THE IMPACT OF COVID IN HIGHER EDUCATION

Prevalence of sleep disorders among medical students of Umm Al-Qura University, Makkah, Kingdom of Saudi Arabia

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Abstract

Background: Sleep disorders are a common medical problem and can affect health and quality of life. There are multiple types of sleep disorders such as obstructive sleep apnea, insomnia, narcolepsy, restless legs/periodic limb movement disorder, circadian rhythm disorders, sleepwalking and nightmares. Medical students appear to be more liable to develop sleep disorders due to their high academic load.

Design and Methods: This study seeks to estimate the prevalence of sleep disorders among Umm Al-Qura University medical students and associated risk factors. This cross-sectional study was conducted at the Faculty of Medicine of Umm Al-Qura University in Makkah, Saudi Arabia. A self administered questionnaire was used to collect the data including socio-demographic data and sleep-50 questionnaire. Four hundred and thirty-eight (438) medical students from the second year to the sixth year were recruited to the study.

Results: Three hundred and twenty-three participants (73.8%) complained of at least one sleep disorder. The most prevalent sleep disorder among students was narcolepsy at 226 (51.6%). Female students, second year students and students spending significant time watching television or on smartphones were more affected than others with p values of 0.001, 0.005, and 0.004 respectively.

Conclusions: Sleep disorders are common among medical students. It is essential to detect and address them before their condition deteriorates.

Introduction

Sleeping is a corner stone in human life.[1] Our health is highly linked to our sleep.[2] Sleep patterns are central to numerous human physiological functions, in particular learning capacity, memory consolidation, neurocognitive functions and mental health.[3-5] Sleepiness is one of the factors that adversely affect the general health.[6] Alertness, attention and cognitive processes can be impaired by insufficient sleep.[7,8] Studies reveal that sleep disorders are interrelated with psychiatric diseases, and are early signs for anxiety and depression.[9] If sleep problems are neglected, this can lead to decreased attention, poor academic performance, reduced general health and social relationships problems.[10-13] Sleep disorders' prevalence ranges between 22% and 65%.[6,14] Numerous chronic medical conditions such as hypertension, diabetes mellitus, and coronary artery disease are additionally associated with sleep disorders.[15] Medical students are a subset of the population that are more liable to develop sleep disorders and sleep deprivation; this is likely attributed to long intensive study, clinical tasks and high academic loads.[16] Sleep disorders affect students' quality of life, their general health and academic performance - consequently it is important to detect these disorders prior to the deepening of the problem.[17] Sleep deprivation in medical students is found to affect cognitive functions.[18,19] Numerous studies demonstrate 70-76% of medical students have poor sleep quality.[10,11,13] Research on sleep disorders in medical students is a timely topic due to its high impact on medical students' physical health, mental health and psychological health, as well as their academic performance. In this study we undertake to detect the prevalence of sleep disorders among Umm Al-Qura University medical students through the investigation of seven sleep disorders: obstructive sleep apnea, insomnia, narcolepsy, restless legs/periodic limb movement disorder, circadian rhythm disorders, sleepwalking and nightmares.

Design and Methods

Study design

A cross-sectional study was conducted among Umm Al-Qura University Faculty of Medicine, Bachelor of Medicine, Bachelor of Surgery (MBBS) students in Makkah, Saudi Arabia, between the 10th of February and the 1st of April 2020. It was a questionnaire-based study.

Significance for public health

Sleep disorders are more common early in the medical training, starting in the second year, and start to gradually decrease through the years. Female students appear at higher risk. Medical students should be particularly aware how much time they spend watching television and using their mobile phones, both from perspective of academic performance and formation of healthy sleep habits which persist into their medical careers.

Table 1. Sleep-50 questionnaire with optimal cut-off values and scoring procedures.

Sleep disorder	Items	Optimal cut-off values
Obstructive sleep apnea	1-8	Total of these items ≥15
Insomnia	9-16	Total of these items ≥19
Narcolepsy	17-21	Total of these items ≥7
Restless legs/periodic limb movement disorder (RLS/PLMD)	22-25	Total of these items ≥7
Circadian rhythm disorder	26-28	Total of these items ≥8
Sleepwalking	29-31	Total of these items ≥7
Nightmares	32-35	Item 32 ≥3 and total of 33-35 items ≥9

Participants

The questionnaire was sent to all MBBS students from the 2nd year through the 6th year. All students that accepted were enrolled in the study. Preparatory year (1st year) students, internship students, and incomplete questionnaires were excluded.

Data collection

The electronic questionnaire was distributed among all students meeting the inclusion criteria in two languages: Arabic and English. A total of 438 students participated with a 35% response rate from the selected MBBS students.

Study tool

The survey consisted of two parts: first, the socio-demographic data - age, gender, marital status, body mass index (BMI), academic year, grade point average (GPA), chronic diseases, psychiatric illnesses, family history of sleep disorders, smoking status, caffeine intake, time spent on smartphone and/or television, exercising within two hours before going to bed, and whether sleeps in a very cold room. The second part consisted of the Sleep-50 questionnaire.

Sleep-50 questionnaire

The study used the Sleep-50 questionnaire scale validated by Spoormaker and its scoring system.[20] This questionnaire consisted of 50 questions (items) divided into 7 sections (subscales), with each subscale assessing a specific sleep disorder according to DSM-IV criteria. Sleep disorders assessed were obstructive sleep apnea, insomnia, narcolepsy, restless legs/periodic limb movement disorder, circadian rhythm disorders, sleepwalking and nightmares.

Items were scored according to a 4-point scale (1=not at all; 2=somewhat; 3=rather much; 4=very much) and this was termed an impact scale (22). If any one item was scored as either 3 or 4 points, that indicated the presence of a sleep symptom for that specific sleep disorder. Each subscale had its own cut-off point (Table 1). To diagnose a specific sleep disorder two considerations must be met: i) the total items score for the subscale must exceed its cut-off point, and i) at least one item in the subscale scored with 3 or 4 points, indicating the presence of at least one symptom.[20]

Data analysis

The study was analyzed statistically using SPSS software version 20 for Windows. Continuous variables data were summarized using means and standard deviations, and the categorical variables were described using frequencies and percentages. The significance level was set at 0.05. Independent continuous variables

Table 2. Characteristics of the study population of medical students during clinical years (n=438).

Characteristic	Frequency	%
Gender		
Male	217	49.5
Female	221	50.5
Marital status		
Single	422	96.3
Married	15	3.4
Divorced	1	0.2
Academic year		
2nd year	70	16
3rd year	67	15.3
4th year	59	13.5
5th year	122	27.9
6th year	120	27.4
Have a chronic disease	55	12.6
Use tobacco products	71	16.2
Daily caffeine use	347	79.2
(+) Family history of sleep disorder(s)	122	27.9
Engage in sports ≤ two hours before sleep	33	7.5
Sleep in a very cold room	266	60.7

underwent to *t*-test while categorical variables underwent to Chi square test.

Results

Table 2 comprises general participant characteristics. A total of 438 medical students were recruited from the second year to the sixth year. The highest number of participants was from the fifth year with 122 students (27.4%), whereas the lowest number of participants was from the fourth year with 59 students (13.5%). Half (50.5%) were female, nearly all (422, 96.3%) had a single marital status, and a minority (55,12.6%) had chronic disease. Seventy-one (16.2%) of the students were smokers, 347 (79.2%) students were caffeine users, 122 (27.9%) had a family history of sleep disorder, 33 (7.5%) exercised within two hours before going to bed, and 266 (60.7%) slept in a very cold room.

Table 3 presents frequencies of specific sleep disorders. The Sleep-50 questionnaire was utilized in diagnosing seven common sleep disorders: 323 (73.7%) of the participants complained of at least one sleep disorder. The most prevalent sleep disorder was Narcolepsy (NL) with 226 (51.6%), followed by 138 (31.5%) with insomnia, and 98 (22.4%) indicating Circadian Rhythm sleep Disorder (CRD). Table 4 lists combined sleep disorders, with 87

(19.9%) of respondents positive for at least two combined sleep disorders, and 63 (14.4%) demonstrating three combined sleep disorders. Table 5 presents the relation between sleep disorders and several academic-social variables. There was no significant GPA or BMI difference found in those students with sleep disorders and those students without. However, in the time students spent watching television and/or on smartphones, there was significant difference in students with sleep disorders (m=6.71 hours, SD=3.83) and those without (m=5.90 hours, SD=3.40) (p=0.004). Table 6 presents the relation between categorical variable and sleep disorders. There was a significant relationship between gender and sleep disorder, with females more affected at 178 (80.5%) than males at 145 (66.8%) (p=0.001). A significant and decreasing intensity was seen in sleep disorders between students by academic year; from 62 (88.6%) second year students the rate steadily diminished to 78 (65%) students of the sixth year (p=0.005). Relationships with other categorical variables were found to be insignificant.

Discussion

This study among Umm Al-Qura university medical students has revealed a high rate of sleep disorders. This was seen in previous studies reporting high prevalence of sleep disorders in medical students.[16] These sleep disorders influence memory consolidation, learning capacity, physiological functions and general health.[4-6,21]

At least one sleep disorder was found in 73.7% of this study population. This is in contrast to lower findings in Thomas in Alabama, who found 24% presented with a sleep disorder,[22] and Abdulghani with 36.6% of students in Riyadh's King Saud University.[23] Narcolepsy was the most prevalent sleep disorder with 51.6% of this study population, insomnia second with 31.5%, circadian rhythm sleep disorder and restless leg/periodic limb movement disorder were both found in 22.4%, and 16.4% were positive for obstructive sleep apnea; the least prevalent sleeping disorders were nightmares at 13.7% and sleepwalking at 3.7%. These ratios were contrasted with Thomas, who stated 22% of Alabamaa students had insomnia, 17% nightmares, 8% circadian rhythm sleep disorder, 7% had both narcolepsy and restless legs syndrome, 4% obstructive sleep apnea, and 1% sleep walking.[22]

Poor academic performance was not associated with sleep disorders. No significant GPA difference was noted in medical students with sleep disorders (mean 2.72/4) and those without sleep disorder (mean 2.61/4). This was in accordance with Thomas who reported no significant difference in students with sleep disorders (mean 3.43/5) and those without (mean 3.42/5).[22] A study conducted Taylor reported students with sleep problems had slightly

Table 3. Prevalence of sleep disorders.

Sleep disorder	Frequency	%
Obstructive sleep apnea	72	16.4
Insomnia	138	31.5
Narcolepsy	226	51.6
RLS/PLMD	98	22.4
Circadian rhythm disorder	98	22.4
Sleepwalking	16	3.7
Nightmares	60	13.7
Total of those having ≥1 sleep disorder	323	73.7

Table 4. Frequencies of combined sleep disorders.

Sleep disorder	Frequency	%
Two (2) combined sleep disorders	87	19.9
Three (3) combined sleep disorders	63	14.4
Four (4) combined sleep disorders	21	4.8
Five (5) combined sleep disorders	18	4.1
Six (6) combined sleep disorders	5	1.1
Seven (7) combined sleep disorders	2	0.5

Table 5. Relationship between sleep disorder and academic-social variables.

Variable	Sleep disorder	Mean ± SD	p-value
GPA, n/4	Yes	2.72 ± 1.34	0.484
	No	2.61 ± 1.43	
BMI, kg/m^2	Yes	24.8 ± 6.45	0.936
	No	24.8 ± 7.50	
Time spent on TV / smart phones, hours	Yes	6.71 ± 3.83	0.047
	No	5.90 ± 3.40	

GPA, grade point average; MBI; body mass index.

Table 6. Relationship between sleep disorder and characteristic.

Characteristic	Sleep disorder		p-value
	Yes (%)	No (%)	
Gender			0.001
Male	145 (66.8)	72 (33.2)	
Female	178 (80.5)	43 (19.5)	
Marital status			0.395
Single	313 (74.2)	109 (25.8)	
Married	9 (60)	6 (40)	
Divorced	1 (100)	0 (0)	
Have chronic disease			0.637
Yes	42 (76.4)	13 (23.6)	
No	281 (73.4)	102 (26.6)	
Regular tobacco use			0.916
Yes	52 (73.2)	19 (26.8)	
No	271 (73.8)	96 (26.2)	
Daily caffeine use			0.977
Yes	256 (73.8)	91 (26.2)	
No	67 (73.6)	24 (26.4)	
(+) Family history of sleep disorder(s)			0.329
Yes	94 (77)	28 (23)	
No	229 (72.5)	87 (27.5)	
Engage in sports ≤ two hours before sleep			0.494
Yes	26 (78.8)	7 (21.2)	
No	297 (73.3)	108 (26.7)	
Sleep in a very cold room			0.682
Yes	198 (74.7)	68 (25.6)	
No	125 (72.7)	47 (27.3)	
Academic year			0.005
2nd year	62 (88.6)	8 (11.4)	
3rd year	54 (80.6)	13 (19.4)	
4th year	43 (72.9)	16 (27.1)	
5th year	86 (70.5)	36 (29.5)	
6th year	78 (65)	42 (35)	

decreased but insignificant difference in GPAs (mean 2.83) with students who experienced normal sleep (mean 2.92).[24] BMI was similarly found without an association with sleep disorders. This study found no significant difference in students with sleep disorders (mean 24.76 kg/m^2) and those without sleep disorder (mean 24.81 kg/m^2); this was in agreement with Thomas, where the mean BMI in students with sleep disorders was 23.2 kg/m^2 and in those without was 24.0 kg/m^2.[22] We observed an association between time spent on television and smart phones and the development of sleep disorders. The mean time that medical students suffering of sleep disorders spent on TV or using smart phones was 6.71 hours, in contrast to those without sleep disorders spending a mean of 5.90 hours. This was similarly seen by Mohammadbeigi's study on medical students in Qom, Iran, with the prevalence of mobile phone over-use was 10.7%, and the prevalence of poor sleep quality was 61.7%; these results revealed a significant association between mobile phone over-use and poor sleep quality.[25] Saxena in India established a statistically significant association between sleep disturbances and excessive use of mobile phones in medical students.[26] Ibrahim *et al.*'s study in King Abdulaziz University near Jiddah found more than two-thirds of medical students had poor sleep quality due to prolonged mobile phones usage.[27] Hossain *et al.* in Bangladesh found that Variety-Seeking (VS) tendencies on smartphone usage, with emphasis on social networking sites of the current university-level generation, had a strong relationship with Academic Performance (AP); as most tend to over-use digital technologies, it led to adverse results in AP.[28] The development of sleep disorders due to VS and mobile phones over-use may indicate an intermediary step towards eventual poor AP. Another noteworthy result in this study was the significant relationship between gender and sleep disorders. 66.8% of male students complained of sleep disorders, but on the other hand female students presented a much higher impact with 80.5%. This aligns with Alsaggaf's study conducted in King Saud University demonstrating 25% of male students had sleep disorders in contrast to higher rate of 54% in the female students.[29] Our results were also in agreement with Gaultney's study revealing female college students were at greater risk of developing sleep disorders.[30]

This study was conducted during the ongoing global COVID-19 crisis and lockdown, with resultant build-up in stress on the entire campus and student body; our students' academic participation was severely curtailed in March 2020 and the medical curriculum significantly modified by the crisis, leading to an increase in remote online learning and a decrease in physical participation, among other stressors. Educators such as Sundarasen *et al.*, Ferrel, and Torun remarked on the elevated anxiety and stress levels in medical education due to COVID-19.[31-33]

Conclusions

Sleep disorders are common among medical students and it affects their physical, mental, and psychological health. It is crucial to detect these problems and address them before their condition deteriorates. Sleep disorders are more common early in the medical training, starting in the second year, and start to gradually decrease through the years. Female students appear at higher risk. Medical students should be particularly aware how much time they spend watching television and using their mobile phones.

The impact of the ongoing 2020-2021 global COVID-19 crisis and rolling lockdowns on medical students' sleep patterns, mobile phone use and socialization, as well as on academic performance, has been consequential and a topic for investigation in further studies.

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