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Sleep deprivation and associated factors among students of the Institute of Health in Jimma University, Southwest Ethiopia

Original article

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Abstract: **Objective:** Despite getting sufficient sleep being one of the most important things that we can do to keep our body and mind healthy, sleep deprivation has become a major public health concern. This study aimed to determine the prevalence of sleep deprivation and its associated factors among students of the Institute of Health in Jimma University.

Methods: An institution-based cross-sectional study was conducted from April 10 to April 24 in 2019. Data were collected from 365 randomly selected participants and analyzed using Statistical Package for the Social Sciences (SPSS; version 23). Multivariate logistic regression analysis was used to identify the factors associated with sleep deprivation. The level of significance was declared at a *P*-value of <0.05.

Results: A total of 365 participants participated, with a response rate of 97.6%. The study findings showed that 60.8% of students had sleep deprivation and 68.2% had sleep latency. Health problems (adjusted odds ratio [AOR] = 1.91 [95% confidence interval {CI} = 1.01–3.58]), alcohol consumption [AOR = 0.42 (95% CI = 0.2–0.89)], cigarette smoking [AOR = 0.31 (95% CI = 0.09–0.93)], khat chewing [AOR = 0.47 (95% CI = 0.12–0.82)], use of an electronic device before bedtime [AOR = 5.26 (95% CI = 1.78–15.52)], and cumulative grade point average (CGPA) [AOR = 0.48 (95% CI = 0.27–0.83)] were significantly associated with sleep deprivation.

Conclusions: Sleep deprivation was common in the study area. This is mainly due to health problems, substance utilization, long-time use of an electronic device, and low CGPA. Therefore, a strategy and system should be established to limit substance use, enhance proper use of electronic devices, and create awareness on the impact of nonoptimal sleep.

Keywords: *Ethiopia • Jimma University • health students • sleep deprivation*

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1. Introduction

Sleep is a naturally recurring process that is important for human life.[1] It is crucial for daily activities, as well as for physical and mental health. It is also vital for proper brain function, being as important as air, water, and food.[2] Previous studies in America, investigating the regular sleep time for optimal health, have indicated that

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children aged 6–12 years sleep 9–12 h, teenagers aged 13–18 years sleep 8–10 h, and adults sleep 7–9 h per 24-h periods.[3,4]

Sleep deprivation is the condition in which one fails to get enough sleep. It is characterized by the following: failure to get the optimum duration of sleep, sleep interruption, and inability to fall asleep in the bed.[3] Its impact on individuals of all age levels is growing across the world. Among University students all over the world, sleep deprivation has been specifically increasing over time due to the multifaceted and complex interplay among genetics, academic load, technology, environmental factors, social factors, along with the presence of comorbidities.[4,5] It has become a common problem among university students than in the remainder of the population.[2] Among university students around the world, sleep deprivation and poor sleep quality are common and have become significant public health problems. Studies have indicated that sleep deprivation among university students ranges from 24% to 49%,[6,7] and poor sleep quality among students ranges from 33.7% to 84%.[8–12] In Ethiopia, one study revealed that 55.8% of university students had poor sleep quality. Daytime dysfunction was found only among 6.1%, while habitual sleep efficiency was found among 19.4% of the participants.[13]

Sleep deprivation has been shown to have a detrimental effect on certain aspects of working memory.[2] Sleep deprivation has negative consequences in university students, including a wide range of behavioral changes, as well as cognitive and performance deficits. It also leads to declined mood, health problems, and performance deficiency in students, which in turn leads to increased error.[14,15] Specifically, health science students are at increased risk for sleep deprivation because they need to be either awake to do their duty in the hospital or under constant study because of their academic load and examinations.[16]

Different factors can affect sleep quality. For instance, young adults commonly use psychoactive substances due to the latter's temporary stimulant effect and this leads to the problem of poor sleep.[17,18] Caffeine use ultimately leads to decreased amount of nighttime sleep and daytime dysfunction, which usually results in sleep deprivation.[19] High prevalence of poor sleep quality due to Internet addiction and depression in undergraduate students has been reported in Nepal[12] and Ethiopia.[13] Use of alcohol results in serious cognitive impairment and psychomotor and sleep disturbances.[20] Poor sleep quality has been also found to be associated with poor academic achievement and health problems, as well as increased health-care costs and absenteeism from work.[21] In contrast to the above evidence, sleep deprivation has been associated with good academic performance among Iran university students.[22] Studies have found that female students experienced sleep problems more than male students,[23,24] but no significant difference has been found between male and female students in Northern Malaysia.[25] A study on Egyptian medical students has revealed that there was a significant difference among caffeine users and cigarette smokers.[26] Another study on Nigerian university students has shown that there was no significant difference among married and unmarried participants, but a chronic physical illness and alcohol consumption were associated with sleep deprivation.[27]

In general, though different studies indicated that sleep deprivation has become a common problem of university students in different countries, there are very limited studies regarding the prevalence of sleep deprivation and associated factors among university students in sub-Saharan African countries, particularly in Ethiopia. Therefore, this study was intended to determine the prevalence of and factors affecting sleep quality among health science students.

2. Methods

2.1. Study design, area, and period

An institution-based cross-sectional study design was used for this study extending from April 10 to April 24, 2019, in Jimma University. Jimma University is found in the Oromia Region at 352 km southwest of Addis Ababa. Jimma University is one of the oldest public higher education institutes in Ethiopia. The study was conducted in three faculties of the Institute of Health at Jimma University, namely, Faculty of Medical Sciences, Faculty of Public Health, and Faculty of Health Sciences. During the survey, 3274 regular undergraduate students were attending education at the Institute of Health of Jimma University.

2.2. Populations and sample size determination

All regular undergraduate students of the Institute of Health comprised the source population of the study. The study population consisted of randomly selected students who were present during the data collection period and had at least the result of the final semester before the study. Students who had known psychiatry problems other than depression were excluded. The sample size was computed based on a single-population proportion formula with the following assumptions: proportion of problem 55.8% (taken from a previous study),[13] 95% confidence interval (CI), and marginal error of 5%. Finite population correction

formula was used. For nonrespondents, 10% of the final sample size was considered, and the final sample size was 374. After the study population was stratified into 11 departments, proportional allocation was made to each department and the respective batches. Finally, the simple random-sampling technique was used to select the study subjects, by which students were selected at the gates of their classes while they were leaving the class.

2.3. Operational definitions

(1) **Sleep latency:** Refers to the state when the participant reported that he/she takes >15 min to fall asleep in bed**.**
(2) **Electronic device use:** If the participant utilizes/watches at least one of the followings: television, computer, tablet, mobile phone, or audio player, in bed before going to sleep.
(3) **Health problems:** Presence of any physical disabilities and/medical problems, such as epilepsy, asthma, depression, diabetes mellitus, heart problems, and renal problems.
(4) **Sleep deprivation:** This was measured using the Pittsburgh Sleep Quality Index (PSQI): if the summation score of the participant was >5 points out of 21 points, sleep deprivation was ascertained.

2.4. Data collection tools and procedures

Data were collected using the structured and validated PSQI[28] questionnaire and Patient Health Questionnaire (PHQ)-9.[29] PSQI has 7 components and 19 items. The PSQI is a 19-item self-reported questionnaire that evaluates sleep over the past month. The sleep component scores were summarized to yield a total score ranging from “0” to “21”. A score of “0” indicates sufficient sleep, and higher scores indicate severe sleep deprivation. Depression was measured using the PHQ-9. This questionnaire has 9 questions, with 4 scales ranges from “not at all (0)” to “nearly every day (3)”. Finally, it was dichotomized as “having depression” and “not having depression”. Sleep efficiency was calculated from the total number of hours of sleep, by dividing it by the total number of hours in bed and multiplied by 100.

Data were collected via a self-administered questionnaire, and participants filled out the questionnaire by themselves. Data collectors obtained informed consent and gave orientation to the participants on how to fill the questionnaire and waited for the respondents to complete their questionnaires. The questionnaires were immediately retrieved from the respondents.

2.5. Data quality management

The English version questionnaire was translated into Amharic and Afan Oromo local languages. Then, it was retranslated back to English to ensure its consistency. Training was given for 4 baccalaureate science degree nurses, 4 data collectors, and 1 Master of Science degree supervisor 1 week ahead of the actual data collection time on how to take informed consent for ethical issues and collect data. The questionnaire was pretested on 5%[17] of the sample size at Wolkite University, and some relevant amendment was done. The internal consistency of the items was checked, and Cronbach’s α was 0.74. Every questionnaire was cross-checked daily by the supervisors and the principal investigator.

2.6. Data processing and analysis

The data were entered into EpiData (Odense Denmark, EpiData Association, version 4.4.1) and analyzed using Statistical Package for the Social Sciences (SPSS; version 23). Descriptive analysis was done to describe the distribution of variables under study. Bivariate logistic regression analysis was computed to identify the candidate variables for multivariate analysis. Variables with a *P*–value <0.25 were further tested by multivariate logistic regression analysis to identify the factors independently associated with sleep deprivation, and the level of significance was set at *P*-value of <0.05.

2.7. Ethical consideration

The study was conducted after ethical clearance, and an official letter was written to the head of each department by the Institutional Review Board (IRB) of the Institute of Health, Jimma University. The aim of the study was explained to the participants, and informed consent was obtained from each participant. Furthermore, they were given assurance that they are free to withdraw consent and to discontinue participation without any form of prejudice. All completed questionnaires were anonymous, and confidentiality of the collected information was ensured throughout the procedure.

3. Results

3.1. Sociodemographic characteristics and other related variables

Of the 374 students who planned to participate in the study, 365 participants fully responded to the questionnaire, yielding a response rate of 97.6%. According to this study, 303 (83%) participants were not married and 204 (55.9%) participants were males. Regarding

exercise, 151 (41.4%) participants engaged in regular physical activity (Table 1).

Concerning substance use, the study showed that the most common substance utilized was coffee, which was followed by Coca-Cola, and the least common one was smoking cigarette (Figure 1).

3.2. Prevalence of sleep deprivation

The study findings showed that 222 (60.8%) of respondents experienced sleep deprivation. The average nighttime sleep duration of the study participants was 6.29 h (standard deviation [SD]: ±0.854). Participants fell asleep with an average of 23.01 min (SD ± 16.116) after they got into the bed. The sleep latency was reported to be <15 min among 31.8% of the students, 15–30 min among 56.4%, and 30–60 min among 11.5% of students (Table 2; "0" represents sleep latency of <15 min, "1" represents 15–30 min, "2" represents 30–60 min, and "3" represents >60 min). Regarding sleep efficiency, 56.2% of students reported sleep efficiency of >85%. The study also revealed that 161 (44.1%) participants had mild daytime dysfunction due to their sleepiness.

3.3. Factors associated with sleep deprivation

The study findings showed that health problems, cumulative grade point average (CGPA), alcohol consumption, khat chewing, smoking cigarettes, and using electronic devices before bedtime had significant association with sleep deprivation. Accordingly, those students who had health problem/s were almost 2 times more likely to experience sleep deprivation (adjusted odds ratio [AOR] = 1.91 [95% CI = 1.01–3.58; $P = 0.044$]) compared to their counterparts. Similarly, the differences in CGPA showed a significant effect on sleep deprivation; those scoring CGPA of 2–2.99 were 52% less likely to have good sleep compared to those who had ≥3.5 CGPA points (AOR = 0.48 [95% CI = 0.27–0.83; $P = 0.009$]). Alcohol consumption was also a significant contributor to sleep deprivation among these university students, in which alcohol consumers were 58% less likely to have good sleep as compared to their counterparts (AOR = 0.42 [95% CI = 0.2, –0.89; $P = 0.023$]). Khat chewers also experienced more sleep deprivation than those who were not khat chewers; students who were khat chewers were 53% less likely to have good sleep (AOR = 0.47 [95% CI = 0.12–0.82; $P = 0.018$]) than their counterparts. Smoking cigarettes also showed a significant effect on sleep quality; cigarette smokers were 69% less likely to have good sleep compared to nonsmokers (AOR = 0.31 [95% CI = 0.09–0.93; $P = 0.05$]). An electronic device is one of the newly emerging risks for sleep

Variables	Frequency	%
Sex		
Male	204	55.9
Female	161	44.1
Age (years)		
18–19	73	20
20–23	215	58.9
>23	77	21.1
Marital status		
Single	303	83.0
Married	30	8.2
Divorced	11	3.0
Separated	21	5.8
Conflict with friends		
Yes	77	21.1
No	288	78.9
Physical activity		
Yes	151	41.4
No	214	58.6
Current residence		
On campus	320	87.7
Off campus	45	12.3
Health problem		
Yes	65	17.8
No	300	82.2
Conflict with instructors		
Yes	36	9.9
No	329	90.1
Year of study		
1st year	62	17.0
2nd year	72	19.7
3rd year	70	19.2
4th year	70	19.2
5th year	60	16.4
6th year	31	8.5
Current GPA		
>3.5	100	27.4
3–3.49	105	28.8
2–2.99	160	43.8
Depression of participant		
Minimal	161	58.5
Mild	84	30.5
Moderate	24	8.7
Moderate-to-severe	6	1.8

Note: GPA, grade point average.

Table 1. Sociodemographic and other characteristics of the students of the Institute of Health of Jimma University in the year 2019 ($N = 365$).

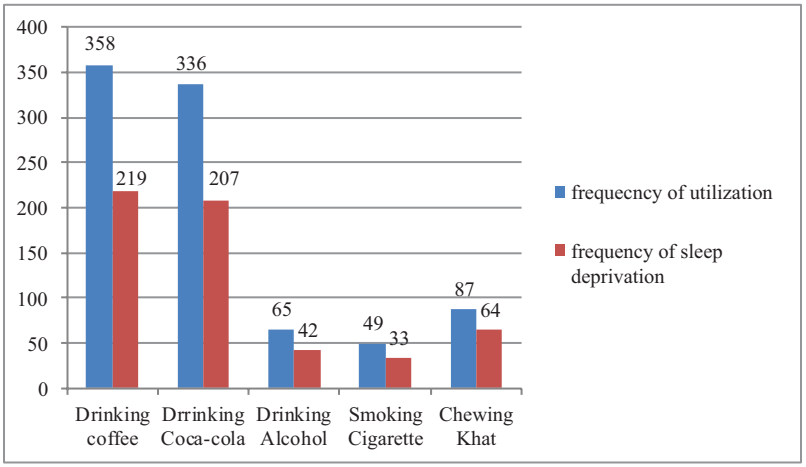


Figure 1. Substance use and sleep deprivation among students of Institute of Health, Jimma University, in 2019.

Variables	Number (%)
Sleep duration (h)	
≥7	159 (43.6)
6–7	146 (40.0)
5–6	45 (12.3)
<5	15 (4.1)
Sleep latency (score)	
0	116 (31.8)
1	206 (56.4)
2	42 (11.5)
3	1 (0.3)
Daytime dysfunction (score)	
0	197 (54)
1	161 (44.1)
2	6 (1.6)
3	1 (0.3)
Habitual sleep efficiency (%)	
>85	205 (56.2)
75–85	87 (23.8)
65–74	35 (9.6)
<65	38 (10.4)
Subjective sleep quality	
Very good	116 (31.8)
Fairly good	104 (28.5)
Fairly bad	145 (39.7)
Sleep disturbance (score)	
0	67 (18.4)
1	279 (76.4)
2	19 (5.2)
3	0
Use of sleep medication	
Not during the past month	313 (85.8)
Less than once a week	51 (14.0)
Once or twice a week	1 (0.3)
Three or more times a week	0
Sleep quality score	
Good sleep	143 (39.2)
Sleep deprivation	222 (60.8)

Table 2. Sleep deprivation and its components' scores among students of the Institute of Health, Jimma University, 2019 ($N = 365$).

quality. In this study, participants who used electronic devices for 60–120 min before bedtime were 5.26 times (AOR = 5.26 [95% CI = 1.78–15.52; $P = 0.003$]) more likely to experience sleep deprivation, as compared to those students who used electronic media for <60 min (Table 3).

4. Discussion

Getting optimal sleep is important for memory consolidation, learning, decision-making, and critical thinking.[30] Therefore, studying about sleep deprivation is vital to identify factors affecting sleep quality and maintain these cognitive functions at optimal level for performance and mental health.

In this study, 60.8% of students were sleep deprived; 44.6% of the participants reported that they slept >7 h/day, whereas 40% slept only 6–7 h/day. In this study, sleep latency was reported by more than three fifths of the study participants. A study conducted in Egypt showed slightly better results than the current findings: according to the Egyptian study, 51.7% of students slept >7 h/d and 28.1% slept 6–7 h/d.[12] The prevalence of sleep deprivation in this study was higher than that in the majority of other studies: United Kingdom,[6] Taiwan,

Variables	Global score (PSQI)		COR (95% CI)	AOR (95% CI)	P–value
	Sleep deprived	Not sleep deprived			
Health problem					
Yes	45 (72.6)	17 (27.4)	0.53 (0.29, 0.97)	1.91 (1.01, 3.58)	0.044
No	177 (58.4)	126 (41.6)	1.00		
Current GPA					
>3.5	52 (52)	48 (48)	1.00		
3–3.99	63 (60)	42 (40)	0.72 (0.41, 1.25)	0.72 (0.40, 1.29)	0.27
2–2.99	107 (66.9)	53 (33.1)	0.53 (0.32, 0.89	0.48 (0.27, 0.83)	0.009
Alcohol consumption					
Yes	92 (67.2)	45 (32.8)	0.61 (0.39, 0.95)	0.42 (0.20, 0.89)	0.023
No	130 (57)	98 (43.)	1.00		
Khat chewing					
Yes	64 (73.6)	23 (26.4)	0.47 (0.27, 0.80)	0.31 (0.12, 0.82)	0.018
No	158 (56.8)	120 (43.2)	1.00		
Smoking cigarettes					
Yes	33 (67.3)	16 (32.7)	0.50 (0.26, 0.94)	0.30 (0.09, 0.93)	0.05
No	187 (59.6)	127 (40.4)	1.00		
Use of electronic media					
<60	166 (62.2)	101 (37.7)	1.00		
60–120	16 (42.3)	15 (57.7)	2.24 (0.99, 5.07)	5.26 (1.78, 15.52)	0.003

Note: AOR, adjusted odds ratio; CI, confidence interval; COR, crude odds ratio; GPA, grade point average; PSQI, Pittsburgh Sleep Quality Index.

Table 3. Factors affecting sleep quality among students of the Institute of Health, Jimma University, 2019 (*N* = 365).

China,[7] India,[8] Malaysia,[9] Lebanon,[10] Nepal,[12] Nigeria,[27] Egypt,[26] and Ethiopia, but, consistent with the findings of a study in Iran.[31] On the other hand, the current study's finding was lower than that from a Saudi university.[11] This implies that sleep deprivation is more common among Jimma University students of health sciences, and that students have been affected by inadequate sleep, which has an impact on their cognitive and academic performances, social life, daily activities, and professional competency, and it can increase the risk of significant public health problems. The possible justification for the higher sleep deprivation in this study area compared with others might be the differences in the educational system and the educational environment; the course delivery system, shortage of time to have a balanced student activity load, and imbalance between the course content and the time available to cover them. The location of the university, which exposes the students to different substance utilization[17,18] and excessive Internet use in the current study area, was also one possible justification for this discrepancy.

This study tried to identify the factors that affect sleep quality. In our study, almost two thirds of caffeine users were sleep deprived (Figure 1), which is almost consistent with the findings in Egypt.[12] Caffeine consumption, even in the afternoon, can impair the ability to fall asleep. Caffeine is an adenosine receptor antagonist and can increase arousal. Caffeine may also act on the gamma-amino butyric acid neurons of the posterior hypothalamus to suppress sleep-promoting pathways. The net effect is that caffeine increases vigilance, alertness, and deprivation.[19] Alcohol consumption was found to be one of the significant factors that increase the risk of sleep deprivation in the study population. Students who drank alcohol were 66% less likely to have good sleep, which agreed with the study findings from Nepal.[12] This is because even though some individuals used alcohol as a sleeping aid, alcohol promotes fragmented sleep in the latter half of the night, which further may also increase the risk for obstructive sleep apnea,[32] which results in sleep disturbance and sleep deprivation. In this study, cigarette smoking was also found to be a risk factor for sleep deprivation, which agreed with the findings of other studies.[10,17] This might be in part due to the fact that cigarette smoking can lead to depression, which in turn leads to sleep disturbance and sleep deprivation. This can be supported by the large proportion of students with depression who were sleep derived.

In this study, khat chewing increased the risk of sleep deprivation, which is in agreement with the findings of other studies.[33] This is because khat contains

cathinone and cathine, which are structurally related to amphetamine, which induces the release of serotonin and dopamine. Both increase alertness and reduce fatigue. The use of these stimulants disturbs sleep patterns, and it is conceivable that chronic use may lead to reduced sleep quality and long-term adverse health effects.[34–36]

Utilization of an electronic device before bedtime was also another determinant factor of sleep quality in our study area, which was also true in other studies. This implies that students who have been utilizing electronic devices for short period of time before bedtime were protected from being sleep deprived.[37] This is due to the fact that during technology use, the blue light that is emitted from the screens of mobile phones, computers, and other devices stops the production of melatonin, the hormone that controls the sleep–wake cycle of the circadian rhythm. Reducing the amount of melatonin produced makes it harder to fall sleep and stay asleep.[38] On the other hand, using electronic devices diverts the attention from initiating sleep and shortens the duration of time for adequate sleep. Moreover, students' low CGPA was also found to be a risk factor for sleep deprivation among the students of the Institute of Health, Jimma University, which agreed with the findings of other studies. This implies that higher-scoring students were saved from being sleep deprived. Other studies indicate that there was variation in sleep quality based on students' academic performance.[39] This can be explained by the deduction that students with lower scores may be worried regarding survival and stayed awake for long periods of time in the night to study, and on the other hand, the above-mentioned factors can affect their academic performance, which will in turn lead to depression and, finally, result in sleep deprivation.

5. Conclusions

The authors conclude that sleep deprivation was common among the students of the Institute of Health, and they are under increased risk for the short- and long-term effects of inadequate sleep. Health problems, alcohol consumption, cigarette smoking, khat chewing, long-time use of an electronic device before bedtime, and low CGPA were independent predictors of sleep deprivation among the study participants. Thus, Jimma University, in collaboration with the Ministry of Education, should establish a system that limits substance utilization among health science students and develop a strategy to monitor the proper use of electronic devices. Health education should be given to increase students' awareness on the importance of optimal sleep, quality of sleep, impact of sleep deprivation, and how to adapt to university life. Further studies on large sample sizes at the national level are needed to analyze the factors unaddressed in this study.

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Ethical approval

The study was conducted after ethical clearance and an official letter was written to the head of each department by the Institutional Review Board (IRB) of the Institute of Health, Jimma University. The aim of the study was explained to the participants, and informed consent was obtained from each participant. Moreover, assurance was given that they are free to withdraw consent and to discontinue participation without any form of prejudice. All completed questionnaires were anonymous, and the confidentiality of the collected information was ensured throughout the procedure.

Conflicts of interest

All contributing authors declare no conflicts of interest.

References

1. Giri P, Baviskar M, Phalke D. Study of sleep habits and sleep problems among medical students of Pravara Institute of Medical Sciences Loni, Western Maharastra, India. *Ann Med Health Sci Res*. 2013;3:51–54.
2. Patrick Y, Lee A, Raha O, et al. Effects of sleep deprivation on cognitive and physical performance in university students. *Sleep Biol Rhythms*. 2017;15:217–225.
3. Genzel L, Ahrberg K, Roselli C, et al. Sleep timing is more important than sleep length or quality for medical school performance. *Chronobiol Int*. 2013;30:766–771.

4. Stranges S, Tigbe W, Gómez-Olivé FX, Thorogood M, Kandala N-B. Sleep problems: an emerging global epidemic? Findings from the INDEPTH WHO-SAGE study among more than 40,000 older adults from 8 countries across Africa and Asia. Sleep. 2012;35:1173–1181.
5. El Hangouche AJ, Jniene A, Aboudrar S, et al. Relationship between poor quality sleep, excessive daytime sleepiness and low academic performance in medical students. *Adv Med Educ Pract*. 2018;9:631–638.
6. Bogowicz P, Ferguson J, Gilvarry E, Kamali F, Kaner E, Newbury-Birch D. Alcohol and other substance use among medical and law students at a UK university: a cross-sectional questionnaire survey. *Postgraduate Med J*. 2018;94:131-136.
7. Pensuksan WC, Lertmaharit S, Lohsoonthorn V, et al. Relationship between poor sleep quality and psychological problems among undergraduate students in the Southern Thailand.*Walailak J Sci Technol.* 2016;13:235-242.
8. Kaur G, Sharma V, Singh A. Association of sleep quality with general health: an Indian college students study. *Int J Med Sci Public Health*. 2015;4:1767–1771.
9. Aung K, Nurumal M. Sleep quality and academic performance of nursing students. *J Nurs Health Sci*. 2016;5:145–149.
10. Hajjar-muça TA, Duffy JF. Predictors of poor sleep quality among Lebanese university students: association between evening typology, lifestyle behaviors, and sleep habits. *Nat Sci Sleep*. 2014;6: 11–18.
11. Alsaggaf MA, Wali SO, Merdad RA, Merdad LA. Sleep quantity, quality, and insomnia symptoms of medical students during clinical years: relationship with stress and academic performance. *Saudi Med J*. 2016;37:173–182.
12. Bhandari PM, Neupane D, Rijal S, Thapa K, Mishra SR, Poudyal AK. Sleep quality, internet addiction and depressive symptoms among undergraduate students in Nepal. *BMC Psychiatry*. 2017;17:106.
13. Lemma S, Gelaye B, Berhane Y, Worku A, Williams MA. Sleep quality and its psychological correlates among university students in Ethiopia: a cross-sectional study. *BMC Psychiatry*. 2012;12:237.
14. Fafrowicz M, Oginska H, Mojsa-kaja J, Marek T, Golonka K, Tucholska K. Chronic sleep deficit and performance of a sustained attention task — an electrooculography study. *Chronobiol Int.* 2010;27:934–944.
15. El Desouky EM, Lawend A, Abu H, Awed EM. Relationship between quality of sleep and academic performance among female nursing students. *Int J Nurs Didactics*. 2015;4:1–9.
16. Rasekhi S, Ashouri FP, Pirouzan A. Effects of sleep quality on the academic performance of undergraduate medical students. *Health Scope.* 2016;5:e31641.
17. Vélez JC, Souza A, Traslaviña S, et al. The epidemiology of sleep quality and consumption of stimulant beverages among Patagonian Chilean College Students. *Sleep Disord*. 2013;2013:910104.
18. Dean DA 2nd, Goldberger AL, Mueller R, et al. Scaling up scientific discovery in sleep medicine: the national sleep research resource. *Sleep.* 2016;39:1151-1164.
19. Walsh JK, Muehlbach MJ, Humm TM, Dickins QS, Sugerman JL, Schweitzer PK. Effect of caffeine on physiological sleep tendency and ability to sustain wakefulness at night. *Psychopharmacology*. 1990;101:271–273.
20. Sarbazvatan H, Amini A, Aminisani N, Shamshirgaran SM. Sleep quality and academic progression among students of Tabriz University of Medical Sciences, Northwest of Iran. *Res Dev Med Educ*. 2017;6:29–33.
21. Cheng SH, Shih CC, Lee IH, et al. A study on the sleep quality of incoming university students. *Psychiatry Res*. 2012;197:270–274.
22. Rasekhi S, Ashouri FP, Pirouzan A. Effects of sleep quality on the academic performance of undergraduate medical students. *Health Scope*. 2016;5.
23. Becker SP, Jarrett MA, Luebbe AM, Garner AA, Burns GL, Kofler MJ. Sleep in a large, multi-university sample of college students: sleep problem prevalence, sex differences, and mental health correlates. *Sleep Health*. 2018;4:174–181.
24. Kenney SR, Lac A, Labrie JW, Hummer JF, Pham A. Mental health, sleep quality, drinking motives, and alcohol-related consequences: a path-analytic model. *J Stud Alcohol Drugs*. 2013;74:841–851.
25. Lai PP, Say YH. Associated factors of sleep quality and behavior among students of Two Tertiary Institutions in Northern Malaysia. *Med J Malaysia*. 2013;68:195–203.
26. Elwasify M, Barakat DH, Fawzy M, Elwasify M. Quality of sleep in a sample of Egyptian medical students Quality of sleep in a sample of Egyptian medical students. 2018;4:31.
27. James BO, Omoaregba JO, Igberase OO. Prevalence and correlates of poor sleep quality among medical students at a Nigerian university. *Ann Niger Med*. 2011;5:1–5.
28. Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index:

a new instrument for psychiatric practice and research. Psychiatry Res. 1989;28:193-213.
29. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med*. 2001;16:606–613.
30. Amin HS, Almazroua IS, Alsahlan AS, et al. Effect of sleep deprivation on the attitude and performance of medical students, Riyadh, Saudi Arabia. *Int J Med Sci Public Health*. 2016;5:575-581.
31. Sage C, Burgio E. Electromagnetic fields, pulsed radiofrequency radiation, and epigenetics: how wireless technologies may affect childhood development. *Child Dev*. 2017;89:129-136.
32. Taylor DJ, Bramoweth AD. Patterns and consequences of inadequate sleep in college students: substance use and motor vehicle accidents. *J Adolesc Health*. 2010;46:610–612.
33. Lemma S, Patel SV, Tarekegn YA, et al. The epidemiology of sleep quality, sleep patterns, consumption of caffeinated beverages, and khat use among Ethiopian College Students. *Sleep Disord*. 2012;2012:583510.
34. Hassan NA, Gunaid AA, Murray-Lyon IM. Khat (Catha edulis): health aspects of khat chewing. *East Mediterr Health J*. 2007;13:706–718.
35. Kelly JP. Cathinone derivatives: A review of their chemistry, pharmacology and toxicology. *Drug Test Anal.* 2011;3:439–453.
36. Cox G, Rampes H. Adverse effects of khat: a review. *Adv Psychiatr Treat.* 2003;9:456–463.
37. Hapuarachige C, Fakunle I, Ahmed HI, Sparrow S. The effects of electronic device use on the sleep quality of health science students in the United Arab Emirates. *Gulf Med Univ*. 2014;3:6–15.
38. Fossum IN, Nordnes LT, Storemark SS, Bjorvatn B, Pallesen S. The association between use of electronic media in bed before going to sleep and insomnia symptoms, daytime sleepiness, morningness, and chronotype. *Behav Sleep Med.* 2014;12:343–357.
39. Lemma S, Berhane Y, Worku A, Gelaye B, Williams MA. Good quality sleep is associated with better academic performance. *Sleep Breath*. 2014;18:257–263.