The Prevalence of Sleep Deprivation and its influence on Students' Life Attending Medical School at King Saud University

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ABSTRACT

Background: Sleep is an essential physiological function in which both the body and the mind rest. However, lack of sleep and deprivation can greatly affect many aspects of our lives including social, academic, psychological, and even physiological factors. Medical students often tend to have long studying hours and less sleep throughout their college time. We aim to study the effect of sleeplessness and deprivation among them. **Methods:** This is a cross-sectional study that was performed during the 2017-2018 academic year at the College of Medicine of King Saud University in Riyadh, Saudi Arabia. We included a stratified random sampling technique where 430 healthy medical students from five academic years (first, second, third, fourth, and fifth years) of both genders were recruited to fill a self-administered questionnaire to assess sleep disorders. The questionnaire included questions exploring the impact on social life and academic performance by grade point average (GPA) 5/5. Data were analyzed using IBM SPSS V 21.0 software. **Results:** Out of 430 participants, main causes of sleep deprivation were stress 296 (19.6%), college assignments 310 (20.6%), internet 257 (17.0%), anxiety 157 (10.4%), work 107 (7.1%), socializing with friends 99 (6.6%), depression 78 (5.2%), family commitments 70 (4.6%), video games 55 (3.6%), sleep disorder 41 (2.7%), partying 17 (1.1%), loud disruptive housemates 12 (0.8%) and young children 9 (0.6%). Meanwhile, gender ($P < 0.01$), academic performance ($P < 0.01$) and academic level ($P = 0.005$) had significant association with sleep deprivation. **Conclusion:** The results showed that the medical students at King Saud University are suffering from sleep deprivation and the main reason for their sleep deprivation is the academic burden. Therefore, sleep deprivation impacts their academic performance.

Key Words: *Medical, Academic Performance, Deprivation, Motivation, Stress.*

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INTRODUCTION

Sleep is a natural physiological and complex process in which the body and mind rest with one-third of the humans' life cycle [1]. Sleep can be measured in a simple way of decreased relative movement activity and by rest, while a more complicated way is to measure sleep by measuring the electrical brain signals obtained in the electroencephalogram (EEG) [2]. Overall, sleep is very important for the basic functionality of human beings such as learning, making decisions, consolidating memories, and analytical thinking [3, 4]. The ideal sleeping hours which is needed to retain a normal stable healthy life is between 7 to 7.9 hours per day [5, 6].

Sleep habits are affected by many factors including the internet and social networks. They are considered as the leading causes of delayed sleep patterns. Other causes of staying up at night are using central nervous system stimulants such as caffeinated food and drinks, cigarettes, and even protein-rich meals which often can lead to insomnia [7, 8]. Moreover, some medical conditions can also disrupt sleep patterns and cause further problems such

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as obstructive sleep apnea, chronic sleep deprivation, narcolepsy, cataplexy, depression, and anxiety [8, 9]. Medical students are exposed to sleeping disorders much more than any other student [10].

Sleep deprivation is a worldwide common issue among university students with the burden of academic work and social pursuits, caffeine intake, stimulants, drugs, and social media. As a result, many students, especially medical pupils are at an increased risk of sleep deprivation and disturbances when they often experience insufficient sleep time and quality [9]. However, sleep disturbances and sleep tardiness among medical students are greatly variable based on year, examinations, country, university system. Around exam times, sleep disturbances can be varied as low as 19% up to even 90% [10].

Sleep deprivation can have a great effect on mood, alertness, cognitive functions, and motor activity. These factors represent the vital features in the life of a medical student as they are one of the top university students with longer hours of study and homework [11]. The amount of working time for a medical student and house medical staff can reach to long hours per day. Thus, the anxiety cycle and thoughts about the severe effects of lack of sleep in student training, medical errors, and patient safety increase [12].

METHODS:

This is a cross-sectional study that was performed during the 2017-2018 academic year at the College of Medicine at King Saud University in Riyadh, Saudi Arabia. A total of 430 medical students were included using a stratified random sampling technique. Regarding inclusion criteria, first, second, third, fourth, and fifth-year students of both genders were enrolled. Meanwhile, students with any medical condition were excluded. The sample size calculated by using the formula $n=Z2\alpha\ P(1-P)/d2$, where: P is the proportion with 36.6% expected reported rate of a medical student who has sleep deprivation according to Abdulghani HM et al. [13] with Z=1.96 for 95% confidence level, d=precision 5% (n=357) + (20% of the sample size to cover non-response). Furthermore, we divided the students equally into ten strata, depending on the gender and the academic year (female: first, second, third, fourth, fifth year) and (male: first, second, third, fourth, fifth year) in each stratum they were 43 students. The questionnaire is a self-administrated questionnaire that was distributed to assess gender, academic year, sleep/wake schedule, sleep habits, and sleep hours. Their Perceptions about the impact of sleep deprivation on their academic performance, physical and mental health were reported by recording their performance (GPA 5/5). Data were analyzed using IBM SPSS version 21.0 software. Descriptive statistics including frequencies, percentages, the mean, and standard deviation were used to describe the categorical and quantitative variables. Appropriate statistical tests were used to perform the univariate analysis. Lastly, a p-value of ≤ 0.05 and 95% confidence intervals were used to report the statistical significance and precision of results.

RESULTS:

Out of 430 participants, gender was equally distributed with 215 (50%) students in each gender. Regarding participants according to their academic year, it was also equally distributed among all 5 academic levels with 86 (20%) participants in each academic year. The students who had received a GPA score of more than 4.5 were the highest group 160 (37.2%), followed by students with a GPA between 3.5 to 4 with a count of 134 (31.2%), then students with a GPA range between 4 to 4.5 with a total of 121 (28.1%) and lastly students with a GPA of less than 3.5 were 15 (3.6%). Interestingly, most of the students (318 (74%)) felt that they were sleep-deprived with a total of (236 (54.9%)) only 4 to 6 hours sleeping. Moreover, students who sleep between 6 to 8 hours, 2 to 4 hours, 8 to 10 hours were 112 (26%), 58 (13.5%), and 20 (4.7%), respectively. Lastly, almost two-third (264 (61.4%)) of the students who did not have sufficient sleep the night before stated that they occasionally struggle to stay awake and be focused on their classes the following day while around one third (137 (31.9%)) of them reported that they can never be able to focus and stay awake the next day. On the other hand, those who stated that they sometimes find it difficult to fall asleep at night were 182 (42.3%) students compared to those who answered they cannot fall asleep and sleep through the night were 140 (32.6%) (Table 1).

Regarding psychological and social aspects, the majority of students (313 (72.8%)) stated that they experience mood and behavior changes when they have lower amounts of sleep while 374 (87%) expressed that they have less energy/motivation throughout the day when they have less sleep than needed the night before. Furthermore, the main causes that were reported as the culprit responsible for difficulty sleeping at night according to the questionnaire were stress (296 (19.6%)), college assignments (310 (20.6%)), internet (257 (17.0%)), anxiety (157 (10.4%)), work (107 (7.1%)), socializing with friends (99 (6.6%)), depression (78 (5.2%)), family commitments (70 (4.6%)), video games (55 (3.6%)), sleep disorder (41 (2.7%)), partying (17 (1.1%)), loud disruptive housemates (12 (0.8%)), and young children (9 (0.6%)) (Figure 1). Interestingly, almost half the students reported that the major cause of stress/anxiety was attributed to college assignments and studying (310 (52%)) while the least stressful factor was having to do housework (21 (3.5%)). As to be expected with academic work and its relation with physical activity, the students showed a tendency to not exercise with 175 (40.7%) reporting that they never

exercise during the week while only 75 (17.4%) of them exercise more than 3 days a week compared to 16 (3.7%) students practicing only during weekends. Lastly, two-third of the students (285 (66.3%)) feel that insufficient sleep and deprivation hinder their academic performance through the year compared to one-third (145 (33.7%)) saying that it does not (Table 1).

Regarding potential side effects experienced after a night of very little sleep, half of the students tend to agree that it can cause difficulty in concentration with a mean score of 4.06 ± 0.80 out of 5, while they tend to agree that it causes a lack of motivation with a mean value of 3.94 ± 0.94 out of 5. Similarly, a high portion of them tends to agree that it causes mood swings 3.67 ± 0.99 out of 5 as well as irritability with a mean score of 3.38 ± 1.14 out of 5. On the other hand, both Absentmindedness/Forgetfulness and tremor response were neutral among respondents with a mean score of 3.36 ± 1.08 and 2.30 ± 1.26 out of 5, respectively (Table 2).

To find out if the relationship between the feeling of sleep deprivation with those not feeling sleep deprived are significant with other variables. Table 3 shows that no relationship was found between gender and the feeling of sleep deprivation (P = 0.187). However, it shows that the relationship between the year of study and average GPA and sleep deprivation was significant with a P-value of 0.004. Similarly, the relationship between sleep deprivation and the academic level was also significant (P = 0.005) (Table 3). Moreover, the association between sleep experiences with if students feel sleep-deprived or not was significant (P < 0.01) with difficulty falling asleep and sleep throughout the night (Table 4). Similarly, hindering feelings of low academic performance was also found significantly associated with difficulty falling asleep and sleeping through the night (P < 0.01) (Table 4). Lastly, gender reported less energy and motivation throughout the following days of few sleeping hours, academic performance was affected which was significant with reporting unpleasant experiencing issues after a sleep-deprived night (P < 0.01) (Table 5).

DISCUSSION:

It has been revealed that sleep quality has an impact on medical students' physical and mental health, and subsequently their working capacity [14]. This could affect the community as medical errors and accidents would be more frequent due to the decrease in their working capacity. Moreover, attention, memory, learning process deficits, and alterations in cognitive functions are all associated with sleep depreciation [15, 16]. This can go along with our finding where students found their academic performance low as well as difficulty in concentrating in classes the following day. It also has been found that when sleep deprivation is cumulative, it can lead to negative consequences for a person's health and efficiency, besides the risk of accidents increase [17]. In general, the academic performance is affected or decreased by the time of waking up, the later the student wakes up the lower their academic performance get [18, 19]. A study on 512 medical students in 2019 reported that a low GPA was significantly lower than that of good sleepers which go along with our findings [20]. Maheshwari et al. also stated that the higher proportion of medical students had a total sleep duration of fewer than 5-7 hours similar to our finding where most of the students (236 (54.9%)) reported sleeping between 4-6 hours.

Other studied factors including eating habits, exercise, mood states, perceived stress, socializing, spiritual meditation, time management, religious habits, working hours during the week, gender, and age showed a strong correlation and effect on sleeping habits [21]. Lastly, a cross-sectional study that was performed in Hong Kong on 1629 adolescent found that students who had earlier bedtime and longer sleep time during weekdays with no delay in bedtimes as well as waking up early at the weekends had an excellent academic performance compared to those who had poor grades [21].

LThe limitation of our study is different in the subjective understanding of the personal need for sleep from one student to another. In addition, students might have an exaggeration response when it comes to emotional and personal matters such as GPA and sleep.

CONCLUSION:

Sleep deprivations have a wide effect on many social, academic, and psychological aspects of medical students. In addition,, it can have a great effect on their performance, confidence, and social interactions. Further studies are needed to compare different universities as some universities might have more workload and assignments than others.

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Table 1. Participants profile (n= 430)

	n (%)
Gender:	
Male	215 (50.0%)
Female	215 (50.0%)
Which year were you in medical school?	
1st Year	86 (20.0%)
2nd Year	86 (20.0%)
3rd Year	86 (20.0%)
4th Year	86(20.0%)
5th Year	86 (20.0%)
What is your average GPA?	
Less than 2	0 (0.0%)
Between (2 to 2.5)	2 (0.5%)
Between (2.5 to 3)	2 (0.5%)
Between (3 to 3.5)	11 (2.6%)
Between (3.5 to 4)	134 (31.2%)
Between (4 to 4.5)	121 (28.1%)
More than 4.5	160 (37.2%)
Do you feel that you are sleep deprived as a medical student?	
Yes	318 (74.0%)
No	112 (26.0%)
How many hours do you sleep each night? (on weeknights)?	
Less than 2 hours	3 (0.7%)
2-4 hours	58 (13.5%)
4-6 hours	236 (54.9%)
6-8 hours	112 (26.0%)
8-10 hours	20 (4.7%)
More than 12 hours	1 (0.2%)
How many hours do you sleep each night? (on weekends)?	
Less than 2 hours	2 (0.5%)
2-4 hours	4 (0.9%)
4-6 hours	32 (7.4%)
6-8 hours	144 (33.5%)
8-10 hours	201 (46.7%)
More than 12 hours	47 (10.9%)
On a day when you did not get sufficient sleep the night before, do you struggle to stay awake/focused during your classes?	
Always	137 (31.9%)
Occasionally	264 (61.4%)
Never	29 (6.7%)
I find it difficult to fall asleep and sleep through the night.	
Yes	108 (25.1%)
No	140 (32.6%)
Sometimes	182 (42.3%)
My mood and behavior are affected when I have lower amounts of sleep.	
I did not notice.	84 (19.5%)
Yes	313 (72.8%)

No	33 (7.7%)
Do you feel that you have less energy/motivation throughout the day when you have less sleep than needed the night before?	
Yes	374 (87.0%)
No	56 (13.0%)
Cause you to lose sleep:	
stress	296 (19.6%)
Partying	17 (1.1%)
College assignments	310 (20.6%)
Work	107 (7.1%)
Depression	78 (5.2%)
Anxiety	157 (10.4%)
Young children	9 (0.6%)
Socializing with friends	99 (6.6%)
Internet	257 (17.0%)
Sleep disorder	41 (2.7%)
Loud disruptive housemates	12 (0.8%)
Video games	55 (3.6%)
Family commitments	70 (4.6%)
If you selected stress/anxiety, what causes the most stress/anxiety:	
College assignments	310 (52.0%)
Family Relationship problems	114 (19.1%)
Housemates	21 (3.5%)
Work	77 (12.9%)
Friends	26 (4.4%)
Housework	17 (2.9%)
Financial problems	31 (5.2%)
How many times do you exercise during the week?	
Never	175 (40.7%)
Occasionally	143 (33.3%)
more than 3 times	75 (17.4%)
Daily	21 (4.9%)
At weekends	16 (3.7%)
Do you feel that your academic performance is hindered due to insufficient sleep?	
Yes	285 (66.3%)
No	145 (33.7%)

Table 2. Experience Profile, following after a night of very little sleep (n= 430)

	Strongly disagree		**Disagree**		**Neutral**		**Agree**		**Strongly agree**		**Mean**	**SD**
	C	**%**	**C**	**%**	**C**	**%**	**C**	**%**	**C**	**%**		
Difficulty in concentrating	3	0.7%	14	3.3%	68	15.8%	215	50.0%	130	30.2%	4.06	0.80
Lack of motivation (e.g. Attending classes/ Studying)	4	0.9%	37	8.6%	69	16.0%	190	44.2%	130	30.2%	3.94	0.94
Mood swings	9	2.1%	49	11.4%	107	24.9%	176	40.9%	89	20.7%	3.67	0.99
Irritability	33	7.7%	61	14.2%	113	26.3%	154	35.8%	69	16.0%	3.38	1.14
Absentmindedness/ Forgetfulness	22	5.1%	70	16.3%	137	31.9%	135	31.4%	66	15.3%	3.36	1.08
Hand tremors	154	35.8%	106	24.7%	85	19.8%	55	12.8%	30	7.0%	2.30	1.26

Headaches	24	5.6%	35	8.1%	116	27.0%	145	33.7%	110	25.6%	3.66	1.11
Overall mean											3.48	0.69

C: Count, SD: Standard Deviation

Table 3. The relationship between Gender, year of study, and GPA with sleep-deprived students or not.(n= 430)

Parameter	Gender		Do you feel that you are sleep deprived as a medical student?		Total	P-value
			Yes	No		
Gender	Male	Count	165	50	215	0.187
		%	51.9%	44.6%	50.0%	
	Female	Count	153	62	215	
		%	48.1%	55.4%	50.0%	
Year in medical school	1st Year	Count	74	12	86	0.005
		%	23.3%	10.7%	20.0%	
	2nd Year	Count	56	30	86	
		%	17.6%	26.8%	20.0%	
	3rd Year	Count	59	27	86	
		%	18.6%	24.1%	20.0%	
	4th Year	Count	59	27	86	
		%	18.6%	24.1%	20.0%	
	5th Year	Count	70	16	86	
		%	22.0%	14.3%	20.0%	
Average GPA	Between (2 to 2.5)	Count	0	2	2	0.003
		%	0.0%	1.8%	0.5%	
	Between (2.5 to 3)	Count	2	0	2	
		%	0.6%	0.0%	0.5%	
	Between (3 to 3.5)	Count	8	3	11	
		%	2.5%	2.7%	2.6%	
	Between (3.5 to 4)	Count	113	21	134	
		%	35.5%	18.8%	31.2%	
	Between (4 to 4.5)	Count	80	41	121	
		%	25.2%	36.6%	28.1%	
	More than 4.5	Count	115	45	160	
		%	36.2%	40.2%	37.2%	

Table 4. The association between sleep experiences and sleep-deprived students or not. (n= 430)

		Do you feel that you are sleep deprived as a medical student?		Total	P-value
		Yes (%)	No (%)		
On a day when you did not get sufficient sleep the night before, do you struggle to stay awake/focused during your classes?	Always	99 (31.1%)	38 (33.9%)	137	0.652
	Occasionally	199 (62.6%)	65 (58.0%)	264	
	Never	20(6.3%)	9 (8.0%)	29	
I find it difficult to fall asleep and sleep through the night.	Yes	97 (30.5%)	11 (9.8%)	108	0.000
	No	89 (28.0%)	51 (45.5%)	140	
	Sometimes	132 (41.5%)	50 (44.6%)	182	
My mood and behavior are affected when I have lower amounts of sleep.	I did not notice.	54 (17.0%)	30 (26.8%)	84	0.040
	Yes	236 (74.2%)	77 (68.8%)	313	
	No	28 (8.8%)	5 (4.5%)	33	
Do you feel that you have less energy/motivation throughout the day when you have less sleep than needed the night before?	Yes	276 (86.8%)	98 (87.5%)	374	0.848
	No	42 (13.2%)	14 (12.5%)	56	
Do you feel that your academic performance is hindered due to insufficient sleep?	Yes	232 (73.0%)	53 (47.3%)	285	0.000
	No	86 (27.0%)	59 (52.7%)	145	

Table 5. The relationship between Overall mean experience profile of some issues, after a night of very little sleep considering some variables. (n= 430)

Overall mean **experience profile of some issues, after a night of very little sleep.**		N	Mean	SD	t-Value	P-value
Do you feel that you are sleep deprived as a medical student?	Yes	318	3.4668	0.69497	-0.717	0.474
	No	112	3.5217	0.70345		
Gender	Male	215	3.3449	0.68652	-4.129	0.000
	Female	215	3.6173	0.68169		
Do you feel that you have less energy/motivation throughout the day when you have less sleep than needed the night before?	Yes	374	3.5466	0.68074	5.191	0.000
	No	56	3.0434	0.64806		
Do you feel that your academic performance is hindered due to insufficient sleep?	Yes	285	3.5709	0.68496	3.808	0.000
	No	145	3.3044	0.68827		

N: Numbers, SD: Standard Deviation

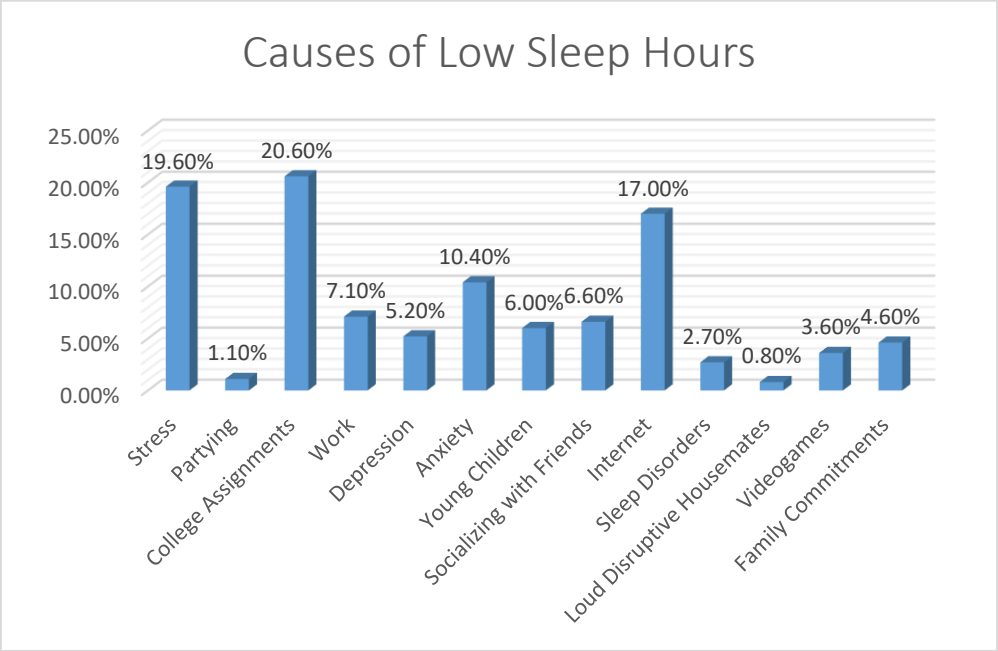

Figure 1. Causes of low sleeping hours.