

## Prevalence of Insomnia and its Associated Factors Among Medical Students, Umm Al-Qura University, Makkah, Saudi Arabia

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### ABSTRACT

**Background:** Medical students is one of population that appears to be at increased risk for sleep deprivation due to demanding academic and clinical duties which in coexistent with change in living style such as poor accommodation, being away from family put them at greater risk of poor sleeping and its subsequent mental and physical morbidity.

**Objectives:** To determine the magnitude of insomnia and factors associated with it among 2nd and 3rd year medical students in faculty of medicine, Umm Al-Qura University in Makkah.

**Subjects and Methods:** A cross-sectional, analytical study was applied. It included a representative sample of male and female students registered in the 2nd and 3rd levels in faculty of medicine at Umm Al-Qura University. Questionnaires of Pittsburgh sleep quality Index and functional outcome of sleep in simple English Language were applied in addition to demographic characteristics of the students.

**Results:** The study included 166 medical students enrolled in second and third academic years out of 183 invited to participate in the study, giving a response rate of 90.7%. Majority of them 88% were poor sleepers during the past month, based on Global PSQI Score. Almost one-third of medical students 31.7% had no daytime dysfunction while 47.3%, 16.8% and 4.2% of them reported mild, moderate and severe daytime dysfunction, respectively. Current smoker medical students mean rank = 96.63 reported more daytime

dysfunction than non-smoker students mean rank=76.09 and ex-smokers mean rank=80.5. Most of medical students 80.7% reported no use of sleep medications while 13.3% and 3.6% of them reported usage of sleep medications in a dose of less than once per week and once or twice weekly, respectively. Female students, divorced students, those resided in external houses, students with below average income, current smokers and those with history of chronic diseases tended to use sleep medications more than others.

**Conclusion:** Poor sleep quality is a common problem affecting most of male students enrolled in the second and third levels, College of Medicine, Umm Al-Qura University, Makkah, KSA.

**Keywords:** Insomnia, Medical Students, Prevalence, PSQI Score, Sleep Quality.

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### INTRODUCTION

Insomnia is defined as repeated difficulty with the initiation, duration, maintenance, or quality of sleep that occurs despite adequate time and opportunity for sleep and results in some form of daytime impairment.<sup>1</sup> Approximately one third of adults report some difficulty falling asleep and/or staying asleep during the past 12 months, with 17% reporting this problem as a significant one. As many as 95% of Americans have reported an episode of insomnia at some point during their lives.<sup>2</sup>

The 2008 update to the American Academy of Sleep Medicine AASM guideline for the evaluation and management of chronic insomnia calls insomnia an important public health issue.<sup>3</sup>

Difficulty in sleeping under stressor due to various living style needs appears to be a great risk factor for physical and mental health status, At first glance; low sleep may result in over activity

and increase productivity, but in long term lack of sufficient sleep may lead to psychological distress and low productivity.<sup>4</sup> Study recruiting healthy samples revealed that even low levels of sleepiness have an adverse influence on general health.<sup>5</sup> Studies have demonstrated that poor sleep quality, sleep disruption and change in regular Sleep-wake pattern may cause physical and psychological burden such as impairment in job performance, decreased work efficiency and learning disability.<sup>6-11</sup> For example, Partinen et al reported an association between Inadequate sleep and cardiovascular disease and mortality.<sup>12,13</sup>

Medical students is one of population that appears to be at increased risk for sleep deprivation due to demanding academic and clinical duties which in coexistent with change in living style such as poor accommodation, being away from family put them at

greater risk of poor sleeping and its subsequent mental and physical morbidity. A long prospective study at the John Hopkins University showed that insomnia during medical school is indicative of a subsequent depression and other psychiatric distress persisting at least for 30 years.<sup>14</sup>

This study was conducted to evaluate the prevalence of insomnia among 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> year medical students enrolled in faculty of medicine, Umm Al-Qura University in Makkah, Saudi Arabia.

**SUBJECTS AND METHODS**

Cross-sectional, analytical study was conducted among male and female students at 2nd and 3rd years, faculty of medicine, Umm Al-Qura University, Makkah 2017-2018. Makkah Al Mukarramah is the most holy city on earth for Muslims. Umm Al-Qura University is the only governmental university in Makkah, which has Faculty of medicine. The total number of male students in the faculty of medicine is 248 students from the second n=120 and third years n=128 while the total number of female students in the faculty of medicine is 251 Students from the second n=126 the third year n=125. The sample size is calculated by using Epi info version 6, it is 183 male and female students at 95 % confidence intervals expected frequency 25 % "worst prevalence in general community worldwide".

The sample size was distributed among the two years medical students males and females and determined as a percentage proportionally related to the total of the students in each academic year for both male and female students. Using systematic random sampling technique the students were selected as follows:

- 2<sup>nd</sup> year Male 120 students 24.0% = 44 students every third student was selected randomly
- 3<sup>rd</sup> year Male 128 students 25.7% = 47 students every third student was selected randomly
- 2<sup>nd</sup> year Female 126 students 25.2% = 46 students every third student was selected randomly
- 3<sup>rd</sup> year Female 125 students 25.1% =46 students every third student was selected randomly

Self-administered questionnaires of Pittsburgh sleep quality Index and functional outcome of sleep in simple English Language were applied. The study questionnaires were composed of:

- Demographic characteristic: age, gender, academic level, residence, marital status, nationality, smoking status and history of any chronic medical disorders.
- PSQI which measured the quality and patterns of sleep. It differentiated "poor" from "good" sleep by measuring seven areas: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction over the last month. Scoring of answers was based on a 0 to 3 scale, whereby 3 reflected the negative extreme on the Likert Scale. A global sum of "5" or greater indicated a "poor" sleeper. Reliability and validity of PSQI produced a sensitivity of 89.6% and a specificity of 86.5% of patients versus control subjects. This cutoff score correctly identified 84% of patients with disorders of initiating or maintaining sleep, 89% of patients with disorders of excessive sleepiness, and 97% of depressed patients.<sup>15, 16</sup>

Data were entered to a personal computer and analyzed by using Statistical Package for the Social sciences SPSS 25 program version 25. Descriptive statistics were computed in the form of frequency and percentage for categorical data, and measures of central tendency mean, median and mean rank and measures of dispersion standard deviation "SD" and inter-quartile range "IQR" for continuous variables. Analytic statistics were computed where chi-square test was utilized to test for the association and/or difference between categorical variables. Fisher exact test was applied for small frequencies. Kolomongrove-Smironove K-S test was performed for PSQI score to test its normal distribution. The date was abnormally distributed as evidenced by significant K-S test. Therefore, non-parametric statistical tests were applied. Mann Whitney statistical test was utilized for comparison of two groups and Kruskal-Wallis test for comparison of more than two groups. Differences were considered as statistically significant when the p-value was less than 0.05.

Approval of Joint Program of Family medicine JPFM, Makkah was obtained. In addition, permissions of the deans of faculty of medicine male and female sections were obtained. Student consents were obtained and all collected data were kept confidential.

**Table 1: Demographic characteristics of the participants n=166.**

		Frequency	Percent
Age years	≤20	114	68.7
	>20	52	31.3
	Range		18-24
	Mean ± SD		20.3±1.2
Gender	Male	85	51.2
	Female	81	48.8
Academic level	Second	80	48.2
	Third	86	51.8
Nationality	Saudi	157	94.6
	Non-Saudi	9	5.4
Marital status	Single	141	84.9
	Married	19	11.4
	Divorced	6	3.6
Residence	With family	143	86.2
	University house	9	5.4
	External house	14	8.4
income status	Below average	18	10.8
	Average	113	68.1
	Above average	35	21.1

Table 2: Factors associated with sleep quality in the past month among medical students.

		Score of sleep quality 0-3			p-value
		Median	IQR	Mean rank	
Age years	≤20 n=114	2	1-3	83.74	0.921*
	>20 n=52	2	1-3	82.97	
Gender	Male n=85	2	1-3	89.05	0.113*
	Female n=81	2	1-3	77.67	
Academic level	Second n=80	2	1-3	91.08	0.041*
	Third n=86	2	1-3	76.45	
Nationality	Saudi n=157	2	1-3	84.67	0.175*
	Non-Saudi n=9	0	0-3	63.17	
Marital status	Single n=141	2	1-3	87.58	0.002**
	Married n=19	1	1-3	72.08	
	Divorced n=6	0	0-1	23.83	
Residence	With family n=143	2	1-3	83.66	0.954**
	University house n=9	2	1-3	85.94	
	External house n=14	2	1-3	80.29	
income status	Below average n=18	1	0-2	54.89	0.005**
	Average n=113	2	1-3	83.47	
	Above average n=35	2	1-3	98.30	
Smoking status	Current smoker n=30	2	2-3	71.77	0.249**
	None-smoker n=124	2	1-3	85.29	
	Ex-smoker n=12	1	1-3	94.33	
Chronic diseases	No n=102	2	1-3	85.80	0.417*
	Yes n=64	2	1-3	79.83	

\* Mann-Whitney test IQR: Inter-quartile range

\*\* Kruskal-Wallis test

Table 3: Factors associated with overall sleep quality in the past month among medical students.

		Overall sleep quality		X <sup>2</sup>
		Poor N=146	Good N=20	
Age years	≤20 n=114	101 88.6	13 11.4	0.706
	>20 n=52	45 86.5	7 13.5	
Gender	Male n=85	72 84.7	13 15.3	0.188
	Female n=81	74 91.4	7 8.6	
Academic level	Second n=80	71 88.8	9 11.3	0.761
	Third n=86	75 87.2	11 12.8	
Nationality	Saudi n=157	137 87.3	20 12.7	0.305*
	Non-Saudi n=9	9 100	0 0.0	
Marital status	Single n=141	122 86.5	19 13.5	0.383
	Married n=19	18 94.7	1 5.3	
	Divorced n=6	6 100	0 0.0	
Residence	With family n=143	127 88.8	16 11.2	0.530
	University house n=9	8 88.9	1 11.1	
	External house n=14	11 78.6	3 21.4	
income status	Below average n=18	14 77.8	4 22.2	0.370
	Average n=113	101 89.4	12 10.6	
	Above average n=35	31 88.6	4 11.4	
Smoking status	Current smoker n=30	29 96.7	1 3.3	0.221
	None-smoker n=124	106 85.5	18 14.5	
	Ex-smoker n=12	11 91.7	1 8.3	
Chronic diseases	No n=102	89 87.3	13 12.7	0.728
	Yes n=64	57 89.1	7 10.7	

\* Fisher exact test

## RESULTS

The study included 166 medical students enrolled in second and third academic years out of 183 invited to participate in the study, giving a response rate of 90.7%. Table 1 summarizes the demographic characteristics of the medical students participated in the study. Their age ranged between 18 and 24 years with a mean of 20.3 years  $\pm$  1.2 years. Males represent 51.2% of them n=85. Majority of them were singles 141; (84.9%). Slightly more

than half of them 86; (51.8%) enrolled in the third academic level. Vast majority of them were Saudis 157; (94.6%). Most of them 141; (86.2%) were living with their families. Almost two-thirds of them 113; (68.1%) has an average income.

Current smokers represent 18.1% (n=30) of the participants whereas ex-smokers represent 7.2% (n=12) of them. Regarding type of smoking among current smokers, 17 (56.7%) smoked cigarettes, 10 (33.3%) smoked shisha and 7 (20%) smoked

moassel. More than a third 38.6% of medical students had history of chronic diseases. Bronchial asthma and psychiatric problems represent 32.8% and 20.3% of them.

Almost a third 56 (33.7%) of medical students described their sleep quality during the past month as very good whereas 45 (27.1%) and 40 (24.1%) of them described it as good or average, respectively. Twenty-five students 15.1% described their sleep quality as bad.

From table 2, students of the third academic year had better sleep quality than those of the second academic year mean rank was 91.08 versus 76.45. This difference was statistically significant,  $p=0.041$ . Single students had better sleep quality compared to married, and divorced students mean rank was 87.58 versus 72.08 and 23.83, respectively. This difference was statistically significant,  $p=0.002$ . Students with above average family income had better sleep quality compared to those with below average family income mean rank was 98.30 versus 54.89. The difference was statistically significant,  $p=0.005$ . Other studied factors age, gender, nationality, residence, smoking status and history of chronic diseases were not significantly associated with sleep quality during the past month among medical students.

Sleep latency was 15 minutes or less among 48.8% of medical students while it was more than one hour among 3.6% of them. Almost one – fifth of medical students 18.7% reported sleep

duration of less than 5 hours and almost one-third of them 36.7% reported sleep duration ranged between 5 and 6 years. Habitual sleep efficiency was less than 65% among 6.6% of medical students while it was more than 85% among more than half of them 53.0%. Almost two-thirds of medical students 67.5% reported mild sleep disturbances and 22.3% reported moderate sleep disturbances while none of them reported severe sleep disturbances. Seventeen medical students 10.2% did not report any sleep disturbances during the past month. Most of medical students 80.7% reported no use of sleep medications while 13.3% and 3.6% of them reported usage of sleep medications in a dose of less than once per week and once or twice weekly, respectively. About one-third of medical students 31.7% had no daytime dysfunction while 47.3%, 16.8% and 4.2% of them reported mild, moderate and severe daytime dysfunction, respectively.

As shown in figure 1, most of medical students 2<sup>nd</sup> and 3<sup>rd</sup> academic levels, Umm Al-Qura University. Makkah Al-Mukarramah 88% was poor sleepers during the past month, based on Global PSQI Score. Table 3 shows that none of the studied factors age, gender, residency level, residency location, marital status, history of taking sedative or stimulant medications, history of smoking and history of chronic diseases were significantly associated with overall sleep quality.

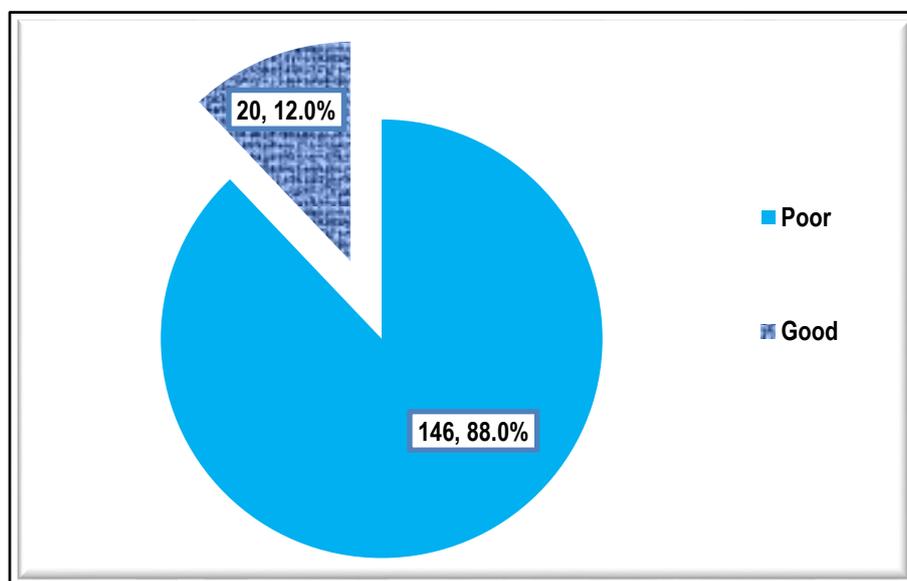


Figure 1: Overall sleep quality based on Global PSQI Score during the past month among medical students 2<sup>nd</sup> and 3<sup>rd</sup> levels.

## DISCUSSION

Medical students are a special group of young adults who have life constraints that can cause irregular sleep habits or shortening of mean sleep length, compared with individual's sleep need. There is some evidence in literature supporting the hypothesis that sleep difficulties and deprivation can significantly impair student's academic performance and learning ability.<sup>17-19</sup> It is associated also with minor psychiatric disorders among medical students.<sup>20</sup> On the other hand, optimized sleep patterns may improve both neuro-cognitive and academic performance.<sup>21</sup>

While other studies have revealed that sleep deprivation was a common finding in student academic life, the results of this study revealed that the prevalence of different forms of sleep disorder

among the medical student's males and females in Umm Al-Qura University, Makkah is very high and similar to those reported in other countries as Brazil<sup>19</sup>, Hong Kong<sup>22</sup>, and Malaysia.<sup>23</sup>

In the present study, almost 88% of the medical students reported poor sleep quality 84.7% of male and 91.4% of female students. There may be several explanations for this poor sleep quality among them. It has been hypothesized that medical students, have difficulties unwinding after studying hours.<sup>24</sup> In addition, it has been found that individuals with insomnia tend to think excessively about their sleep and the consequences for the next day if they do not get enough sleep.<sup>25,26</sup> This represents a hyperactive state, which may involve increased activation of the hypothalamic–pituitary–adrenal HPA axis, resulting in a chronic

allostatic load.<sup>27</sup> In this regard, Melamed et al.<sup>28</sup> suggested that the link between burnout documented among medical students and sleep disturbances may be mediated by a disturbance of the HPA axis, which is considered the central stress–physiological system for an organism's long-term adaptation to stress.<sup>29</sup> Other researches showed similar results.<sup>30,31</sup>

In the present study, there was no significant difference between male and female students although the sleep quality, duration and efficacy were higher among male students. The only difference between male and female students was in the use of sleep medications as female students tended to use them more than male students. The same has been reported in USA by Chong et al 2013 who reported that prescription sleep aid use in the past 30 days was higher among adult women 5.0% than men 3.1%.<sup>32</sup>

In a study on behavioral and psychological consequences of sleep restriction, 2007, evidence pointed toward impaired performance, cognition, mood and overall well-being and safety among medical students.<sup>33</sup> There appeared to be a dose-response relationship between number of hours of acute sleep debt and these impairment. Chronic partial sleep deprivation caused similar consequences on mood, cognition and motor skills.<sup>33</sup> The adverse effects may accumulate dangerously overtime with inadequate recovery sleep. In the present study, we failed to confirm an effect of student's age on sleep quality as age range of our population is very small. However, those of third academic level had poorer sleep quality compared to those of second academic years.

Another interesting finding is that more than two-thirds of students had daytime dysfunction. Excessive daytime sleepiness EDS may cause sleepiness during afternoon lecture.<sup>34</sup> Wali et al<sup>35</sup> showed that 88% of Saudi males nap during the daytime. Among Malaysian medical students, nine out of ten students suffered from daytime sleepiness, with two-thirds of them having moderate to high level of sleepiness.<sup>34</sup> It seems that napping during the daytime is related to cultural background. In a survey conducted among human sciences faculty students in Morocco, Taoudi et al.<sup>36</sup> had shown a much lower percentage of daytime dysfunction 41%. An increase in the percentage of those who nap may indirectly reflect an increased bodily need or wish for more sleep due to sleep deprivation.<sup>37</sup> This suggests that scheduling lecture in the afternoon is not worthwhile. By creating awareness of the high prevalence and possible impact of EDS on the medical students and the teaching staffs, proactive management of sleep education and sleep hygiene can be undertaken, especially to those who are identified as potential individuals.<sup>38-40</sup> In fact, due to the growing concerns of medical errors and medical residents well-being, the Accreditation Council for Graduate Medical Education ACGME has implemented some guidelines on duty hour in 2003 to reduce sleepiness other potential hazards.<sup>41</sup>

In the present study, smoking was associated with higher daytime dysfunction, use of sleep medication and sleep latency and although not significant, poor overall sleep quality. A recent study<sup>42</sup> showed that smoking disrupted sleep in two ways. First, as bedtime approaches, the smoker has a final "relaxing" smoke before retiring. That smoke may seem relaxing, but nicotine the drug found in tobacco is actually a stimulant, and smoking that cigarette is almost as sleep disrupting as drinking a cup of coffee. In addition smoking disrupts sleep in yet another way. During the night, the smoker goes hours without a cigarette. This leads to discomfort and mild withdrawal, making it difficult to fall into a

deep sleep. The light sleep is not sufficient for the smoker to awake refreshed and struggle with his smoker's cough in the morning.

There are few limitations in this study. This study was conducted at one University in the Kingdom and in only two academic levels, therefore the result cannot be generalized to all medical students in the kingdom. We suggest multi-central study involving other universities and all academic levels to improve generalizability and comparison can be made between the medical university students. An important limitation is the cross-sectional design of the study, which precludes evaluation of the temporality and causality of the observed relationships. Another limitation is that data were collected by means of self-reports which raises the possibility that students may not have accurately reported their sleep habits or the nature of the difficulties they were experiencing. However, empirical research has indicated that self-report measures of insomnia are highly correlated with objective measures such as polysomnography or actigraphy.<sup>43</sup> Nevertheless, high prevalence of daytime sleepiness and poor sleep quality were documented. The findings highlighted the potential impact of sleep and stress related problems among medical students.

In conclusion, poor sleep quality is a common problem affecting most of male students enrolled in the second and third levels, College of Medicine, Umm Al-Qura University, Makkah, KSA. There is no significant association between poor sleep quality and any of the studied students' characteristics. Educating medical students about the necessity of regulations of their sleep and the hazardous effect of intake of stimulants and sleeping pills is highly recommended.

## CONCLUSION

Poor sleep quality is a common problem affecting most of male students enrolled in the second and third levels, College of Medicine, Umm Al-Qura University, Makkah, KSA. There is no significant association between poor sleep quality and any of the studied students' characteristics.

There was no significant difference between male and female students although the sleep quality, duration and efficacy were higher among male students. The only difference between male and female students was in the use of sleep medications as female students tended to use them more than male students.

## RECOMMENDATIONS

- 1) Educating medical students about the necessity of regulations of their sleep and the hazardous effect of intake of stimulants and sleeping pills.
- 2) Of extremely importance, early diagnosis and treatment of sleep disorders among medical students.
- 3) University authorities should acknowledge that students' sleep habits are significant concerns that may affect their academic performance and hence, warrant educational programs and interventions
- 4) Investigation of the association between sleep problems, both diagnosed and self-reported and academic performance among medical students is highly recommended to find solutions that will help students combat sleep difficulties and avert the deleterious effects of sleep deprivation.

- 5) Activation of smoking cessation programs among medical students.
- 6) Rescheduling timetables of university activities to combat the afternoon sleepy status of the students.

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