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# Impact of screen time on sleep quality, quantity and academic performance among medical students in north coastal Andhra Pradesh-A cross-sectional study

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## ABSTRACT

### Background

There is existing research indicating that exposure to blue light from electronic devices can affect sleep, and that reduced sleep can impact academic performance, the specific investigation of these factors in the context of medical students is yet to be explored. Hence the present study was done with the primary objective of exploring the relationship between electronic gadget screen time, sleep quality, sleep quantity, and academic performance in undergraduate medical students.

### Methods

A cross-sectional study was conducted among the students of Andhra Medical College, Visakhapatnam city between 1 to 4 Professional years. A convenient sample size of 327 was considered to carry out the study. Data of electronic gadget usage was collected using a pre-tested proforma. Data of sleep quality, quantity was collected using Pittsburg Sleep Quality Index through google forms. Data of academic performance was collected from the marks sheet provided by the college authorities.

### Results

Average screen time was found to be 5 hours per day. A significant association between screen time and sleep quality (PSQI score with a p value of 0.001) was observed on application of Chi-square test but quantity of sleep was not affected by number of hours spent on screen. Screen time found to have no direct relationship with sleep quantity and academic performance.

### Conclusion

Screen time does not have a direct relationship with sleep quantity academic performance.

**Key-words:** Screen time, sleep quantity, sleep quality, academic performance, medical students

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## INTRODUCTION

In last decade, with technological advancement, there is a dramatic increase in the availability and use of electronic gadgets such as smartphones, computers, videogame consoles and tablets. The time spent on television, internet, and videogames, which is collectively known as SCREEN TIME is increasing among today's youth. [1]The National Kaiser Family foundation [US] survey found that children aged 8-18 years had an average screen time of 7.5hours/day [2]. This has glaringly exceeded the American Academy of Paediatrics [AAP]recommendation of 2hours/day or less [3].

Sleep is a vital, often neglected component of every person's overall health and well-being. Sufficient nap is a biological and psychological requirement and prerequisite to sound cognition, good psychological status, and overall performance. Exposure to luminous light from the electronic devices would hinder sound sleep by altering communication pattern between sleep–wake cycle and the internal clock.[4] Getting exposed to screen light during the nighttime could elevate alertness, diminish melatonin production, and bring on phase lag in the circadian clock such as lag in sleep time.[5],[6]

Excessive exposure to screen especially at adolescence has been associated with lower academic performance, increased sleep problems, obesity behaviour problems, increased aggression, lower self-esteem, and depression. Exposure to blue light has been found to affect sleep. Reduced sleep has been found to affect academic performance.[7]However, electronic gadget screen time, sleep quality and quantity and academic performance in undergraduate medical students has not been explored so far. Sleep deprivation during adolescence can cause problems with mood, emotion, and academic performance. Teens who don't sleep well are more likely to have problems with their peers, and chronic sleep loss can lead to a weakened immune system, depression, and suicidal thoughts.Sleep loss and screens are both risk factors for obesity as well, especially when screen time takes the place of exercise. Sleep loss also leads to increased tiredness during the day, which can be very dangerous for young drivers.[8]

The significance of sleep to overall health and well-being exemplifies the critical need to identify factors that negatively affect it, especially during unprecedented times such as the COVID-19 global epidemic, and it requires an overarching investigation. Study done by Bharadwaj et al in 2021, observed that screen time affects our physical health, mental health and directly impacts child development. Excessive screen time results in a sedentary lifestyle with little to no physical activity. Artificial light emitting from screens affects our eyes, brain, and sleep. Because of these concerns, experts have suggested controlling screen time. In recent years there have been significant strides made to reduce screen time; some governments have placed restrictions on its usage while some companies have considered the possibility of allowing employees to have breaks from their work to not view a screen.[9]

Restricted social interactions imposed by the pandemic aggravated the over-use of digital devices for socializing which included virtual dates, virtual tourism, virtual parties, and family conferences Notably, in times of social distancing; there is a possibility that screen time may not negatively interfere with well-being as it is the only way to remain socially connected. However, mindful use of the digital screen time needs to be under the check. The unprecedented digital life during the pandemic also gave rise to increased levels of anxiety, sad mood, uncertainty and negative emotions like irritability and aggression, a normative response to pandemic. However, anxiety and aggression also meant an increase in cybercrimes and cyber-attacks. This has raised concerns about the impact of screen time on mental health.[10]The primary objective of this study was to explore Electronic Gadget Screen time, sleep quality, and sleep quantity and academic performance among medical students.

## OBJECTIVES

- Measurement of average screen time among the medical students.
- To estimate the impact of screen time on sleep and academics among the study subjects.

## METHODOLOGY

A cross-sectional study was conducted among the students of Andhra Medical College, Visakhapatnam city between 1 to 4 Professional years. A convenient sample size of 327 was considered to carry out the study.

**Study period**: August 2022 to October 2022.

**Sample size:**

A convenient sample of 400 students, 100 students from each professional year were selected randomly. Approval from the Institutional Research Ethics Committee of Andhra Medical College was obtained before conduct of study.Data was collected from the eligible students and willing to give consent for study. Informed consent forms were taken from all the subjects between 18-24 years before data collection.

**SAMPLING TECHNIQUE:**

Duration of MBBS course is spread over four professional years. At the time of study, number students in the 1st, 2nd, 3rd, and 4th professional years were 200 each. From each professional year 100 students were randomly selected for the study, eligible subjects who met the inclusion criteria were listed out from them. Information was obtained from the participants after obtaining informed consent. Questionnaire was shared online in google forms to collect the data. The responses were received from 327 students whose data was analysed and presented.

**STUDY TOOLS:**

Pittsburgh Quality of Sleep Index questionnaire, sleep quantity assessment questionnaire, internal assessment marks sheets and google forms.

**INCLUSION CRITERIA:**

MBBS students who possess and use any form of electronic gadgets (Mobiles, Laptops, T.V, & iPad) and are consenting to participate in the study between 18-24 years age.

**EXCLUSION CRITERIA**

MBBS students who have disturbed sleep due to any other disease states and not willing to participate were excluded from the study. Students who did not respond to the google sheets were also excluded from the study.

**METHOD OF DATA COLLECTION:**

Data regarding usage of electronic gadget was collected using a predesigned pretested questionnaire, including self-reported usage of the type of electronic gadget (TVs, PCs, Laptops, Tablets, Smart phones etc.).Data with respect to sleep quality was collected using Pittsburgh Sleep Quality Index (PSQI) questionnaire.Information on academic performance was obtained from their recent internal assessment marks sheets from the respective departments to avoid subjective error.

**STUDY VARIABLES:**

Age, gender, current professional year, number of hours of sleep, opinion about the reduction of screen time, PSQI questionnaire containing the data required for sleep quality and quantity assessment.

**PSQI:**

It is Sleep quality index developed by Pittsburgh university to assess the sleep quality. It consists of questionnaire regarding sleep quality and the result will be assessed by scoring each question in the questionnaire. Score is calculated by taking sum of 7 components, each component consists of set questions in the questionnaire. Each component has minimum score of 0 and a maximum score of 3. The PSQI total score ranges from 0-21. According to this source higher the score poorer is the sleep quality.

**Academic performance:**

Academic performance was assessed by taking internal marks from the department and average marks of each participant was calculated for all subjects in their respective years.

The cutoff average is taken as 50, those with less than 50 is considered to have bad performance and with more than 50 good performances.

**Sleep quantity:**

Assessment of sleep quantity was done by taking average sleep hours of the participants with the help of a questionnaire. The cutoff sleep quantity was taken as 6 hours. Above 6 hours was good sleep and less than 6 hours was considered as poor sleep quality.

## DATA ANALYSIS

Data collected was entered into Microsoft excel spread sheets. Population descriptive analysis with mean values and standard deviation of continuous variables was done. Pearson's Chi-square Test was used to evaluate the statistical significance between variables using software SPSS version 25.

## OBSERVATIONS AND RESULTS

Responses were obtained from 327 students. All the students between age 18 – 24 were considered for the study. Their mean age was 20.2 years.More than half (55.3%) of the students were in the age group of 18-20 years followed by 21-23 (44.3%) and 0.003% in the age group 24-26 years.More than half (55%) of the study participants were males and females were 45%.Type of screen used by majority of the subjects was mobile phone (98.2%) followed by tablet (31.5%), Tv (22.3%), laptop (13.5%) and others.The average screen time was found to be 5 hours and it was observed among 26% of the subjects. About 30% of the subjects spent < 5 hours and 44% spent > 5 hours on screen in the present study.Coming to the perceptions about impact of usage of electronic device on academic performance, 87% of the subjects mentioned that reducing the usage of electronic device can increase their academic performances and 13% subjects felt that there would be no effect on their academic performance.In majority of the study subjects average sleep hours were found to be 6 hours (47.7%) in the present study. Subjects having > 6hours of sleep were 32% as compared to 21% of subjects having < 6 hours of sleep.

Average screen time was found to be 5 hours among the respondents in the present study. The screen time of the participants was ranging from 1hour to 12 hours. It was found that 26.3% of the subjects were spending 5 hours on screen followed by 16.7% for 6 hours, 16.1% for 4 hours. Maximum screen time spent was 12 hours, observed in 2.4% of the subjects.

The subjects (56%) having <5hours of screen time had PSQI score ranging from 3 to 14, whereas the subjects (44%) having >5hours of screen time has PSQI score ranging from 15 to 19. Majority of the study participants had high PSQI score which indicates poor sleep quality. When chi-square test was conducted for screen time and PSQI score there is significant association between them with a p value of 0.001.

### Screen time and number of hours of sleep

There was no significant statistical association found between screen time and number of hours of sleep showing that the quantity of sleep is not affected by number of hours spent on screen.

### Screen time vs academic performance

Among the students whose screen time was less than 5 hours, 51.08% of the subjects had good performance as compared to 48.91% who were bad in their academics.However, no significant statistical association was observed between screen time and academic performance of the students.

## DISCUSSION

Age of the students in the present study was ranging from 18-26 years with a mean age of 20.2 years. Similar finding was also reported by **Renju Sussan Baby et al** that the students from medical college participated in their study were between the age group 18-23 years.[7] More than half (54.4%) of the study participants were males and females were 45.3% in the present study.

A study done by **Koushik Yeluri et.al**, found that the females participated (207) were more as compared to males (191) in their study [11]. In another study by **Hao Wang et. al** 37.7% of their participants were boys and 39.0% were girls.[12]. A study by **Renju Sussan Baby et al** showed that majority (69%) of the students from medical college participated in their study were males. [7]

Type of screen used by majority of the subjects was mobile phone followed by tablet (iPad), Tv, laptop and others. Cumulative percentage was calculated because majority of the study participants were using multiple gadgets. Percentage of subjects using mobile was 98.2%, Tablet (iPad) 31.5%, subjects watching TV were-22.3%, participants using laptop-13.5% in the present study. **Koushik Yeluri et al** found in their study that the most used gadget was the smart phone (100%), followed by laptops (78.7%) and Tablets (42.3%).[11]

**Screen time**

The average screen time recorded for all the subjects was 5 hours per day in the present study. This finding was significantly higher when compared to the screen time of 2 hours as reported by a similar study done in December 2017 in Tamil Nadu by **Gladius Jennifer et al.** [13]

**Koushik et al** observed an average screen time of 5.13 hours among their study population which is in consistent with the observation made in the present study.[11]

**Sleep quality:**

As per the PSQI score, people having high PSQI score were considered to have poor/bad sleep quality. Majority (77.06%) of the subjects in the present study reported that their sleep quality as very bad, 9.78% subjects as bad,10.70% subjects reported as fairly good, 4 % with a very good sleep quality. However according to PSQI grading based on Global PSQI scores, 92% of the subjects were found to have poor sleep quality (PSQI >6) and 8% had good sleep quality (PSQI <6). Slowly higher fraction of students was having poor sleep quality, when compared to previous literature conducted by Jennifer et al where no significant association between screen time and sleep quality was identified. Participants did not show much of difference in their PSQI scores among students having high screen time and low screen time.[13].

Observations made in this study were differing from the findings by **Renju Sussan Baby et al,** revealed that there was a negative correlation between screen time and sleep quality.[7]

In another study by **Gladius Jennifer et al** nearly 80% the students who were using mobile phone more than 2 hours got poor academic performance. They also observed that there was a decreasing trend of getting marks over the years.[13]

**Screen time and sleep quantity:**

With respect to screen time and sleep quantity, a negative correlation was noted between total screen time and sleep quantity (Pearson correlation= -0.065) in this study. The correlation between the parameters though was not significant (p=1.664), the results from our findings contrasted with other studies where a direct significant correlation between overall screen time and the quantity of sleep was observed [13].

Similar findings were noted in **American paediatric population** where they found a modest impact of screen time on sleep quantity.[14]

A study by **Corder.K et al,** concluded that total screen time has either minimal or no effect on sleep time; however, this study was performed in pediatric population. [15]

Whereas in another study done by **Amelia Vivi et al 2019** on screen time activity and its impact on sleep duration among school aged children per day found that about 63.9% of their children have insufficient sleep (less than 9 hours), boys have a higher percentage than girls (70.15%), girls' sleep duration showed a good score which is 9.15 hours per day and most of the girls had sufficient sleep and 56.29% of them were having sleep insufficiency. [16]

It was found in a study done by **Suhas Chandran et al**. on screentime impact on sleep quantity among rural and urban students, total sleep duration on weekdays in rural students was 7.1 hours (SD=83 minutes), as opposed to 6.6 hours (SD=73 minutes) in urban, and onset latency of 15.5 minutes (SD=13) in rural and 25 minutes (SD=17) in urban students, with the latter being statistically significant, during weekends.[17]

Sleep quantity was not affected by screen time because the students who are having more screen time, they are compensating the excessive screen time usage with sleeping for more hours. Going late to bed and waking late in the morning.

**Screen time and academic performance:**

Screen time did not significantly correlate with academic performance in the present study with a p value of 0.243. This finding contrasted with the previous study where it was identified that, screen time had directly and negatively correlated with academic performance of the subjects. The studies were **Gladius Jennifer et al**. [13]. A similar negative correlation between screen time and academic performance was also observed in a Systematic Review and Meta-analysis by Mireia Adelantado-Renau et al, reported that the amount of time spent on overall screen media use was not associated with academic performance [18].

This pattern is probably since reference studies mentioned in this study were carried out 4 years prior to our study when the e-books were not much in use and the increasing prevalence of eBooks during the past few years which need either a mobile phone, tablet, or a laptop to read. This might be an indication of changing trend, the way students read their books and changes in the way gadgets play a role in a student's life.

Interestingly male subjects had a significant positive correlation between academic performance and screen time as observed in a study by **Corder.K et al.** [15]

**Screen time and time taken to fall asleep:**
Total screen time had a significant correlation with the time taken to fall asleep. The average screen time for subjects needing >30 minutes to fall asleep was 5.58 hours as compared to those needing <15 minutes was 4.98 hours.

This study showed that there was a significant correlation between increased mobile phone usage and sleep disturbance, which was supported a study by Gupta et al, who revealed that 76.4% of their study subjects were using smart phones during the nighttime. They also found an association of nighttime phone usage and time spent on mobile phones with decline in study habits, difficulty in concentration, increase in missed classes, and going late for classes. [19]

## LIMITATIONS

Further studies involving higher number of students with a larger sample size and higher number of variables like subjects' physical activity, BMI scores is desirable. Other variables like accident proneness, substance abuse, sleeping during the classes and performance during practical, anxiety was not included.

## CONCLUSION

This study highlights the impact of gadget use and importance of sleep on academic performance. Findings from this study also suggests that the total Screen time have a direct relationship with sleep quality, but there was no impact of screen time on sleep quantity and academic performance. motivate the Students are need to be educated to engage themselves in cocurricular activities. Interventions to limit mobile phone usage at college level should be encouraged. Counselling sessions should become part of the curriculum to combat stress levels and sleep deprivation.

**Table 1: Relation of screen time with sleep quality as per PSQI score**

| | | TOTAL PSQI SCORE MAX SCORE 21 | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | |
| SCREENCAT | <5 hrs | 2 | 9 | 11 | 14 | 10 | 14 | 14 | 25 | 29 | 29 | 28 | 0 | 0 | 0 | 0 | 0 | 185 |
| | >5 hrs | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 30 | 17 | 24 | 46 | 142 |
| Total | | 2 | 9 | 11 | 14 | 10 | 14 | 14 | 25 | 29 | 29 | 28 | 25 | 30 | 17 | 24 | 46 | 327 |

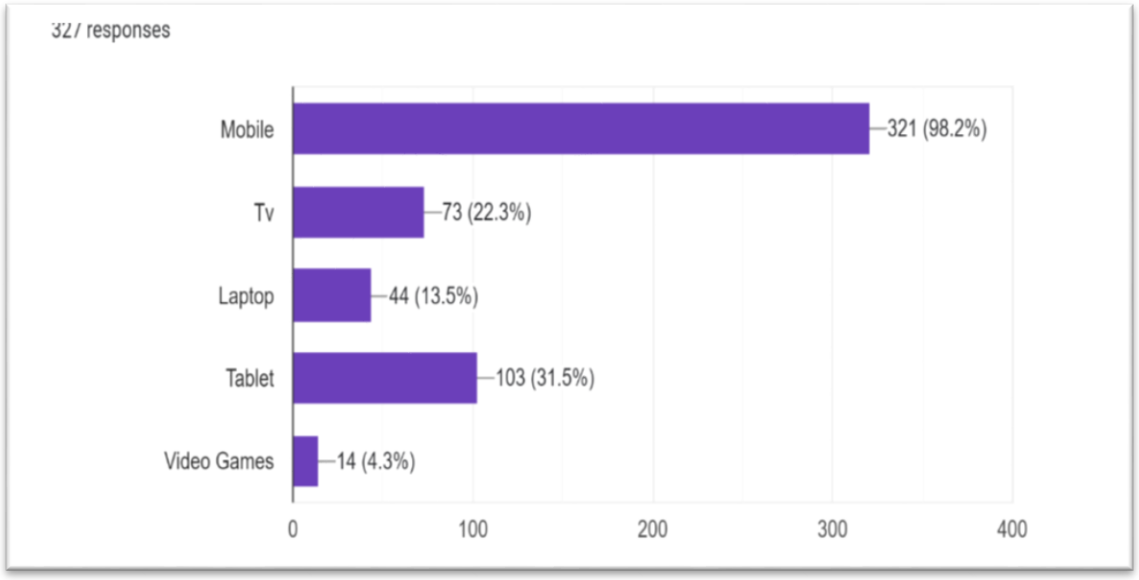


**Figure:1 Distribution of gadgets used by the subjects**

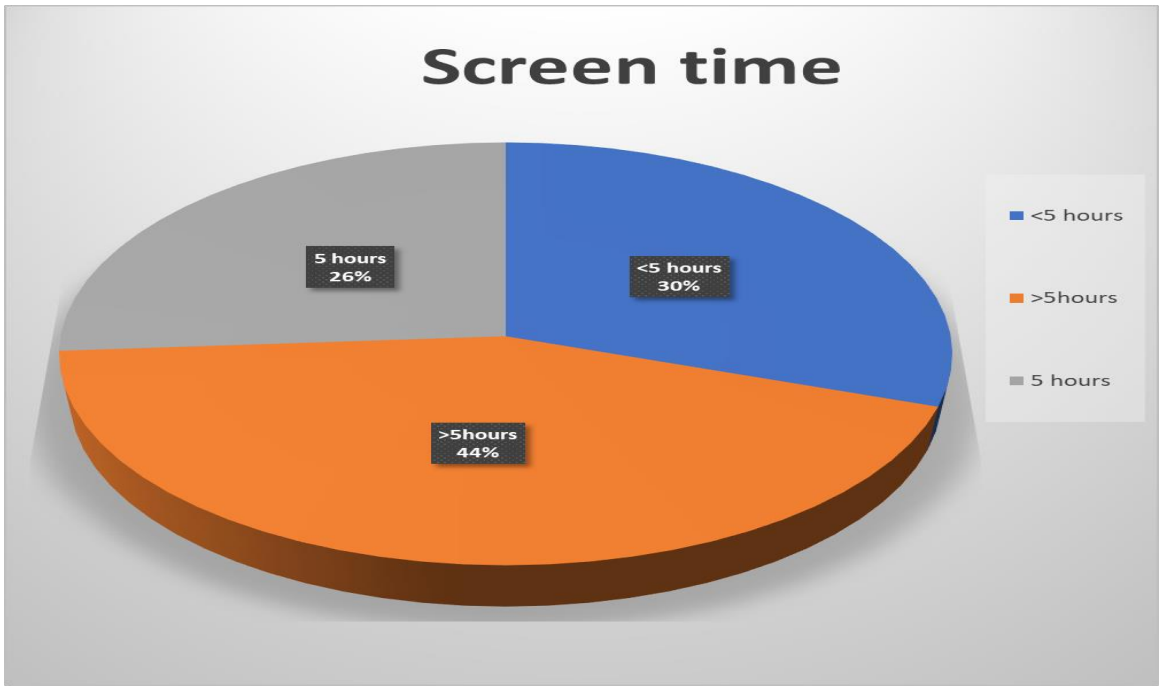


**Figure:2 Distribution of Screen time among subjects**

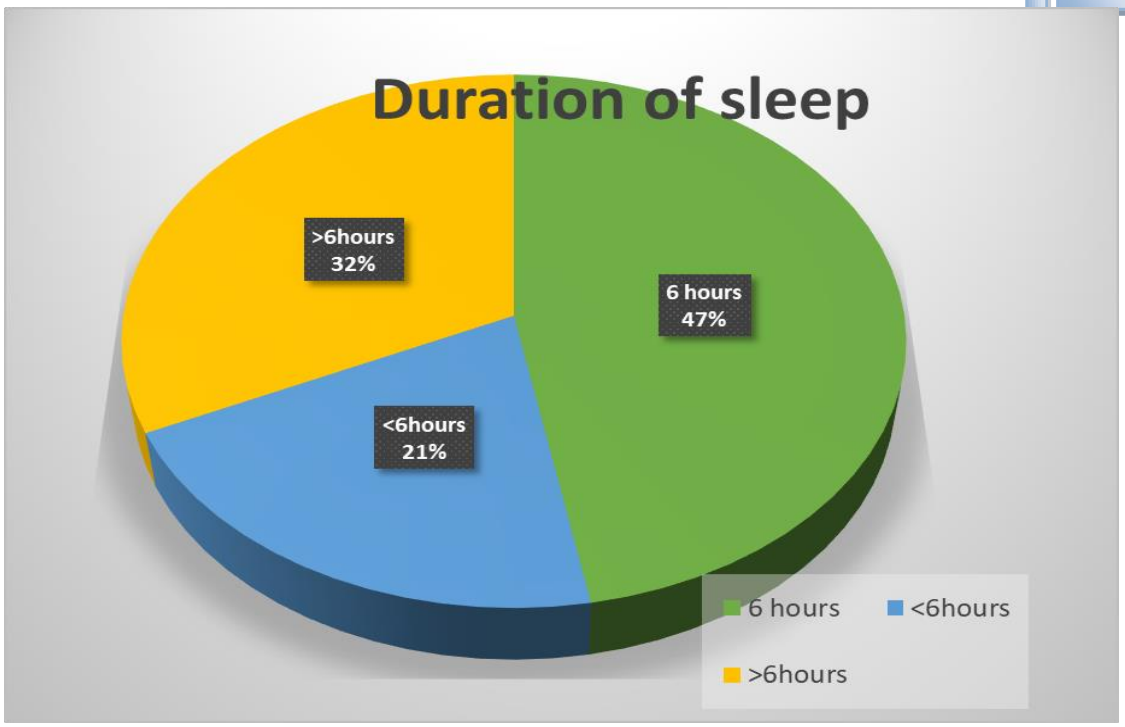


**Figure:4 Duration of sleep among the study subjects**

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