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Sleep disorders as primary and secondary factors in relation with daily functioning in medical students

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BACKGROUND: College students experience various types of sleep disorders that impact daily functioning. Previous studies have focused on the effect of one sleep disorder.

OBJECTIVE: Examine factors that might relate to several sleep disorders and the impacts of sleep disorders on the daily functioning in medical students.

DESIGN: Cross-sectional study.

SETTING: Medical college.

SUBJECTS AND METHODS: A random sample of medical students from a public university was invited to participate in a cross-sectional study using the structured SLEEP-50 self-reported questionnaire. The sleep disorders covered by the questionnaire were insomnia, sleep apnea, restless legs syndrome, sleep walking, circadian rhythm sleep disorder, nightmares, narcolepsy, and factors impacting sleep, effects of sleep complaints on daily functioning, and sleeping duration.

MAIN OUTCOME MEASURE: Sleep duration, sleep disorders

RESULTS: Of 317 participants, 165 (50.2%) reported having less than 7 hours sleep and apart from hypersomnia, had various kinds of sleep disorders. Various factors such as having no pleasure and entertainment, feeling sadness, alcohol drinking, amount of sleeping hours, smoking, age, a noisy or light bedroom, and substance abuse were related to different sleep disorders. Moreover, students with sleep disorders felt tired arising, felt sleepy during the day, were easily irritated, had difficulty in concentration, had concerns about amount of sleep, and slept badly at college.

CONCLUSIONS: Insufficient sleep is a common issue in medical students and a number of sleep disorders were found. The results suggest that sleep disorders could have negative impacts on the daily functioning of students.

LIMITATIONS: The study findings may not be generalizable because sociocultural characteristics of the sample may differ from the general population.

I nvestigators are paying more attention to sleep issues and their interrelationships with academic performance and quality of life of college students.[1-3] The campus life is essential to acquiring effective knowledge for a future career.[4] An important component of the educational environment is adequate health status.[5] An important component of health is adequate sleep. Sleep disorders may impact daily functioning. The consequences of insufficient sleep or non-treated sleep problems are possible deficits in attention and

failure in academic performance,[6] depression and risky behaviors,[7] and reduced health.[8]

The American Psychiatric Association,[9] in its Diagnostic and Statistical Manual version 5 (DSM-5) mentions that persons with sleep disorders normally have sleep-wake complaints of dissatisfaction in the quality, timing, and amount of sleep. The consequences of sleep-wake disorders are daytime distress and impairment of sleep. Persistent sleep disturbances including insomnia and excessive sleepiness are con-

firmed as risk factors for later development of mental illness and substance abuse disorders. In addition, they may constitute a prodromal manifestation for a mental illness episode.

Sing et al,[10] reported that college students do not take sufficient sleep and have erratic and late sleeping schedules. They found that the prevalence of insomnia in college students is 68.6% in Hong Kong. Moreover, Orzech et al,[11] reported that between 25% and 50% of students have daytime sleepiness. Students who do not adhere to a regular sleep schedule have poorer sleep habits.[12] Studies have documented several impacts on the daily activities of college students. For example, an increasing risk for somatic health issues, psychological and interpersonal issues, and daily activities following chronic insomnia have been documented by Roberts et al.[13] Existing reports mostly focus on the impact of one sleep disorder on daily functioning or quality of life in students.[14,15] In this study, the authors examined factors related to sleep disorders and impacts of several sleep disorders on daily functioning in medical students. We hypothesized that students with sleep disorders had adverse effects on daily functioning.

SUBJECTS AND METHODS

Study design and sampling method
The student lists of five medical colleges were provided by the registration office of each college after obtaining official permission from the deaneries. The ID numbers of students of all colleges were used to obtain a random sample of 400 students through the application of a simple random sampling method. The sample from this step consisted of 400 undergraduate students of the 1400 students (28.57%) enrolled in academic year 2016-2017 of the University of Duhok, a large public university in Iraq. The 400 students were contacted through the class representatives and were invited to partake in the study. The study was endorsed by local Health Ethics Committee of Duhok General Directorate of Health and the participants were guaranteed the confidentiality of their responses and voluntarily participation.

Both genders of students were invited to participate, regardless of their socio-demographic status except those students with overt mental disorders, or those absent or not-willing to participate. Before the study verbal consent was taken from all students and study objectives were explained. Data were collected carefully between 20 February and 20 March 2017. Response to the questions should have taken about 30 minutes. No incentive or reward was offered for study participation.

The authors arbitrarily estimated that 20% (280 students) of the total 1400 medical students of all medical colleges of the university would be sufficient sample size. The sample size was extended to 400 persons due to possibility of refusal or absence. Of 400 eligible students, those who refused to participate or had more than 20% missing data or an incomplete questionnaire were not included in the study. To reduce possible measurement bias in the study, the questionnaires were collected by the second author, a professional psychiatric nurse. The second author also instructed the students on how to respond to questions in the self-reported SLEEP-50 questionnaire.

Measurement criteria
The validated SLEEP-50 questionnaire for college students by Spoormaker et al,[16] was used for the analytical cross-sectional study. The SLEEP-50 questionnaire has 50 questions designed for different aspects of sleep according to diagnosis by DSM-IV. The scale recognizes ten sleep disorders from other disorders, including obstructive sleep apnea (OSA), insomnia, narcolepsy, RLS/PLMD (restless legs/periodic limb movement disorder), circadian rhythm disorders (CRDs), sleepwalking, nightmares, affective disorder, hypersomnia, and sleep state misperception (SSM). Moreover, the questionnaire can determine seven factors influencing sleep and seven impacts.[17] Some validated literature-based socio-demographic aspects were added by investigators to the questionnaires. The internal consistency of the SLEEP-50 scale is 0.85 and its test-retest reliability in its psychometric components evaluation is 0.78. No reliability was established by authors as the official language in medical colleges of Iraqi universities is English.

In this scale, each item is rated with the range from 1 (not at all), 2 (somewhat), 3 (rather much), and 4 (very much) to the applicability of the students' sleep quality in the previous 4 weeks. The total score and scores are obtained by adding the subscales. The scale designers recommend a cutoff score for each subscale taking into account the optimized sensitivity and specificity of the subscales.[16] The subscale score and total scores in sleep disorders are calculated by adding each score and subscales. The presence of a particular sleep disorder is based on optimal cutoff values (**Table 1**).[16] Students that slept less than 6 h in 24 h were considered short sleepers, 6-8 h as normal sleepers, and those who slept more than 8 h were classified as long sleepers.[18]

Statistical methods

Table 1. Estimation of sleep disorders based on scores on the SLEEP-50 questionnaire.

Disorder	Items	Subscore
Sleep apnea	1-8	≥15
Insomnia	9-16	≥19
Affective disorder	10, 11, 43, 44	≥12
Sleep state misperception	Insomnia, estimated hours slept <4	≥19
Narcolepsy	17-21	≥7
Restless legs syndrome	22-25	≥7
Circadian rhythm disorder	26-28	≥8
Sleep walking	29-31	≥7
Nightmares	32 33-35	≥3 ≥9
Hypersomnia	44-50	No item or ≥15 on impact of sleep disorder on daily functioning
All sleep disorders		≥15 on impact of sleep disorder on daily functioning

The descriptive data are summarized by frequency and percentage. Univariate ANOVA and multivariate analysis were performed to find factors associated with sleeps disorders and impacts of sleep disorders on daily functioning in medical students. A significance level of less than 5% was considered a significant difference. R square values are provided to measure goodness-of-fit. IBM SPSS version 23 was used for statistical analysis.

RESULTS

Of 400 questionnaires, students returned 317 questionnaires (79.3%) with complete or an acceptable amount of missing information. The students were aged from 17 to 28 years old and more than half were females (180, 56.7%) for a male: female ratio of 0.7:1.0. The mean (SD) age was 20.4 (1.9) years. More than one third of them were short sleepers (37.2%), more than half (53.6%) were normal sleepers, and close to one tenth (9.2%) were long sleepers. Feeling sadness and depression (65.6%) and having no interest in daily occasions (57.9%), including all severities, were the factors most reported to influence sleep followed by too much noise (34.3%) and light (33.8%) in the bedroom (**Table 2**). More than eighty percent (82.1%) of students

stated they were tired at getting up in the morning and 76.7% felt sleepy during the day and struggled to remain alert. A large percentage (85.7%) would like to feel more energetic during the day (fatigability). A notable percentage were easily irritated (66.7%) and had difficulty in concentrating at work or school (68.7 %). More than half (64.7%) were not sure they had sufficient sleep and 63.3% slept badly.

Sleep disorders as secondary factors

Each type of sleep disorder was considered as the dependent variable and univariate analysis was performed for the factors influencing sleep on the SLEEP-50 scale. Items 37-43 were considered factors influencing sleep. In general, feeling sad and depressed (P=.017) and having no pleasure or interest in daily occasions (P=.0001) are the main predictors of all sleep disorders (**Table 3**). Specifically, using other substances during evening except alcohol (e.g. sleep or other medications) was the predictor of occurrence of sleep apnea (P=.013), narcolepsy (P=.001), and sleep walking (P=.047). Having no pleasure or interest in daily occupations were significantly related to prevalence of sleep apnea (P=.009) and affective disorder (P=.0001). Feeling sad and depressed was the factor for students not falling asleep earlier (P=.0001) and emotional disturbance (P=.0001). Drinking alcoholic beverages during the evening was the predictor of emotional disturbance (P=.034) and restless legs syndrome during night (P=.003). In addition, smoking during evening was the factor for students who had body movement during sleep (P=.005) and non-rhythmic sleep (P=.013). Too much light in the bedroom during the night, and too noisy a bedroom during the night were only predictors for emotional disturbance (P=.004) and restless leg syndrome (P=.033). Finally, age was the factor for substantial differences in the prevalence of restless leg syndrome (P=.008). No factors were related to nightmares and sleep state misconception. **Table 3** shows statistics and **Table 4** shows goodness-of-fit values for the analysis.

Sleep disorders as primary factors

In the analysis in **Table 5**, items number 44-50 were considered as impacting sleep complaints on daily functioning. Circadian rhythm disorders were the predicting factor in medical students who felt tired at getting up (P=.006), feeling sleepy during the day and struggling to remain alert in class (P=.016), feeling fatigue during the day (P=.007), and sleeping badly (P=.002). Moreover, affective disorders or emotional disturbance in students was a predictor for feeling tired at getting up in the morning (P=.0001), feeling sleepy during the

Table 2. Factors influencing sleep and their impacts on daily functioning of students.

Factors influencing sleep and impact of sleep complaints on daily functioning	Not at all	A little	Rather much	Very much	Presence (all severities)
Factors influencing sleep					
It is too light in my bedroom during the night.	210 (66.2)	74 (23.3)	25 (7.9)	8 (2.5)	107 (33.8)
It is too noisy in my bedroom during the night.	207 (65.7)	86 (27.3)	18 (5.7)	4 (1.3)	108 (34.3)
I drink alcoholic beverages during the evening.	273 (88.1)	24 (7.7)	10 (3.2)	3 (1.0)	37 (11.9)
I smoke during the evening.	278 (88.5)	17 (5.4)	13 (4.1)	6 (1.9)	36 (11.5)
I use other substances during the evening (e.g., sleep or other medication).	285 (90.8)	22 (7.0)	4 (1.3)	3 (1.0)	29 (9.2)
I feel sad and depressed.	109 (34.4)	138 (43.5)	40 (12.6)	30 (9.5)	208 (65.6)
I have no pleasure or interest in daily occupations.	130 (42.1)	119 (38.5)	43 (13.9)	17 (5.5)	179 (57.9)
Impact of sleep complaints on daily functioning					
I feel tired at getting up.	56 (17.9)	151 (48.2)	74 (23.6)	32 (10.2)	257 (82.1)
I feel sleepy during the day and struggle to remain alert.	73 (23.3)	145 (46.3)	61 (19.5)	34 (10.9)	240 (76.7)
I would like to have more energy during the day.	45 (14.3)	87 (27.6)	95 (30.2)	88 (27.9)	270 (85.7)
I am told that I am easily irritated.	103 (33.3)	124 (40.1)	46 (14.9)	36 (11.7)	206 (66.7)
I have difficulty in concentrating at work or school.	99 (31.3)	139 (44.0)	58 (18.4)	20 (6.3)	217 (68.7)
I worry whether I sleep enough.	110 (35.3)	108 (34.6)	67 (21.5)	27 (8.7)	202 (64.7)
Generally, I sleep badly.	116 (36.7)	107 (33.9)	62 (19.6)	31 (9.8)	200 (63.3)

Data are numbers (percentage).

day and struggling to remain alert in class (P=.003), concentrating at work or school difficulty (P=.003), worrying whether students slept enough (P=.040), and slept badly (P=.0001). Body movement or restless legs during night was the predictor of feeling exhaustion at getting up in the morning (P=.007), worrying wheth- er students slept enough (P=.006), and slept badly (P=.026). Similarly, insomnia was the predictor for wor- rying whether students slept enough (P=.009) and slept badly (P=.021). Sleepwalking was only the predictor for students who felt sleepy during the day and struggled to remain alert (P=.008) and had nightmares about

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Table 3. Univariate analysis of variance of factors potentially related to sleep disorders in medical students.

Sleep Disorders	Factors	F	P value
Sleep apnea	I use other substances during the evening (e.g., sleep or other medication).	3.694	.013
	I have no pleasure or interest in daily occupations.	3.948	.009
Insomnia	I feel sad and depressed.	7.490	.0001
Affective disorder	It is too light in my bedroom during the night.	4.613	.004
	I drink alcoholic beverages during the evening.	2.935	.034
	I feel sad and depressed.	8.459	.001
	I have no pleasure or interest in daily occupations.	13.525	.0001
Narcolepsy	I use other substances during the evening (e.g., sleep or other medication).	13.339	.0001
RLS/PLMD	It is too noisy in my bedroom during the night.	2.963	.033
	I drink alcoholic beverages during the evening.	4.757	.003
	I smoke during the evening.	4.358	.005
	Age	2.481	.008
Circadian rhythm	I smoke during the evening.	3.675	.013
Sleep walking	I use other substances during the evening (e.g., sleep or other medication).	2.684	.047
Nightmares	No factor	N.A	N.A
Sleep state misconception	No factor	N.A	N.A
All sleep disorders	I feel sad and depressed.	3.451	.017
	I have no pleasure or interest in daily occupations.	9.447	.0001

RLS/PLMD: restless legs/periodic limb movement disorder.

Table 4. Model summary for analysis in Table 3.

	Model summary			
Sleep disorders	R	R square	Adjusted R square	Standard error of the estimate
Sleep apnea	.330	.109	.086	2.529
Insomnia	.467	.218	.198	3.821
Affective disorder	.741	.549	.538	1.802
Narcolepsy	.402	.162	.141	2.415
RLS/PLMD	.297	.088	.066	1.955
Circadian rhythm	.227	.051	.028	1.743
Sleep walking	.243	.059	.035	1.565
All sleep disorders	.437	.191	.172	.455

Table 5. Multivariate analyses of factors potentially related to sleep disorders complaints.

Impact of sleep complaints on daily functioning	Sleep disorders	F	P value
I feel tired at getting up.[a]	Affective disorder	40.184	.0001
	RLS	7.456	.007
	CRSD	7.591	.006
I feel sleepy during the day and struggle to remain alert.[b]	Affective disorder	8.974	.003
	CRSD	5.849	.016
	Sleep walking	7.223	.008
I would like to have more energy during the day.[c]	CRSD	7.499	.007
I am told that I am easily irritated.[d]	No sleep disorder	NA	NA
I have difficulty in concentrating at work or school.[e]	Affective disorder	8.992	.003
I worry whether I sleep enough.[f]	Insomnia	6.907	.009
	Affective disorder	4.269	.040
	RLS	7.541	.006
	Nightmares	8.787	.003
Generally, I sleep badly.[g]	Insomnia	5.412	.021
	Affective disorder	14.988	.0001
	RLS	4.985	.026
	CRSD	9.512	.002

RLS: restless legs; CRSD: circadian rhythm disorders; NA: not available

Table 6. Model summary for analysis in Table 5.

a. R Squared=.290 (Adjusted R Squared=.268)
b. R Squared=.158 (Adjusted R Squared=.132)
c. R Squared=.064 (Adjusted R Squared=.035)
d. R Squared=.066 (Adjusted R Squared=.037)
e. R Squared=.128 (Adjusted R Squared=.100)
f. R Squared=.190 (Adjusted R Squared=.165)
g. R Squared=.227 (Adjusted R Squared=.203)

sleep sufficiency (P=.003). No particular sleep disorder was related to being easily irritated .

DISCUSSION

The investigators' aim in conducting the present study was to investigate the impacts of sleep disorders on daily functioning as a primary factor and sleep disorders as secondary factors in medical students. The study documented inadequate sleep in our sample size, confirming that more than half of college students (50.2%) suffer from insufficient sleep (less than 7 hours). Apart from hypersomnia, they had various kinds of sleep disorders. Moreover, the study showed that sleep disorders interrelated with daily functioning and that a number of academic or personal behavioural aspects could be predictors of sleep disorders. For example, insomnia as a type of sleep disorder is a prevalent and related to a variety of factors. We found that feeling sadness and depression contributed to insomnia.

Other studies such as Bastien et al,[19] identified the family, health, and work-school related events as the most common insomnia-related factors. Living near a noisy road with heavy traffic was a high risk factor for insomnia in a Japanese population.[20] We could not find this association in Iraqi subjects in the current study, but a noisy bedroom corresponded with restless legs syndrome. Insomnia is a predictor of depression, anxiety, alcohol consumption or dependence, drug abuse, suicide, and other psychological disorders.[14] Our study confirmed that insomnia is a predictor of bad sleeping in medical students. Taylor et al[14] reported that insomnia might act as a stressor to initiate the development of other health issues and predispose to depression and substance abuse. The evidence ensures that those with one or more symptoms of insomnia are at a risk of meeting criteria of DSM-IV for chronic insomnia. These persons are further at risk of somatic health issues, interpersonal issues, psychological problems, and difficulties in daily activities.[13]

In addition, daytime sleepiness and erratic sleeping schedules were highly prevalent sleep complaints in college students as 76.7% of the sample size reported that they felt sleepy during the day in different severities. Lower academic performance, the risk of academic failure, mood impairment, and the risk of motor vehicle accidents can result from daytime sleepiness, sleep deprivation[4] and alertness reduction.[21] Moreover, Campos-Morales et al[22] reported that in a group of Mexican undergraduate students, more time was required by sleepy students to solve mathematical problems with more mistakes. In fact, sleep quality rather than quantity significantly corresponded with sleepi-

ness.[23] The astonishing finding of the study was that 82.1% of the students reported that they felt tired getting up in the morning. Feeling tired when getting up in the morning as a sleep disorder has been reported by other studies as well. For instance, Buboltz Jr et al,[24] reported that 53.7% of men and 55.2% of women felt tired in the morning. The present study showed that affective disorder, restless legs syndrome, and circadian rhythm disorders were related to feeling tiredness at getting up in the morning. Feeling tired is an issue that must be addressed by health professionals in college students.

Access to the complete picture of complaints related to sleep and daily functions is required to understand sleep episodes that might infer the involvement of psychological processes. In this regard, diverse types of personal attitudes, beliefs, and fears could have a significant role in sleep issues onset. Taking naps and adjusting sleeping schedules have been mentioned by Yang et al,[25] as effective coping strategies to improve sleep quality in first-year college students. Revision in college policies and academic schedules might foster healthy and sufficient sleeping in college students. A sleep media campaign as demonstrated by Orzech et al[11] may be effective in that students slept on average 20 minutes earlier and fell asleep quicker and slept longer than other students.

Because sleep disorders are common among college students, the authors strongly recommend that the college students be assessed sleep disorders and that effective strategies for managing be undertaken. The findings reported in the present study must be interpreted in the light of inherent limitations of a cross-sectional study. In addition, the discrepancy between the results reported in the study and those seen in other studies might be a reflection of the sampling, measurement or methodological criteria. The findings of the study may not be generalizable to other populations in the country because of different sociocultural aspects of the sample size. The study may have been susceptible to measurement bias with respect to the question on alcohol consumption due to nature of cultural perspectives in this region. Moreover, there may have been bias due to poor recall or having a desire to present the "right" response with self-reported data. Future studies might take this into account.

In conclusion, the present study confirmed that insufficient sleep is a common sleep issue in medical students at the University of Duhok, Iraq. The study showed that sleep disorders could have negative impacts on the daily functioning of students. In addition, a number of behavioral and social aspects can be related to the onset of sleep disorders.

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