

# Daytime Sleepiness and Sleep Quality Among Malaysian Medical Students

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## SUMMARY

Poor sleep quality and daytime somnolence is reported to be associated with cardiovascular events, road traffic accident, poor academic performance and psychological distress. Some studies documented that it is prevalent in most populations but its frequency among medical students has not been documented in Malaysia. This is a self-administered questionnaire survey of medical students from International Medical University, Malaysia. Daytime sleepiness of medical students was assessed using Epworth Sleepiness Scale (ESS). Student scoring ESS  $\geq 11$  was regarded as having excessive daytime sleepiness. Psychological distress was measured using 12-item General Health Questionnaire (GHQ-12). A total of 799 medical students participated in this survey (response rate 69.5%). Daytime sleepiness occurred in 35.5%, psychological distress was present in 41.8% and 16.1% reported bad sleep quality. Daytime sleepiness was significantly more common among the clinical students, those with self-reported bad sleep quality and psychological distress; but unrelated to the number of hours sleep at night. We have documented high prevalence of daytime sleepiness, poor sleep quality and psychological distress. Higher frequency among clinical students and the significant relationship with psychological distress suggest possible link to the stressful clinical training.

## KEY WORDS:

*Sleep quality, Daytime sleepiness, Medical students*

## INTRODUCTION

Excessive daytime sleepiness among the adults has been demonstrated to be a public health issue. It has been linked to increased motor vehicle accidents<sup>1</sup>, workplace accidents, and propensity for medical errors among the sleep deprived doctors<sup>2,3</sup>.

Napping in the lecture halls is commonly observed among the medical students but the prevalence rate of daytime sleepiness in this group is less well documented. The few prevalence studies available showed highly variable rates among college or university students, from as low as 4.1% in Japanese graduate students<sup>4</sup> to as high as 39.5% and 42.4% in two different Brazilian medical schools<sup>5,6</sup>. Rodrigues *et al.*<sup>5</sup> had shown that daytime sleepiness increased in prevalence as the medical students progressed through the course and that sleeper students did not achieve as well as the others in their final examinations. In another Brazilian medical school, Hidalgo and Caumo<sup>6</sup> reported that daytime sleepiness was significantly associated with minor psychiatric disorder.

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More importantly, poor sleep quality among medical students correlated with lower academic progress<sup>7</sup>.

There are limited studies documenting the prevalence of studies in Asian medical schools. In this study, we wish to determine the prevalence of daytime sleepiness and poor sleep quality and among medical students and the associated factors.

## MATERIALS AND METHODS

### *Study design and subjects*

This was a cross sectional study using self-administered questionnaire among medical students at International Medical University (IMU), Malaysia. Only students in Semester 1-9 were invited; Semester 1-5 students ("Phase 1", equivalent to pre-clinical phase of medical course) were located at the main campus in Bukit Jalil, Kuala Lumpur, Malaysia, while the Semester 6-9 ("Phase 2", equivalent to clinical phase of medical course) students were located in Seremban, 60km south of Kuala Lumpur. Semester 10 students (the final six months of the medical programme) who were located in Batu Pahat, 240km south of Kuala Lumpur, were not involved in this survey. Group leaders from all the semesters helped to distribute the questionnaire. Posters in the campus were mounted at strategic location within the campus to publicise the research project. It was conducted in October 2005, and did not coincide with any major examinations.

This study was approved by the IMU Research and Ethics Committees. All participants gave written informed consents.

### *Questionnaires*

The anonymous questionnaire collected data on socio-demographic, weight and height, sleep quality, daytime sleepiness, lifestyle data (smoking, alcohol use, and caffeine intake), and psychological distress.

Sleep duration was recorded to the nearest hour. Sleep quality was assessed using the question: "During the past month, how would you rate your sleep quality overall?" with a four-point response (very good, fairly good, fairly bad, very bad) and later recoded into "good" or "bad".

Daytime sleepiness was measured using the Epworth Sleepiness Scale (ESS)<sup>8</sup>; this scale asked the respondents to self-evaluate their tendency to doze off in eight daily situations, and was scored as follows: 0=would never doze, 1=slight

chance of dozing, 2=moderate chance of dozing, 3=high chance of dozing. An aggregate of all eight items produces a score between 0-24, respondents scoring 11 or more are considered to have excessive daytime sleepiness. An additional question scored in the same way for the eight items was introduced in our questionnaire ("Attending a lecture in the afternoon") but this question was not included in the total ESS score.

Psychological distress was measured using the 12-item General Health Questionnaire (GHQ-12)<sup>9</sup>; those scoring ≥3 were considered high scorers (thus having psychological distress)<sup>10</sup>.

**Statistical analysis**

Data were analysed using the Statistical Package for Social Sciences (SPSS) version 11.5. The outcome variable of interest is "excessive daytime sleepiness". We compared categorical variables using  $\chi^2$  test, unadjusted odds ratios (with 95% confidence intervals) were also generated. Statistical significance was set at  $p < 0.05$ . Factors that were statistically significant were entered into a logistic regression model, adjusted odds ratios (with 95% confidence intervals) were generated.

**RESULTS**

A total of 799 medical students participated in this survey (response rate 69.5%, Phase 1 students 52.1%, Phase 2 students 81.2%). There was a slight female predominance (female 59%) with the mean age 20.8 years (range 20-30 years old).

These students reported sleeping between 1-11 hours per day (mean 6.6, SD=1.3), only 51.2% slept seven hours or more per night (Table I). A minority of the respondents (3.9%) used sleep medication in the past one month (Table I). The self-rated sleep quality was as given in Table I, 16.1% of the respondents reported fairly bad to very bad sleep quality. The median GHQ-12 score was 2 (range 0-12), 41.8% of respondents had psychological distress (GHQ ≥3).

Two-third of the respondents (65.4%) reported moderate to high chance of dozing during the afternoon lecture. The median Epworth Sleepiness Score was 9.0 (range 0-24). Excessive daytime sleepiness (ESS ≥11) occurred in 35.5% of students, this is statistically significantly more in Phase 2 students when compared to Phase 1 students (Table I,  $\chi^2=11.2$ ,

$p=0.001$ ). Excessive daytime sleepiness was not significantly associated with gender, obesity (BMI ≥30 kg/m<sup>2</sup>), sleep duration, and usage of sleep medication. However, it was significantly more common in those with self-rated "bad" sleep quality (Table I,  $\chi^2=15.8$ ,  $p < 0.001$ ), and also significantly more common in those with psychological distress (Table I,  $\chi^2=16.7$ ,  $p < 0.001$ ). In a multivariate logistic model including training phase (Phase 2 vs. Phase 1), sleep quality (bad vs. good), and psychological distress, all three factors remained statistically significantly associated with excessive daytime sleepiness (Table II).

**DISCUSSION**

One in five of medical students in International Medical University reported fairly bad to very bad sleep quality. This is higher if compared to medical students in a university in Estonia<sup>7</sup>. They reported that 7% of the first to the sixth year medical students, had poor to very poor sleep quality using a

**Table I: Sleep quality<sup>a</sup>, sleepiness and General Health Questionnaire Score**

Characteristics	Number (%)
<b>Sleep duration (n=780), hours</b>	
≥7	399 (51.2)
6-6.9	255 (32.7)
5-5.9	94 (12.1)
<5	32 (4.1)
<b>Use of sleep medication (n=766)</b>	
Not during the past month	736 (96.1)
Less than once a week	19 (2.5)
Once or twice a week	7 (0.9)
Three or more times a week	4 (0.5)
<b>Overall sleep quality (n=794)</b>	
Very good	201 (25.3)
Fairly good	465 (58.2)
Fairly bad	112 (14.1)
Very bad	16 (2.0)
<b>Tendency to doze during afternoon lecture (n=794)</b>	
Would never doze	72 (9.1)
Slight chance of dozing	203 (25.6)
Moderate chance of dozing	250 (31.5)
High chance of dozing	269 (33.9)
<b>Epworth Sleepiness Score (n=792)</b>	
No daytime sleepiness (ESS <11)	511 (64.5)
Daytime sleepiness (ESS ≥11)	281 (35.5)
<b>General Health Questionnaire score (n=788)</b>	
Low scorer (GHQ <3)	459 (58.2)
High scorer (GHQ ≥3)	329 (41.8)

<sup>a</sup>Sleep quality: "good" includes "very good" and "fairly good", "bad" includes "fairly bad" and "very bad"

**Table II: Prevalence and associations of daytime sleepiness**

	Prevalence of excessive daytime sleepiness (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
<b>Phase</b>			
<sup>a</sup> Phase 1	32.3	Reference group	Reference group
<sup>b</sup> Phase 2	45.5	1.76 (1.26-2.45)*	1.81 (1.28-2.54)*
<b>Sleep quality</b>			
Good	32.4	Reference group	Reference group
Bad	50.8	2.15 (1.47-3.15)**	1.88 (1.26-2.79)*
<b>GHQ-12 score</b>			
Low scorer	29.9	Reference group	Reference group
High scorer	44.1	1.85 (1.38-2.49)**	1.69 (1.25-2.30)*

<sup>a</sup>Phase 1- pre-clinical phase, <sup>b</sup>Phase 2 - clinical phase, <sup>c</sup>Sleep quality: "good" includes "very good" and "fairly good", "bad" includes "fairly bad" and "very bad"; <sup>d</sup>GHQ-12 score: low scorer, GHQ <3; high scorer, GHQ ≥3; \* $p < 0.001$ ; \*\* $p < 0.001$

five-point scale. In their study, poor sleep quality is associated with poor academic progress<sup>7</sup> and sleep quality has been reported to be related to health, well being and emotional feelings<sup>11</sup>.

The outstanding result of this study is the high prevalence of excessive daytime sleepiness (EDS), 35.5% compared to 14.8% of the Malaysian general population<sup>12</sup>. This result is slightly lower than those experienced by the Brazilian medical students (42.4%)<sup>6</sup>. This is an important finding as a few studies have reported significant association between daytime sleepiness and adverse academic performance<sup>5,7</sup>. In this study, the independent predictors of excessive daytime sleepiness were: clinical training, poor sleep quality and psychological distress. This echoes the study done by Hidalgo and Caumo<sup>6</sup>, who reported that daytime sleepiness (OR, 2.12), insomnia (OR, 2.45), and sleeping less than 7 hours per night (OR, 2.02), were associated with psychiatric disorders<sup>6</sup>. Bixler *et al.*<sup>13</sup> also noted that EDS is more prevalent in those younger than 30 years of age. They suggested that sleep deprivation and depression is the cause of the high occurrence of EDS among the young.

Excessive daytime sleepiness may cause sleepiness during afternoon lecture. In this study, nine out of ten students suffered from this, with two-thirds of them having moderate to high level of sleepiness. 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>14-16</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>17</sup>.

This study demonstrates that medical students sleep less than the general Malaysian population<sup>12</sup>. Their average sleep hours per night are similar to those who had insomnia in a Malaysian study<sup>12</sup>, and the Japanese graduates<sup>4</sup>. This result is consistent with many other studies<sup>3,18,19</sup> in which sleep deprivation is part of the medical students' training and may be associated with poor work-related performance, mood and affect and medical errors. However, the literature review conducted by Gomes *et al.*<sup>20</sup> revealed somewhat variable relationship between insufficient sleep and lower academic achievement, possibly due to the methodological difficulty of such synthesis.

It is also noted that both medical students and young doctors appear to accept that sleep deprivation is norms to their medical training, however the authors are not sure whether it has to be so. Further studies are needed how to improve the wellbeing of this special group of population. The lack of association between sleep duration and excessive daytime sleepiness suggests that number of hour sleeping at night is possibly a poor guide of sleep deprivation.

There are a few limitations in this study. This study was conducted at a Private Medical University, therefore the result cannot be generalised to all medical students. We suggest multi-centre study involving both private and public universities to improve generalizability and comparison can

be made between private and public university students. Further studies are also needed to explore the association between poor sleep quality, daytime sleepiness and academic performance in local medical students.

Nevertheless, high prevalence of daytime sleepiness, poor sleep quality and psychological distress was documented. The findings highlight the potential impact of sleep and stress related problems among medical students.

## CONCLUSION

Daytime sleepiness is highly prevalent in the medical school in this study. Sleep deprivation and the association between sleep quality and psychological distress are areas of student well-being that need focusing in the medical school.

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