



## Sleep Deprivation Among Students Of A Post Graduate Institute , Kolkata : A Cross-Sectional Study

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| <b>Dr Shobhit Garg</b>           | MBBS, Junior Resident MD(CM) Department of Preventive & Social Medicine, All India Institute of Hygiene and Public Health, Kolkata, West Bengal. India         |
| <b>Dr Aparajita Dasgupta</b>     | MD(PSM) Director-Professor and Head , Department of Preventive & Social Medicine All India Institute of Hygiene and Public Health, Kolkata, West Bengal. India |
| <b>Dr Bobby Pal</b>              | MD(PSM) Assistant Professor , Department of Preventive & Social Medicine, All India Institute of Hygiene and Public Health, Kolkata, West Bengal. India        |
| <b>Dr Swanya Prabha Maharana</b> | MBBS Junior Resident MD(CM) Department of Preventive & Social Medicine, All India Institute of Hygiene and Public Health, Kolkata, West Bengal. India          |

### ABSTRACT

Chronic sleep deprivation is becoming pandemic among young people worldwide. Sleep initiation and maintenance disorders are associated with poor academic performance, mental morbidities and increased cardiovascular events. This study was done to assess the sleep pattern of post-graduate students and to elicit the relationship between their sleep pattern with selected cardio-vascular risk factors. This cross-sectional study was done among the post-graduate students. Anthropometric measurements and blood pressure were taken after they filled the questionnaire containing Pittsburgh Sleep Quality Index and Patient Health Questionnaire(PHQ-4). Descriptive statistics and hierarchical logistic regression were used to analyze the data. 91(65%) had poor sleep quality, 91(65%) inadequate sleep duration, 13(9.3%) participants used medication for sleeping, 70(50%) daytime dysfunctions and 85(60.7%) reported night time waking. Students should be made aware of methods of improving sleep quality and fostering healthier and proactive lifestyle.

**KEYWORDS :** Sleep deprivation, Sleep initiation and maintenance disorders, Students.

### Introduction:

Sleep is a physiological process essential to life. Quality sleep is a prerequisite for healthy functioning of human mind and body. Sleep initiation and maintenance disorders are associated with various detrimental effects on human health such as decreased attention, reduced cognitive performance, poor academic performance, altered sympathetic activity etc<sup>[1,2]</sup>.

Chronic sleep deprivation is becoming pandemic among young people worldwide, its prevalence rate ranging from 19.2%-62.6%<sup>[3,4,5,6]</sup>.

Today's youth, especially students experience great psychological pressure due to demands of academic performance, changing career market and increased competition for jobs leading to various sleep disorders<sup>[1]</sup>.

Insufficient sleep is potentially an important modifiable risk factor for obesity. We know that conventional factors like physical activity status, dietary habit and genetic inheritance determine the body composition but recent studies in various parts of the world found sleep to be an evolving factor playing major role in body composition[7,8,9]. Physiological studies suggest sleep deprivation may influence weight through effects on appetite, physical activity or thermo-regulation. This is evidenced by the recent obesity epidemic that has accompanied the parallel growth of chronic sleep deprivation<sup>[10]</sup>.

The effect of blood pressure on sleep has been well documented by various research works worldwide<sup>[11,12,13]</sup>. There are several mechanisms by which sleep inadequacy affects the blood dynamics such as elevated sympathetic nervous system activity, elevated physical and psycho-social stressors, increased salt retention, obesity and disrupted circadian rhythmicity<sup>[13]</sup>.

Cardiovascular disease is no more a disease of the middle-aged. Since the last decade its incidence is rising among the youth as well<sup>[14,15]</sup>.

Therefore satisfactory sleep pattern may help in prevention or delay of many non-communicable diseases. It is very important that all risk factors of sleep deprivation are identified and prevented as far as possible.

With this backdrop, the current study was done to assess the sleep pattern of the post-graduate student and to elicit the relationship, if any, between their sleep pattern with selected cardio-vascular risk factors for which they were screened.

### Methods and Materials:

This cross-sectional study was done among the post-graduate students of All India Institute of Hygiene and Public Health ( AIH&PH), Kolkata during the month of April 2016 to assess their sleep pattern after the approval of Institutional Ethics Committee. AIH&PH, the apex institute of Indian Republic in the field of Public health is totally dedicated to Public health.

The students in all the courses present on the day of survey were approached after their lectures and were briefed about the purpose and procedure of the study. After taking informed written consent, they were asked to fill a questionnaire and then they were requested to go to the adjoining room for the measurement of height, weight & blood pressure(BP). Out of 157 students who were enrolled, 143 were present on the day of survey, out of which 3 forms were incomplete, leaving 140 participants for final analysis.

The study participants were enquired about various socio-demographic factors, meal frequency/day, laptop or mobile use before sleeping and examinations in previous or next month with the help of questionnaire.

The participants were screened for Depression, Anxiety and Stress using Patient Health Questionnaire (PHQ-4)<sup>[16]</sup>. It is a 4 item scale with each item rated on 4-point scale. Sum of items 1 and 2 were used for screening Anxiety and that of items 3 and 4 for Depression. A score of 3 or more for each category was considered positive. Total score of

more than 2 was considered positive for stress.  $\alpha$  reliability for this sample was 0.829.

Sleep quality of the participants was assessed with the help of Pittsburgh Sleep Quality Index (PSQI)[17], which is a 9 question index with score ranging from 0-21, and final score was dichotomized with good sleep quality(score  $\leq$  5) and poor sleep quality(score  $>$  5). Sleep duration which was asked in PSQI was separately dichotomized into Adequate and Inadequate ( $\leq$ 7 hours) according to median score i.e. 7 hours.  $\alpha$  reliability for this sample was 0.683.

The blood pressure, weight and height of the study participants were measured by standard operating procedures. Participants were classified as overweight(BMI $\geq$ 25 kg/m<sup>2</sup>) and normal.

All analyses were conducted with the SPSS software version 16.0. Statistical significance for all analyses was set at P<0.05. Data was analyzed with descriptive and hierarchical logistic regression statistics.

**Results:**

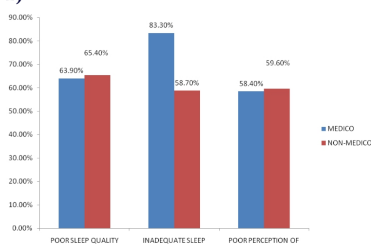
The mean age of the participants was 28.63(6.96) years. 85(60.8%) belonged to age group 20-29 years and 106(75.7%) were females. 104(74.3%) were non-medico(not having M.B.B.S. degree) and 100(71.4%) were getting stipend. 82(58.3%) of the participants were residing either in hostel or in rented house without their families. 105(75%) of them belonged to socio-economic class I(modified B. G. Prasad scale(2016)), 54(38.6%) participants had examinations in last month while 27(19.3%) had examination in next month. Mean meal frequency was 3.77[0.80]/day. 112(80%) participants had habit of using laptop/mobile before going to bed.

91(65%) were found to have poor sleep quality and the same number of participants had inadequate sleep duration. 13(9.3%) participants had used medication for sleeping while 70(50%) had gone through daytime dysfunctions. 85(60.7%) reported night time waking or early morning waking.(Table 1)

**Table 1: Sleep characteristics of the students(n = 140)**

| Sleep Characteristic   | No. (%)   |
|--|-----------|
| Poor sleep quality(PSQI score > 5)   | 91(95)    |
| Inadequate sleep duration( $\leq$ 7)(median=7 hours)   | 91(65)    |
| Poor subjective sleep quality  | 83(59.30) |
| Poor sleep latency(usual time to fall asleep>30 mins)  | 90(64.3)  |
| >85% habitual sleep efficiency [(actual hours of sleep / total hours in bed)X100]                            | 111(79.3) |
| Use of medications for sleep induction   | 13(9.3)   |
| Daytime dysfunction  | 70(50.0)  |
| Sleep disturbance(snoring, pain, cough, bathroom use, feeling hot or cold ,bad dreams or breathing problems) | 124(88.6) |
| Wake up in the middle of the night or early morning  | 85(60.7)  |
| Have to get up to use the bathroom   | 78(55.7)  |
| Cannot breathe comfortably   | 18(12.8)  |
| Cough or snore loudly  | 22(15.7)  |
| Feel too cold  | 26(18.6)  |
| Feel too hot   | 46 (32.9) |
| Have bad dreams  | 75(53.6)  |
| Have pain  | 56(40)    |

63.9% medicos had poor sleep quality while non-medico had 65.4%.(Figure 1)



**Figure 1: Bar diagram showing the comparison of sleep characteristics according to Education profile**

The hierarchical logistic regression revealed that at Step one socio-demographic factors accounted for 15% of the variation in sleep inadequacy. Introducing the examination pattern, meal pattern and laptop/mobile use pattern explained an additional 10% of variation in sleep inadequacy with medicos, individuals living with family and with no examination in last month was found to have significant odds of 7.5, 3.7 and 0.1 respectively. Further addition of cardiovascular risk factors explained an additional 4% of variation in sleep inadequacy with significant odds of all above three variables. At all three steps model was fit as shown by the non-significant hosmer-lameshow statistic. At all three level model correctly predicted 66%-72% of the dependent variables.(Table 2)

**Table 2: Factors associated with Inadequate sleep among study participants(n=140): Hierarchical logistic regression**

| Variables                                  | Inadequate sleep |         | Step 1 OR[CI] | Step 2 OR[CI]         | Step 3 OR[CI]         |
|--|------------------|---------|---------------|-----------------------|-----------------------|
|  | N                | %       |               |                       |                       |
| Age>27 years (n=67) (median age=27years)   | 50               | 74.6    | 1.5 [0.3-4.9] | 0.4 [0.1-2.5]         | 0.4 [0.06-2.2]        |
| Male(n=34)                                 | 28               | 82.4    | 1.7 [0.5-5.9] | 1.6 [0.4-5.6]         | 1.02 [0.24-4.3]       |
| Married(n=57)                              | 43               | 75.4    | 2.1 [0.5-7.6] | 1.3 [0.3-5.7]         | 1.2 [0.3-4.9]         |
| Living in Permanent residence* (n=58)      | 42               | 72.4    | 2.3 [0.9-5.5] | <b>3.7 [1.3-10.5]</b> | <b>4.1 [1.4-12.1]</b> |
| Medicos†(n=36)                             | 30               | 83.6    | 2.0 [0.5-7.3] | <b>7.5 [1.3-42.4]</b> | <b>7.1 [1.2-42.5]</b> |
| Class I SES(n=105)                         | 71               | 67.6    | 1.1 [0.5-2.5] | 0.96 [0.4-2.4]        | 1.1 [0.4-3.0]         |
| Stipend(Yes)(n=100)                        | 69               | 69      | 1.1 [0.4-2.8] | 0.4 [0.1-1.4]         | 0.3 [0.1-1.2]         |
| No Examination in last month(n=86)         | 52               | 60.5    |               | <b>0.1 [0.01-0.6]</b> | <b>0.1 [0.01-0.4]</b> |
| No Examination in next month(n=113)        | 76               | 67.3    |               | 3.8 [0.9-14.7]        | 3.9 [0.9-17]          |
| Laptop/mobile use before sleep(Yes)(n=112) | 69               | 61.6    |               | 0.4 [0.1-1.2]         | 0.3 [0.1-1.1]         |
| Meal frequency/day(Mean & SD)              | 3.81             | (0.79)  |               | 1.6 [0.9-2.7]         | 1.5 [0.9-2.7]         |
| Mental morbidity†† (Yes) (n=85)            | 55               | 64.7    |               |                       | 1 [0.4-2.3]           |
| overweight(Yes) (n=58)                     | 44               | 75.9    |               |                       | 1.6 [0.6-3.8]         |
| SBP mm of Hg(Mean & SD)                    | 118.44           | (14.86) |               |                       | 0.99 [0.9-1.1]        |
| DBP mm of Hg(Mean & SD)                    | 76.59            | (9.5)   |               |                       | 1.1 [0.9-1.1]         |
| Nagelkarke R2                              |                  |         |               |                       | 0.292                 |

\*=those who are living with family, †=those with minimum degree of M.B.B.S., ††=Individuals with any of depression, anxiety or stress

The hierarchical logistic regression revealed that at Step one socio-demographic factors accounted for 8% of the variation in sleep quality. Introducing the examination pattern, meal pattern and laptop/mobile use pattern explained an additional 13% of variation in sleep quality with Laptop/mobile use before sleep was found to have significant odds of 2.7. Further

addition of cardiovascular risk factors explained an additional 24% of variation in sleep quality with significant odds for individual using Laptop/mobile use before sleep(3.8) and for individual with mental morbidity(10.26). At all three steps model was fit as shown by the

non-significant hosmer-lameshow statistic. At all three level model correctly predicted 69%-77% of the dependent variable.(Table 3)

**Table 3: Factors associated with poor sleep quality among study participants(n=140): Hierarchical logistic regression**

| Variables                                   | Poor sleep quality |       | Step 1 OR[CI]    | Step 2 OR[CI]             | Step 3 OR[CI]              |
|---|--------------------|-------|------------------|---------------------------|----------------------------|
|   | N                  | %     |                  |                           |                            |
| Age>27 years (n=67)<br>(median age=27years) | 41                 | 61.2  | 0.7<br>[0.2-2.7] | 0.9<br>[0.2-4.1]          | 1.4<br>[0.3-7.7]           |
| Male(n=34)                                  | 25                 | 73.5  | 3.1<br>[0.9-9.5] | <b>3.4</b><br>[1.04-10.9] | <b>9.3</b><br>[2.0-42.3]   |
| Married(n=57)                               | 35                 | 61.4  | 0.9<br>[0.3-2.8] | 0.7<br>[0.2-2.5]          | 0.5<br>[0.1-2.4]           |
| Living in Permanent residence* (n=58)       | 41                 | 70.7  | 1.6<br>[0.7-3.5] | 1.5<br>[0.6-3.7]          | 1.4<br>[0.5-4.0]           |
| Medicos†(n=36)                              | 23                 | 63.9  | 0.4<br>[0.1-1.2] | 0.4<br>[0.1-1.5]          | 0.2<br>[0.04-1.03]         |
| Class 1 SES(n=105)                          | 71                 | 67.6  | 2.8<br>[0.8-4.9] | 2.04<br>[0.8-5.0]         | 1.8<br>[0.6-5.1]           |
| Stipend(Yes) (n=100)                        | 64                 | 64    | 1.1<br>[0.4-3.0] | 1.1<br>[0.4-3.1]          | 1.5<br>[0.5-4.9]           |
| No Examination in last month (n=86)         | 58                 | 67.4  |                  | 0.8<br>[0.2-3.4]          | 0.9<br>[0.2-4.5]           |
| No Examination in next month# (n=113)       | 71                 | 62.8  | -                | -                         | -                          |
| Laptop/mobile use before sleep(Yes) (n=112) | 78                 | 69.6  |                  | <b>2.7</b><br>[1.1-6.7]   | <b>3.8</b><br>[1.3-11.1]   |
| Meal frequency/day (Mean & SD)              | 3.82               | 0.72  |                  | 1.3<br>[0.7-2.1]          | 1.3<br>[0.7-2.3]           |
| Mental morbidity†† (Yes) (n=85)             | 69                 | 81.2  |                  |                           | <b>10.26</b><br>[4.1-26.4] |
| overweight(Yes) (n=58)                      | 36                 | 62.1  |                  |                           | 0.8<br>[0.3-2.1]           |
| SBP mm of Hg(Mean & SD)                     | 116.4<br>6         | 16.08 |                  |                           | 0.99<br>[0.9-1.1]          |
| DBP mm of Hg(Mean & SD)                     | 75.16              | 10.01 |                  |                           | 0.99<br>[0.9-1.1]          |
| Nagelkarke R2                               |                    |       | 0.08             | 0.13                      | 0.37                       |

# - Not included in model due to interaction. \*=those who are living with family, †=those with minimum degree of M.B.B.S., ††=Individuals with any of depression, anxiety or stress

**Discussion:**

Sleep research is a relatively new in the field of science. However, the increasing breadth of sleep research and the recognition of the growing importance of non-communicable diseases across all economic strata highlights the importance of healthy sleep globally. We have known the importance of lifestyle factors in the rise of non communicable diseases(NCDs), but less has been known about the sleep duration and quality as a risk to NCDs.

The present cross-sectional study among postgraduate students found several cardio-vascular risk factors and socio-demographic factors (stress, depression, anxiety, SBP, DBP, BMI, age, male, marital status and laptop use) which predicted poor sleep pattern in form of poor sleep quality and inadequate sleep duration.

In the present study 65%(91) students were found to have poor sleep quality which is comparable to a study done in Delhi by Shad R et al among undergraduate medical and non medical students which reported 62.4% poor sleep quality<sup>[6]</sup>. Comparability of results indicated that sleep deprivation is prevalent in other parts of India as well.

In the present study 65%(91) students were found to have poor sleep quality which is more than that of 36.8% as found in a study done in Pakistan among the practicing Junior doctors <sup>[18]</sup>. This difference might be due to the practicing status of the junior doctors while in our study the participants were still studying and will have to struggle for job in future.

In this study, a significant association was found between sleep duration and BMI status with odds of 2.3 & between sleep duration and SBP and DBP which is in concurrence with the findings of Shaikh WA et al. among 16-19 years old in Gujarat for BMI but not for BP<sup>[19,20]</sup>. This finding emphasizes on the relationship between the sleep pattern and cardio-vascular risk factors which need to be addressed immediately.

Higher odds of poor sleep quality in individuals with mental morbidity in our study is in concurrence with that was found in a study between sleep disturbance and depression in London<sup>[21]</sup>. Again this finding is pointing towards a necessary but awaited public health issue which is not addressed till date.

In the present study 50% students had daytime dysfunction which is more than that of 30.6% found in a study done in Loni Maharashtra<sup>[22]</sup>. This difference can be explained by the difference in the educational status of the participants as in our study participants were Postgraduates in contrast to mostly undergraduates in the other study. In same study female were found to have good sleep quality as was found in our study.

This study has certain limitations i.e. some of the important predictors of sleep quality like caffeine intake, physical activity, addiction etc were not assessed<sup>[22]</sup>. PSQI has some responses which can be affected by the recall. PSQI which was used assessed the sleep quality in last one month hence it was not possible to differentiate between acute and chronic condition. Various studies have documented the differences between the subjective and objective sleep quality that can be true in this study also<sup>[23]</sup>.

Students should be made aware of methods of improving sleep quality (not using laptop after dinner, reduction of weight etc), fostering healthier and proactive lifestyle. Improving the awareness of students regarding importance of sleep duration as a lifestyle modification strategy for reduction of non-communicable diseases is of utmost importance. As depression and stress was found to be associated with poor sleep quality, stress management, coping skills and time management would empower them to modify this risk factor of CHD.

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