



Original article

The prevalence of insomnia and characteristics of sleep patterns collected from sleep diary among medical students of University of Medicine and Pharmacy at Ho Chi Minh City, Vietnam

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Abstract: Introduction: Insomnia is a common disease in all societies and age groups. Among them, medical students are one of the population most susceptible to sleep problems. Studies from many countries have shown high prevalence of insomnia among medical students. Sleep diary is the gold standard for evaluating subjective insomnia and other sleep disorders. This research aims to study the prevalence of insomnia in Vietnamese medical students, associated factors, and their sleep patterns. **Method:** In a cross-sectional survey using stratified random sampling, a total of 176 medical students was recruited, each completed a self-administered questionnaire and a 7-consecutive-day sleep diary. Demographic data and lifestyle factors were obtained from the questionnaire, while sleep patterns and quality were collected from the sleep diary. We performed data analysis using SPSS ver 22, $p < 0.05$ was statistically significant. **Results:** Overall, out of 176 participants, 93 (52.8%) were affected by insomnia. On average, students acquired 6.2 hours of sleep each night. 70.94% of the recorded nights had total sleep time (TST) less than 7 hours. Associated factors of insomnia include sleep environment, sleep efficiency (SE), bedtime, falling asleep time, get up time, self-reported sleep quality. **Conclusion:** The findings of our study revealed the high prevalence of insomnia among medical students. From recorded sleep data, we observed that sleep deprivation is also a common issue faced by the study participants. The valuable insights provided by sleep diary proved to be crucial in evaluating sleep patterns and quality.

Keywords: Insomnia; sleep diary; sleep pattern; medical students.

1. INTRODUCTION

Insomnia disorder is defined as a “persistent complaint of difficulty initiating or maintaining sleep, associated with daytime impairment or distress, and not accounted for by inadequate opportunity or circumstances for sleep” [1, 2]. About 30% to 50% of the population has experienced short-term insomnia in some period of their lifetime [3]. The prevalence of insomnia symptoms in the adult population in Korea, Japan, and South India was reported to be 22.8%,

21.4%, and 18.6%, respectively [4-6]. In the U.S., although 29.9% of the adult population experienced insomnia symptoms, only 25.3% complained about sleep issues [7]. Indeed, it is reported that an insomnia epidemic is rising with high prevalence globally.

Many studies have revealed the widespread appearance of insomnia among young adults, especially university students [8-11]. Additionally, other sleep disturbances, including sleep deprivation [12], poor sleep quality [12-14], and excessive

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daytime sleepiness [13], have been reported with high prevalence among medical students in various countries. Medical students are generally more exposed to poor sleep due to emotional stress from laborious coursework and abnormal sleep-wake pattern from night shifts [15].

Sleep diaries are widely used in sleep research and clinical practice and are considered the gold standard for subjective sleep assessment [16]. A sleep diary consists of daily recording of information by the participant about their sleep habits, wakefulness, and general activities during a certain period of nights/days [17]. Sleep diaries are widely recommended for insomnia studies by experts around the world [16]. This tool provides a cheap, accessible, and convenient method to record sleep patterns and related daytime activities [16, 17] Rogers obtained similar results when measuring sleep data using sleep diary and polysomnography ($\kappa = 0.87$) [18].

Despite several mentioned advantages, sleep diaries have yet to be applied for research of insomnia among medical students in Vietnam. The goals of this study are to (1) estimate the prevalence of insomnia, (2) assess the sleep patterns collected from sleep diaries, and (3) determine the relationship between insomnia and associated factors.

2. MATERIALS AND METHOD

2.1. Study setting and participants

This was a descriptive, cross-sectional study, conducted at the Faculty of Medicine, University of Medicine and Pharmacy at Ho Chi Minh City, Vietnam, from April to June 2020. The participants of our study were medical students from the first year to the sixth year during the 2019-2020 academic year. These students must be able to access to an online questionnaire and 7-day sleep diary. Students who did not fully answer questionnaires or did not complete information for 7 consecutive days in the sleep diary were excluded from the study.

2.2. Ethical clearance

Before being recruited into the study, subjects were clearly explained about the benefits, purposes and disadvantages of participating in the study, and had the right to opt out of the study. The protocol of the study was reviewed and approved by the Ethics Committee of the University of Medicine and Pharmacy at Ho Chi Minh City (approval number: 278/HĐĐĐ-ĐHYD).

2.3. Data collection

The student database was provided by the Faculty of Medicine Office. The data were partitioned by student academic year and class. Due to the different study curriculum from each school year, we choose the stratified sampling. Firstly, we listed students and classes by school year. Then, we selected 2-3 classes in each year corresponding to the sample rate of each stratum. Each student from the chosen classes received emails about the study including step by step explanation, online-form questionnaires, and sleep diary. Data were only collected under permission from the student in the informed consent form. Each participant filled out the questionnaire once at the beginning of the enrollment and the sleep diary every day after waking up for 7 consecutive days.

2.4. Outcome measures

A self-administered questionnaire was designed to collect sociodemographic characteristics including age, gender, academic level, body mass index (BMI), having a part-time job, doing exercise. Our sleep diary was developed based on The Expanded Consensus Sleep Diary for Morning [17] to measure the quality and patterns of sleep and identify insomnia symptoms. Sleep data included TST, SE, bedtime, falling asleep time, wake up time, get up time, sleep onset latency, and sleep quality.

In the current study, insomnia was defined as the inability to sleep within 30 minutes (3 or more times/week) or spending 30 minutes or more awake during the night (3 or more times/week) or early morning awakening at least 30 minutes prior to the desired wake-up time (3 or more times/week), these data was collected via sleep diary. This definition was based on insomnia's clinical features, including difficulty initiating or maintaining sleep [19].

2.5. Data analysis

Data were analyzed using the Student Version of Statistical Package for Social Sciences (SPSS) version 22.0. Categorical variables were presented by frequency and percentages, and continuous variables by mean and standard deviation. The Independent Samples T-Tests were used to determine the differences in sleep data between weekdays and weekends. The Chi-square (Fisher's exact tests where necessary) and Independent Samples T-Tests were used to analyze the relationship between insomnia symptoms and categorical and continuous data, respectively. The $p < 0.05$ was considered statistically significant.

3. RESULTS

Out of 309 participated students, 176 (57.0%) completed the questionnaire and 7-consecutive-day sleep diary. The mean age of the group was 21.86 ± 1.98 years (ranged from 19 to 27 years). There was a slightly higher proportion of the male gender (51.7%). Classified by academic level, 32 (18.2%) students were from the 1st year, 21 (11.9%) from the 2nd year, 29 (16.5%) from the 3rd year, 32 (18.2%) from the 4th year, 21 (11.9) from the 5th year, and 41 (23.3%) from the 6th year. The mean Body Mass Index (BMI) was 21.54 ± 3.16 . Only 32 (18.2%) students got enough exercise. A total of 86 (48.9%), 65 (36.9%), and 11 (6.3%) of students were lived with friends, family, and relatives, respectively. The remaining 14 (8%) participants lived alone.

Table 1 shows and compares the average time of sleep parameters on weekdays and weekends. The mean of reported TST and SE were 6.2 ± 1.4 hours and $89 \pm 9.2\%$, respectively. Not presented in the table is the percentage of the recorded nights showing TST less than 7 hours and SE less than 85%, which is 70.94% and 20.13%, respectively. The table clearly depicts the statistical differences of sleep data between the weekdays and weekends in terms of TST, wake-up, and get-up time. Students waked up and got up at a significantly later hour during the weekends than the weekdays ($p < 0.001$). However, there were no significant differences in the bedtime and falling asleep time between the weekdays and the weekends. Therefore, the students' TST on average was significantly higher during the weekends (6.6 hours) than that during the weekdays (6.1 hours), with $p < 0.001$.

The prevalence of insomnia among the students was 52.8% (n=176). There was a statistically significant relationship between insomnia and sleep environment (p=0.028). The percentage of insomnia was highest among students sleeping in a separated room (67.3%) and lowest

among students sharing the room and the bed with another. As shown in Table 2, no association was found between insomnia and gender, academic year, having part-time job(s), subjects lived with, exercise, and BMI.

Table 1. Sleep patterns collected from sleep diaries of the study population

Characteristics	Overall sample mean ± SD	Weekdays mean ± SD	Weekends mean ± SD	p*
Total sleep time (hours)	6.2 ± 1.4	6.1 ± 1.4	6.6 ± 1.3	<0.001
Sleep efficiency (%)	89 ± 9.2	89 ± 8.9	89 ± 10.1	0.397
Bedtime (clock time)	0:01 ± 1:17	23:59 ± 1:17	0:05 ± 1:17	0.248
Falling asleep time (clock time)	0:31 ± 1:17	0:29 ± 1:18	0:35 ± 1:16	0.185
Wake up time (clock time)	6:48 ± 1:26	6:36 ± 1:23	7:18 ± 1:25	<0.001
Get up time (clock time)	7:03 ± 1:28	6:50 ± 1:24	7:37 ± 1:29	<0.001

*between weekdays and weekends

Table 2. Relationships between insomnia and student characteristics

Characteristics	Insomnia, n (%)		P
	Yes	No	
Gender			
Male	49 (53.8)	42 (46.2)	0.782
Female	44 (51.8)	41 (48.2)	
Academic year			
1st	14 (43.8)	18 (56.3)	0.705
2nd	14 (66.7)	7 (33.3)	
3rd	15 (51.7)	14 (48.3)	
4th	16 (50)	16 (50)	
5th	11 (52.4)	10 (47.6)	
6th	23 (56.1)	18 (43.9)	
Having part-time job(s)			
Yes	13 (38.2)	21 (61.8)	0.058
No	80 (56.3)	62 (43.7)	
Living with			
Family	34 (52.3)	71 (47.7)	0.7
Relatives	4 (36.4)	7 (63.6)	
Friend	47 (54.7)	39 (45.3)	
Alone	8 (57.1)	6 (42.9)	
Sleep environment			
Same room, same bed	20 (38.5)	32 (61.5)	0.028
Same room, separated bed	22 (56.4)	17 (43.6)	
Same room, bunk bed	16 (48.5)	17 (51.5)	
Separated room	35 (67.3)	17 (32.7)	
Exercise			
Yes	18 (56.3)	14 (43.8)	0.669
No	75 (52.1)	69 (47.9)	
BMI classification			
Obese Type 1	13 (76.5)	4 (23.5)	0.109
Obese Type 2	1 (50)	1 (50)	
Normal	57 (49.1)	59 (50.9)	
Underweight	13 (68.4)	6 (31.6)	
Pre-obese	9 (40.9)	13 (59.1)	

Detailed relationships between insomnia and sleep diary statistics are shown in Table 3. Students with insomnia went to bed at a significantly earlier time and fell asleep later than normal students (p=0.001 and 0.002, respectively). The mean SE of insomnia students (86%) was significantly lower than that of normal students (93%). Sleep quality is significantly associated with insomnia (p=0.01). In the self-reported poor

and very poor sleep quality groups, there was a high percentage of insomnia subjects, 64.2% and 60%, respectively.

Table 3. Relationship between insomnia and sleep patterns, sleep quality

Characteristics	Insomnia mean ± SD or n (%)		p
	Yes	No	
Total sleep time (hours)	6.2 ± 1.4	6.3 ± 1.4	0.155
Sleep efficiency (%)	86 ± 10.2	93 ± 6.2	<0.001
Bedtime (clock time)	23:54 ± 1:15	24:08 ± 1:19	0.001
Falling asleep time (clock time)	00:37 ± 1:16	00:23 ± 1:18	0.002
Wake up time (clock time)	6:52 ± 1:30	6:44 ± 1:20	0.12
Get up time (clock time)	7:10 ± 1:32	6:56 ± 1:22	0.007
	Sleep quality		
Very poor	6 (60.0)	4 (40.0)	0.01
Poor	102 (64.2)	57 (35.8)	
Good	440 (50.2)	437 (49.8)	
Very good	103 (55.4)	83 (14.3)	

4. DISCUSSION

The prevalence of insomnia was different between previous studies because of the difference in how insomnia was defined, and more importantly which population was studied. A systematic review conducted in 2015 found that in the same age group (20-29 years), the mean prevalence of insomnia was significantly higher in university students (18.5%) than in the general population (7.4%) [8]. Recently, a cross-sectional study carried out in Italy among 300 undergraduate students demonstrated that the prevalence of insomnia was 47%, which corresponded to the Insomnia Severe Index score from 8 to 28 [9]. In a cross-sectional study involving 977 medical and paramedical students, Alqudah (2019) showed the prevalence of subthreshold and clinical insomnia to be 75.9% [10]. In our study, insomnia was defined as the characteristic of sleep diary. The result of the study revealed that the prevalence of insomnia among medical students in Vietnam was 52.8%, which is in congruence with a report in Italy [9] and considerably lower than in Jordan and Ethiopia [10, 11]. There were some differences between the prevalence of insomnia among students in general and medical students in particular from different studies around the world. This result came from the differences between the

countries and culture, the questionnaires or scales and the selected cutoff point of the scales. But in general, the high prevalence of insomnia in students might reflect the lack of concern about sleep problems of the community and society, and the lack of measures to support students.

Our results showed that 70.94% of the recorded nights had the TST less than 7 hours, which is approximately equal to the average amount of hours recommended for young adults. Similarly, a study conducted among medical students at a medical university in Saudi Arabia showed that 73.4% of students get less than 7 hours of sleep at night [20]. Moreover, in our study, the mean of TST was significantly higher on the weekends than on the weekdays. This statistic is consistent with Yazdi's finding (2016) [21]. In the current study, SE mean was $89 \pm 9.2\%$ and the percentage of nights with SE less than 85% was 20.13%. Similar results were observed from polysomnography data in a study carried out in 206 healthy adults showed similar results [22]. In this study, the SE means for male and female was 90.6% and 89.3%, respectively [22]. Indications of poor sleep quality including sleep deprivation and low SE are common among medical students. More sleep on weekends can be a manifestation of sleep deprivation. However, if students maintain the habit of weekend catch-up sleep, as a result, they may find it difficult to sleep on Sunday nights, and wake up late on Monday mornings. Thus, poor sleep hygiene will be repeated. Moreover, lack of sleep affects the ability to concentrate on studying and living. Practicing sleep hygiene is a recommended method for improving SE and sleep quality in general.

In this study, the insomnia prevalence of students in 2nd year was 66.7%, this is the highest proportion among 6 school years, and the lowest one is the 1st-year students with 43.8% in insomnia prevalence, but not statistically significant. Our results are similar to that of Haile when conducted on 388 students in many different disciplines, the author also noted that there was no statistically significant difference between school years and the prevalence of insomnia [11]. However, the study of Alqudah on medical students showed that 2nd year students had a significantly higher proportion of insomnia than the rest [10]. This discrepancy is probably due to differences in curriculum across years and disciplines when comparing different countries.

In a study conducted by Cheng-Fang on 8004 high school students, students with part-time jobs were more likely to develop insomnia than the other group, but not statistically significant [23]. Many other studies showed that students with part-time jobs having less TST than the other group [24, 25]. Our study found that students with part-time jobs had a lower proportion of insomnia than those without jobs, but not statistically significant. The explanation for this result is that having part-time jobs can result in lack of sleep and tiredness at the end of the day, partly contributes to sleep better and reduces the proportion of insomnia, according to the sleep diary criteria. However, this factor has not been investigated in many studies, and the relationship between insomnia and part-time jobs has not been agreed, so more further studies are needed.

Research on the association between insomnia and the bedroom features in Norway 2018 conducted by Bjorvatn, noted no association between insomnia and sleeping space sharing [26]. However, our study showed that the proportion

of insomnia was high in the group of students sleeping in a private room (67.3%), and the lowest was in the group of students sharing a bed with others (38.5%). This difference is statistically significant. The reason for this result may be that students with insomnia tend to choose the most comfortable sleeping place possible to improve their insomnia. The sleeping space is very important in the practice of sleep hygiene, more studies are needed to examine the association between insomnia and this factor.

Several studies showed that regular exercise reduces the risk of insomnia [27, 28]. In particular, Inoue's study on 14001 elderly people in Japan found that regular exercise was significantly associated with a reduced incidence of insomnia [28]. In our study, there was no statistically significant difference when examining the association of physical activity with the prevalence of insomnia. The differences between these results may be due to the fact that the sample size in our study was not large enough to show any association or because the elderly are typically more prone to underlying medical conditions and exercise helps improve many other health problems, and has an impact on sleep problems. However, we believe that physical activity is one of the key factors and future insomnia studies need to be further examined.

Findings from the current study reflect that there was no difference in TST between students with and without insomnia. Compared to the latter, however, the former group appears to go to bed earlier, fall asleep later, get up later, and have lower SE. These are exactly the type of perpetuating factors discussed in the behavioral model of chronic insomnia [29], in which the excessive time in bed (with no sleep) is an indicator for poor sleep hygiene and can make us difficult to sleep. A large study of 1074 college students from the United States revealed that SE and get up time were also associated with the prevalence of insomnia [30]. Moreover, in our study, a significant relationship was found between insomnia and self-reported sleep quality, which conforms to Alqudah's findings [10].

The primary limitations of the current study are the cross-sectional nature of the data collection and the lack of objective measurement of sleep. Thus, from our results, we cannot establish a causal relationship between each factor and insomnia. All data were self-reported in our study, so recall bias inevitably existed. Further studies could incorporate sleep diary and objective measurement of sleep using actigraphy or polysomnography.

Conclusion

In summary, our study findings suggest a high prevalence of insomnia among medical students. An indication of such was the low TST in the majority of the recorded nights. The study also suggests that insomnia was highly associated with self-reported sleep quality and sleep patterns. Although the cause-effect relationship was not found through this cross-sectional study, but we think that it is crucial for students to be educated about the importance of maintaining good sleep hygiene and sleep quality. We also believe that sleep diary should be used more in sleep studies and clinical practice to thoroughly investigate sleep data in a subjective manner, together with other objective ones such as actigraphy or polysomnography.

LIST OF ABBREVIATIONS

BMI: Body Mass Index, SE: Sleep Efficiency, TST: Total Sleep Time


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