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Original Article

Daytime sleepiness and chronic sleep deprivation effects on academic performance among the Sudanese medical students

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الملخص

أهداف البحث: أظهرت الأدبيات الطبية تأثيرا سلبيا من النعاس أثناء النهار على الأداء الأكاديمي لطلبة الطب. تهدف هذه الدراسة إلى استكشاف العلاقة بين الأداء الأكاديمي، والحرمان من النوم، والنعاس أثناء النهار بين طلاب الطب السودانيين.

طرق البحث: أجريت هذه الدراسة المقطعية على ١٠٨طالب طب في جامعة "أم درمان" خلال الفترة من يونيو-أغسطس ٢٠١٤م. تم اختيار الطلبة والطالبات الدارسين في المراحل السريرية والحاصلين على درجات ممتازة (أ) ودرجات متوسطة (ج). واستخدمت استبانة تعبأ ذاتيا لجمع البيانات. وتضمنت الأسئلة الشعور الشخصي بعدم كفاية النوم، والشعور بالنعاس خلال وقت الصف الدراسي، والنوم أقل من ست ساعات لست ليالي، والتدخين، ووجود مرض طبي أو عصبي، والنعاس أثناء النهار حسب تقييم مقياس النعاس "إب ويرث".

النتائج: وجد اختلاف ذي دلالة إحصائية ($P < ٠.٠٠١$) بين الفئتين أ (ممتاز) و ج (متوسط) فيما يتعلق بالنعاس خلال النهار، وعدم كفاية النوم، والنوم لأقل من ست ساعات بالليلة، والشعور بالنعاس أثناء القراءة ($P < ٠.٠٠٥$). ولا يوجد اختلاف ذي دلالة إحصائية فيما يتعلق بالشخير والشعور الشخصي بالنعاس خلال ساعات الدراسة.

الاستنتاجات: أكدت الدراسة على الآثار السلبية الهائلة للحرمان من النوم والنعاس خلال النهار على الأداء الأكاديمي لطلبة الطب. هنالك حاجة لدراسات أكبر متعددة المراكز لفحص الأسباب، وتنفيذ تدابير وقائية حول الآثار الخطيرة لهذه المشاكل الصحية الهامة.

الكلمات المفتاحية: النعاس أثناء النهار؛ الحرمان المزمن من النوم؛ الأداء الأكاديمي

Abstract

Objectives: The literature has shown a negative impact of daytime sleepiness on the academic performance of medical students. This study explored the relationship between academic performance, sleep deprivation, and daytime sleepiness among Sudanese medical students.

Methods: This cross-sectional study was conducted on 108 medical students from Omdurman University during the period from June to August 2014. Male and female students with excellent (A) and average (C) grades in the clinical phases of their studies were chosen. A self-administered questionnaire was used to collect data. The questionnaire contained questions about the following: subjective feelings of insufficient sleep, feelings of sleepiness during class time, sleeping less than 6 h for six nights in a row, smoking status, medical or neurological diseases, and daytime sleepiness as assessed by the Epworth sleepiness scale.

Result: A significant difference ($p < 0.001$) was found between the A (excellent) and C (average) groups regarding daytime sleepiness, insufficient sleep, sleeping less than 6 h per night, and falling asleep while reading ($p < 0.005$). No significant difference was reported regarding snoring or the subjective feeling of sleepiness during study hours.

Conclusion: Our study underscores the enormous effects of sleep deprivation and daytime sleepiness on academic performance among medical students. Larger multicenter

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studies are needed to examine the causes and to implement preventive measures for the serious effects of these significant health problems.

Keywords: Daytime sleepiness; Chronic sleep deprivation; Academic performance

Introduction

When college students find difficulty in maintaining alertness during learning activities, they may fall asleep; about half to three-quarters of college students report sleepiness during the day as a result of insufficient sleep. This problem can end in serious outcomes, including poor academic performance, reduced coping mechanisms for college and life requirements, and increased risk for road traffic accidents. These problems can be solved by carefully searching for the prevalence of such problems and solving them.[1]

Technology and the use of social media before going to sleep are the major causes of daytime sleepiness as a result of insufficient sleep; however, obstructive sleep apnea, insomnia, narcolepsy, Periodic Limb Movement Disorder/Restless Leg Syndrome (PLMD/RLS), circadian rhythm sleep disorders, and hypersomnia constitute an approximately 27% risk of sleepiness during learning activities.[2]

Another cause of sleeping late is the use of central nervous system stimulants, such as caffeine, caffeinated drinks, and caffeinated cocktails with alcohol.[3,4] Seven to sixteen percent of adolescents have delayed sleep phase syndrome, which is a circadian sleep rhythm disorder that is characterized by the inability to fall asleep at the desired time for two or more hours and going to sleep beyond the socially acceptable or conventional bedtime with the consequence of an inability to wake up at the desired time and thus, excessive daytime sleepiness.[5]

One of the most influential theories regarding sleep is its role in the consolidation of recently acquired memories. Almost all studies analyzed by Rauchs et al. showed that all four long-term memory systems (procedural memory, perceptual representation system, semantic and episodic memory) need either non-rapid eye movement (NREM) or rapid eye movement (REM) sleep or need both sleep stages to consolidate memories.[6,7]

To our knowledge, this is the first study about the association between academic performance, daytime sleepiness, and chronic sleep deprivation in Sudan. The study adds to our knowledge about sleep disturbances among Sudanese medical students. With this data, awareness can be raised by both medical students and teaching staff about the dangerous effects of sleep disturbances on academic performance. Measures to improve sleep habits among medical students are highly recommended.

Materials and Methods

A cross-sectional study was conducted from June 2014 to August 2014 among clinical stage medical students in the Faculty of Medicine in Omdurman University Sudan. All students in fifth and sixth classes were targeted (a total of 200). One hundred thirty-six medical students, representing all students with scores of A (excellent) or C (pass) in the previous year and who agreed to participate in the study were included; those with a score of B (good), as well as twenty-eight with incomplete data, were excluded from the study. The Epworth sleepiness scale (ESS), a well validated self-reported questionnaire[8] was used to assess excessive daytime sleepiness. The scale asked the participant if they fell asleep or dozed in eight different situations: sitting and reading, watching TV, sitting inactive in public places, as a passenger in a car for 1 h without a break, lying down to rest in the afternoon when circumstances permit, sitting talking to someone, sitting quietly after a lunch without alcohol, and in a car while stopped for a few minutes in traffic, with an aggregate of 0–24. Interpretations are as follows: from 0 to 6, sufficient sleep; from 6 to 8, healthy population; and above 9, seek medical advice.[9]

The questionnaire also included questions about nighttime sleeping hours. Students who slept less than 6 h a night for six nights were considered as having chronic sleep deprivation.[9] Habitual snoring was graded as: 0-no snoring, 1-occasional snoring, and 2-regular snoring. Only regular snorers were considered.

An orientation meeting was arranged with the participants. They were orally briefed on the purpose of the research; it was explicitly stated that their participation was entirely voluntary and that their marks would not be affected in any way. Students were also asked to maintain a diary of their sleep habits for two weeks and then were asked to respond to the questionnaire. The research was conducted on non-examination days to avoid stress.

The information collected includes subjective feeling of insufficient sleep, feeling of sleepiness during class time, job during school days, week day bed- and wake up-times, snoring, fatigue upon wakening, tiredness, sleeping less than 6 h for six nights, current medical or neurological diseases, smoking status, afternoon sleeping hours, and the eight components of the Epworth sleepiness scale.

Data were analyzed using statistical software (SPSS version 20); Chi square was used for testing the statistical significance. A P value of less than 0.05 was considered to be statistically significant. Approval to conduct this research was obtained from the ethical committee of the Faculty of Medicine-University of Omdurman.

Results

A total of 136 medical students were included (108 provided complete data). Ninety-eight (90.7%) were females. Their ages ranged from 19 to 30 years old (22.6 ± 1.8). Forty-eight (44.4%) scored excellent (A) during the previous year, and 60 (55.6%) scored pass (average). Ninety (83.3%) of the medical students feel tired and not sufficiently rested during class hours. Seventy-six (70.4%) had subjective feelings of insufficient sleep, and 74 (68.5%) had excessive daytime

Table 1: Main characteristics of study subjects.

Character	No, (%)
Age	
Range (19–30) Years	108 (100.0)
Mean (22.6 ± 1.8)	
Sex	
Male	10 (9.2)
Female	98 (90.8)
Fatigue during the day	90 (83.3)
Subjective feeling of insufficient sleep	76 (70.4)
Sleepiness during class time	87 (80.6)
Job (paid or unpaid)	15 (13.9)
Snoring	14 (13.0)
Sleeping less than 6 h/six days	45 (41.7)
Medical or neurological disease	8 (7.4)
Overall sleepiness score	
Bad sleepers	74 (68.5)
Good sleepers	34 (31.5)

sleepiness according to the Epworth Sleepiness Score (Table 1). A statistically significant difference was found between the excellent scoring and average students with regards to excessive daytime sleepiness ($P < 0.001$), subjective feelings of insufficient sleep ($P < 0.001$), and sleeping less than 6 h for six nights (chronic sleep deprivation) ($p < 005$). The rest of the sleep characteristics among the medical students are shown in (Table 2).

Discussion

The outstanding result of this study is the high percentage of daytime sleepiness (68.5%) in the responders, which is higher than those experienced by Malaysian[10] (35.5%) and Japanese (4.1%) medical students.[11] This can be explained in part by the cutoff value of the Epworth Sleepiness Scale because we used the standard mean value of 9; the cutoff value in the Malaysian study was 11. The Epworth sleepiness scale was developed by Murray Johns in Australia

Table 2: Epworth Sleepiness Scale components among study groups.

Character		A N (%)	C N (%)	Total A N (%)[a]	Total C N (%)[b]	χ^2 value	P Value
Sitting and reading				38 (79.1)	47 (94.9)	11.113	0.011
	Mild	15 (13.8)	18 (16.6)				
	Moderate	19 (17.6)	22 (20.3)				
	Severe	4 (3.7)	17 (15.7)				
	Not applicable[c]	10 (9.2)	13 (12.0)				
Watching TV				25 (52)	49 (81.7)	11.017	0.12
	Mild	15 (13.8)	30 (27.6)				
	Moderate	6 (5.5)	13 (12.0)				
	Severe	4 (3.7)	6 (5.5)				
	Not applicable	23 (21.2)	11 (10.2)				
Sitting in public place				28 (57.8)	46 (76.7)	16.104	0.01
	Mild	21 (19.4)	15 (13.8)				
	Moderate	5 (4.6)	21 (19.4)				
	Severe	2 (1.8)	10 (9.2)				
	Not applicable	20 (18.5)	14 (12.9)				
As a passenger for 1 h				27 (56.1)	51 (84.9)	15.188	0.02
	Mild	8 (7.4)	22 (20.3)				
	Moderate	14 (12.9)	14 (12.9)				
	Severe	5 (4.6)	15 (13.8)				
	Not applicable	21 (19.4)	9 (8.3)				
Lying down in the afternoon				37 (77.1)	59 (98.3)	13.426	0.004
	Mild	13 (12.0)	21 (19.4)				
	Moderate	13 (12.0)	15 (13.8)				
	Severe	11 (10.1)	23 (21.2)				
	Not applicable	11 (10.1)	1 (0.9)				
Sitting and talking to someone				24 (59.8)	44 (73.2)	8.746	0.033
	Mild	14 (12.9)	17 (15.7)				
	Moderate	8 (7.4)	19 (17.5)				
	Severe	2 (1.8)	8 (7.4)				
	Not applicable	24 (22.2)	16 (14.8)				
Sitting quietly after lunch				37 (76.9)	55 (91.6)	5.083	0.166
	Mild	13 (12.0)	21 (19.4)				
	Moderate	17 (15.7)	21 (19.4)				
	Severe	7 (6.4)	13 (12.0)				
	Not applicable	11 (10.1)	5 (4.6)				
In a car while stopped for a few minutes				13 (37)	28 (46.6)	6.916	0.075
	Mild	8 (7.4)	11 (10.2)				
	Moderate	5 (4.6)	13 (12.0)				
	Severe	0 (0.0)	4 (3.7)				
	Not applicable	35 (32.4)	32 (29.6)				

[a] The percent was calculated over the total number of excellent group students (A) = 48.
[b] The percent was calculated over the total number of average group students (C) = 60.
[c] Represents those who did not dose or fell asleep in different components of the Epworth Sleepiness Scale.

and it was developed at the Epworth Hospital in Melbourne. It is a well-validated eight item questionnaire.[8] The scale asks the participant how often he/she dozed (or fell asleep) in eight daily activities. Each component had four grades (0 = no chance of dosing, 1 = slight chance of dosing, 2 = moderate chance of dosing, and 3 = high chance of dosing, with an aggregate of 0–24). Those with a score of 9 or more are asked to seek medical advice. Importantly, in this study, napping or the tendency to doze was highest while sitting and reading (88%) with the obvious bad consequences on students' academic performance.

In the current study, a statistically significant difference ($p < 0.001$) was found between daytime sleepiness (DTS) and poor academic performance; this result is in accordance with Veldi,[12] who concluded that 39.5% of the 172 medical students that were studied had daytime sleepiness and 22% of the remaining students developed daytime sleepiness by the end of the semester. They also observed that sleepier students also did not perform well on their final exam; this body of evidence about bad consequences of DTS on academic performance highlights the need to improve awareness among medical students and teaching staff about sleep education and sleep hygiene in addition to implementing measures for lecture and duty hour scheduling. A highly statistically significant difference between the excellent group (A) and the average group (C) was concluded with regards to feelings of insufficient sleep (P value < 0.001) and sleeping less than 6 h per night for six days (sleep deprivation); this result was in accordance with Pravendran[13] who concluded that sleep deprivation is part of medical students' training and is associated with poor work-related performance, mood, and medical errors.

Medical students sleep less than general populations. Their average night time sleeping hours are similar to those with insomnia[14]; moreover, daytime sleepiness, insomnia, and sleeping less than 7 h per night are associated with psychiatric disorders. In this study, chronic sleep deprivation was detected in 56 (42.4%) medical students with a highly statistically significant difference between those who score high and average students ($P < 0.005$); this result was similar to Tavares,[15] who stated that self-reported insufficient sleep was among the main predictors of academic performance. There is increasing concern about the association between sleep deprivation and depression; therefore, screening for psychopathology and other causes of sleep deprivation and daytime sleepiness among medical students is highly recommended. Measures to improve living conditions, avoid over-crowded dormitories, and educate about good sleep hygiene are needed. Collectively, the current study gave insight to a significant health and academic problem. We think that screening for possible causes of excessive daytime sleepiness, such as obstructive sleep apnea, depression and use of central nervous system stimulants, (all of which are preventable and treatable disorders) can improve medical students' health and academic performance.

The limitation of this study is the small sample size of students. The reliance on the self-reported questionnaire in data collection made our data more subjective and may also deserve mention. Nevertheless, the strong relationship between daytime sleepiness and poor academic performance was documented. The study was conducted at a public university; thus, generalization cannot be insured.

Further larger studies are needed to explore the relationship between daytime sleepiness and sleep deprivation among medical students.

Authors' contributions

H. O. M., the correspondence author conceived the concept and design, data collection and interpretation. He drafted the manuscript and revised the article. M. A. A. rendered substantial contribution in data interpretation, drafting of the manuscript, and revision before sending for revision. A. S. E. was involved in statistical analysis, and substantial contribution in data interpretation, drafting of the manuscript, and revision before sending for revision. All the authors are responsible for the content and similarity index of the manuscript.

Conflict of interest

The authors have no conflict of interest to declare.

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