

Sleep quality and associated factors during COVID-19 pandemic among medical students of St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia

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Abstract

Background: Poor sleep can affect mental health and cause metabolic, immunologic and endocrine problems. Sleep quality of students has shown drastic change during COVID-19. In Ethiopia, there is gap in the knowledge of sleep quality of medical students, especially during a pandemic. This study was conducted to assess the quality and associated factors of sleep among undergraduate medical students during the COVID-19 pandemic in St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia.

Methods: We conducted cross-sectional study from July to September 2021 by selecting eligible undergraduate medical students using stratified sampling method. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI) score and poor sleep was defined as a PSQI score >5. Multiple binary logistic regression was used to determine the factors associated with poor sleep at p-value < 0.05. The data were analyzed using IBM SPSS Statistics Version 24.

Results: Out of the 224 students who participated in the study, 57.6% had poor sleep. The premed students were four times more likely [Adjusted Odds Ratio (AOR) = 4.09; 95% CI: 1.14, 14.67]; the preclinical-year-1 students were five times more likely (AOR = 5.05; 95% CI: 1.67, 15.25); and the clinical-year-2 students were 2.65 times more likely (AOR = 2.65; 95% CI: 1.05, 6.70) to have poor sleep as compared with medical interns. Khat users were 4.56 times more likely (AOR = 4.56; 95% CI: 1.15, 18.00), and students who had dorm mates with respiratory illness symptoms were two times more likely to have poor sleep (AOR = 1.94; 95% CI: 1.05, 3.59).

Conclusion: Poor sleep is a common problem in the College affecting six out of ten medical students during the COVID-19 pandemic. The college should make regular assessment of the sleep quality of students and should develop strategies to address the identified determinants of poor sleep.

Keywords: COVID-19, Ethiopia, Medical students, PSQI score, Sleep quality

Background

Sleep is defined as a naturally recurring state characterized by unconsciousness, relatively suspended sensory activity, and inactivity of nearly all voluntary muscles (1). Good sleep quality is directly linked with better psychological and physical health, less daytime sleepiness and a general sense of well-being (2).

The direct benefits of quality of sleep were not as well quantified and described as the deleterious effects from lack of quality sleep (3). Sleep deprivation affects the immune system negatively and results in metabolic regulation problems disrupting the blood pressure and cardiovascular functions. In addition, it impairs mental well-being (4). Moreover, among medical students, poor sleep quality has been linked to poor mental and physical health, addiction to substances and suicidal ideation. These effects in turn affect academic performances and result in grave consequences such as accidents and medical error (5).

Since its detection in Wuhan China, in December 2019, Coronavirus Disease 2019 (COVID-19), an infection with the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) has spread exponentially and has resulted in deaths of more than 6 million people until 30 June 2022 (6, 7). The consequences from the pandemic have been multidimensional. People suffered from fear of death of themselves and their loved ones and had anxiety from the unknown as much as they suffered from the physical consequences of the illness. Changes in the daily routine of people, like changes in sleep habits, eating habits and electronic usage were studied across the globe in many countries, many studies showing resultant unhealthy coping mechanisms in different populations especially medical students (4, 7-9).

Some of the measures applied to control the rapidly transmitting COVID-19 infections, e.g., the physical distancing, testing, quarantine and mandatory mask use, were stressful for the majority of the population. Such alterations in the routine were also extended to university students who faced a lot of additional unexpected changes like a pause in their education followed by implementation of e-learning during the pandemic. Medical students also experienced a shift in their curriculum with changes especially on lab sessions and clinical rotations in many colleges. Such changes can directly or indirectly affect the quality of sleep of medical students (10, 11).

There is only a little published evidence on the quality of sleep of university students in Ethiopia. Data is even scarcer among medical students, with only two published studies from Jimma University and Addis Ababa University (3, 5).

The quality of sleep of medical students which is believed to be poor makes them among the most liable for a bigger impact from external changes. There are no studies that assessed the effect of the COVID-19 pandemic on the quality of sleep of medical students in Ethiopia. There is only one cross-sectional research done on the same topic in other African countries as well (12). This study aimed to objectively assess the quality of sleep with its associated factors among medical students at St. Paul's Hospital Millennium Medical College (SPHMMC), Addis Ababa, Ethiopia, in 2021, during the COVID-19 pandemic.

Methods

Study setting, design, period, and population

To conduct this study, ethical clearance was granted from the Institutional Review Board (IRB) of SPHMMC and informed consent was obtained from each of the study participants. We conducted an institution-based cross-sectional study at SPHMMC, Addis Ababa, Ethiopia, from August to September 2021. SPHMMC is one of the three public medical colleges located in Addis Ababa, Ethiopia. Addis Ababa is the capital city of Ethiopia and the seat of the African Union. Though St. Paul Hospital was established more than five decades ago, the College was established during the Ethiopian Millennium in 2007. As of 2021, the College has more than 3,000 clinical and non-clinical staff and provides medical service, medical training and community service for the population of Addis Ababa and the surrounding regions. The College enrolls undergraduate medical students from all regional states of Ethiopia with special considerations for emerging and underrepresented regions. In the 2020/21 academic year, a total of 648 undergraduate medical students were enrolled and attending their education in the College. The premed, preclinical year, clinical year and internship students were 82, 199, 256 and 112, respectively.

Sample size determination and data collection methods

The study participants were randomly selected undergraduate medical students who were registered for the academic year and attending their school during the study period. Those students who were sick and unable

to respond to the questions were excluded from the study. We calculated sample size for each of the two specific objectives using the single population proportion and the two population proportions formulae, respectively, and we took the larger. We also adjusted the calculated sample size for the total number of undergraduate medical students in the College (i.e., 648) and added a 10% non-response rate. Accordingly, the final estimated sample size was 238. Based on the total number of registered undergraduate medical students in each batch and the proportion of male and female students, we employed stratified sampling technique.

Study variables and operational definitions

Sleep quality was the dependent variable of the study and it was categorized into poor and good sleep quality based on the Pittsburgh Sleep Quality Index (PSQI) score. The independent variables were socio-demographic characteristics (age, sex, year of study and number of students per dorm); behavioral characteristics (use of substances like khat, alcohol, caffeinated drinks and cigarette; bed time internet and computer use; and regular physical exercise); COVID-19-related variables (having COVID-19; family member having COVID-19; class/dorm-mate having COVID-19); respiratory illness symptoms related (having respiratory illness symptoms and class/roommate having respiratory illness symptoms). Sleep quality was defined as a measurement of how well students were sleeping and that was assessed based on the PSQI score. The PSQI tool has seven components (subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication and daytime dysfunction). Each component has four possible scores: 0 to 3. Zero and three implied the best and poorest scores for sleep quality, respectively. Hence, the global PSQI was calculated out of 21 and scores > 5 were categorized as **poor sleep quality** and scores < 5 were categorized as **good sleep quality** (13).

Alcohol use: use of drinks which have alcoholic content irrespective of type and dose.

Khat use: consumption of Khat irrespective of type and amount.

Cigarette/marijuana use: smoking tobacco or marijuana irrespective of type and amount.

Caffeine intake: consumption of caffeinated drinks (tea, coffee,

macchiato, Coca-Cola) and chocolate. COVID related Respiratory symptoms: having acute duration of (within 2 weeks) cough, fever, shortness of breath).

Data collection and processing

We prepared an online self-administered questionnaire in English language by adapting it from the PSQI tool and other similar studies(2). The questionnaire had four sections: socio-demographic, behavioral, COVID-19-related and PSQI parts. Before the actual data collection, we conducted pilot test among 25 medical students from Bethel medical college. Some students commented about vagueness of few questions and we made revisions accordingly. We shared the online Google Form for the sampled students and they filled it online. We checked the completeness, consistency and accuracy of the filled forms and made the necessary cleaning. We exported the filled forms first to Microsoft Word 2016 and then to IBM SPSS (Statistical Product and Service Solutions) Statistics Version 24 (IBM Corp, Armonk, NY, USA) for final analysis.

Statistical analysis

We used descriptive statistics to summarize the variables by computing the percentage, mean, median, standard deviation (SD) and interquartile range (IQR), as appropriate. To identify the factors associated with poor sleep quality, we used binary logistic regression analyses. During the final regression analysis, we checked for the presence of any outlier, multi-collinearity and the model's goodness-of-fit. Accordingly, no outlier was detected based on the Cook's distance which was less than one for all the cases; no multi-collinearity was detected among the independent variables; and based on the Hosmer-Lemeshow test, the model was a good fit with p value of 0.181. For the final multiple binary logistics regression model, we used all the variables that had $p < 0.2$ during the simple binary logistic regression analysis. To present the estimated crude and adjusted effect sizes, we used Odds Ratio (OR) with 95% Confidence Interval (CI). We used $p < 0.05$ to claim statistically significant association.

Results

Socio-demographic profile of students

A total of 224 undergraduate medical students participated in the study with a response rate of 94.1%. The students' age ranged from 18-28 years and the mean (\pm SD) was 22.2 (\pm 2.1) years. One hundred thirty-two (58.9%) of the respondents were male students. Pre-med and clinical-year-2 students comprised the lowest (26, 11.6%) and the highest (50, 22.3%) number of participants, respectively. Six out of ten (59.8%) participants were Orthodox Christians and 168 (75.0%) of them were living in dormitories with 4-6 students. [Table 1]

Table 1. Demographic characteristics of undergraduate medical students at SPHMMC, Addis Ababa, Ethiopia, 2021 (n = 224)

Variable	Category	Frequency	Percent
Age	18-20	50	22.3
	21-23	117	52.2
	24+	57	25.4
Age	Mean = 22.2 Standard Deviation (SD) = 2.1		
Sex	Female	92	41.1
	Male	132	58.9
Year of study	Pre-med	26	11.6
	Preclinical 1	31	13.8
	Preclinical 2	40	17.9
	Clinical 1	39	17.4
	Clinical 2	50	22.3
	Interns	38	17.0
Religion	Orthodox	134	59.8
	Protestant	47	21.0
	Muslim	27	12.1
	Other*	16	7.1
Students per dorm	<4	56	25.0
	4-6	168	75.0

SPHMMC: St. Paul's Hospital Millennium Medical College

*Other includes Atheist, Agnostic, None, Messianic, Jehovah's Witness, Catholic and Maverick Spirituality

Behavioral characteristics of students

Among the respondents, 163 (72.8%), 209 (93.3%) and 207 (92.4%) of them never used alcohol, cigarette and khat, respectively. Around half (46.4%) of them used caffeinated drinks often. Half (49.1%) of the students used internet always during bed time and 50.9% of them used computer always during bed time. Only 34 (15.2%) of the students performed regular physical exercise. [Table 2]

Table 2. Behavioral characteristics of undergraduate medical students at SPHMMC, Addis Ababa, Ethiopia, 2021 (n = 224)

Variable	Category	Frequency	Percent
Alcohol intake	Often	7	3.1
	Occasionally	51	22.8
	Rarely	3	1.3
	Never	163	72.8
Use of cigarette or Marijuana or Shisha	Often	5	2.2
	Occasionally	10	4.5
	Never	209	93.3
Use of khat	Often	6	2.7
	Occasionally	11	4.9
	Never	207	92.4
Caffeine intake (Coca, tea, coffee, chocolate)	Often	104	46.4
	Occasionally	100	44.6
	Never	18	8.0
	Other	2	0.9
Internet use during bed time	Always	110	49.1
	Sometimes	114	50.9
Computer use during bed time	Always	114	50.9
	Sometimes	110	49.1
Regular physical exercise	Yes	34	15.2
	No	190	84.8

SPHMMC: St. Paul's Hospital Millennium Medical College

COVID-19 infection and related manifestations

One third (33.0%) of the students themselves and 29.9% of their family members had had COVID-19, respectively. More than eight in ten (82.6%) of the students had classmates with COVID-19. Around one third (35.3%) of the students themselves and 42.4% of their dorm mates had respiratory illness symptoms. Ninety-eight (43.8%) of the participants had concern about the cancellation of classes because of COVID-19 and 50 (22.3%) of them had negative thoughts about COVID-19. [Table 3]

Table 3. Clinical and COVID-19-related responses of undergraduate medical students at SPHMMC, Addis Ababa, Ethiopia, 2021 (n = 224)

Variable	Category	Frequency	Percent
Infected with COVID-19	Yes	74	33.0
	No	150	67.0
Any family member infected with COVID-19	Yes	67	29.9
	No	157	70.1
Any classmate with COVID-19	Yes	185	82.6
	No	39	17.4
Respiratory symptoms	Yes	79	35.3
	No	145	64.7
Dormmate with respiratory symptoms	Yes	95	42.4
	No	129	57.6
Concern about cancelation of classes due to COVID-19	Yes	98	43.8
	No	126	56.3
	Yes	50	22.3
Negative thoughts about COVID-19	No	94	42.0
	Maybe	80	35.7

SPHMMC: St. Paul's Hospital Millennium Medical College; COVID-19: Coronavirus Disease 2019

Magnitude and components of sleep quality

The median global PSQI score was 6.0 out of 21 and the interquartile range (IQR) was 4.0-8.0. The minimum and maximum scores were 0 and 16, respectively. In this study, more than half of the students (129, 57.6%) were having poor sleep quality (PSQI > 5). Among the seven components of sleep quality (*subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication and day time dysfunction*), the day time dysfunction (36.2%), sleep duration (30.8%) and subjective sleep quality (27.7%) were the three highest proportions with a score of either “2” or “3”. [Table 4]

Factors associated with poor sleep quality

The year of study, use of khat and presence of dorm-mate with respiratory illness symptoms were the three variables that showed significant association with poor sleep quality in the current study.

Table 4. PSQI scores of medical students at SPHMMC, Addis Ababa, Ethiopia, 2021 (n = 224)

Components	Score			
	0 n (%)	1 n (%)	2 n (%)	3 n (%)
Component 1: Subjective sleep quality	42 (18.8)	120 (53.6)	46 (20.5)	16 (7.1)
Component 2: Sleep latency	79 (35.3)	94 (42.0)	43 (19.2)	8 (3.6)
Component 3: Sleep duration	26 (11.6)	129 (57.6)	50 (22.3)	19 (8.5)
Component 4: Habitual sleep efficiency	140 (62.5)	46 (20.5)	21 (9.4)	17 (7.6)
Component 5: Sleep disturbances	24 (10.7)	169 (75.4)	29 (12.9)	2 (0.9)
Component 6: Use of sleeping medication	203 (90.6)	7 (3.1)	10 (4.5)	4 (1.8)
Component 7: Day time dysfunction	36 (16.1)	107 (47.8)	66 (29.5)	15 (6.7)
Global PSQI Score (Out of 21)	Minimum = 0 Median = 6.0	Maximum = 16 Interquartile range = 4.0–8.0		
Sleep Quality	Poor (PSQI Score > 5)		129 (57.6)	
	Good (PSQI Score < 5)		95 (42.4)	

PSQI: Pittsburgh Sleep Quality Index; SPHMMC: St. Paul's Hospital Millennium Medical College

Though the number of students in a dormitory and the presence of a classmate infected with COVID-19 showed significant association during the simple binary logistic regression analysis, they were no more significant during the multivariable analysis. In the current study, neither

the simple nor the multiple binary logistic regression analyses showed significant association between sex of the student and poor sleep quality. Compared with the medical interns, the premed, preclinical-year-1 and clinical-year-2 students were more likely to have poor sleep quality: the premed students were four times more likely (AOR = 4.09; 95% CI: 1.14, 14.67); the preclinical-year-1 students were five times more likely (AOR = 5.05; 95% CI: 1.67, 15.25); and the clinical-year-2 students were 2.65 times more likely (AOR = 2.65; 95% CI: 1.05, 6.70). Students who use khat were 4.56 times more likely to have poor sleep quality compared with the non-users (AOR = 4.56; 95% CI: 1.15, 18.00). Students who had dorm mates with respiratory illness symptoms were two times more likely to have poor sleep quality compared with their counterparts (AOR = 1.94; 95% CI: 1.05, 3.59). [Table 5]

Discussion

Poor sleep quality can lead to various short- and long-term consequences on the health and academic performance of college students. The frequency of sleep disruption and the related problems could be even worse among medical students because of multifaceted factors including homesickness, life-style, environmental factors, higher levels of academic loads, frequent exams and possibly higher stresses (14). Worse yet, in 2020 and 2021, the world experienced one of the worst pandemics in history COVID-19 which had the potential to affect the sleep patterns of medical students. In Ethiopia, there is scarcity of data that can adequately inform policy and practice related to sleep pattern of medical students, especially during a pandemic. Hence, we conducted a study on the sleep quality of medical students in SPHMMC, Addis Ababa, Ethiopia. The study revealed that about six in ten students were having poor sleep and the factors associated with poor sleep were year of study, use of khat and the presence of a dorm mate with respiratory illness symptoms.

Among the 224 medical students enrolled in this study, 57.6% of them had poor sleep. This magnitude was comparable to other studies conducted in Jimma University, a single study from Haromaya University and University of Gondar, and Addis Ababa University which were 54.2% and 55.8% and 62%, respectively (3, 5, 15). However, the magnitude was quite higher than the reports from Malaysia, Nigeria, China, Nepal and India that estimated 16%, 32.5%, 19%, 30.4%, and 34.6% of poor sleep among medical students, respectively (2, 14, 16-18).

Table 5. Factors associated with poor sleep quality among medical students at SPHMMC, Addis Ababa, Ethiopia, 2021 (n=224)

Variable	Category	Sleep Quality		COR (95% CI)	AOR (95% CI)	P-value
		Poor n (%)	Good n (%)			
Sex	Female	59 (64.1)	33 (35.9)	1.45 (0.84, 2.50)	1.70 (0.93, 3.13)	0.087
	Male	73 (55.3)	59 (44.7)	Ref*	Ref	
Year of study	Pre-med	20 (76.9)	6 (23.1)	5.11 (1.67, 15.67)	4.09 (1.14, 14.67)	0.031
	Preclinical 1	23 (74.2)	8 (25.8)	4.41 (1.57, 12.40)	5.05 (1.67, 15.25)	0.004
	Preclinical 2	18 (45.0)	22 (55.0)	1.26 (0.51, 3.09)	1.42 (0.54, 3.74)	0.475
	Clinical 1	23 (59.0)	16 (41.0)	2.20 (0.89, 5.48)	2.16 (0.82, 5.71)	0.118
	Clinical 2	33 (66.0)	17 (34.0)	2.98 (1.24, 7.14)	2.65 (1.05, 6.70)	0.039
	Internship	15 (39.5)	23 (60.5)	Ref	Ref	
Number of students in dorm	<4	26 (46.4)	28 (53.6)	0.51 (0.28, 0.93)	0.56 (0.29, 1.08)	0.085
	4-6	106 (63.1)	62 (36.9)	Ref	Ref	
Khat use	Yes	14 (82.4)	3 (17.6)	3.52 (0.98, 12.62)	4.56 (1.15, 18.00)	0.030
	Never	118 (57.0)	89 (43.0)	Ref	Ref	
Classmate infected with COVID-19	Yes	102 (55.1)	83 (44.9)	0.37 (0.17, 0.82)	0.43 (0.17, 1.11)	0.081
	No	30 (76.9)	9 (23.1)	Ref	Ref	
Dormmate with respiratory illness symptoms	Yes	62 (65.3)	33 (34.7)	1.58 (0.92, 2.73)	1.94 (1.05, 3.59)	0.033
	No	70 (54.3)	59 (45.7)	Ref	Ref	

*Ref: Reference; COR: Crude Odds Ratio; CI: Confidence Interval; AOR: Adjusted Odds Ratio; SPHMMC: St. Paul's Hospital Millennium Medical College; COVID-19: Coronavirus Disease 2019

Whilst a Chinese study on depression and poor sleep during a pandemic among medical students showed a 33.2% of poor sleep (9). Similar to ours, the Nepalese and Indian studies were conducted during COVID-19 but the estimate in our study was almost double to their reports (2, 17). Other research in Greece indicated poor sleep of (52.4% with mean PSQI score of 6.6 ± 3.25) (10). A cross-sectional study in seven different countries (Egypt, Sudan, Dominican republic, India, Pakistan, Guyana and Mexico,) revealed poor sleep in 73.5% of participants, which is higher than ours (12). Similarly, a research in Tunisian medical college also showed higher proportion of poor sleep in 72.5% of the medical students (19). Likewise, the magnitude of poor sleep quality in the current study was lower than the Pakistani and Saudi Arabian studies that reported 64.2% and 74.2% of their medical students, respectively, were having poor sleep (20, 21). A study conducted in Peru during the pandemic reported that 83.9% of the medical students were having bad sleep according to the PSQI score, but only 47.1% perceived as having a bad sleep (22). These discrepancies in the magnitude of poor sleep could be related with the timing of studies, the sample sizes, environmental, social and cultural variations as well as the different learning curriculum of the medical schools. An Italian study of 6th year medical students showed that during the lockdown, students generally had longer sleep and sitting time than the pre-lockdown time (23). In a Turkish study that compared the pre- and post-COVID-19 sleep quality of medical interns, 27.8%, 38.6%, and 33.6% of the participants reported *no change*,

improvement, and *reduction* of their sleep quality, respectively (7). Similarly, in a Brazilian study among medical students, 34.5% reported worsening of sleep quality after COVID-19 while 36% of them reported improvement in their sleep quality after the pandemic (24). A Polish study during the pandemic showed a higher chances of insomnia and poor sleep among university medical students during COVID-19 which rose from 28.2% to 58.1% from pre COVID-19 to COVID-19 era (25).

The year of study was one of the determinants of sleep quality in the current study. The pre-medicine, pre-clinical year 1 and clinical year 2 students were more likely to have poor sleep quality compared with the medical interns. Several other studies also found out that the pattern of sleep quality was unevenly distributed across years of study. Saudi Arabian and Brazilian studies among medical students showed that second- and fourth-year students were more likely to have poor sleep compared with other students (20, 24). Similarly, a study in Jimma and Haromaya Universities by Lemma et al showed that the odds of having poor sleep was significantly higher among second and third year students (3). A study in Greece also showed 6th year medical students being more affected by poor sleep than the rest (10); while Chinese study showed 5th year students being more affected by poor sleep (9). This variation can possibly result from difference in curriculum implemented by the medical schools and the fact that fresh students in their first 2 years of medical school life can possibly encounter a struggle to cope up with the home sickness, stressful environment and high academic load. In addition, the

type of exams and academic load across the different years of study are potential factors. For example, in SPHMMC students should take qualification exams during their clinical year two attachment that is quite demanding and might compromise their sleep.

Khat use was another significant factor that affected the sleep quality of the medical students in the current study. Students who were using khat were 4.56 times more likely to have poor sleep. This finding is in line with a research done in Jimma University that showed an association between khat chewing and poor sleep quality (1). A Nigerian study also showed a significant association between poor sleep and using psychoactive substances like alcohol (14). This is probably due to a sympathetic stimulation by the psychoactive substances. Such substances can disrupt the sleep pattern and keep the users awake (1).

The presence of a dormmate with respiratory illness symptoms was a significant factor associated with poor sleep in this study. Students who had symptomatic dormmate were two times more likely to have poor sleep. This might be related with the fact that COVID-19 is transmitted through a close respiratory contact. Students with symptomatic dormmate can probably be worried that their dormmate could be infectious. Such worry can compromise their sleep quality. A study which was done in 7 different countries (Egypt, Sudan, Dominican Republic, India, Pakistan, Mexico and Guyana) showed a higher number of poor sleep in students who share rooms with COVID-19 infected individual than those who do not have COVID-19 patients in their surroundings (12).

In the current study, quite higher proportion of female medical students had poor sleep compared with the males (64.1% and 55.3%), but the difference was not statistically significant. A study conducted among nonmedical students of Ethiopia in Gondar and Haromaya Universities showed that females were more likely to have poor sleep (3). A Nepalese study also showed that females were more likely to have poor sleep than male student.(2) Same goes with a Pakistani study conducted in 2013 that showed 80.5% of the female students had poor sleep whereas only 74.0% of the males had poor sleep (26). A study in Saudi Arabia also showed a higher level of poor sleep in female medical students than males (20). Female medical students in Greece and China also had a higher percentage of poor sleep (9, 10). While studies conducted in Addis Ababa University Medical School showed no significant association between sleep quality and sex (5). Similarly, a study in 7 different

countries in medical students, showed no variation of sleep quality among the two sexes (12). Same goes for Turkish medical students (7). These discrepancies could possibly result from differences in the sample sizes of the studies as well as sociocultural and environmental issues in the different settings.

Definitely, the study could elicit interesting and relevant findings about sleep pattern during a pandemic from a setting where there is scare data, but there were few potential limitations which need to be considered. We used self-administered questionnaires and some responses of the participants might be biased because of social desirability (e.g., substance use). Since we employed cross-sectional study, we cannot be sure of the temporal order of the independent and dependent variables (e.g., khat use and having dormmate with respiratory illness symptoms versus the poor sleep quality).

Conclusion and recommendations

Poor sleep is a huge problem in the college affecting more than half of the undergraduate medical students. The determinants of poor sleep are the year of study, khat use and having a dormmate with respiratory illness symptoms. Thus, the college should regularly assess the sleep quality of medical students and design strategies to improve their sleep quality with special emphasis to most affected groups. Other medical schools and Federal Ministry of Health (FMOH) should work on conducting similar researches in other medical schools.

Abbreviations and Acronyms

AOR: Adjusted Odds Ratio

CI: Confidence Interval

COR: Crude Odds Ratio

COVID-19: Coronavirus Disease 2019

FMOH: Federal Ministry of Health

IQR: Interquartile Range

IRB: Institutional Review Board

OR: Odds Ratio

PSQI: Pittsburgh Sleep Quality Index

SARS-CoV-2: Severe Acute Respiratory Coronavirus 2 Syndrome

SD: Standard Deviation

SPHMMC: St. Paul's Hospital Millennium Medical College

SPSS: Statistical Product and Services Solutions

Declarations

Ethics approval and consent to participate

Ethical clearance was obtained from the Institutional Review Board (IRB) of St. Paul's Hospital Millennium Medical College. All the study participants provided their informed consent to participate in the study voluntarily. We strictly observed the confidentiality of the information and privacy of the participants.

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Authors' contributions

MS: Conceptualized and designed the study as well as prepared the manuscript. ED, TE, BK and LG did the data collection and curation. YW: contributed for the study design, data analysis and interpretation. All authors reviewed and approved both the proposal and the final manuscript.

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Competing interests

All the authors declared no competing interest in this work.

Data availability statement

All the collected data were analyzed and used for the manuscript preparation. The complete dataset used for the study is available from the corresponding author upon reasonable request.

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