Research Article

A Cross Sectional Study on Sleep Quality among Medical Students and Its Association with Their Academic Performance and Smart Phone Use in a Private Medical College in Kerala

Prince Alex Abraham[1], Amruthaa Raman Nair[*2], Shaba Chinnu Thomas[3], Allen Kuriakose[4], Gokul K Gopinath[5]

[1,2,3,4,5]Department of Community Medicine, Mount Zion Medical College, Adoor, Pathanamthitta, India

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*Corresponding author:

Dr. Amruthaa Raman Nair

Department of Community Medicine

Mount Zion Medical College Adoor,

Pathanamthitta, Kerala, India

ABSTRACT

Introduction and Objectives: Good quality sleep is essential for good health and well-being. However, lifestyle and environmental factors are increasingly causing difficulties in sleeping patterns of individuals. The main effects of sleep deprivation include physical effects like sleepiness, fatigue, hypertension and cognitive impairments like deterioration of performance, attention, motivation, diminishment of concentration and intellectual capacity. Also inadequate sleep increases the likelihood of accidents at work and during driving. Medical education is regarded as one of the most demanding areas of professional education but it is also linked with stress related to studies and postings .It is expected that they are prone to numerous forms of sleep problems. It has also been found that using mobile phones highly linked to sleep-related difficulties in medical students .Due to the demanding nature of medical school and the possible consequences of poor sleep on outcomes in academics, clinical care and mental health, sleep quality is a crucial concern for medical students. This study aims to assess the sleep quality among medical students using PSQI (Pittsburgh Sleep Quality Index) Score and to identify the factors associated with sleep quality. *Materials and Methods:* The study was a cross sectional study conducted from October 20th to November 20th 2023 among 180 randomly selected medical students of 2019, 2020 and 2021 batches of Mount Zion Medical College. Sleep quality and factors affecting their sleep was assessed using PSQI (Pittsburg Sleep Quality Index) Score and SAS-SV (Smart phone Addiction Scale-Short Version) questionnaire. Academic performance of each student was assessed based on the percentage of their last university examination. *Results:* 77.8% of the study population had normal sleep quality whereas 22.2% had sleep disturbances according to PSQI score. A score more than 5 according to PSQI score was taken as considerable sleep disturbance. PSQI global score range between 0 to 21.Higher the PSQI score worse the sleep quality.83.3% of students showed smart phone addiction whereas 16.7 % of study participants had no considerable smart phone addiction according to SAS-SV score. A score more than 15 was considered as problematic smart phone use or addiction to smart phone use. SAS-SV score ranges between 0 and 60.The study showed significant association for sleep quality with academic performance and smart phone addiction. *Conclusion:* Sleep Quality issues in terms of sleep duration, day time dysfunction and sleep disturbances were common among medical students. Students who performed well in their academics had good sleep quality pattern. Among those with no considerable smart phone addiction majority had good sleep quality. Thus good sleep quality was found to be associated with better academic performance and balanced smart phone use.

Introduction

The significance of good quality sleep in maintaining optimal health and well-being cannot be overstated. Sleep is a crucial physiological activity that allows the human body to function properly [1]. Various indicators are used to assess sleep disturbances and disorders, providing insights into the overall sleep health of an individual. Sleep latency, the time it takes to transition from wakefulness to sleep, is a key indicator of sleep efficiency [2]. Prolonged sleep latency can be influenced by factors such as stress and environmental conditions, and it is associated with a higher risk of sleep disorders. Monitoring the number and duration of nocturnal awakenings provides further information on sleep quality. Frequent awakenings may signal disturbances such as insomnia or sleep apnea, impacting the overall restorative nature of sleep **(Figure 1)** [3].

Total sleep time is essential for maintaining health, with chronic sleep deprivation linked to various physical and cognitive impairments. Proper rhythms of specific sleep stages, including Rapid Eye Movement (REM) sleep, play a vital role in emotional regulation, memory consolidation, and cognitive health [4]. Disruptions in these sleep stages can contribute to mood disorders and impact overall mental well-being. Autonomic functions, such as heart rate, blood pressure, vasoconstriction, and respiratory rate, undergo significant changes during different sleep stages[5].These fluctuations are integral to cardiovascular health and overall homeostasis. Disturbances inautonomic functions during sleep can contribute to sleep disorders

Figure 1: Different factors affecting sleep

and exacerbate existing health conditions[6].

Repetitive nights of sleep disruption over a week or a month can lead to cumulative sleep debt, impacting physical health, cognitive performance, and emotional well-being [7]. The long-term consequences of persistent sleep disturbances emphasize the importance of early intervention and effective sleep management strategies. Self-reported sleep, while considered the least reliable objectively, holds subjective importance for individuals[8]. Perception of sleep quality and satisfaction influences overall well-being and daily functioning. Understanding both objective and subjective indicators is crucial for a comprehensive evaluation of an individual's sleep health[9-11].

The effects of sleep deprivation extend beyond mere fatigue. Physically, it manifests as sleepiness, fatigue, and hypertension. Cognitively, inadequate rest leads to deterioration in performance, attention, motivation, mental concentration, and intellectual capacity. The increased likelihood of accidents at work and during driving is a significant concern, highlighting the impact of sleep deprivation on safety[12, 13]. Mental health complications are also associated with insufficient sleep. Inadequate rest impairs the ability to think, handle stress, maintain a healthy immune system, and regulate emotions. The potential consequences include falling asleep at work, school, or while driving, feelings of tiredness, concentration and vigilance detriments, memory blanks, irritability, frustration, and a higher probability of accidents or injuries[14, 15].

The World Health Organization (WHO) has recognized the det-rimental effects of insufficient sleep on various aspects of health. Insufficient sleep is linked to cardiovascular diseases, neurocognitive function, psychological disorders, metabolic abnormalities, immunological response, and academic performance. This acknowledgment underscores the need for prioritizing sleep as a crucial component of overall well-being[16].

The journey to becoming a medical professional is undoubtedly rigorous and demanding, marked by high academic and professional standards[17]. Admission to medical school is highly competitive and requires exceptional achievement. However, the demanding nature of medical education often takes a toll on the sleep quality of medical students, making sleep disruption a prevalent concern within this population. Medical students, due to the intense academic and clinical demands, are particularly prone to various forms of sleep problems [18]. Research indicates that sleep disruption among medical students is not merely an isolated issue but is, in fact, akin to a pandemic when compared to the general population. The unique challenges faced by medical students contribute to a heightened susceptibility to sleep-related difficulties[19-21].

The use of electronic devices, such as mobile phones and television, has been identified as a significant contributor to sleep problems among medical students. The prevalent use of these devices, often as a means of unwinding or staying connected, can interfere with the natural sleep-wake cycle. The exposure to the blue light emitted by screens can disrupt the production of melatonin, a hormone responsible for regulating sleep, leading to difficulties in falling asleep and maintaining a restful sleep. The demanding nature of medical school, characterized by high academic expectations, long study hours, and intensive clinical rotations, creates a perfect storm for sleep distur-

-bances and disorders. The pressure to excel academically, coupled with the responsibility of patient care in clinical settings, can contribute to heightened stress levels and increased anxiety, further exacerbating sleep-related challenges [22-24].

The consequences of poor sleep quality among medical students extend beyond personal well-being and comfort. The potential impact on academic performance is a significant concern, as inadequate sleep has been linked to decreased cognitive function, impaired memory consolidation, and reduced overall academic achievement. In the field of healthcare, where critical decision-making is paramount, compromised cognitive function due to poor sleep can have far-reaching consequences for patient care [25].

Mental health is also a critical aspect affected by sleep quality in medical students. The stressors inherent in medical education, combined with sleep-related difficulties, can contribute to elevated levels of stress, anxiety, and depression. Mental health concerns not only affect the individual's well-being but can also impact their ability to provide compassionate and effective care to patients [26].

Recognizing the importance of addressing sleep-related challenges among medical students, educational institutions and healthcare systems are increasingly implementing strategies to promote better sleep hygiene. These strategies may include educational programs on the importance of sleep, counseling services to address stress and mental health concerns, and interventions to reduce the use of electronic devices before bedtime [27].

The demanding nature of medical education and the associated pressures make medical students particularly susceptible to sleep-related difficulties. Acknowledging the prevalence of sleep disruption in this population is crucial for developing targeted interventions and support systems. Improving sleep quality among medical students not only enhances their personal well-being but also contributes to better academic outcomes, improved clinical performance, and overall mental health. As the medical community continues to prioritize the holistic well-being of its future professionals, addressing sleep-related challenges becomes an integral aspect of fostering a healthier and more resilient generation of healthcare practitioners [28-30].

This study aims to assess the sleep quality among medical students in a private medical college in Kerala using PSQI (Pittsburgh Sleep Quality Index) Score. The study also aims to identify any association of factors like academic performance and smart phone use with sleep quality.

Materials and Methods

Study design: Institution based Cross sectional study

Study setting: Mount Zion Medical College, Adoor

Study duration: 1 month (20/10/23 -20/11/23)

Type of sampling: Stratified sampling

Sample size: After considering 5 % of non-response rate sample size calculated as 180

Study tools: Data was collected using predesigned and pretested questionnaires. It included Pittsburgh Sleep Quality Index (PSQI) Smartphone Addiction Scale- Short Version (SAS-SV) along with general information questionnaire for general details and academic score.

Study methodology: Students from 2019, 2020 and 2021 batches who had appeared for their last university exam were included in the study. A sample size of 180 students were calculated and by probability proportionate sampling method ,from a total of 94, 77 and 120 students of 2019, 2020 and 2021 batches 58, 48 and 74 students were selected respectively from each batch randomly using random number generator available online. Collection of data was done using a semi structured questionnaire including the PSQI questionnaire and SAS-SV questionnaire along with general information related questions given to participants as Google forms Data was entered into Microsoft excel and analyzed using SPSS version 20. Descriptive statistics were used to express variables like sleep quality, its components and smart phone addiction. Chi-square test was applied to test association of qualitative variables.

Results

The mean age of the study population was 22.18+/-1.24 years.Among the 180 participants, 63.7% were females and 36.3% males. Out of the 180 study population, 32.2% belonged to 2019 batch , 26.7 % to 2020 batch and 41.1 % belonged to 2021 batch .Among 180 study participants,1.1% were day scholars and 98.9% of them were hostlers.

Out of the 180 students, 14.4% of students had more than 7 hours of sleep duration, 62.8% had 6 to7 hours of sleep duration, 19.4% had 5-6 hours of sleep duration and 3.3% of students had less than 5 hours of sleep duration 87.8% of students had sleep efficiency more than 85% of and 12.2% of students had sleep efficiency less than 84%. 36.1% of the study population had sleep latency score zero, 42.2% had sleep latency score 1-2 ,19.4% had score 3-4 and 2.2 % showed sleep latency score 5-6.Hence 2.2 % had poor sleep latency score because higher scores indicates poor character of sleep. 36.1% of the study population showed no daytime dysfunction whereas 10% showed severe day time dysfunction.

Subjective sleep quality was found good in 23.3% of the study population, 66.1% had fairly good subjective sleep quality, 9.4% had fairly bad subjective sleep quality and 1.1% had very bad subjective sleep quality score. Almost 10.5% of the study population had a bad sleep quality. Out of 180 study population 21.1% showed no sleep disturbances, 72.2% showed mild sleep disturbances, 6.7% showed moderate sleep disturbances and no one showed severe sleep disturbances. Thus 78.9% showed mild to moderate sleep disturbance. 94.4 % were not using any sleep medications for past one month , 3.3% were using sleep medications for less than once a week ,1.1% were using sleep medications once or twice a week and 1.2% were using sleep medications for three or more times a week. Hence 5.6% of the study population ever used sleep medications over past one month.

As per PSQI score,77.8% had normal sleep quality and 22.2% had po-

-or sleep quality A PSQI score of more than 5 was considered as poor sleep quality **(Figure 2).** Higher the PSQI score worse t-

-he sleep quality. Mean value of PSQI score was 5.02+/-2.61.

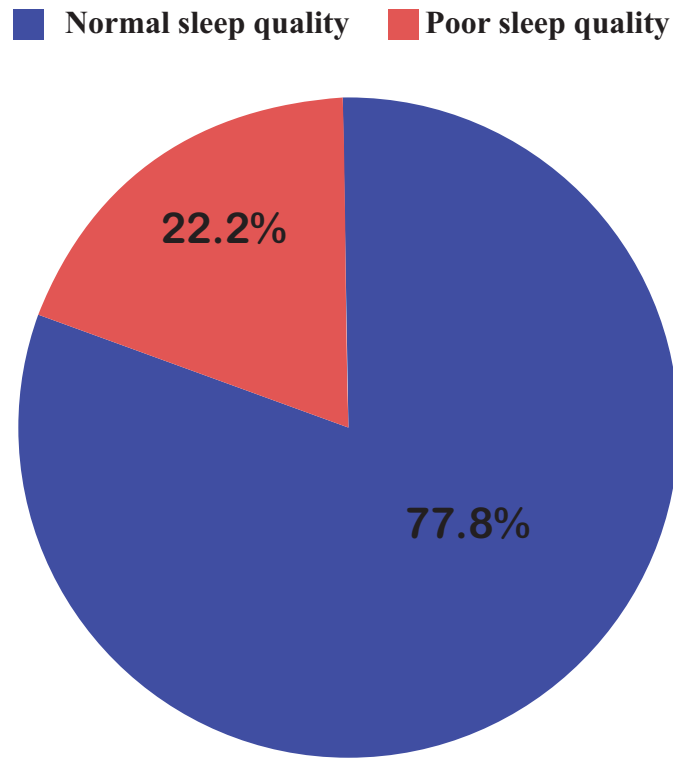**■ Normal sleep quality** **■ Poor sleep quality**

Figure 2: Distribution of study population based on sleep quality

Out of 180 students,83.3% of students had considerable smart phone addiction and 16.7% did not have smart phone addiction as per SAV-SV score. SAS-SV score more than 15 was taken as considerable smart phone addiction.

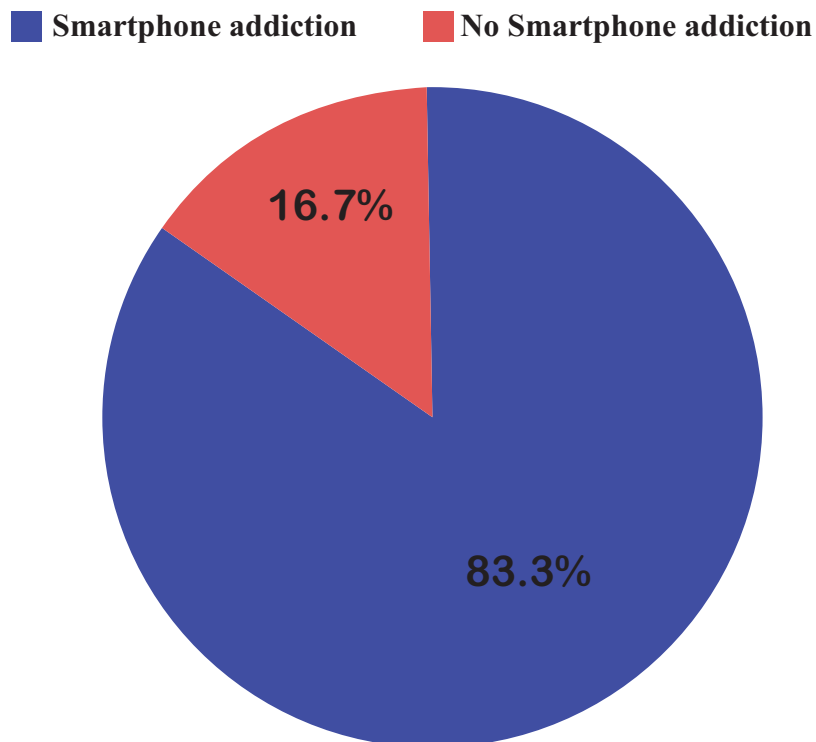Higher the scores the greater the problematic use of smart phone **(Figure 3).**

■ Smartphone addiction **■ No Smartphone addiction**

Figure 3: Distribution of study population based on smart phone addiction

Table 1: Results showing the association of sleep quality with academic performance of study participants

Academic performance	PSQI Score based Sleep Quality		Total
	Good Sleep Quality	**Poor Sleep Quality**	
Good	134 (80.2%)	33 (19.8%)	167(100%)
Poor	6 (46.2%)	7 (53.8%)	13(100%)
Total	140	40	180

Chi Square value 8.108   p value <0.01

Among the students who performed poor in their academics, 53.8% showed sleep disturbances whereas 46.2% did not have any sleep quality issues. On the other hand, out of students who performed well in their academic performance 80.2% had good sleep quality and only 19.8% had poor sleep quality. This association between sleep quality and academic performance was found to be significant with a p value less than 0.01**(Table 1).**

Among those with no considerable smart phone addiction 83% had good sleep quality and only 17% had poor sleep quality. Out of those study participants with smart phone addiction 37.8% had poor sleep quality whereas among those with no smart phone addiction only 17% had poor sleep quality. This fi-

-nding was found significant with a p value less than 0.01**(Table 2).** No significant association was found between sleep quality and place of residence/stay and choice of study.

Discussion

According to a cross sectional study by Muralidhar M *et al.,* on sleep quality among medical students conducted at a Medical College, Wayanad District, Kerala in 2018 62.4% had good sleep quality and 37.6% had poor sleep quality. The prevalence of poor sleep quality was more among those who had failed in the previous university exam/internal assessment when compared to those who had secured distinction/I/II class. This finding was similar to the finding from our current study where 77.8% had normal sleep quality and poor sleep

Table 2: Table showing the association of sleep quality and smart phone use among study participants

Smart Phone Use	PSQI Score based Sleep Quality		Total
	Good Sleep Quality	**Poor Sleep Quality**	
No Smart phone addiction	112 (83%)	23 (17%)	135 (100%)
Smart phone addiction	28 (62.2%)	17 (37.8%)	45 (100%)
Total	140	40	180

Chi square value 8.400   p value <0.01

quality was associated with poor academic performance [31-33].

In a cross-sectional study conducted by Anuradha R *et al.,* among 367 undergraduate medical students in Government Medical College, Chennai, Tamil Nadu, in 2017, Pittsburgh Sleep Quality Index (PSQI) was used to asses sleep quality. Poor quality of sleep was found among 54.2% of students. Poor

sleep quality was significantly associated with increased duration of mobile phone usage. Significant association was found between sleep quality and academic performance .Statistically significant correlation was found between sleep quality and duration of mobile phone usage. 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 slee-

-pers. This finding was comparable to our study finding that showed strong association between sleep quality, academic performance and smart phone use [35,36].

In another cross-sectional study conducted Kurugodiyavar *et al.,* among 240 medical students at KIMS, Hubballi, Karnataka it was found that 48.75% were poor sleepers 51.25% were good sleepers according to PSQI global sleep score. According to SAS score 51.2% were low users and 48.75% were high users of smart phone. The mean PSQI global score(SD) was 4.8 (2.49). This study concluded that in medical students smart phone addiction affects sleep quality significantly[27, 37, 38].

In a cross-sectional study by Awasthi S *et al.,* conducted among the undergraduate medical students of Government Medical College (GMC), Haldwani, Uttarkand smart phone addiction scale (SAS-SV) and WHO-BREF questionnaires for QOL were used for assessing smart phone use and QOL of the medical students, respectively. Out of the total 395 medical students, 42% considered themselves addicted to the smartphone. According to SAS-SV, smart phone addiction was found among 43.8% medical students. The QOL of the students was significantly affected by smart phone use in all domains assessed. Study concluded that smart phone addiction was high among medical students and it had a significant negative impact on their QOL. This study also share similar finding as our current study in relation with smart phone use among medical students. An observational study conducted Sinha S and Patil M in 2018 among medical students of Belagavi, Karnataka concluded that even though mobile phone has positive role in daily lives, its overuse had lead to negative impact on health, sleep, and academic performance of students[39,40].

In a study conducted by Sonali Sharma *et al.,* in RUHS College of Medical Sciences, Jaipur, on sleep quality among medical students and its relation with academic performance majority of students had a global PSQI score greater than 6 and about 67% of students were poor sleepers. They concluded that early screening for poor sleep quality among medical students was essential in assessing the magnitude of the problem and early interventions are needed to improve their academic performance and quality of care provided by them later in their professional life [41].

Conclusions

Sleep Quality issues in terms of sleep duration, day time dysfunction and sleep disturbances were common among medical students. Students who performed well in their academics had good sleep quality pattern. Thus good sleep quality was found to be associated with better academic performance. Among those without considerable smart phone addiction, majority had good sleep quality.

Conflict of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

Source of Funding

Ethical Clearance

Necessary approval has been taken from institutional ethical committee.

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