

## ASSOCIATION OF SLEEP DURATION WITH SCREEN TIME IN SCHOOL CHILDREN IN THE AGE GROUP OF 10 TO 12 YEARS DURING COVID-19 PANDEMIC AT SOUTHERN INDIA

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### Abstract

**Background:** Screen time, sleep pattern and physical activity pattern of students had undergone drastic changes during COVID – 19 pandemic. The objective of the study was determining the association of sleep duration with screen time duration and night time screen behaviours in school children aged 10 to 12 years during COVID – 19 pandemic. **Material and Methods:** This cross-sectional study was conducted among school children aged 10 to 12 years at southern India during COVID-19 pandemic over a period of three months from March 2021 to May 2021. Data was collected using a pre designed questionnaire from the parents and children and analyzed. **Results:** The mean average screen time duration per day was  $4.523 \pm 0.611$ (SD) hours. The mean average screen time duration spent for non-academic purpose per day was  $1.733 \pm 0.481$ (SD) hours. Majority of the children 140 (81.4%) had an average screen time duration of more than 4 hours per day. 42.4% used visual screen in the bedroom, 12.8 % used visual screens at night time in darkness and 86% of the children stopped using visual screens within 60 minutes prior to sleep. The mean average sleep duration per day was  $10.141 \pm 1.311$ (SD) hours. The mean average sleep duration per day on school days was  $9.959 \pm 1.752$ (SD) hours and on holidays was  $10.596 \pm 1.649$ (SD) hours. 11 % had night time waking and 12.8% had day time tiredness. There was no statistically significant correlation of average screen time duration per day with average sleep duration per day. There was no statistically significant correlation of average screen time duration and average sleep duration per day with age, gender, socioeconomic status, family type and night time screen behaviour. **Conclusion:** There was no association of sleep with screen time duration and night time screen behaviours among school children aged 10 to 12 years during COVID-19 pandemic.

## INTRODUCTION

World Health Organization (WHO) declared COVID-19 as a pandemic on March 11, 2020. Around 87% of the world's student population was affected by COVID-19 school closures. COVID-19 pandemic led to several changes in the educational sector including online learning methods in place of traditional face to face learning. In addition to changes in the educational system, due to social distancing and restrictive movement policies students experienced several lifestyle changes. Screen time, sleep pattern and physical activity pattern of students had undergone drastic changes during the pandemic.<sup>[1]</sup>

The objective of the study was to determine the association of sleep duration with screen time

duration and night time screen behaviours in school children aged 10 to 12 years during COVID – 19 pandemic.

## MATERIALS AND METHODS

This cross sectional study was conducted among school children aged 10 to 12 years at Kanyakumari district, Tamilnadu, India during COVID – 19 pandemic over a period of three months from March 2021 to May 2021. 172 school children fulfilling the inclusion and exclusion criteria were included in the study. School children in the age group of 10 to 12 years whose parents are willing to participate in the study were included. Children with Mood Disorders, Anxiety, Behavioural Problems, ADHD, Autism, Parasomnias, Sleep apnea, chronic illness, acute

illness and Children on medications. After obtaining informed consent from the parents and children, demographic details and data regarding screen time and sleep duration were collected using a pre designed questionnaire from the parents and children. Average Screen time per day was calculated by the following formula (Average Screen Time per day on school days X Number of school days per week) + (Average Screen Time per day on Holidays X Number of holidays per week)/7 Average sleep duration per day was calculated by the following formula (Average sleep duration per day on School Days X Number of School days per week) + (Average sleep duration per day on Holidays X Number of Holidays per week)/7

Statistical analysis of the data collected was done using SPSS 25 software using suitable statistical methods. P Value less than 0.05 was considered statistically significant.

## RESULTS

The demographic details of the 172 school children enrolled in the study is shown in [Table 1].

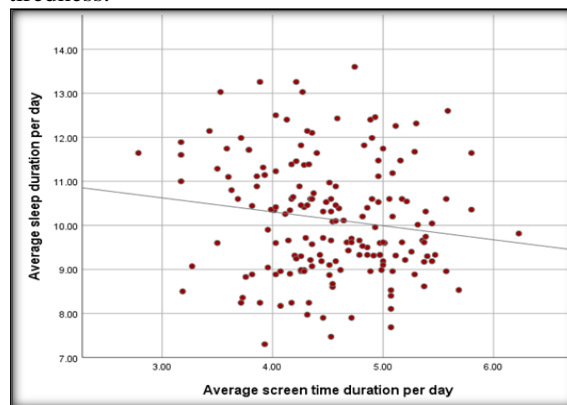
The mean average screen time duration per day of school children aged 10 to 12 years at Kanyakumari district, Tamilnadu, India during COVID 19 pandemic was  $4.523 \pm 0.611$ (SD) hours [Table 2].

Majority of the children 140 (81.4%) had an average screen time duration of more than 4 hours per day. 42.4% used visual screen in the bedroom, 12.8 %

used visual screens at night time in darkness and 86% of the children stopped using visual screens within 60 minutes prior to going to sleep.

The mean average sleep duration per day was  $10.141 \pm 1.311$ (SD) hours. The mean average sleep duration per day on school days was  $9.959 \pm 1.752$ (SD) hours and on holidays was  $10.596 \pm 1.649$ (SD) hours.

In our study 69.8% of the students had an average sleep duration per day between 9 to 12 hours [Table 4]. Of the 172 school children studied, 11 % had night time waking and 12.8% had day time tiredness.



**Figure 1: Average screen time duration per day and average sleep duration per day**

Pearson Correlation:  $r(170) = -0.148$ , P Value - 0.053 (Not significant).

**Table 1: Demographic details**

	Number of children (Total n =172)	Percentage
Age (Years)		
10	54	31.4%
11	53	30.8%
12	65	37.8%
Gender		
Male	93	54.1%
Female	79	45.9%
Socioeconomic Status (Modified Kuppuswamy Scale)		
Class I	19	11.0%
Class II	31	18.0%
Class III	82	47.7%
Class IV	23	13.4%
Class V	17	9.9%
Type of family		
Joint Family	96	55.8%
Nuclear Family	76	44.2%

**Table 2: Mean Average Screen Time Duration per day**

Average Screen Time Duration per day	Mean (Hours)	Standard Deviation
Overall	4.523	0.611
on School Days	5.168	0.767
on Holidays	2.909	0.873
For Academic Purpose (On School Days)	3.905	0.519
Non-Academic Screen Time	1.733	0.481

**Table 3: Mean Average Sleep Duration per day**

Average Sleep Duration per day	Mean (Hours)	Standard Deviation
Overall	10.141	1.311
on School Days	9.959	1.752
on Holidays	10.596	1.649

**Table 4: Average sleep duration per day**

Average Sleep Duration per day (Hours)	Number of children	Percentage
< 9	36	20.9%
to 12	120	69.8%
>12	16	9.3%
Total	172	100 %

**Table 5: Correlation between screen time and sleep duration with various factors**

Parameter 1	Parameter 2	Chi Square	P Value	Statistical Significance
Average Screen Time Duration per day	Age	X <sup>2</sup> = 0.297	0.862	Not significant
Average Screen Time Duration per day	Gender	X <sup>2</sup> = 1.125	0.289	Not significant
Average Screen Time Duration per day	Socioeconomic Status	X <sup>2</sup> = 2.151	0.708	Not significant
Average Screen Time Duration per day	Family Type	X <sup>2</sup> = 0.202	0.653	Not significant
Average Screen Time Duration per day	Number of visual Screens	X <sup>2</sup> = 5.258	0.072	Not significant
Average Screen Time Duration per day	Nighttime waking	X <sup>2</sup> = 0.085	0.771	Not significant
Average Screen Time Duration per day	Day time tiredness	X <sup>2</sup> = 1.508	0.219	Not significant
Average Sleep Duration per day	Age	X <sup>2</sup> = 4.605	0.330	Not significant
Average Sleep Duration per day	Gender	X <sup>2</sup> = 5.672	0.059	Not significant
Average Sleep Duration per day	Socioeconomic status	X <sup>2</sup> = 6.657	0.574	Not significant
Average Sleep Duration per day	Family type	X <sup>2</sup> = 4.331	0.115	Not significant
Average Sleep Duration per day	Average screen time duration per day for nonacademic purpose	X <sup>2</sup> = 0.631	0.729	Not significant
Average Sleep Duration per day	Number of visual screens used	X <sup>2</sup> = 3.885	0.422	Not significant
Average Sleep Duration per day	Use of visual screens in bedroom	X <sup>2</sup> = 0.363	0.834	Not significant
Average Sleep Duration per day	Use of visual screens in dark at night time	X <sup>2</sup> = 0.215	0.898	Not significant
Average Sleep Duration per day	Time prior to sleep when child stops using visual screens	X <sup>2</sup> = 1.981	0.371	Not significant
Nighttime waking	Time prior to sleep when child stops using visual screens	X <sup>2</sup> = 0.209	0.648	Not significant
Nighttime waking	Use of visual screens in dark at night time	X <sup>2</sup> = 3.133	0.077	Not significant

As shown in [Figure 1], average screen time duration per day and average sleep duration per day were found to have very weak negative correlation with Pearson correlation coefficient  $r(170) = -0.148$ . But this was not statistically significant. There was no statistically significant correlation of various factors with average screen time duration per day, average sleep duration per day and night time screen behaviour as shown in [Table 5].

## DISCUSSION

The American Academy of Sleep Medicine (AASM) recommends that children between 6 to 12 years of age should sleep 9 to 12 hours per 24 hours on a regular basis to promote optimal health.<sup>[2]</sup> The average sleep duration of Indian children has been observed as 8.6 ( $\pm 0.7$ ) hours (Roman-Vinas et al - 2016), 7.2  $\pm$  1.26 hours (Mathew et al -2019), between 7.6 $\pm$ 2.7 hours to 9.04 $\pm$  0.9 hours (Ilamparithi P et al – 2017) in various studies.<sup>[3-5]</sup>

In our study we found a higher mean average sleep duration per day of 10.141 $\pm$  1.311(SD) hours compared to the average sleep duration recorded by various studies during COVID-19 pandemic done in Italy (9.11  $\pm$  1.10 hours) and Canada 9.19 hours (SD - 2.33).<sup>[6,7]</sup>

by Prateek Kumar Panda et al and Zhou et al observed during COVID-19 pandemic that 21.3% and 40% of

children had sleep disturbance.<sup>[8,9]</sup> In a study among rural Indian children (2011), in the age group of 7 to 12 years, excessive daytime sleepiness was noted in 1.9% of children and awakening during night in 11.87%.<sup>[10]</sup> This is comparable to our study (11%) though excess daytime sleepiness noted in our study among children is slightly higher (12.8%).

Gender association with sleep duration has been observed by Konstantinos D Tambalis et al and Mathew et al,<sup>[4,11]</sup> Lesser sleep duration was reported in children from lower socioeconomic status in studies by Salway et al, Petrov et al, Mathew et al and Doane et al.<sup>[4,12-15]</sup> Sleep related problems were more in Indian children raised in nuclear families in a study by Bharti et al.<sup>[16]</sup> However, we found no statistically significant correlation of sleep duration with age, gender, socioeconomic status and family type.

Indian Academy of Pediatrics (IAP) recommends that children below the age of 2 years should not be exposed to any type of screen with the exception of occasional video call with relatives. A maximum of one hour of supervised screen time per day for children 24-59 months of age and less than two hours per day for children 5-10 years of age. For older children and adolescents, it is important to balance screen time with other activities that are required for overall development. Screens should be switched off 1 hour before bedtime.<sup>[17]</sup>

During covid 19 pandemic, daily screen time duration in children observed among various studies were  $7.61 \pm 2.13$  hours (Italy)  $5.14$  (SD - 3.54) hours to  $6.53$  (SD - 3.31) hours.(Canada). 1,6 The average screen time duration per day observed in our study was  $4.523 \pm 0.611$ (SD) hours.

Age, gender, social economic status and family type had no significant association with increased screen time in our study. No age associations were observed in the studies by Dubey et al (New Delhi, India) and Ye et al (China).<sup>[18,19]</sup> Urban boys reported a significantly higher screen usage in bedroom in a study at Tanjore, Tamilnadu.<sup>[5]</sup>

An inverse relationship between screen time duration and socioeconomic status has been observed in studies by Mannikko et al and Bapat et al.<sup>[20,21]</sup> A higher maternal education was observed to significantly reduce screen time duration among Indian school children in a study by Ravikiran et al.<sup>[22]</sup> However socioeconomic status did not show any significant association with screen time in a study in New Delhi, India by Dubey et al (2018).<sup>[18]</sup> Family type had no association with screen time duration among children in studies by Dubey et al, and Mcmillan et al.<sup>[18,23]</sup> Unlike our study, number of devices owned by a child were found to be positively associated with child's screen time in a study by Ishtiaq et al.<sup>[24]</sup>

Hale L et al, Twenge JM et al, Konstantinos D Tambalis et al, CASPIAN-V Study (Iran) have demonstrated shortened sleep duration and poor sleep outcomes with increasing screen time.<sup>[11,25-29]</sup> However only a weak or modest association between screen time and sleep were observed by Andrew K Przybylski and Stiglic and Viner in their studies similar to our observation.<sup>[30,31]</sup>

In our study 86% of the children used visual screens within 60 minutes prior to going to sleep comparable to the 71.5% night time screen media use observed by mireku et al.<sup>[32]</sup> The same study observed that 32.2% of the children used mobile phones in darkness which is higher than the 12.8% observed in our study.<sup>[32]</sup> The lesser night time usage in darkness in our study could be explained by co sleeping with parents practised in this region.

Problematic night time screen behaviours have been found to adversely affect sleep outcome in studies by Garrison M et al, Cespedes E M et al, Mireku MO et al, and Falbe et al.<sup>[32-35]</sup> Our study showed no statistically significant correlation of sleep duration or night time waking with night time screen behaviour.

More research is required with focus on the type of screen time contents to understand better the influence of screen time duration and night time screen behaviours with sleep. Our study is also limited by the lack of sleep studies in the participants.

## CONCLUSION

In our study 69.8% of the students had an average sleep duration per day between 9 to 12 hours as recommended by AASM. 81.4% of the students had an average screen time duration of more than 4 hours per day. There was no statistically significant correlation of sleep duration with screen time duration and nighttime screen behaviours. More studies on the association of sleep quality with screen time duration and screen time content are required to learn more about influence of screen time on sleep.

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