Original article

Sleep quality and associated factors among undergraduate medical students during Covid-19 confinement

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A B S T R A C T

Problem considered: Medical students are vulnerable to poor sleep quality which may lead to attention difficulties and poor academic performance. Good quality sleep is needed for optimal neurocognitive and psychomotor functions as well as physical and mental health. This study aimed to assess the prevalence of poor sleep quality among undergraduate medical students during home confinement at the time of Covid-19 pandemic and analyze the relationship between sleep quality and relevant socio-demographic and psychological variables.
Methods: A cross-sectional study was conducted among 284 undergraduate medical students of a teaching hospital of Bhubaneswar from October–November 2020. Using a semi-structured questionnaire, relevant information was collected. Sleep quality of the students was assessed using the Pittsburgh Sleep Quality Index (PSQI) questionnaire and mental health status of the students using Depression, Anxiety, and Stress Scale - 21 (DASS-21).
Results: The prevalence of poor sleep quality among undergraduate medical students was 45%. Multivariate logistic regression revealed that students doing exercise for <3 days/week (AOR: 1.81, 95% CI: 1.01–3.23), spending ≥8 h screen time/day (AOR: 2.02, 95%: 1.12–3.66), having anxiety symptoms (AOR: 3.61, 95% CI: 1.72–7.57), and those who were not satisfied with own self (AOR: 2.69, 95% CI: 1.35–5.38) were more likely to report poor sleep quality.
Conclusion: Poor sleep quality was prevalent among undergraduate medical students during their home confinement at the time of Covid-19 pandemic. Sleep educational programs, anxiety management, and lifestyle modifications can be recommended to improve sleep quality among medical students.

1. Introduction

World Health Organization (WHO) has declared corona virus disease (Covid-19) as an international emergency on 30th January 2020 and a pandemic on 11th March.[1,2] In response to the outbreak, the Indian government issued social distancing measures including restriction of social gatherings, closure of educational and religious institutions, and limitation of population movement. The current Covid-19 pandemic is causing psychological distress such as depression, anxiety, stress, fear, and sleep problems among the general population.[3] During Covid-19 home confinement, a greater proportion of individuals experienced psychosocial and emotional disorders with a tendency towards an
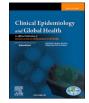
unhealthy lifestyle.[4] Medical students are a subgroup of the general population who are vulnerable to poor sleep quality which may be due to greater academic pressure, longer study hours, frequent examinations, anxiety associated with their studies and results, irregular work schedule, and lifestyle choices.[5,6] Moreover, there is a high prevalence of poor sleep quality among medical students who had been in home confinement during Covid-19 pandemic.[7]

Students have faced numerous challenges during this pandemic, such as adjustment to modified teaching-learning format, loss of social connectedness, and lifestyle changes. This might negatively impact their sleep quality[8] and the levels of depression, anxiety, and stress may be increased.[9,10] Worldwide, it has been reported that the prevalence of

poor sleep quality varies with a wide range from 19% to 90% among medical students.[5] Poor sleep quality may lead to attention difficulties and poor academic performance as good quality sleep is needed for optimal neurocognitive and psychomotor functions as well as physical and mental health.[5,11] Poor sleep quality is associated with several factors including psychological factors, physical activity, screen time, lifestyle factors, life satisfaction, chronic diseases.[12–14]

This is a first-of-its-kind study in India to assess the prevalence of poor sleep quality among undergraduate medical students during home confinement at the time of Covid-19 pandemic and analyze the relationship between sleep quality and relevant socio-demographic and psychological variables. Understanding these factors may help in developing strategies to promote sleep quality and thereby raising the quality of life of medical students.

2. Materials and methods

This online cross-sectional survey was carried out during October–November 2020 among the undergraduate medical students studying at Kalinga Institute of Medical Sciences (KIMS), KIIT University, Bhubaneswar. This study was approved by the Institutional Ethics Committee of Kalinga Institute of Medical Sciences (Ref. No: KIIT/KIMS/IEC/365/2020) and registered with Clinical Trial Registry-India (CTRI registration No: CTRI/2020/08/027492). Informed consent was obtained from all participants of this study.

A sample size of 267 was estimated assuming a prevalence of 50% poor sleep quality among undergraduate medical students, a confidence level of 95%, and an allowable error of 6%. All the first and second-year MBBS students studying in KIMS were considered for the study. They were contacted over phone/e-mail, informed about the study procedure and provided the protocol, information sheet, and consent form through e-mail. They were clarified about their doubts and assured about the privacy and confidentiality of their data. Students suffering from Covid-19 or any acute severe illness, and those having any of their family members infected/died with Covid-19 were excluded from the study. A google form was created using a semi-structured questionnaire and sent to the eligible study participants through e-mail after obtaining their informed consent. Overall, 293 students were approached and 284 responded by sending back the filled questionnaire.

Information on demographic characteristics, lifestyle behaviors such as days of exercise (at least 30 min a day) per week, screen time (time spent on electronic devices including smartphones, laptops, tablets, TV, videogames) per day, frequency of fast food (pizza, burger, muffin, noodle, rolls, chips, etc.) consumption per week, frequency of soft drink (nonalcoholic sweetened carbonated beverages like soda, Pepsico, coca-cola, sprite, etc.) consumption per week was collected. Students were also asked about their satisfaction with themselves, family life, college life, and the place where they live. Sleep quality of the respondents was assessed using the Pittsburgh Sleep Quality Index (PSQI), which is a self-administered questionnaire that assesses sleep quality in the past month.[15] It consists of 19 items grouped into 7 components: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction. Each component score ranges from 0 to 3, and the total score ranges from 0 to 21 points. The lower the score, the better the quality of sleep. Students having a total PSQI score >5 were considered as having poor sleep quality in this study. Cronbach' α for this tool was 0.718 in this study.

DASS-21 questionnaire was used to assess the mental health status of the students.[16] It consists of 21 items categorized into 3 sub-scales namely depression, anxiety, and stress each containing 7 items. The responses for each item are based on a 4-point Likert scale (0 - did not apply to me at all; 1- applied to me to some degree, or some of the time; 2 - applied to me to a considerable degree or a good part of time; 3 - applied to me very much or most of the time). The scores for the relevant items were added, scores for depression, anxiety, and stress were calculated and categorized into absence or presence of these distress

Table 1
Sociodemographic and lifestyle characteristics of the respondents (n = 284).

	Total	Good sleeper	Poor sleeper	p-value
	n (%)	**n (%)**	**n (%)**	
Age group (year)				
≤ 20	139 (48.9)	75 (54.0)	64 (46.0)	0.747
>20	145 (51.1)	81 (55.9)	64 (44.1)	
Gender				
Female	169 (59.5)	89 (52.7)	80 (47.3)	0.352
Male	115 (40.5)	67 (58.3)	48 (41.7)	
Body mass index				
Underweight	21 (7.4)	09 (42.9)	12 (57.1)	0.483
Normal	96 (33.8)	55 (57.3)	41 (42.7)	
Overweight/Obese	167 (58.8)	92 (55.1)	75 (44.9)	
Exercise per week				
<3 days	94 (33.1)	42 (44.7)	52 (55.3)	0.015
≥3 days	190 (66.9)	114 (60.0)	76 (40.0)	
Screen time per day				
<8 h	98 (34.5)	65 (66.3)	33 (33.7)	0.005
≥8 h	186 (65.5)	91 (48.9)	95 (51.1)	
Fast food consumption per week				
<3 times	217 (76.4)	121 (55.8)	96 (44.2)	0.613
≥3 times	67 (23.6)	35 (52.2)	32 (47.8)	
Soft drink consumption per week				
Nil/Once	234 (82.4)	135 (57.7)	99 (42.3)	0.043
More than once	50 (17.6)	21 (42.0)	29 (58.0)	

symptoms.

All statistical analyses were performed by SPSS version 21.0 software. Categorical variables were expressed as frequencies and percentages whereas continuous variables were presented as means ± standard deviations. The continuous variables across subgroups of categorical variables were compared using Student's t-test and the relationship between categorical variables was analyzed using Pearson's chi-square test. Variables with p value < 0.1 in bivariate analyses were included in the final multivariate logistic regression model to control the effect of confounding variables. Finally, the variables that have significant (p value < 0.05) associations with sleep quality were considered as potential risk factors of sleep quality. Adjusted Odds Ratio and 95% confidence intervals were also estimated after controlling for other confounders. Multicollinearity among the independent variables was not present in our data.

3. Results

3.1. Characteristics of the study sample

In total, 284 completed questionnaires from undergraduate university student participants were considered for final analysis. The age of the students ranged from 18 to 23 years, and the mean age was 20.6 (SD = 1.1) years. Almost half of the participants (48.9%) were aged below 20 years and a majority of the students were females (59.5%). Moreover, more than half of the students (58.8%) were overweight/obese. With regard to lifestyle behavior, more than two-thirds of students (66.9%) were doing exercise for ≥3 days (at least 30 min every day) in a week. Also, nearly two-thirds of students (65.5%) were spending ≥8 h per day with electronic devices such as smartphones, laptops, tablets, TV, video games. Almost one-quarter of the participants (23.6%) were consuming fast food ≥3 times in a week and nearly 18% were consuming soft drink > once in a week. The mean global PSQI score was 5.8 points overall (SD = 3.3), 5.7 points in males (SD = 3.2), and 5.9 points in females (SD = 3.4). There was no statistically significant difference in the PSQI score between males and females (p = 0.462). The total PSQI score decreased with increased age, from 6.1 points (SD = 3.4) in students aged ≤20 years to 5.6 points (SD = 3.2) in students aged >20 years (p = 0.167). In addition, the overall prevalence of poor sleep quality was 45%. Bivariate analyses showed that variables like exercise, screen time, and soft drink consumption were significantly associated with poor sleep quality

Table 2
Gender and age specific scores of sleep quality components among the respondents (n = 284).

Sleep quality	Total	Gender			Age group (years)		
Components		**Male**	**Female**	**p-value**	**≤ 20**	**> 20**	**p-value**
Subjective sleep quality (Mean ± SD)	0.93 ± 0.68	0.93 ± 0.67	0.93 ± 0.68	0.956	0.99 ± 0.69	0.88 ± 0.66	0.146
Sleep latency, n (%)							
≤15min	72 (25.4)	26 (36.1)	46 (63.9)	0.272	35 (48.6)	37 (51.4)	0.646
16–30 min	91 (32.0)	43 (47.3)	48 (52.7)		48 (52.7)	43 (47.3)	
>30 min	121 (42.6)	46 (38.0)	75 (62.0)		56 (46.3)	65 (53.7)	
Sleep duration (Mean ± SD) 0.011	6.78 ± 1.22	6.73 ± 1.11	6.81 ± 1.29	0.588	6.59 ± 1.25	6.96 ± 1.17	
Sleep duration, n (%)							
>7 h	90 (31.7)	34 (37.8)	56 (62.2)	0.572	36 (40.0)	54 (60.0)	0.065
6–7 h	160 (56.3)	69 (43.1)	91 (56.9)		82 (51.3)	78 (48.8)	
<6 h	34 (12.0)	12 (35.3)	22 (64.7)		21 (61.8)	13 (38.2)	
Habitual sleep efficiency, n (%)							
>85%	223 (7.5)	94 (42.2)	129 (57.8)	0.164	98 (43.9)	125 (56.1)	0.005
75–84%	32 (11.3)	14 (43.8)	18 (56.3)		22 (68.8)	10 (31.3)	
<75%	29 (10.2)	07 (24.1)	22 (75.9)		19 (65.5)	10 (34.5)	
Any sleep disturbance, n (%)							
No	42 (14.8)	23 (54.8)	19 (45.2)	0.041	19 (45.2)	23 (54.8)	0.603
Yes	242 (85.2)	92 (38.0)	150 (62.0)		120 (49.6)	122 (50.4)	
Use of sleep medication, n (%)							
No	242 (85.2)	92 (38.0)	150 (62.0)	0.041	122 (50.4)	120 (49.6)	0.234
Yes	42 (14.8)	23 (54.8)	19 (45.2)		17 (40.5)	25 (59.5)	
Daytime dysfunction, n (%)							
No	76 (26.8)	40 (52.6)	36 (47.4)	0.012	37 (48.7)	39 (51.3)	0.958
Yes	208 (73.2)	75 (36.1)	133 (63.9)		102 (49.0)	106 (51.0)	

SD: Standard deviation.

Table 3
Health disorder and satisfaction with life among the respondents (n = 284).

	Total	Good sleeper	Poor sleeper	p-value
	n (%)	n (%)	n (%)	
Comorbidity				
Absent	255 (89.8)	139 (54.5)	116 (45.5)	0.673
Present	29 (10.2)	17 (58.6)	12 (41.4)	
Depression				
Absent	194 (68.3)	131 (67.5)	63 (32.5)	0.000
Present	90 (31.7)	25 (27.8)	65 (72.2)	
Anxiety				
Absent	204 (71.8)	138 (67.6)	66 (32.4)	0.000
Present	80 (28.2)	18 (22.5)	62 (77.5)	
Stress				
Absent	252 (88.7)	151 (59.9)	101 (40.1)	0.000
Present	32 (11.3)	05 (15.6)	27 (84.4)	
Satisfied with family life				
No	96 (33.8)	46 (47.9)	50 (52.1)	0.090
Yes	188 (66.2)	110 (58.5)	78 (41.5)	
Satisfied with college life				
No	139 (48.9)	74 (53.2)	65 (46.8)	0.575
Yes	145 (51.1)	82 (56.6)	63 (43.4)	
Satisfied with yourself				
No	128 (45.1)	51 (39.8)	77 (60.2)	0.000
Yes	156 (54.9)	105 (67.3)	51 (32.7)	
Satisfied with place where you live				
No	92 (32.4)	49 (53.3)	43 (46.7)	0.696
Yes	192 (67.6)	107 (55.7)	85 (44.3)	

Table 4
Risk factors for poor sleep quality among the respondents (n = 284).

Variable	B	SE	AOR (95% CI)	p-value
Exercise per week				
<3 days	0.593	0.296	1.81 (1.01–3.23)	0.045
≥3 days[R]			1	
Screen time per day				
≥8 h	0.704	0.303	2.02 (1.12–3.66)	0.020
<8 h [R]			1	
Soft drink consumption per week				
More than once	0.151	0.378	1.16 (0.55–2.44)	0.689
Nil/Once [R]			1	
Depression				
Present	0.590	0.364	1.80 (0.88–3.68)	0.020
Absent [R]			1	
Anxiety				
Present	1.285	0.377	3.61 (1.72–7.57)	0.001
Absent [R]			1	
Stress				
Present	0.822	0.592	2.28 (0.71–7.26)	0.165
Absent [R]			1	
Satisfied with family life				
No	0.534	0.368	1.71 (0.83–3.51)	0.146
Yes [R]			1	
Satisfied with yourself				
No	0.990	0.353	2.69 (1.35–5.38)	0.005
Yes [R]			1	

Note – B: Unstandardized coefficient; AOR: adjusted odds ratio; CI: Confidence Interval; R: Reference category; Model $\chi2$ statistic = 78.177 (p < 0.001) and Hosmer-Lemeshow p value = 0.698 show that the model fits and support the existence of the relationship between independent variables and the dependent variable. Classification table reports that 73.6% of the cases can be expected to be classified correctly by the model.

among the students. The results in detail are presented in Table 1.

3.2. Components of sleep quality

The average bedtime of the participants was 7.5 ± 1.3 h, and the average sleep duration was 6.8 ± 1.2 h. The average sleep efficiency of the participants was 91%. Although 85% and 73% of students complained of sleep disturbance and daytime dysfunction respectively, only 15% of the students used sleep medication. No statistically significant differences were observed between younger (≤20 years) and older (>20 years) students on all components of sleep quality except habitual sleep efficiency. More female students had sleep disturbance and daytime dysfunction than their male counterparts whereas more male students were using sleep medications. Non-significant differences between males and females were observed on other components of sleep quality. The results are presented in Table 2.

3.3. Health status and life satisfaction

In most of the participants, comorbidities like hypertension, diabetes, asthma, depression, anxiety, and stress were absent. More than

half of the students were satisfied with their self and college life, whereas nearly two-thirds were satisfied with family life and the living place. Poor sleepers were those who had depression, anxiety, stress, and dissatisfaction with themselves. Results in detail are shown in Table 3.

3.4. Risk factors for poor sleep quality

The results of the multivariate logistic regression showed that participants doing exercise for <3 days/week (AOR: 1.81, 95% CI: 1.01–3.23), spending ≥8 h screen time/day (AOR: 2.02, 95%: 1.12–3.66), having anxiety symptoms (AOR: 3.61, 95% CI: 1.72–7.57), and those who were not satisfied with own self (AOR: 2.69, 95% CI: 1.35–5.38) were more likely to report poor sleep quality after adjustments were made for other confounding variables. The results are presented in Table 4.

4. Discussion

The present study explored that 45% of the undergraduate medical students studying at KIIT University had poor sleep quality during Covid-19 lockdown period. Saguem et al. In their study observed a high prevalence (72.5%) of poor sleep quality among medical students during their Covid-19 home confinement.[7] Consistent with our result, 44% of Kathmandu medical college students had poor sleep quality.[17] In an earlier study, Basu et al. showed a higher rate (63.5%) of poor sleep quality among undergraduate medical students[18] whereas Goyal et al. in their study observed that about 30% medical students had poor sleep quality scores.[19] In another study conducted among undergraduate medical students in Ethiopia, the prevalence of poor sleep quality was found to be 62%.[20] Higher proportion (70.4%) of medical students of Abdulaziz University, Saudi Arabia were found to have poor sleep quality.[21] The variation between different studies might be influenced by variability in methodologies, different study locations, different socio-cultural habits, and different academic pressures among different population groups. Consistent with the findings of our study, other studies have also shown that a higher proportion of female students were poor sleepers than their male counterparts.[17,18,21]

In the present study, among the PSQI components, sleep disturbance was the most common (85.2%), followed by daytime dysfunction (73.2%), longer sleep latency (42.6%), and use of sleep medication (14.8%).

In our study, the odds of having poor sleep quality was 1.8 times higher among the students who were less frequently engaged in exercise (<3 days in a week) compared to those who were doing exercise for ≥3 days/week. The results are in accordance with those of previous studies.[14,22–24] Studies have shown that physical activity influences sleep through complex interactions involving physiological and psychological pathways.[25] Physical activity benefits sleep regulation by increasing slow-wave sleep in children[26] and promotes sleep quality by improving mental well-being.[27] We observed in our study that students spending more screen time had poor sleep quality than their counterparts. In an earlier study, Natrajan et al. showed a strong association between poor sleep quality and increased duration of screen time.[28] Various studies have shown the detrimental effect of screen time on sleep.[14,24,29] This might be explained by the concept of time displacement[30] which means longer screen time consumes time that could have been used for other activities including exercise which may benefit sleep quality.[30] Also, arousals induced by the media contents might cause difficulty in falling asleep. Moreover, blue light (short-wavelength enriched light) emitted by electronic devices reduces or delays the melatonin production in the evening thereby decreasing the feelings of sleepiness.

In this study, students having anxiety symptoms were more likely to have poor sleep quality than those who did not have anxiety. Similar results have been reported in earlier studies.[12,31] This underscores the importance of students' mental health status as it is strongly linked to sleep quality.

Additionally, this study found that being satisfied with self independently decreased the risk of poor sleep quality. Students not being satisfied with themselves had 2.7 times higher odds of poor sleep quality than their counterparts. Ness et al. in their study conducted in university students revealed that better sleep quality was associated with life satisfaction.[32] Similarly, in another study, better sleep quality was significantly associated with better satisfaction life, thus the well-being of the students.[33]

Although, the present study included undergraduate medical students from a single centre, but they represent diverse geographical and sociocultural backgrounds. There are several limitations pertaining to this study that need to be highlighted. First, the causal relationship between poor sleep quality and its associated factors cannot be established due to cross-sectional study design. Second, as the data were based on self-rating measurements, it might introduce recall bias. Third, the findings may not be generalized to other paramedical students as this study focused only on medical students. Finally, differences in sleep quality of the students at different times could not be found as we did not have any baseline data of the students before Covid-19 pandemic.

5. Conclusion

Poor sleep quality was prevalent among undergraduate medical students during their home confinement at the time of Covid-19 pandemic. The risk factors included physical inactivity, more screen time/day, anxiety symptoms, and being dissatisfied with oneself. The findings could be helpful in designing appropriate interventional strategies that aim to improve sleep quality among medical students.

Declaration of competing interest

All the authors hereby declare that they have no conflicts of interest.

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