# NOCTURNAL SLEEP QUALITY AND DAYTIME SLEEPINESS AMONG FIRST AND SECOND YEAR MBBS STUDENTS

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**ABSTRACT**

**BACKGROUND**

Medical students are more prone to have poor sleep quality because of stress, and greater academic commitments. Studies from different countries have reported that medical students have daytime sleepiness, poor sleep quality, and higher prevalence of sleep complaints than the general population. But these studies differed on the effect of gender on sleep. There is a correlation between sleep quality and academic performance of college students. Daytime sleepiness affects performance.

**METHODS**

We conducted a cross sectional analytical study on the sleep quality assessed by Pittsburgh Sleep Quality Index (PSQI), the sleep quality reported by students and the daytime sleepiness assessed by Epworth Sleepiness Scale (ESS) among 272 first and second year MBBS students of Govt. Medical College, Kottayam. Statistical analysis was done using SPSS Version 22.0. $\chi 2$-test was used to evaluate the association between the variables, independent samples t-test for continuous variables, Pearson's test for correlation, Mann-Whitney U test to compare the sleep quality and daytime sleepiness of first-years with those of second-years and multinomial logistic regression analysis for confounding factors

**RESULTS**

Most of the first and second year MBBS students have good quality of sleep as per self-reporting and as assessed by PSQI and have higher normal daytime sleepiness. The poorer the sleep quality assessed by PSQI, the greater is the daytime sleepiness. Gender does not affect the quality of sleep and daytime sleepiness. Second year students have better sleep quality than first year students.

**CONCLUSIONS**

Most of the first and second year MBBS students in our institution have good sleep quality and higher normal daytime sleepiness. Poorer the sleep quality, greater is the daytime sleepiness. Gender has no effect on sleep quality or daytime sleepiness.

**KEYWORDS**

Sleep Quality, Sleepiness, Medical Student

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## BACKGROUND

Sleep problems are common in the general population.[1] College students have been found to suffer from various sleep problems.[2,3] Delayed sleep phase syndrome marked by significant delays in sleep/wake cycles is common among college students and may result in increased daytime sleepiness.[4]

Medical students are more prone to have poor quality of sleep, sleep deprivation, and irregular sleep/wake patterns because of stress, greater academic commitments, long duration and high intensity of study till immediately before going to bed, overnight on-call duties, emotionally challenging work, lifestyle choices, and early class starting time.[5,6,7,8] Several studies, reported that the prevalence of sleep complaints among medical students exceeded that of the general population.[9] Studies conducted in Spain,[10] Lithuania,[11] Iran,[12] Pakistan,[13] Brazil,[14] China[15] and Malaysia found poor sleep quality in 16-79.3% of medical students. A study conducted in the United States of America reported that the sleep quality (measured by PSQI) was significantly worse in medical students compared to a healthy adult sample.[16] An Indian study found that only 47.1% of medical students had refreshing sleep at night while 60.8% of law students had, and that initial insomnia was more frequent in medical students than in law students.[17] Law students had better depth of sleep than the medical students. Studies conducted in Spain,[10] India,[18] and China[19] found that 49.8%, 30.6%, and 90% of the medical students respectively were found to have excessive daytime sleepiness. The Chinese study reported that more males than females were affected[19] by daytime sleepiness. Studies in Malaysia[20] and Pakistan[13] reported that daytime sleepiness was significantly

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more common among those with poor sleep quality. Another study report from Brazil says that among medical students, females have more difficulty in maintaining sleep than males, and that males are more likely to report "falling asleep later."[21] The study in Pakistan revealed that the poor sleep quality was significantly associated with female gender.[13] In the Iranian study, the poor sleep quality was not associated with gender.[12] A study in China reported that there were differences in the sleep quality between years of study but not between genders.[15] But an Indian study found that sleep quality was better in females.[18]

Sleep characteristics influence academic performance.[22] The consolidation of higher-order implicitly learned information is linked to the rapid eye movement (REM) stage of sleep.[23] Sleep deprivation may impair memory and decision making.[24] Daytime sleepiness and reduced levels of attention affect performance.[25] Poor sleep can affect performance indirectly also by increasing depression, decreasing motivation and compromising health.[26] The study conducted by Howell et al. on college students confirmed a correlation between poor sleep quality and academic performance.[27] There were no studies on the sleep quality of medical students in Govt. Medical College, Kottayam, where we were working. So, we undertook this study to understand sleep related problems of our students to enable us to mentor them more effectively.

We wanted to assess the quality of nocturnal sleep of first and second year MBBS students from self-reporting and using the Pittsburgh Sleep Quality Index (PSQI), assess the daytime sleepiness among them using the Epworth Sleepiness Scale (ESS) and determine the association if any between the quality of nocturnal sleep and daytime sleepiness.

## METHODS

### Study Design

Cross sectional analytical study.

### Period of Study

6 months from November 2017 to January 2018.

### Study Population

First and Second Year MBBS students in Government Medical College, Kottayam.

### Sample Size

Sample size was calculated using the formula:

$n = 4pq/d^2$

where,
p= anticipated population proportion of factor under study;
q= 1-p; d= relative precision i.e., 20% of p.

The calculation was based on the finding that 39.5% of students had poor sleep quality in a cross-sectional study conducted among medical students from 5 colleges in Karachi in Pakistan.[4]

$$d = \frac{20 \times 39.5}{100} = 7.9$$

$$\text{Sample size, } n = \frac{4 \times 39.5 \times (100-39.5)}{(7.9)^2} = \frac{4 \times 39.5 \times 60.5}{62.41} = 153$$

To get results more representative of the population, all the 272 students who satisfied the inclusion criteria and did not meet the exclusion criteria were included in the study.

### Inclusion Criteria

First and second year MBBS students of Government Medical College Kottayam, who gave voluntary consent and filled up the questionnaire.

### Exclusion Criteria

- Any diagnosed mental illness.
- Any medication capable of depressing or stimulating brain function except those medications used as treatment for sleep abnormalities.
- Abuse of drugs.
- Habitual liquor intake or at present under the influence of alcohol.
- Diseases of thyroid gland.
- Habitual smokers.
- Habitual pan chewers.

### Ethical Considerations

The study was approved by the Institutional Ethics Committee of Govt. Medical College, Kottayam (IRB No. 121/2017, dated 31/10/2017).

### Methodology

After getting the permission of the institutional ethical committee, all the first and second year MBBS students of Govt. Medical College, Kottayam were explained about the study procedure. Those willing to undergo the study were requested to sign the consent form. Those who signed were administered the questionnaire regarding exclusion criteria to answer in privacy and, if willing, to return it the next day. Each questionnaire form contained a unique identification number. To maintain confidentiality, the students were instructed not to write their names in the questionnaire form. Students were explained the importance of filling the questionnaire honestly for the outcome of the study. Those who returned forms, but lacked the exclusion criteria, were requested to fill the Pittsburgh sleep quality index (PSQI) questionnaire form and the Epworth sleepiness scale (ESS) questionnaire form. Those who returned fully filled forms were included in the study. The global PSQI score and the total ESS score were calculated for each student.

### Study Tools

- Questionnaire regarding presence of exclusion criteria
- Pittsburgh sleep quality index (PSQI)[28]
- 1997 Version of Epworth sleepiness scale (ESS) to assess daytime sleepiness.[29]

**Statistical Analysis**

Data were entered in Microsoft Office Excel. Statistical analysis was done using the software Statistical Package for Social Sciences (SPSS)-Version 22.0. Arithmetic means of the global PSQI scores and the ESS scores were calculated for the whole group of students studied as well as separately for first-year students and second-year students. Chi-square test ($\chi^2$ -test) was used to find out association between the variables. Independent samples t-test was used for continuous variables. Pearson product moment correlation(r) was used to check the correlation between ESS scores and global PSQI scores. Probability of value ≤ 0.05 was considered significant. Confounding effects of gender, illness and place of sleep were ruled out by multinomial logistic regression analysis.

## RESULTS

**Gender Distribution**

There were 272 students, of which 160 (58.82%) were females and 112 (41.18%) were males.

**Sleep Quality Assessed by Global PSQI Score**

Assessment of the sleep quality using Pittsburgh Sleep Quality Index (PSQI) showed that 73.2% (199) students had good sleep quality (PSQI≤5) and that only 26.8% (73) had poor sleep quality (PSQI>5).

**Self-Reported Sleep Quality**

89% (242) students reported that they felt good sleep quality. Of them, 32.35% (88) reported very good sleep and 56.6% (154) reported fairly good sleep. Only 11% (30) students reported poor quality of sleep. Of them, only 1.5% (4) reported very bad sleep.

**Daytime Sleepiness**

68% (185) students had only normal daytime sleepiness; and 57% (155) had higher normal daytime sleepiness. Only 32% of students had excessive daytime sleepiness; and only 2.9% (8) students had severe excessive daytime sleepiness.

Of the students who had good sleep quality as assessed by global PSQI score, 97.5% had self-reported good sleep quality; only 2.5% reported to have bad sleep quality. By Chi-Square test, the association between the sleep quality assessed using global PSQI score and the self-reported sleep quality felt was found to be very highly significant (p<0.001). 89% of the students reported good nocturnal sleep quality and the remaining 11% reported bad quality. Of the students who reported good nocturnal sleep quality, 67.4% had normal daytime sleepiness and 32.6% had excessive daytime sleepiness. But, of the students who reported bad sleep quality, only 26.7% had excessive daytime sleepiness and 73.3% had only normal daytime sleepiness. Chi-square showed no significant association (p>0.05) between self-reported sleep quality and daytime sleepiness. 73.2% students had good sleep quality as assessed by global PSQI score and the remaining 26.8% had poor sleep quality. Of the students having good sleep quality, 70.4% had only normal daytime sleepiness while only 29.6% had excessive daytime sleepiness. Of the students having poor sleep quality, 38.4% had excessive daytime sleepiness; but 61.6% had only normal daytime sleepiness. Thus, among students having poor sleep quality also, only a minority had excessive daytime sleepiness though excessive daytime sleepiness was more common among students having poor sleep quality than among those having good sleep quality. Chi-Square test was done which showed absence of significant association between the sleep quality assessed by global PSQI score and the daytime sleepiness assessed using Epworth Sleepiness Scale scores. Spearman's test, taking the ESS scores and global PSQI scores of individual students, did not reveal a significant positive correlation (p>0.05).

| Daytime Sleepiness | | No. of Students | | Percentage of Students | |
|---|---|---|---|---|---|
| Normal (ESS= 0-10) | Lower Normal (ESS= 0-5) | 30 | 185 | 11 | 68 |
| | Higher Normal (ESS= 6-10) | 155 | | 57 | |
| Excessive (ESS= 11-24) | Mild Excessive (ESS= 11-12) | 46 | 87 | 16.9 | 32 |
| | Moderate Excessive (ESS= 13-15) | 33 | | 12.1 | |
| | Severe Excessive (ESS= 16-24) | 8 | | 2.9 | |
| **Total** | | **272** | | 100 | |

***Table 1. Daytime Sleepiness Assessed by Epworth Sleepiness Scale (ESS) Score***

| | | Subjective Sleep Quality | | Total | p Value |
|---|---|---|---|---|---|
| | | Good | Bad | | |
| Objectively assessed Sleep Quality | Good (PSQI ≤ 5) | 194 | 5 | 199 | 0.000 |
| | | 97.5% | 2.5% | 100% | |
| | Poor (PSQI > 5) | 48 | 25 | 73 | |
| | | 65.8% | 34.2% | 100% | |
| Total | | 242 | 30 | 272 | |
| | | 89% | 11% | 100% | |

***Table 2. Frequency Distribution of Sleep Quality Assessed Using PSQI and Self-Reported Sleep Quality***

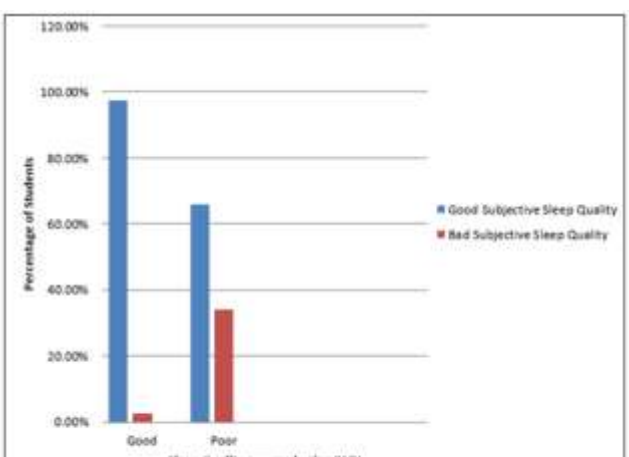


***Figure 1. Sleep Quality Assessed Using PSQI and Self-Reported Sleep Quality***

| | | | Daytime Sleepiness | | Total | p Value |
|---|---|---|---|---|---|---|
| | | | Normal (ESS = 0-10) | Excessive (ESS = 11-24) | | |
| Self-reported Sleep Quality | Good | No. of students | 163 | 79 | 242 | >0.05 |
| | | % within subjective quality | 67.4% | 32.6% | 100% | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Bad | No. of students | 22 | 8 | 30 | |
| | | % within subjective quality | 73.3% | 26.7% | 100% | |
| Total | | No. of students | 185 | 87 | 272 | |
| | | % within subjective quality | 68% | 32% | 100% | |

***Table 3. Daytime Sleepiness with respect to Self-Reported Sleep Quality***

| | | | Daytime Sleepiness | | Total | p Value |
|---|---|---|---|---|---|---|
| | | | Normal (ESS = 0-10) | Excessive (ESS = 11-24) | | |
| Sleep Quality assessed using PSQI | Good (PSQI ≤ 5) | No. of students | 140 | 59 | 199 | >0.05 |
| | | % within sleep quality | 70.4% | 29.6% | 100% | |
| | Poor (PSQI > 5) | No. of students | 45 | 28 | 73 | |
| | | % within sleep quality | 61.6% | 38.4% | 100% | |
| Total | | No. of students | 185 | 87 | 272 | |
| | | % within sleep quality | 68% | 32% | 100% | |

***Table 4. Daytime Sleepiness with Respect to Sleep Quality Assessed using PSQI***

### Effects of Gender, Place of Sleep, and Presence of Illness

Multinomial logistic regression analysis did not reveal any statistical significance of gender, place of sleep, and presence of illness on quality of sleep assessed by global PSQI score, daytime sleepiness assessed by ESS and self-reported quality of sleep.

### Comparison of Sleep of First-Year and Second-Year Students

The mean of the self-reported sleep quality scores was 0.8 for the whole study group as well as for the first-year MBBS students alone and was 0.7 for the second-year MBBS students alone; both these values are corresponding to 'fairly good' quality of sleep. Self-reported sleep quality, PSQI and ESS of first-years were compared with those of second-years using Mann-Whitney U test (table-5). Second-years had slightly less mean score indicating better self-reported sleep quality than the first-years; but the difference was not significant (p>0.05). The mean of the ESS scores was 9.14 for the whole group, 9.35 for the first-years, and 8.93 for the second-years. All these values correspond to 'higher normal' daytime sleepiness. The second-years had comparatively less mean score and hence less daytime sleepiness than the first-years; but this difference was also not significant (p>0.05). The mean of the global PSQI scores was 4.26 for the whole group, 4.99 for the first-years, and 3.51 for the second-years. All these values correspond to 'good' sleep quality. But the second-years are having less mean global PSQI score indicating that the quality of their sleep is better than that of the first-years. There was a very highly significant difference (p<0.001) between the first-years and the second-years in the sleep quality assessed by the global PSQI scores.

| Ranks | | | | | Mann-Whitney U | Asymp. Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| | Category | N | Mean Rank | Sum of Ranks | | |
| Self-reported Sleep Quality | 1st Year | 138 | 143.91 | 19859.00 | 8224.000 | .075 |
| | 2nd Year | 134 | 128.87 | 17269.00 | | |
| | Total | 272 | | | | |
| Global PSQI | 1st Year | 138 | 162.22 | 22386.50 | 5696.500 | .000 |
| | 2nd Year | 134 | 110.01 | 14741.50 | | |
| | Total | 272 | | | | |
| ESS | 1st Year | 138 | 141.10 | 19472.00 | 8.611E3 | .325 |
| | 2nd Year | 134 | 131.76 | 17656.00 | | |
| | Total | 272 | | | | |

***Table 5. Mann-Whitney U Test***

## DISCUSSION

The mean PSQI of the study group was 4.222, which indicates good sleep quality (PSQI ≤5). 73.8% of the students have good sleep quality (PSQI ≤5) and 26.2% have poor sleep quality (PSQI >5). A study from Brazil had a similar report that 28.2% of medical students have insomnia.[21] Other studies conducted in Spain,[10] Lithuania,[11] Iran,[12] Pakistan,[13] Brazil,[14] China[15] and Malaysia[20] found poor sleep quality in 79.3%, 40%, 40.6%, 39.5%, 38.9%, 19%, and 16% of medical students respectively. Renu Lohitashwa and co-workers, after studying a group of 50 MBBS students in Karnataka, reported that 58% were poor sleepers.[30] These researchers have not specified any particular phase of the MBBS course from which the students were recruited. There is a possibility that they had included students having night internment posting in labour rooms. This and the smaller sample size of their study may be the reasons for the difference in the proportion of students having good sleep when compared to the present study conducted on 272 students, all of whom were devoid of night postings.

88.9% of students reported the subjectively felt quality of sleep as good (32.6% reported very good and 56.3% fairly good). Only 11.1% students reported it as bad (1.7% reported very bad and 9.7% fairly bad). The study by Zailinawati et al also had similar results of a subjectively good sleep quality of 83.5% among Malaysian medical students (25.3% having very good, 58.2% fairly good, 14.1% fairly bad and only 2% very bad).[20] In the study conducted in Karnataka, Lohitashwa R et al also reported that 78% of medical students felt good sleep quality.[30] Though Lohitashwa R et al found a significant difference between self-reported sleep quality and sleep quality assessed using PSQI,[30] we detected a significant association between the quality of sleep assessed by PSQI and the subjectively felt quality of sleep reported by students. This may be because we had enlightened the students on the need for honest filling of questionnaires and assured them confidentiality.

The mean Epworth Sleepiness Score (ESS) was 9.108, which indicated higher normal daytime sleepiness. Our result is similar to the median ESS of 9.0 among Malaysian medical students, reported by Zailinawati et al.[20] In our study, 57%

of the students had higher normal daytime sleepiness (ESS= 6-10); and 11.5% had only lower normal daytime sleepiness (ESS= 0-5). The remaining 31.5% had excessive daytime sleepiness: 16.5% having mild excessive daytime sleepiness (ESS= 11-12); 12.2% having moderate excessive daytime sleepiness (ESS= 13-15); and only 2.9% having severe excessive daytime sleepiness (ESS= 16-24). Our result is similar to that obtained in a previous Indian study by Giri P, Baviskar M, and Phalke D which reported that 30.6% of the medical students had excessive daytime sleepiness.[18] Zailinawati et al had reported a similar observation of excessive daytime sleepiness among 35.5% of Malaysian medical students, with only 32.3% of the students in the pre-clinical phase suffering this.[20] We found absence of significant association (p=0.054) between daytime sleepiness and the self-reported sleep quality. But Zailanawati et al found that excessive daytime sleepiness was significantly more common in those Malaysian medical students with self-rated "bad" sleep quality.[20] This may be the merit of the much greater sample size of that study. In our study, more percentage (32.6%) of students having self-reported good nocturnal sleep than those (26.7%) having self-reported bad nocturnal sleep had excessive daytime sleepiness. So, the results of this study do not support the popular view that the deficiency of properly refreshing nocturnal sleep will lead to daytime sleepiness. The subjective feeling of same sleep by different students may be different and hence the uniformity in rating the sleep quality subjectively cannot be ensured and might have affected the results. Medical students are having 7 hours academic programmes during the 8 hours from 8AM to 4PM daily, involving both the categorical and the representational cerebral hemispheres, of which 5 to 6 hours are practicals. After 4PM, they usually go for games until sunset. Thus, there is little time during the day, when the brain is freed from external alerting inputs and has to remain awake by its own. Those students who have inherent difficulty in sleeping during night, may be having higher level of anxiety and stress, which prevents sleepiness during daytime also. In our study, excessive daytime sleepiness was more common among students having poor sleep quality (38.4%) assessed using PSQI than among those having good sleep quality (29.6%); but there was no significant association and no significant positive correlation between the poor sleep quality assessed by global PSQI score and the daytime sleepiness assessed using ESS scores. Even among students having poor sleep quality assessed using PSQI, only a minority had excessive daytime sleepiness, probably because of the same reasons speculated for many students having subjectively poor sleep quality lacking excessive daytime sleepiness. But a study from Karachi in Pakistan had reported significant association of PSQI with excessive daytime sleepiness.[4]

In our study, gender, place of sleep (hostel or home), and presence of illness did not have confounding effect on quality of sleep assessed by PSQI, daytime sleepiness assessed by ESS and subjectively felt quality of sleep reported by the students. Various studies conducted in different parts of the world differ from each other in their results on the effects of gender on the sleep characteristics of medical students. Zailanawati et al has reported that excessive daytime sleepiness was not significantly associated with gender.[20] Studies conducted in Iran[12] and China[15] also reported that the quality of sleep was not associated with gender. Lohitashwa et al also reported absence of significant difference between the genders regarding the PSQI and subjective sleep quality in medical students in Karnataka, and that significantly more percentage of girls were affected by daytime dysfunction than boys.[30] The study from Karachi in Pakistan reported that poor sleep quality was significantly associated with female gender.[13] But another Indian study by Giri P, Baviskar M, and Phalke D found that sleep quality was better in females than in males.[18] The lack of association with gender found in some studies and the contradictory findings in the other studies may be because sleep of both male and female medical students were affected, but in different ways as reported by a Brazilian study which detected that females had more difficulty in maintaining sleep than males, and that males were more likely to report "falling asleep later."[21]

We found that the second-year students had significantly less PSQI (i.e. better sleep quality) than the first-year students. Lesser stress due to lesser workload and better adaptation and habituation to the medical college life over the past one year may have contributed to the better sleep quality of the second-year students. However, no significant difference was found between the first and the second-year students in terms of the self-reported quality of sleep and excessive daytime sleepiness. This may be because both groups did not have clinical postings at night. Zailanawati et al included students in all phases and detected significantly more daytime sleepiness among students in the clinical phase than those in the pre-clinical phase.[20]

## CONCLUSIONS

Most of the first and second year MBBS students have good quality of sleep as assessed by self-reporting as well as by PSQI. Most of them have higher normal daytime sleepiness. The poorer the quality of sleep assessed using PSQI, the greater is the daytime sleepiness. Gender and place of sleep (whether hostel or home) did not affect the quality of sleep and daytime sleepiness. Second year students have better sleep quality than first year students.

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