Original article:

Effect of light exposure during sleep on the curricular and extracurricular activities of medical students

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Abstract:

Introduction*:* Many researches have demonstrated the effect of artificial light exposure during sleep on the circadian rhythm that controls the sleep-wake cycle. Lighting during sleep suppresses the melatonin that is responsible for the sleep-wake cycle. Consequently, this affects student's academic performance and their involvement in curricular and extracurricular activities. ***Aims:*** We conducted a study to find the effects of the exposure of light during sleep on student's sleep quality, level of concentration in class, academic performances and involvement in extracurricular activities. ***Material and methods:*** A cross sectional study was performed by distributing a questionnaire to 238 second year medical undergraduate students. ***Results:*** We found that 84% of the respondents usually slept with light off. Students sleeping with light on reported having a lower quality of sleep and also reported having more difficulty concentrating in class. As compared to students with lights off during sleep, those who reported sleeping with the light on also reported scoring lower marks and less extracurricular activity, .***Conclusion:*** Sleeping with lights on during sleep appears to be related to poor sleep quality, lowered level of concentration in class, lower student's academic performances and less involvement in extracurricular activities.

Keywords: lights; circadian rhythm; sleep; curricular and extracurricular activity.

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Introduction:

Prior to the usage of artificial light in our daily life, sun was the major source of light. Unfortunately many individuals are not aware that exposure to light from modern electronic devices may disrupt the quality of our sleep and be related to negative aspects of academic life. Modern lifestyles uses artificial lighting at night as an essential aid for work, but some of us prefer to sleep with light on without realizing the effect of light exposure on our circadian rhythms.[1]The main effect of this modern lifestyle is the disruption to our circadian rhythm. Circadian rhythms are variations in physiology and behavior of a person within a cycle of 24 hours, which may persist even in the absence of periodic environmental stimuli. Circadian rhythms has to be consistently

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entrained to the nearby 24-hour day cycle on a regular basis.[1] This process of entrainment occurs through regular exposure to light and darkness.[1]

In modern life using more and more light is related to a decrease the amount of sleep one experiences. For example, in United States 30% of employed adults and 44% of employees working at night time have reported an average of less than 6 hours of sleep per night. This can be compared with 3% of United States adult population who slept less than 6 hours per night 50 years ago.[2] Even school aged children are sleeping an average of around 1.2 hours less every night than the children used to sleep a century ago. In addition, sleeping at different times during the weekend in an effort to catch up on sleep lost during the work week is said to induce "social jet lag" and thus disrupts the circadian rhythm.[2] Forty percent of people in the US have insufficient sleep and 25% complain about decrease in concentration due to fatigue.[2]

Light is a powerful stimulating signal for human alertness and cognition and has been routinely investigated for the impact on performance. [2] Much of the research to date has focused on the effect of sleeping with the light on health. Research is needed to better understand the effect of a light being on during sleep on academic and non-academic performances of students. This study is intended to investigate and evaluate the effect of light during sleep on the level of concentration in class and performance in academic and extracurricular activities.

Materials and methods:

Study material

A cross sectional study using a faculty validated close -ended questionnaire was designed and distributed to undergraduate medical students of the Second Year MBBS(Bachelor of Medicine and Bachelor of Surgery) course. Approval for the study was obtained from the Institutional Research Committee. The questionnaire consisted of set of close-ended questions reflecting the sleeping attitudes of the student and their academic performances.

Study sample size

Total number of students of second year MBBS participating in the current study was 238.

Data analysis

From the response of questionnaire, the students were divided into two groups depending on whether they keep light on or off during sleep, and each group were questioned regarding their curricular and extracurricular activities. Data obtained from the responses given to the questionnaire was analyzed by making percentages for every choice of every question. The result was interpreted into bar graphs to assess any relationship between the variables and to compare the results of two groups of respondents.

Results:

In the present study it was noted that 87% of our respondents prefer to sleep with light off. According to the responses to our questionnaire as seen in Table 1 and 2, Majority of the respondents report sleeping for more than 5 to 8 hours at night. For both groups, more than 70% of the students reported never late to class. About5.9% and 3.9% of students from "light on" and "light off" group respectively were constantly late to class. There are5.9% of students from lights on category who indicated never felling sleepy in afternoon session class as compared to 7.2% of students of lights off category, indicating a difference of 1.3% of students indicating remaining awake from lights off category. From the students responses we calculated that percentage oflight on category students who are well focused in class during sleep are 2% less than percentage of students from lights off category. The students awake but not focused in class are more from lights on category. This finding suggests that light exposure during sleep may contribute to lack of concentration of students in class. Regarding the recall capacity of students, 70.6% of the light off category students reported recalling all plus at least half of the lessons at the end of class compared to only 67.4% in students who sleep with light on. To assess the effect of lighting during sleep on academic performance of students we categorized the students into 2 groups, group -1 who scored 61% marks or more and the group - 2 scored 60% marks or below. As we can see from Figure 1, number of students scoring more than 60% marks with light off is more than students with light on during sleep. Number of students scoring marks below 60% is more with light on category than with lights off category during sleep. To assess the relationship between lighting during sleep and the involvement of students in extracurricular activities we can refer to Figure 2 and it can be observed that the number of students sleeping with lights on was relatively very less involved in sports, cultural events and exercise as compared to students who sleep with lights off.

Discussion:

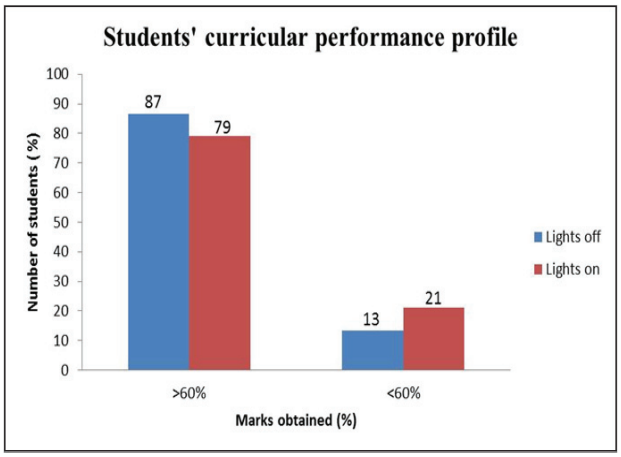
A feature of circadian rhythm sleep disorders is a persistent nonalignment between the patient's sleep pattern and the normal pattern of sleep described as

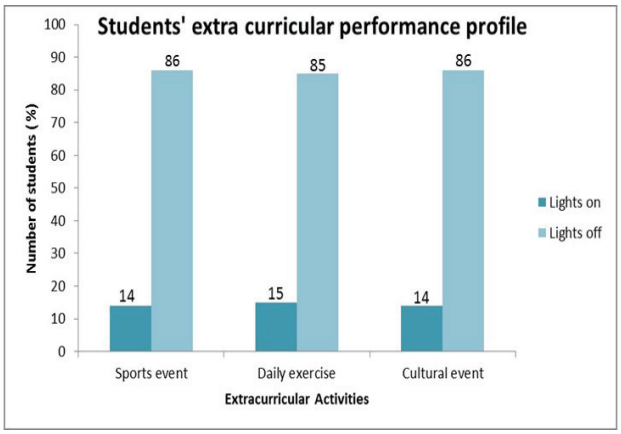
Table 1

Students response profile with lights on category			
	Percentages (%)		
Questions	A	B	C
2	20.6	70.6	8.8
3	5.9	20.6	73.5
4	14.7	79.4	5.9
5	27.0	13.3	59.7
6	9.9	57.5	32.6

Table 1

Students response profile with lights off category			
	Percentages (%)		
Questions	A	B	C
2	14.4	80.1	5.5
3	3.9	24.3	71.8
4	38.1	54.7	7.2
5	29.4	11.8	58.8
6	8.8	61.8	29.4





the societal norm.[4] Exposure of electrical lighting in the late evening for chronic period disrupts melatonin level and could impact sleep, thermoregulation, blood pressure and glucose homeostasis.[5] Room light during late hour decreases melatonin levels and the body's internal representation of night duration is shortened.[5] The expression of physiologic rhythms including circadian rhythm depends on the suprachiasmatic nucleus controlled by the sleep wake cycle.[1]Exposure of light during night time will result in the inhibition of melatonin synthesis due to activation of suprachiasmatic nucleus.[1]

The relationship between sleep and memory formation are not yet completely understood. Certain types of memory such as procedural memory may be dependent on REM (rapid eye movement) sleep and declarative memory on NREM (non-REM) sleep. Memory formation may be caused by slow-wave sleep and consolidated by REM sleep. These facts may help to explain how a student's sleep pattern could impact learning. Thus irregular sleep and sleep during day time can affect learning, performance and memory adversely.[6]

Hans mentioned that there appears to be a short term post lunch change in the circadian profiles as observed by change in neurobehavioral variables and core body temperature called as post-lunch or postprandial dip which is independent of food intake.[7]According to Mary et al., a secondary peak of sleep onsets is also observed during afternoon [8]suggesting that it is quite normal for the students to feel sleepy during afternoon class, accordingly we found more students reported feeling sleepy during post lunch period even from lights off category.

As evident from the results of this study, we find that students who are exposed to light during sleep are facing lack of concentration in class, underscore during academic examinations and are less involved in extracurricular activities. Thus light exposure during sleep can put some impact on quality of sleep, level of concentration in class thus influencing on students alertness in class, memory, marks obtained in exams and the participation in the extracurricular activities like exercise, sports and participation in cultural activities.

There are a few limitations that we encounter in our study. Our study is only questionnaire-based. There might be other factors that influence the effect of light on academic performance and extracurricular activities which might have not been taken into considerations in this study and further research needs to be done.

Conclusion:

We conclude that sleeping with light off do have more benefits in term of quality of sleep, level of concentration in class and on academic performances and better involvement in extracurricular activities.

This study is significant in creating awareness

on the effect of light during sleep on the students' performances academically and non-academically. With this awareness, medical as well as non-medical students can change their ways in scheduling their sleeping habits especially to improve in their performances in both academic and non-academic activities.

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Appendices

Questionnaires:

1) Do you normally sleep with light on or light off?
   A) Light on
   B) Light off
2) How long do you normally sleep at night?
   A) 3-5 hours
   B) 5-8 hours
C) >8 hours
3) Do you always arrive late to the 9.00AM class?
   A) Always
   B) Sometimes
   C) Never
4) Do you feel sleepy in class especially during the afternoon?
   A) Always
   B) Sometimes
   C) Never
5) How do you rate your attentiveness in class?
   A) Well focused
   B) Sleepy
   C) Awake but not focused
6) To what extent can you recall the lesson that has been taught at the end of class?
A) Almost all
   B) Only half
   C) Very less
7) What is your result of the recent examination?

	<50	50-60	61-75	>75
Anatomy				
Biochemistry				
Physiology				

8) How frequently are you involved in sports events?
   A) Always
   B) Sometimes
   C) Never
9) How regularly do you exercise?
   A) Daily
   B) Sometimes
   C) Never
10) How frequently do you involve in cultural events? (e.g. Dance, singing etc.)
   A) Always
   B) Sometimes
   C) Never

References:

1. Jeanne FD, Charles AC. Effect of Light on Human Circadian Physiology. Sleep Med Clin. Jun 2009; 4(2): 165–177.
2. Czeisler CA. Perspective: casting light on sleep deficiency. Nature. 2013 May 23; 497(7450): S13. doi: 10.1038/497S13a.
3. Nesbitt AD, Dijk DJ. Out of synch with society: an update on delayed sleep phase disorder. CurrOpinPulm Med. 2014 Aug 25. [Epub ahead of print]
4. Michael JT. Classification of Sleep Disorders. Neurotherapeutics. Oct 2012; 9(4): 687–701.
5. Gooley JJ, Chamberlain K, Smith KA, Khalsa SB, Rajaratnam SM et al. Exposure to room light before bedtime suppresses melatonin onset and shortens melatonin duration in humans. J ClinEndocrinolMetab. 2011 Mar; 96(3):E463-72.
6. Shelley DH, Ronald DC. Causes and consequences of sleepiness among college students. Nat Sci Sleep. 2014; 6: 73–84.
7. Hans PA. Van D, David FD. Circadian Rhythms in Sleepiness, Alertness, and Performance. Principles and Practice of Sleep Medicine 2005; 4: 435-40.
8. Mary AC, William CD. Normal Human Sleep: An Overview. Principles and Practice of Sleep Medicine 2005; 4: 13.