

Sleep Quality and Daytime Sleepiness among Medical Undergraduate Students in Tamil Nadu: A Cross-sectional Study

R ANURADHA¹, S HEMACHANDRAN², ARUNA B PATIL³



ABSTRACT

Introduction: Sleep quality is strongly related to psychological and physical well-being. Medical students experience long duration of study period, academic over load, frequent exams, fear of failure and highly demanding lifestyle. They are vulnerable to poor sleep quality.

Aim: To find the prevalence of sleep quality and daytime sleepiness and their associated factors among medical undergraduate students in Tamil Nadu, India.

Materials and Methods: This was a cross-sectional study conducted among 367 undergraduate medical students from first year to final year of a Government Medical College, Chennai, Tamil Nadu, India. A self-administered questionnaire was used to collect data on socio-demographic characteristics, lifestyle behavioural factors, mobile phone usage and academic performance. Pittsburgh Sleep Quality Index (PSQI) and Epworth Daytime Sleepiness Scale (EDSS) were used to assess sleep quality and excessive daytime sleepiness, respectively. Descriptive statistics was used to express baseline characteristics. Chi-square test was applied to test associated factor. Pearson

correlation coefficient was used to find correlation between continuous variables.

Results: Poor quality of sleep and excessive daytime sleepiness was found among 54.2% and 28.6% of students, respectively. Poor sleep quality and excessive daytime sleepiness was significantly associated with increased duration of mobile phone usage ($p=0.030$ and $p=0.009$ respectively). Significant association was found between sleep quality and academic performance ($p=0.004$). Statistically significant correlation was found between sleep quality and duration of mobile phone usage ($r=0.18$, $p=0.0001$) as well as sleep quality and excessive daytime sleepiness ($r=0.14$, $p=0.005$).

Conclusion: Prevalence of poor quality sleep and excessive daytime sleepiness was found to be high among medical students. Mobile phone overuse was significantly associated with poor sleep quality and excessive daytime sleepiness. Students with good quality of sleep had better academic performance when compared to poor sleepers. Excessive daytime sleepiness was found in increasing pattern among those with poor quality sleep.

Keywords: Academic performance, Medicos, Mobile phone use, Quality of sleep

INTRODUCTION

Sleep is a physiological process essential to life. Sleep quality is linked to psychological and physical well-being but has been found to deteriorate due to lifestyle changes, environmental disturbances, stress and modern technologies [1]. Prevalence of poor sleep quality are increasing in both developing and modern societies [2,3]. Lack of good quality sleep may lead to diminution in immunity, psychological problems and metabolic disorders [4].

Medical students are considered a stressful group of students and this may be attributed to their long duration of study period, academic over load, frequent exams and the highly demanding lifestyle [5,6]. Medical students are susceptible to poor sleep quality. Sleep problems among medical students was found to range from 19-90% worldwide [2]. Difficulty in concentration and attention along with poor academic performance are associated with poor sleep quality among students [7]. Poor sleep quality and Excessive Daytime Sleepiness (EDS) may affect the performance of medical students [8] and their future work performance as practitioners which in turn can affect the healthcare system also.

Screening for poor quality of sleep among medicos helps in finding the magnitude of the problem and applying early intervention. This will enhance their academic performance and quality of care given by them in the future. There was only one study done in this part of the country to assess sleep quality and daytime sleepiness among medical students [9]. Hence this study was conducted to find the prevalence of sleep quality and daytime sleepiness and their associated factors among medical undergraduate students in Tamil Nadu and plan appropriate managing strategies based on the findings of the study.

MATERIALS AND METHODS

This was a cross-sectional study conducted among undergraduate medical students of a Government Medical College, Chennai, Tamil Nadu, India between June 2017 and October 2017. Institutional Ethical Clearance (IEC) was obtained (IEC No. 21-17/04/2017). All medical undergraduate students were invited to participate in the study.

Inclusion and Exclusion criteria: The students who were willing to participate were included and those who were not willing to participate were excluded from the study.

Study Procedure

After obtaining informed consent students were asked to complete a self-administered questionnaire. A total of 388 questionnaires were distributed of which 367 were completed and returned. Questionnaire was prepared based on review of literature [10]. PSQI [11] and EDSS [12] are validated scales which were used in this study to assess the sleep quality and daytime sleepiness. The questionnaire consisted of following sections:

- Socio-demographic profile
- Information regarding exercise, smoking, alcohol intake, bedtime intake of coffee, duration of mobile phone usage per day and academic performance.
- PSQI [11] -It is a self-reported instrument to assess the quality of sleep. It consists of 19 individual items, creating seven components that produce one global score. The seven components are subjective sleep quality, sleep latency, sleep duration, sleep efficiency, and sleep disturbance, use of sleep medication and

daytime dysfunction. Each item is weighted on a 0-3 interval scale. The global PSQI score is then calculated by totaling the seven component scores, providing an overall score ranging from 0-21. A total score of 5 or greater is indicative of poor sleep quality.

- d) EDSS [12]- It is a self-administered questionnaire which consists of eight-items to assess the chance of falling asleep or dozing off during different daily life situations on an ordinary day. The study participant rates his or her probability of falling asleep on a scale of increasing probability from 0-3 for eight different situations. The scores for the eight questions are added together to obtain a single number which ranges from 0-24. A score ranging from 0-10 is defined as normal, while a score of 11-24 is considered abnormal and indicates excessive daytime sleepiness.

STATISTICAL ANALYSIS

The data was coded and entered in Microsoft excel sheet. Statistical Package for Social Science (SPSS) software version 21.0 was used for analysis of the data. Descriptive statistics such as frequency and percentages were used to express socio-demographic profile, lifestyle factors, sleep quality and daytime sleepiness. Chi-square test was used to find factors associated with sleep quality and daytime sleepiness. Pearson correlation coefficient was used to find correlations between continuous variables. A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 388 questionnaires were distributed of which 367 questionnaires were completed and returned. The mean age of the study participants was 19.75±1.27 years. Out of the 367 study participants, 221 (60.2%) were females and 146 were males (39.8%). The mean weight of the study participants was 59.8±13.3 kgs. The mean height of the study participants was 1.64±0.09 m. The mean Body Mass Index (BMI) of the study participants was 22.13±4.06 kg/m². There were 210 (57.2%) hostellers and 157 (42.8%) day scholars [Table/Fig-1]. Smoking was noted in 4 (1.1%) and alcohol intake in 8 (2.2%) students. Intake of coffee at bedtime was noted among 18 (4.9%) student's. The habit of exercising was reported among 63 (17.2%) students. Academic score of >70% was found in 97 (26.4%) students [Table/Fig-2]. Laptop usage of more than 2 hours per day was noted among 18 (4.9%) students. Environmental factors such as mosquitoes and loud noise were reported by 292 (79.6%) and 98 (26.7%) students' respectively as major reasons for the sleep disturbance. Other environmental factors such as hot weather and poor ventilation were reported by 6 (1.6%) and 5 (1.3%) students respectively. Poor quality of sleep was reported in 199 (54.2%) study participants [Table/Fig-3]. Proportion of poor sleep quality was reported higher among males (58.2%) compared to females (51.6%), hostellers (55.7%) compared to day scholars (52.2%) and prefinal year (61.1%) students compared to other academic year students. There was a statistically significant association between alcohol consumption and sleep quality (p=0.009). The proportion of students with poor sleeps quality increased with an increase in the duration of mobile usage. A statistically significant association was found between mobile phone usage and sleep quality (p=0.030) [Table/Fig-4]. Academic performance >70% was noted in 59 (35.1%) and 38 (19.1%) among those with good quality sleep and poor-quality sleep, respectively. There was a statistically significant association between sleep quality and academic performance (p=0.004) [Table/Fig-5].

Sociodemographic profile	Number of respondents (n)	Percentage
Age in years		
18-19	84	22.9
19-20	67	18.3
20-21	98	26.7

21-22	99	27.0
≥22	19	5.1
Gender		
Male	146	39.8
Female	221	60.2
School studied		
Public	75	20.4
Private	292	79.6
Year of study		
Final year	91	24.8
Prefinal year	95	25.9
Second-year	94	25.6
First-year	87	23.7
Batch		
Regular	351	95.6
Supplementary	16	4.4
Residence		
Day scholar	157	42.8
Hosteller	210	57.2

[Table/Fig-1]: Distribution of study participants according to socio-demographic profile (n=367).
The upper limit denotes upto but included in next group

Lifestyle associated characteristics	Number of respondents (n)	Percentage
Smoking		
Yes	4	1.1
No	363	98.9
Alcohol		
Yes	8	2.2
No	359	97.8
Bedtime coffee intake		
Yes	18	4.9
No	349	95.1
Habit of exercise		
Yes	63	17.2
No	304	82.8
Mobile phone usage		
<4	225	61.3
4-8	119	32.4
>8-12	23	6.3
Laptop usage (hour/day)		
<1	282	76.8
1- 2	67	18.3
>2	18	4.9
Academic performance		
<50%	23	6.3
50-60%	79	21.5
60-70%	168	45.8
70-80%	83	22.6
>80%	14	03.8

[Table/Fig-2]: Distribution of study participants according to lifestyle behavioural factors and academic performance (n=367).
The upper limit is included in the same group

Pittsburgh Sleep Quality Index (PSQI)	Frequency	Percentage
Good quality sleep (<5)	168	45.8
Poor quality sleep (≥5)	199	54.2
Total	367	100.0

[Table/Fig-3]: Distribution of study participants according to sleep quality (n=367).

Characteristics	Category	PSQI score			Pearson Chi-square, df	p-value
		Good sleep quality n (%)	Poor sleep quality n (%)	Total		
Age (years)	≤20	120 (48.2)	129 (51.8)	249	1.821,1	0.177
	>20	48 (40.7)	70 (59.3)	118		
Gender	Male	61 (41.8)	85 (58.2)	146	1.560,1	0.212 (NS)
	Female	107 (48.4)	114 (51.6)	221		
Year of study	Final year	45 (49.5)	46 (50.5)	91	4.177,3	0.243 (NS)
	Prefinal year	37 (38.9)	58 (61.1)	95		
	Second year	49 (52.1)	45 (47.9)	94		
	First year	37 (42.5)	50 (57.5)	87		
Residence	Day scholar	75 (47.8)	82 (52.2)	157	0.440,1	0.507 (NS)
	Hosteller	93 (44.3)	117 (55.7)	210		
Marital status	Married	1 (50.0)	1 (50.0)	2	0.014,1	0.904 (NS)
	Unmarried	167 (45.8)	198 (54.2)	365		
Smoking	Yes	0	4 (100)	4	3.414,1	0.065 (NS)
	No	168 (46.3)	195 (53.7)	363		
Alcohol consumption	Yes	0	8 (100)	8	6.904,1	0.009**
	No	168 (46.8)	191 (53.2)	359		
Bedtime coffee intake	Yes	10 (55.6)	8 (44.4)	18	0.729,1	0.393 (NS)
	No	158 (45.3)	191 (54.7)	349		
Exercise	Yes	25 (39.7)	38 (60.3)	63	1.138,1	0.286 (NS)
	No	143 (47)	161 (53.0)	304		
Mobile usage in hours/day	<4	88 (50.9)	85 (49.1)	173	7.038,2	0.030*
	4-8	71 (44.4)	89 (55.6)	160		
	>8-12	9 (26.5)	25 (73.5)	34		
Laptop usage in hours/day	<1	133 (47.2)	149 (52.8)	282	0.991	0.609 (NS)
	1-2	28 (41.8)	39 (58.2)	67		
	>2	7 (38.9)	11 (61.1)	18		

[Table/Fig-4]: Association of socio-demographic and lifestyle behavioural factors with sleep quality (n=367).

*p<0.05- significant, **p<0.001- Very Significant, NS- Not Significant, Parenthesis () shows row-wise percentage

Sleep quality	Academic performance					Total	Pearson Chi-square, df	p-value
	<50% n (%)	50-60% n (%)	60-70% n (%)	70-80% n (%)	>80% n (%)			
Good quality sleep	7 (4.2)	27 (16.1)	75 (44.6)	51 (30.4)	8 (4.8)	168	15.48, 4	0.004**
Poor quality sleep	16 (8.0)	52 (26.1)	93 (46.7)	32 (16.1)	6 (3.0)	199		
Total	23 (6.3)	79 (21.5)	168 (45.8)	83 (22.6)	14 (3.8)	367		

[Table/Fig-5]: Association between sleep quality and academic performance. (n=367).

**p<0.001- Very Significant, Parenthesis () shows row-wise percentage

Excessive daytime sleepiness was found in 105 students (28.6%) [Table/Fig-6]. The proportion of excessive daytime sleepiness was higher among prefinal (38.9%) year and second-year students (37.2%) when compared to first (23.0%) and final year (14.3%) students and was found to be statistically significant ($p<0.0001$). The proportion of excessive daytime sleepiness increased with an increase in the duration of mobile phone usage and was found to be statistically significant ($p=0.009$) [Table/Fig-7]. No significant association was found between daytime sleepiness and academic performance [Table/Fig-8]. Poor but highly significant correlation was noted between sleep quality and duration of mobile phone usage (hours) per day ($r=0.18$, $p=0.0001$) [Table/Fig-9]. However,

Epworth sleepiness scale	Frequency	Percentage
0-5-lower normal daytime sleepiness	85	23.2
6-10 -higher normal daytime sleepiness	177	48.2
11-12- mild excessive daytime sleepiness	51	13.9
13-15- moderate excessive daytime sleepiness	39	10.6
16-24 -severe excessive daytime sleepiness	15	4.1
Total	367	100.0

[Table/Fig-6]: Distribution of study participants according to daytime sleepiness (n=367).

no statistically significant correlation was found between excessive daytime sleepiness and duration of mobile phone usage (hours) per day ($r=0.09$, $p=0.069$) [Table/Fig-10]. Correlation between sleep quality and excessive daytime sleepiness was poor but statistically significant ($r=0.14$, $p=0.005$) [Table/Fig-11].

DISCUSSION

In the present study, 54.2% of undergraduate medical students had poor sleep quality as per the PSQI scale which was higher than the findings of a study conducted in Nepal [13]. A higher prevalence of poor quality of sleep among medicos was reported by other studies [Table/Fig-12] [14-18]. Students in the age group >20 years were found to be poor sleepers (59.3%) in present study. The increase in academic burden might be a reason. However, many studies reported a higher proportion of poor quality of sleep among younger students <20 years [14,16,19,20]. This may have been due to the reason the younger students may have not adapted to a higher academic load after their higher secondary education. Anxiety and the pressure of passing the first professional exams may also play a role. Male students (58.2%) had a higher proportion of poor sleep quality when compared to females (51.6%) in the present study. Madhusudan M et al., also revealed males (41.7%) had poor quality of sleep compared to females (36.4%) [19]. In a study conducted

Characteristics	Category	Excessive daytime sleepiness			Pearson Chi-square, df	p-value
		Absent	Present	Total		
Age group (years)	≤20	178 (71.5)	71 (28.5)	249	0.004,1	0.953 (NS)
	>20	84 (71.2)	34 (28.8)	118		
Gender	Male	103 (70.5)	43 (29.5)	146	0.084,1	0.772 (NS)
	Female	159 (71.9)	62 (28.1)	221		
Year of study	First year	67 (77.0)	20 (23.0)	87	18.8,3	<0.0001***
	Second year	59 (62.8)	35 (37.2)	94		
	Prefinal year	58 (61.1)	37 (38.9)	95		
	Final year	78 (85.7)	13 (14.3)	91		
Residence	Day scholar	109 (69.4)	48 (30.6)	157	0.518,1	0.472 (NS)
	Hosteller	153 (72.9)	57 (27.1)	210		
Marital status	Married	2 (100%)	0	2	0.806,1	0.369 (NS)
	Unmarried	260 (71.2)	105 (28.8)	365		
Smoking	Yes	2 (50.0)	2 (50.0)	4	0.906,1	0.341 (NS)
	No	260 (71.6)	103 (28.4)	363		
Alcohol intake	Yes	4 (50.0)	4 (50.0)	8	1.832,1	0.176 (NS)
	No	258 (71.9)	101 (28.1)	359		
Bedtime coffee intake	Yes	12 (66.7)	6 (33.3)	18	0.207,1	0.649 (NS)
	No	250 (71.6)	99 (28.4)	349		
Exercise	Yes	43 (68.3)	20 (31.7)	63	0.366,1	0.545 (NS)
	No	219 (72.0)	85 (28.0)	304		
Mobile phone usage in hours/day	<4	134 (77.5)	39 (22.5)	173	9.329,2	0.009**
	4 to 8	110 (68.8)	50 (31.2)	160		
	>8-12	18 (52.9)	16 (47.1)	34		
Laptop usage in hours/day	<1	205 (72.7)	77 (27.3)	282	1.314,2	0.518 (NS)
	1-2	44 (65.7)	23 (34.3)	67		
	>2	13 (72.2)	5 (27.8)	18		

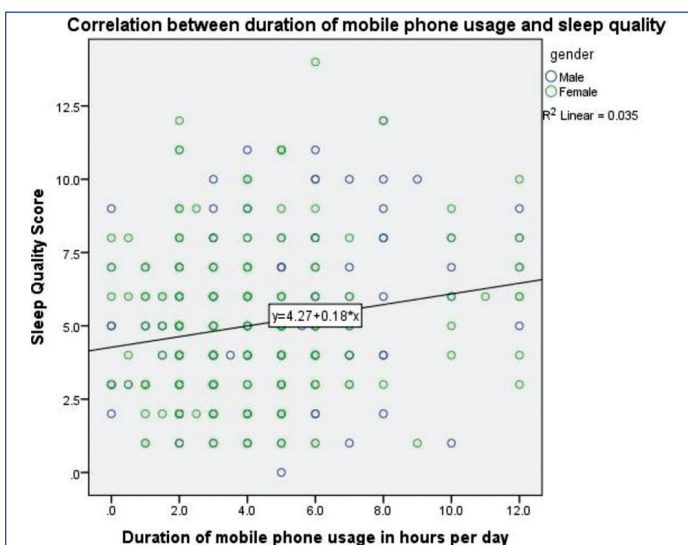
[Table/Fig-7]: Association of sociodemographic factors and lifestyle behaviour with excessive daytime sleepiness (n=367).

***p<0.0001- Highly significant, **p<0.001- Very significant, NS- Not significant, Parenthesis () shows row-wise percentage

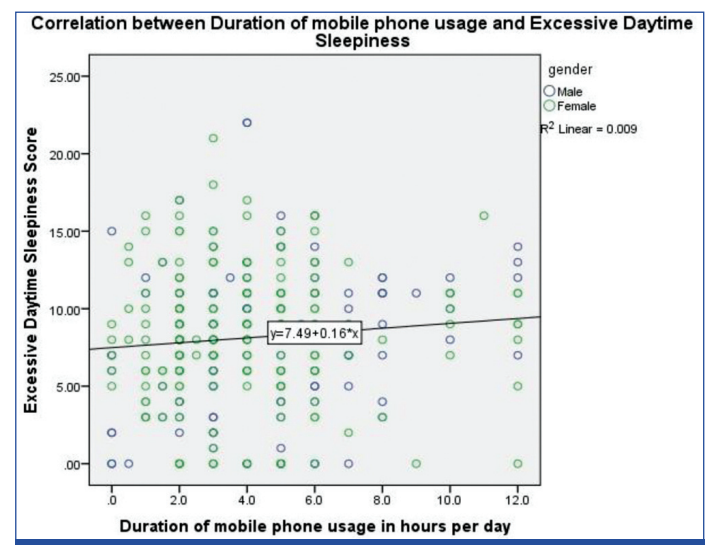
Excessive daytime sleepiness	Academic performance						Pearson Chi- square, df	p-value
	<50%	50-60%	60-70%	70-80%	>80%	Total		
No	19 (7.3)	54 (20.6)	121 (46.2)	59 (22.5)	9 (3.4)	262	2.156,3	0.707 (NS)
Yes	4 (3.8)	25 (23.8)	47 (44.8)	24 (22.9)	5 (4.8)	105		
Total	23 (6.3)	79 (21.5)	168 (45.8)	83 (22.6)	14 (3.8)	367		

[Table/Fig-8]: Association between excessive daytime sleepiness and academic performance (n=367).

NS- Not significant, Parenthesis () shows row-wise percentage



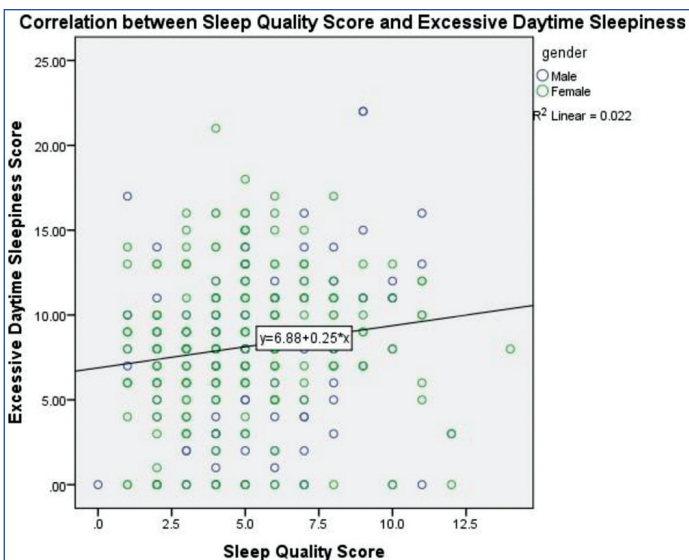
[Table/Fig-9]: Scatter diagram shows poor but statistically significant correlation between Sleep Quality and duration between mobile phone usage (hours) per day (r=0.18, p=0.0001).



[Table/Fig-10]: Scatter diagram shows correlation between Excessive Daytime Sleepiness and duration of mobile phone usage (hours) per day (r= 0.09, p=0.069).

among medicos in Maharashtra females had a better quality of sleep than males. attributing drug abuse among males [10]. In contrast,

females were poorer sleepers compared to males, as reported by many previous studies [3,14,18]. Attributing to more psychological problems like anxiety and depression among females. Prefinal



[Table/Fig-11]: Scatter diagram shows poor but statistically significant correlation between Sleep Quality and Excessive Daytime Sleepiness (r=0.14, p=0.005).

Author's name and publication year	Place of study	Number of subjects	Sample population considered	Parameters assessed	Prevalence of poor quality of sleep
Present study, 2022	Chennai	367	Undergraduate medical students	Sleep quality assessed using PSQI	54.2%
Basu M et al., 2019 [14]	Kolkata	293	Undergraduate medical students	Sleep quality assessed using PSQI	63.48%
Maheshwari G and Shaikat F, 2019 [15]	Karachi, Pakistan	797	Undergraduate medical students	Sleep quality assessed using PSQI	64.24%
Ibrahim NK et al., 2017 [16]	Jeddah, Saudi Arabia.	576	Medical students	Sleep quality assessed using PSQI	70.4%
Gupta S et al., 2020 [17]	Haryana	400	Medical students	Sleep quality assessed using PSQI	72.7%
Wondie T et al., 2021 [18]	Ethiopia	576	Medical students	Sleep quality assessed using PSQI	62%

[Table/Fig-12]: Prevalence of sleep quality from various studies compared with present study [14-18].

year (61.1%) students followed by first-year (57.5%) students were having poor sleep quality in present study. A study conducted in Kerala found poor sleep quality among first MBBS students [19]. Transition from schooling to professional course may be the reason for poor sleep quality among first year students. Basu M et al., reported sleep quality improves as students advance in academic years [14]. The reason may be that over a period of time students become accustomed to their academic schedule and learn to improve their sleep habits. Hostellers had poor quality of sleep when compared to day scholars in the present study which was similarly reported in other studies also [16,20]. Poor sleep quality was found more among single when compared to those married. Ibrahim N et al., reported similar findings in their study [6]. Students who had a smoking habit had a higher proportion of poor quality of sleep in present study however no significant association was found. Similar findings were reported in other studies [10,16]. Alcohol consumption was significantly associated with sleep quality which was also found in other studies [14]. No significant association between bedtime coffee intake and sleep quality was found in the current study. Excessive consumption of caffeine was associated with poor sleep as reported by Ibrahim NK et al., [16] and Sanchez SE et al., [21]. No significant association between exercise and sleep quality was found in the present study. However, a significant association between exercise and sleep quality was reported in a study conducted in Kolkata [14]. Giri PA et al., found that those who exercise daily

showed less sleep disturbance [10]. In present study, increased duration of mobile phone usage was associated with poor sleep quality. Studies revealed long-time use of mobile phones/laptops was associated with poor quality of sleep [10,14]. However a study conducted in Saudi Arabia revealed that there was no association between social media usage at night and sleep quality [16]. Poor sleep quality was associated with low academic performance in this study which was consistent with the findings by Seun-Fadipe CT and Mosaku KS [22]. Few studies reported no significant association between sleep quality and academic performance [19,23]. Excessive daytime sleepiness was found in 28.6% of students in the present study. Studies have shown the prevalence of excessive daytime sleepiness in medical students to be 24.9-36.6% [14,24-26]. No gender difference was observed in the prevalence of excessive daytime sleepiness in this study which was similarly reported in a study conducted in Kerala [27]. However few studies found that females had a higher prevalence of excessive daytime sleepiness [24,28]. Excessive daytime sleepiness was higher among prefinal year (38.9%) students and second year (37.2%) in present study and was found to be statistically significant. However, no significant difference was found between excessive daytime sleepiness and the year of study in a study conducted among medical students in Morocco [26]. The proportion of excessive daytime sleepiness increased with an increase in the duration of mobile phone usage in present study and was found to be statistically significant. Other studies also reported excessive daytime sleepiness among medicos due to excessive use of smartphones and the internet [29,30]. No significant association was found between daytime sleepiness and academic performance in the present study. Similar findings were reported in a study conducted in Morocco and Saudi Arabia [26,31]. Excessive daytime sleepiness was significantly correlated with poor quality sleep in the present study which was similarly reported by Sathe HS et al., [29].

Limitation(s)

This was a cross-sectional study conducted only in one medical college which may limit the generalisability of the findings. Since the responses were collected using a self-administered questionnaire, there may be an information bias.

CONCLUSION(S)

The poor quality of sleep and excessive daytime sleepiness was found to be highly prevalent (54.2%) among medical undergraduate students in this study. Mobile phone overuse was significantly associated with poor sleep quality and excessive daytime sleepiness. Students with good quality of sleep had better academic performance when compared to poor sleepers. Excessive daytime sleepiness was found in increasing pattern among those with poor quality sleep.

Study on sleep quality is very important for the monitoring of sleep in students and helps in the planning of interventions aimed at increasing awareness of this issue. Awareness about the adverse impact of sleep disturbances on academic performance should be raised. Avoidance of overuse of mobile phones is strongly recommended. Sleep quality can be improved through counselling, providing a positive environment and practicing a healthy lifestyle. This can be achieved by establishing counselling facilities, conducting sleep educational programs, stress management courses and promoting good sleep hygiene that can enhance the quality of life of the medicos and cope with their stressful environment.

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PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Community Medicine, ESIC Medical College and PGIMS, Chennai, Tamil Nadu, India.
2. Assistant Professor, Department of Otorhinolaryngology, Sri Lalithambigai Medical College and Hospital, Chennai, Tamil Nadu, India.
3. Associate Professor (Biostatistics), Department of Community Medicine, ESIC Medical College and PGIMS, Chennai, Tamil Nadu, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. R Anuradha,
1041 (Old No 525/2), Periyar EVR High Road, Arumbakkam,
Chennai-600106, Tamil Nadu, India.
E-mail: dr.anuhems@gmail.com

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