the deleterious effects of sleep deprivation on medical house staff in various medical as well as surgical specialties.[25–28] Landrigan et al. showed a 35.9% reduction in errors by interns by introducing an intervention schedule that eliminated extended work shifts and reduced the number of hours worked per week.[29] A national multi-specialty survey of 1653 residents of surgery found that 87% reported more than 80 duty hr/wk, whereas 45% reported working more than 100 hrs/wk.[30] Therefore, sleep pattern and sleepiness can affect the cognitive and psychomotor performance—the functions which are vital for medical students who are responsible for life of patients.

The objective of the current study was to determine self-reported sleep pattern of medical students and residents in teaching hospitals of Iran University of Medical Sciences, Tehran, Iran.

Materials and Methods

Sample and study area

Iran University of Medical Sciences is one of the three largest medical universities in Tehran, the capital of Iran. This University has about 2000 medical students and residents. The study sample consisted of 400 medical students from the first to seventh year and residents from the first to the last year and conducted between December 2007 and February 2008. We used a convenient sampling method. Medical students and residents were recruited during that period at their rest time—times between classes and in resting rooms of hospitals. We first described the study and its objective to the students. Those who agreed to participate in the study were then given a questionnaire. If someone refused to participate in the study, s/he was encouraged to participate by providing more explanation about the objectives of the study. If the subject still refused, s/he was replaced with another student. The verbal consent of the student was necessary for her or his enrolment. Medical students and residents with known sleep disorders, recurrent mood disorder, those who were using sedative/narcotics or depressant drugs, and those with severe medical diseases were excluded from the study.

Instrument

We made a self-administered questionnaire based on DSM-IV criteria and Pittsburg[31] on sleep pattern which included 34 closed questions. Using a tight literature review and expert panel, the content validity of the questionnaire was measured. The expert panel confirmed that the conceptual has been appropriately translated into operational terms and all components of the variable were measured. The expert panel included community medicine specialists, psychiatrists, and psychologists. These experts agreed that this questionnaire is valid for measuring sleep pattern, so, the consensual validity was provided too.

To measure the reliability of the questionnaire, by appraising internal consistency, we used Cronbach's alpha for measuring consistency reliability of the questionnaire. For performing that, we piloted the questionnaire on 20 medical students and residents. The Cronbach's alpha obtained was 0.85. The level of acceptance was considered 0.7 or more.

The questionnaire included demographic characteristics (six questions), sleep/wake habits (six questions), insomnia-related symptoms (four questions), symptoms of parasomnia (six questions), cognitive and psychomotor behaviors (six questions), lifestyle (four questions), self-perception of sleep satisfaction, and use of sleeping pills (two questions). The demographic characteristics included age, gender, weight, height, marital status, and educational level (pre-internship, internship, and residents). Subjects were asked to estimate their weight and height to determine their body mass index (BMI).

Self-perception of sleep satisfaction was measured by a five-point Likert scale ranging from "very poor" to "perfect."

Insomnia questions were asked about difficulty in initiating sleep (yes=2 or no=1), wake up in the middle of the night, wake up early morning (on a five-point continuous scale ranging from "never" to "more than seven times"), and how long (in min) has it usually taken to fall asleep each night (on a five-point continuous scale ranging from "5 min" to "more than one hr"). We asked the participants to limit their responses only to incidents occurred during the past month. We then used this variable as a number with a maximum of 17 and a minimum of four.

To evaluate the symptoms of parasomnia, we

asked "during the past month how often you had trouble with sleeping because of bad dreams, sleep speaking, sleep walking, sleep eating, and bruxism?" as separate questions. The questions were asked on a five-point continuous scale ranging from "never" to "every night." We also asked whether they had snoring or not (yes=2 and no=1). Therefore, the maximum scale would be 27 and the minimum was six.

Life style questions included work while studying, living in dormitory, any noise in their living place, and doing exercise. The first three questions were "yes/no", and the last one was a four-point Likert scale ranging from "do not work at all," "work sometimes," "work part-time," and "worked full-time." Exercise was defined as doing physical activity at least 30 min/day.

To assess the cognitive and psychomotor behaviors, we asked "during the past month, how much of a problem has it been for you to keep up enough enthusiasm to get, social activities, getting up of sleep, participation in classes, and routine activities?" These questions were also asked on a five-point scale from "never" to "everyday." There were two more questions that we asked under cognitive/psvchomotor questions; these were about attention deficit during the day ("yes/no"), and self-perception of learning development (from "perfect" to "very poor").

Statistics

Data were analyzed by the SPSS version 13.0 (SPSS, Inc. Chicago, IL). Frequency tables were used to present the distribution of nominal variables. We used mean and standard deviation (SD) for presenting numeric variables. We used χ^2, Student's *t*-test, one-way ANOVA, and Scheffe test as the *pot hoc* test for analyzing data. The significance level was set at $P<0.05$.

Results

Overall, 432 students were solicited and 400 of them completed the questionnaire. The participation rate was 92.5%. The sample included 135 (33.8%) pre-internship students, 150 (37.5%) interns, and 115 (28.7%) medical residents. The subjects were aged between 17 and 43 years. Women represented 55.8% of the sample. Eight and two-tenth percent of the subjects had a BMI of less than 18.5 kg/m^2 (underweight) and 1.5% of participants had a BMI more than 30 kg/m^2 (obese). About 68% of participants had a BMI of between 18.6 and 24.9 kg/m^2 (normal weight). Overall, 293 (73.3%) were single and 107 (26.7%) married. Among medical residents, almost 70% were married.

Sleep satisfaction was reported as "perfect" by only 14% of participants; 44% reported a "good" sleep, 30% "fair," and 1.5% reported a "very poor" sleep. This self-perception of sleep satisfaction was related to insomnia problems. Those subjects who reported "very poor" and "poor" sleep had the mean±SD insomnia score of 8.8±2.9 while those with "perfect" sleep had a score of 5.6±1.4. The sleep satisfaction was not associated with neither parasomnia, BMI, nor drinking coffee. Students who reported "perfect" sleep had used sleeping pills less often than those with "poor" and "very poor" (data was not shown). Use of sleeping pills in the previous 30 days was reported by only 3.3% of respondents.

One-hundred and three (25.7%) participants were working while studying (sometimes as full-time). Twenty-six and half percent lived in dormitory and about 30% reported noise in their living place. Forty-nine percent (n=196) of students were doing exercise during their resting time as an entertainment activity.

The sleep/wake characteristics are shown in Table 1. The majority of participants usually went to bed between 22:00 and 24:00 o'clock (particularly among pre-internship group, $P=0.01$); most of them got up at or before 7:00 o'clock in the morning (specially, among residents, $P=0.02$). The majority of subjects had 60 to 120 min daytime naps (specially, among pre-internship, $P=0.005$). Between 43% and 48% of participants went to bed later than usually one to three times a week. Most of them did not take coffee late at night, although medical residents got an average amount of coffee (one to five times per week) more than others ($P<0.05$).

The majority of participants had problem to keep up enough enthusiasm to get social activities (from 12% to 52% by grade) one to five times per week; although, there was no specific trend by grade (Table 2). Pre-internship group had less problem with getting up, and doing routine activities than the two other groups ($P<0.05$) (Table 2).

Two-hundred and one (50.3%) subjects reported attention deficit during the day; 43.3% (n=181) had a fair self-perception of their learning development. The pre-internship group reported more "perfect" than the two other groups (data not

Table 1. Sleep/awake habits characteristics of subjects (*n*=400)

Sleep pattern*	Pre-intern *n*(%)	Intern *n*(%)	Resident *n*(%)	*P*- value
1. When do you usually go to bed at night?				0.01
< 22	5 (3.7)	5 (3.3)	3 (2.6)	
22–24	96 (71.1)	83 (55.3)	61 (53.0)	
≥ 24	34 (25.2)	62 (41.3)	51 (44.3)	
When do you usually get up in the morning?				0.02
< 7	125 (93.3)	143 (95.3)	115 (100)	
≥ 7	9 (6.7)	7 (4.7)	0 (0)	
How often do you go to bed later than usual? (per week)				NS**
Never	28 (20.7)	22 (14.7)	11 (9.6)	
<One	30 (22.2)	32 (21.3)	31 (27.0)	
1–3 times	58 (43.0)	74 (49.3)	55 (47.8)	
3–5	10 (7.4)	11 (7.3)	11 (9.6)	
≥ 5	9 (6.7)	11 (7.3)	7 (6.1)	
What is the duration of your daytime naps? (minute)				0.005
5–10	3 (2.2)	8 (5.3)	3 (2.6)	
10–30	8 (5.9)	9 (6.0)	13 (11.3)	
30–60	38 (28.1)	28 (18.7)	44 (38.3)	
60–120	67 (49.6)	59 (39.3)	50 (43.5)	
>120	19 (14.1)	46 (30.7)	5 (4.3)	
How often do you wake up due to noise? (per week)				0.005
Never	55 (40.7)	60 (40.0)	28 (24.3)	
<One	44 (32.6)	36 (24.0)	59 (51.3)	
1–2 times	26 (19.3)	29 (19.3)	26 (22.6)	
3–5	6 (4.4)	12 (8.0)	1 (0.9)	
≥ 5	4 (3.0)	13 (8.7)	1 (0.9)	
How often do you drink coffee late at night? (per week)				0.02
Never	53 (39.3)	55 (36.7)	25 (21.7)	
<One	25 (18.5)	33 (22.0)	38 (33.0)	
1–2 times	22 (16.3)	33 (22.0)	27 (23.5)	
3–5	13 (9.6)	10 (6.7)	13 (11.3)	
≥ 5	22 (16.3)	19 (12.7)	12 (10.4)	

*During the past month; **not significant

shown). The mean insomnia scores (6.6 vs. 7.4) and parasomnia score (6.8 vs. 7.0) were higher among those who reported attention deficit than those without attention deficit (*P*=0.001 for both comparisons). The scores of insomnia and parasomnia increased with a positive trend by self-perception of learning development form perfect to very poor (data not shown).

Almost 14% of subjects reported snoring. With increasing BMI from <18.5 to >30 kg/m^2, the prevalence of snoring increased significantly from 3% to 50%, respectively (*P*<0.05).

The mean±SD of insomnia and parasomnia scores were 7.0±2.3 and 6.8±1.2, respectively. According to the Pearson's correlation coefficient, presence of the insomnia and parasomina had a weak (though significant, *P*<0.01) association with age and BMI, respectively. Insomnia was associated with parasomnia too (r=0.34, *P*=0.001).

Table 3 illustrates the scores of insomnia and parasomnia stratified by demographic and life style characteristics. The mean insomnia score was higher among females, subjects with noise in their living place, and students who worked full-time while studying, and was less in person who did exercise (*P*<0.05).

Students with any noise in their living place had also higher score of parasomnia (*P*<0.05). Participants who did exercise had lower score of parasomnia too (*P*<0.05). The parasomnia score was lower between students who did not work at all than others (*P*<0.05). Students who lived in dormitory reported waking up due to noise more often than other group, although scores of insomnia and parasomnia were a little greater among this group. There was no association between living in dormitory and drinking coffee late at night. Thirty percent of students who did not work at all went to bed late at night as compared to 55% of students who reported working full-time (*P*=0.0001).

Discussion

Sleep has a relevant facilitating role in learning and memory processes. Conversely, sleep depriva-

Table 2. Cognitive and motor behaviors characteristic of subjects (*n*=400), assessed by asking "how much of a problem has it been for you to keep up enough enthusiasm to get?"*

Cognitive/motor behavior	Pre-intern *n*(%)	Intern *n*(%)	Resident *n*(%)	*P*-value
Social activities				0.005
Never	12 (8.9)	19 (12.7)	8 (7.0)	
<One	22 (16.3)	28 (18.7)	27 (23.5)	
1–2 times	44 (32.6)	47 (31.3)	60 (52.2)	
3–5	37 (27.4)	27 (18.0)	14 (12.2)	
≥ 5	20 (14.8)	29 (19.3)	6 (5.2)	
Getting up of sleep				0.005
Never	7 (5.2)	24 (16.0)	10 (8.7)	
<one	30 (22.2)	27 (18.0)	25 (21.7)	
1–2 times	43 (31.9)	37 (24.7)	57 (49.6)	
3–5	40 (29.6)	41 (27.3)	18 (15.7)	
≥ 5	15 (11.1)	21 (14.0)	5 (4.3)	
Participation in classes				NS**
Never	15 (11.1)	14 (9.3)	6 (5.2)	
<One	28 (20.7)	36 (24.0)	35 (30.4)	
1–2 times	62 (45.9)	53 (35.3)	47 (40.9)	
3–5	16 (11.9)	29 (19.3)	14 (12.2)	
≥ 5	14 (10.4)	18 (12.0)	13 (11.3)	
Routine activities				0.006
Never	46 (34.1)	34 (22.7)	17 (14.8)	
<One	45 (33.3)	50 (33.3)	57 (49.6)	
1–2 times	29 (21.5)	38 (25.3)	30 (26.1)	
3–5	9 (6.7)	19 (12.7)	8 (7.0)	
≥ 5	6 (4.4)	9 (6.0)	3 (2.6)	

*Per week; **not significant

tion and/or fragmentation usually impairs these functions.[32] Medical students and residents who suffer from sleep deprivation run a major risk of creating serious medical errors than those who have had an adequate amount of rest. The Accreditation Council for Graduate Medical Education (ACGME) has attempted to address the problem of fatigue in residents by issuing work limitation standards in 2003.[33]

The ACGME is an independent incorporated non-governmental organization responsible for the accreditation of Graduate Medical Education (GME) programs. The goals of the process of accreditation are to evaluate, improve, and publicly recognize programs or sponsoring institutions in GME that are in substantial compliance with standards of educational quality established by the ACGME. Accreditation was developed to benefit the public, protect the interests of residents, and improve the quality of teaching, learning, research, and professional practice.

In this study, we addressed the pattern of sleep and sleepiness problems among medical students and residents. To the best of our knowledge, our study is the first study focusing on sleep pattern of Iranian medical students and residents.

Our study showed that about one-third of medical students and residents had a "fair" sleep. We found the association between self-perception of sleep satisfaction and insomnia. Those with "poor" or "very poor" sleep consumed sleeping pills more frequently than others. Veldi et al.[34] also found association between quality of sleep and complaints of insomnia. Our study could not show any associations between coffee consumption late in the evening or time of going to bed and quality of sleep. The effect of life-style on sleep quality have been examined in several studies and most of them identified an association between this variable and sleep disturbances.[35]

In this study, we showed that the mean insomnia score is higher among women than men (7.5 vs. 6.5). It has been shown that the prevalence of some sleep disturbances is greater in women.[1–2] The survey of Ohayon et al. in the general population found similar results too.[36]

We showed a significant correlation between BMI and scores of parasomnia, but not for insomnia. Also, there was a positive association between increasing BMI and prevalence of snoring. However, the self-perception of sleep quality was not associated with BMI. The explanation could be that the effect of BMI on sleep quality adjusted with other factors. In the

Table 3. Insomnia and parasomnia stratified by demographic and lifestyle characteristics

Characteristic	Insomnia mean (SD*)	Parasomnia mean (SD)
Sex		
Male	6.5 (2.3)†	6.9 (1.3)
Female	7.5 (2.2)	6.8 (1.1)
Marital status		
Single	6.9 (2.2)	6.7 (1.2)
Married	7.4 (2.4)	7.0 (1.2)
BMI		
<18.5	7.4 (2.1)	6.7 (1.0)
18.6 – 24.9	6.8 (2.1)	6.7 (1.1)
25 – 29.9	7.3 (2.7)	7.1 (1.4)
>30	7.3 (2.3)	7.8 (1.1)
Grade		
Pre-internship	6.7 (1.8)	6.7 (1.1)
Internship	7.0 (2.3)	6.8 (1.2)
Resident	7.4 (2.7)	7.0 (1.2)
Living in dorm		
Yes	7.3 (2.1)	6.8 (1.0)
No	6.9 (2.3)	6.8 (1.2)
Any noise in living place		
Yes	7.7 (2.4)†	7.0 (1.3)†
No	6.7 (2.2)	6.7 (1.1)
Doing exercise		
Yes	6.6 (2.1)†	6.7 (1.1)†
No	7.4 (2.4)	7.0 (1.2)
Working during education		
Did not work at all	6.9 (2.1)†	6.7 (1.0)†
Sometimes	7.0 (2.5)	7.1 (1.4)
Part-time	7.6 (3.1)	7.5 (1.8)
Full-time	9.8 (2.3)	7.4 (1.5)

*Standard deviation; †Statistically significant (P<0.05)

study of Veldi et al. BMI was related to snoring and daytime sleepiness.[34]

Older age, as a demographic variable, was found as a risk factor for subjective sleep disturbance and sleep dissatisfaction.[35,36] However, in medical student, it was shown that sleep problems are common in young medical students.[34] Our study revealed a positive correlation between insomnia score and age. Although, the mean score of insomnia and parasomnia were a little bit higher in medical residents compared to medical student (not significant).

The American Sleep Disorders Association considers physical exercise to be a modality of non-pharmacological treatment for sleep disorders.[37] In our study, the mean scores of insomnia and parasomnia were higher in those students who reported did not exercise. However, conflicting results are found in studies on the effect of exercise on sleep, since methodological differences such as time of the day at which the exercise is performed, the form, intensity of individual physical fitness do not allow for adequate comparison. The mechanisms by which physical exercise promotes changes in sleep architecture are not completely known. It is speculated that many hormones, metabolites such as those produced in response to exogenous drugs, might affect sleep, although many studies have shown that only a few substances can significantly affect the sleep pattern.[37]

Marital status was not shown to be associated with sleep disturbances. This result was in keeping with Ohayon et al. findings.[36]

We assessed the living condition of subjects by questioning about living places and waking up due to noise. About 27% of students lived in dormitory. These students reported waking up due to noise more than those who did not live in dormitory. It was shown that the living conditions of students were associated with waking up due to noise and drinking coffee late at night.[34] We did not find any correlations between the living condition and drinking coffee at night.

Our study demonstrates that the workload of participants was associated with insomnia and parasomnia problems. Students who worked full-time had the highest insomnia and parasomnia

scores. This result was also shown by Veldi et al.[34] They showed that the workload on students is associated with going to bed late at night, drinking coffee late at night, snoring, feeling tired in the morning, day time naps, and other criteria of parasomnia and insomnia. We also found association between going to bed late at night and working while studying.

In conclusion, our data demonstrate that sleep disturbances is a considerable issue among medical students and residents. Sleep disturbances were associated with age, gender, living conditions, doing exercise and workload of students. Insomnia and parasomnia problems were associated with attention deficit and learning development. Using sleeping pills and insomnia were associated with quality of sleep. We strongly recommend the implementation of work limitation standards that issued by ACGME in teaching hospitals to prevent medical errors.

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