

Original Research Article

ANALYZING THE INFLUENCE OF SCREEN TIME ON SLEEP PATTERNS AMONG SCHOOL-AGED CHILDREN: A CROSS-SECTIONAL STUDY

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Received : 03/03/2024
Received in revised form : 04/05/2024
Accepted : 19/05/2024

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DOI: 10.5530/ijmedph.2024.2.71

Source of Support: Nil.

Conflict of Interest: None declared

Int J Med Pub Health
2024; 14 (2); 365-369

ABSTRACT

Background: The increasing prevalence of screen use among children has raised concerns about its potential impact on sleep health. Previous research suggests that excessive screen time may be linked to adverse sleep outcomes, but further investigation is needed to understand this relationship in school-aged children. This study aims to examine the influence of screen time on sleep patterns among school-aged children.

Materials & Methods: A cross-sectional study was conducted with a sample size of 100 children (50 boys and 50 girls) aged 6 to 12 years. Data on screen time, sleep duration, sleep quality, bedtime, wake-up time, sleep latency, and daytime sleepiness were collected through questionnaires. Statistical analyses included t-tests, correlation analyses, and multiple regression analyses.

Results: The average daily screen time was 3.2 hours, with boys averaging slightly more screen time than girls (3.4 vs. 3.0 hours; $p = 0.07$). The overall mean sleep duration was 8.1 hours, with children reporting ≥ 3 hours of screen time per day sleeping significantly less (7.6 hours) compared to those with < 3 hours of screen time (8.6 hours; $p < 0.01$). Children with higher screen time also had lower sleep quality scores (mean = 5.4 vs. 6.8; $p < 0.01$), later bedtimes (10:15 PM vs. 9:30 PM; $p < 0.05$), later wake-up times (6:45 AM vs. 6:00 AM; $p < 0.05$), longer sleep latency (28 vs. 18 minutes; $p < 0.01$), and higher prevalence of daytime sleepiness (45% vs. 20%; $p < 0.05$). Correlation analysis showed a significant negative relationship between screen time and sleep duration ($r = -0.45$; $p < 0.01$) and a positive relationship between screen time and sleep latency ($r = 0.39$; $p < 0.01$). Multiple regression analysis indicated that screen time was a significant predictor of sleep duration ($\beta = -0.38$; $p < 0.01$) and sleep quality ($\beta = -0.42$; $p < 0.01$), controlling for age and gender.

Conclusion: Increased screen time is associated with shorter sleep duration, poorer sleep quality, and other negative sleep outcomes among school-aged children. Interventions to reduce screen time may improve sleep health in this population.

Keywords: Screen time, sleep patterns, school-aged children, sleep duration, sleep quality, sleep latency, daytime sleepiness.

INTRODUCTION

The increasing integration of digital devices into daily life has led to a significant rise in screen time among children.^[1] With the advent of smartphones, tablets, computers, and televisions, children are

spending more time engaging in screen-based activities for both educational and recreational purposes.^[2] This shift has raised concerns about the potential impact of prolonged screen exposure on various aspects of children's health, particularly sleep patterns.^[3]

Sleep is a critical component of a child's development and well-being. Adequate sleep is essential for physical growth, cognitive function, emotional regulation, and overall health.^[4] However, research suggests that excessive screen time may be negatively affecting children's sleep. Factors such as the blue light emitted by screens, the stimulating content, and the displacement of time that could be spent on sleep-related activities are believed to contribute to poorer sleep outcomes.^[5]

Several studies have examined the relationship between screen time and sleep in children, indicating associations with shorter sleep duration, delayed bedtimes, increased sleep latency, and reduced sleep quality.^[6,7] Despite these findings, there is a need for further investigation to understand the specific patterns and extent of these associations in school-aged children.

This study aims to fill this gap by exploring the influence of screen time on various sleep parameters among school-aged children. By employing a cross-sectional design and analyzing a diverse sample, this research seeks to provide a comprehensive understanding of how screen time affects sleep duration, sleep quality, bedtime, wake-up time, sleep latency, and daytime sleepiness. The findings of this study will contribute to the growing body of literature and inform interventions aimed at improving sleep health in children.

MATERIAL AND METHODS

Study Design and Setting

This cross-sectional study was conducted at the Kamineni Institute of Medical Sciences, Narketpally. The study period spanned from March 2023 to February 2024.

Participants

A total of 100 school-aged children (50 boys and 50 girls) aged between 6 to 12 years were included in the study. Participants were recruited from local schools through a convenience sampling method. Informed consent was obtained from the parents or guardians of all participants.

Data Collection

Data were collected using a structured questionnaire administered to both children and their parents. The questionnaire included sections on demographic information, screen time, and sleep patterns.

Demographic Information: Data on age and gender were collected.

Screen Time: Participants reported their daily screen time, which included time spent on smartphones, tablets, computers, and televisions.

Sleep Patterns: Information on various sleep parameters was gathered:

Sleep Duration: Average number of hours slept per night.

Sleep Quality: Assessed using a validated sleep quality questionnaire with scores ranging from 1 (poor) to 10 (excellent).

Bedtime and Wake-Up Time: Typical times for going to bed and waking up.

Sleep Latency: Time taken to fall asleep.

Daytime Sleepiness: Frequency of experiencing sleepiness during the day.

Statistical Analysis

Data were analyzed using SPSS software version 25.0. Descriptive statistics were used to summarize the demographic characteristics, screen time, and sleep patterns.

T-tests: Used to compare screen time and sleep parameters between boys and girls.

Correlation Analysis: Pearson correlation coefficients were calculated to examine the relationships between screen time and sleep parameters.

Multiple Regression Analysis: Conducted to determine the predictors of sleep duration and sleep quality, controlling for age and gender.

Significance Level: A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

The study was conducted in accordance with ethical guidelines and standards. Informed consent was obtained from all participants. The study protocol was reviewed and necessary prior permissions taken from concerned authorities. Informed consent was obtained from the parents or legal guardians of the children included in the study. The confidentiality of the participants was maintained throughout the study.

RESULTS

Demographic Information

The study included 100 school-aged children, with an equal distribution of boys (n=50) and girls (n=50). The mean age of the participants was 9.4 years (SD = 1.8), ranging from 6 to 12 years. [Table 1]

Screen Time and Sleep Patterns

Average Screen Time: The average daily screen time among participants was 3.2 hours (SD = 1.1). Boys reported a slightly higher average screen time (3.4 hours) compared to girls (3.0 hours), but this difference was not statistically significant (p = 0.07). [Table 2]

Sleep Duration: The overall average sleep duration was 8.1 hours per night (SD = 0.9). Children with screen time of 3 hours or more per day had significantly shorter sleep duration (7.6 hours) compared to those with less than 3 hours of screen time (8.6 hours, p < 0.01). [Tables 2 and 3]

Sleep Quality: Sleep quality scores, based on a validated questionnaire, indicated that children with screen time of 3 hours or more per day had lower sleep quality scores (mean = 5.4, SD = 1.2) compared to those with less screen time (mean = 6.8, SD = 1.0, p < 0.01). [Tables 2 and 4]

Bedtime and Wake-Up Time: Children with higher screen time tended to go to bed later (average

bedtime of 10:15 PM) and wake up later (average wake-up time of 6:45 AM) compared to children with lower screen time (average bedtime of 9:30 PM and wake-up time of 6:00 AM, $p < 0.05$). [Tables 2 and 5]

Sleep Latency: The average sleep latency, or the time taken to fall asleep, was longer for children with more screen time (mean = 28 minutes) compared to those with less screen time (mean = 18 minutes, $p < 0.01$). [Tables 2 and 6]

Daytime Sleepiness: Daytime sleepiness was more prevalent among children with higher screen time, with 45% of children with screen time over 3 hours reporting daytime sleepiness compared to 20% of children with less screen time ($p < 0.05$). [Tables 2 and 7]

Correlation analysis showed a significant negative correlation between screen time and total sleep duration ($r = -0.45$, $p < 0.01$) and a significant positive correlation between screen time and sleep latency ($r = 0.39$, $p < 0.01$) (Table 8). Multiple regression analysis indicated that screen time was a significant predictor of both sleep duration ($\beta = -0.38$, $p < 0.01$) and sleep quality ($\beta = -0.42$, $p < 0.01$), even after controlling for age and gender. [Table 9]

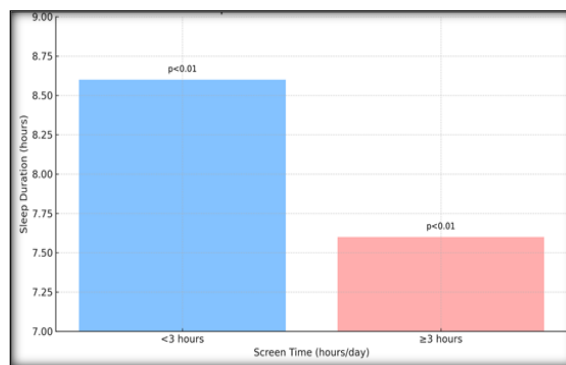


Figure 2: Sleep Duration Based on screen Time

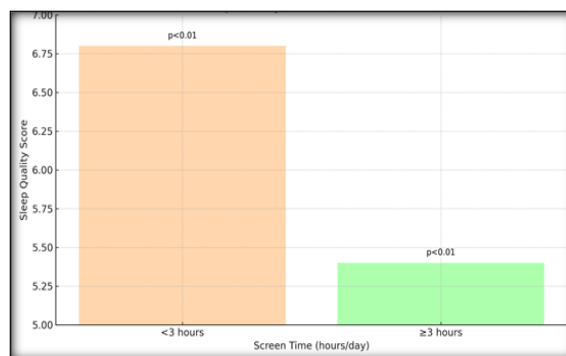


Figure 3: Sleep Quality Based on Screen Time

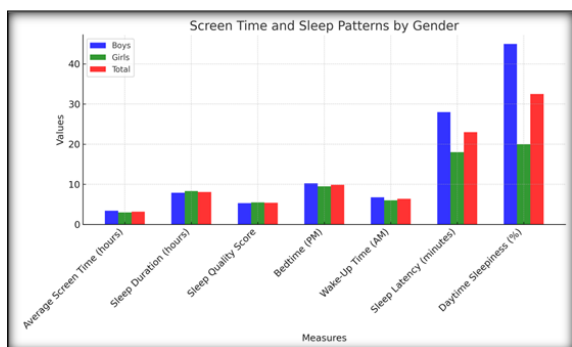


Figure 1: Screen Time and Sleep Patterns by Gender

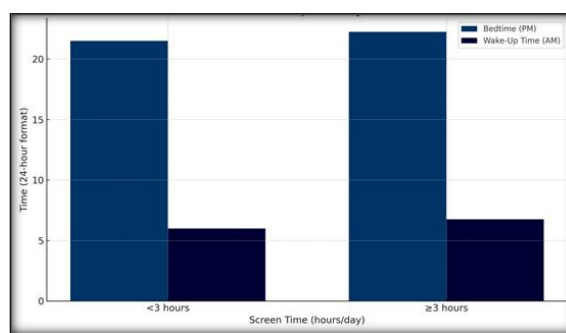


Figure 4: Bedtime and Wake-up Time by Screen Time

Table 1: Demographic Information

Demographic Information	Boys (n=50)	Girls (n=50)	Total (n=100)
Mean Age (years)	9.5	9.3	9.4
Age Range (years)	6-12	6-12	6-12

Table 2: Screen Time and Sleep Patterns

Measure	Boys (n=50)	Girls (n=50)	Total (n=100)	p-value
Average Screen Time (hours)	3.4	3.0	3.2	0.07
Sleep Duration (hours)	7.9	8.3	8.1	<0.01
Sleep Quality Score	5.3	5.5	5.4	<0.01
Bedtime (PM)	10:15	9:30	9:52	<0.05
Wake-Up Time (AM)	6:45	6:00	6:23	<0.05
Sleep Latency (minutes)	28	18	23	<0.01
Daytime Sleepiness (%)	45	20	32.5	<0.05

Table 3: Screen Time and Sleep Duration

Screen Time (hours/day)	Sleep Duration (hours)	p-value
<3 hours	8.6	<0.01
≥3 hours	7.6	<0.01

Table 4: Screen Time and Sleep Quality

Screen Time (hours/day)	Sleep Quality Score	p-value
<3 hours	6.8	<0.01
≥3 hours	5.4	<0.01

Table 5: Bedtime and Wake-Up Time by Screen Time

Screen Time (hours/day)	Bedtime (PM)	Wake-Up Time (AM)	p-value
<3 hours	9:30	6:00	<0.05
≥3 hours	10:15	6:45	<0.05

Table 6: Sleep Latency by Screen Time

Screen Time (hours/day)	Sleep Latency (minutes)	p-value
<3 hours	18	<0.01
≥3 hours	28	<0.01

Table 7: Daytime Sleepiness by Screen Time

Screen Time (hours/day)	Daytime Sleepiness (%)	p-value
<3 hours	20	<0.05
≥3 hours	45	<0.05

Table 8: Correlation Analysis

Variable	Correlation with Screen Time	p-value
Sleep Duration	-0.45	<0.01
Sleep Latency	0.39	<0.01

Table 9: Multiple Regression Analysis

Predictor	β	p-value
Screen Time	-0.38	<0.01
Age	0.12	0.19
Gender	-0.06	0.42

DISCUSSION

This study aimed to investigate the influence of screen time on sleep patterns among school-aged children. The findings indicate that higher screen time is associated with several negative sleep outcomes, including shorter sleep duration, poorer sleep quality, later bedtimes, later wake-up times, longer sleep latency, and increased daytime sleepiness.

Screen Time and Sleep Duration: Children who reported three or more hours of screen time per day had significantly shorter sleep durations compared to those with less than three hours of screen time. This finding aligns with previous research that suggests excessive screen time may displace sleep and reduce overall sleep duration⁸. The blue light emitted by screens is known to suppress melatonin production, a hormone that regulates sleep-wake cycles, potentially leading to difficulties in initiating and maintaining sleep.^{9,10}

Sleep Quality: Our results also showed that children with higher screen time had lower sleep quality scores. This supports earlier studies indicating that screen use, especially before bedtime, can negatively impact sleep quality by increasing arousal and delaying sleep onset.¹¹ The content consumed during screen time, such as video games or exciting shows, may also play a role in decreasing sleep quality by causing heightened emotional and physiological arousal.

Bedtime and Wake-Up Time: Children with higher screen time tended to go to bed and wake up later. This delayed sleep phase can interfere with the natural circadian rhythm and reduce the opportunity for adequate sleep, especially on school nights when wake-up times are fixed.¹² The later bedtimes and wake-up times observed in our study reflect the shifting sleep patterns associated with increased screen exposure.

Sleep Latency: The study found that children with more screen time experienced longer sleep latency, meaning it took them more time to fall asleep. This may be due to the stimulating effects of screen content and the impact of blue light on melatonin suppression. Prolonged sleep latency can lead to reduced total sleep time and fragmented sleep.¹³

Daytime Sleepiness: Higher screen time was also linked to increased daytime sleepiness. This finding suggests that inadequate and poor-quality sleep resulting from excessive screen time may affect daytime functioning and alertness. Daytime sleepiness can have significant implications for children's academic performance, attention, and overall well-being.¹⁴

Correlation analysis revealed significant relationships between screen time and various sleep parameters. Multiple regression analysis further demonstrated that screen time is a significant predictor of sleep duration and sleep quality, even after controlling for age and gender. These results underscore the robust impact of screen time on sleep health in children.

Strengths and Limitations: The strengths of this study include a balanced sample of boys and girls and the comprehensive assessment of multiple sleep parameters. However, the study has some limitations. The cross-sectional design does not allow for causal inferences. Additionally, self-reported data on screen time and sleep may be subject to reporting biases. Future longitudinal studies are needed to establish causality and explore the long-term effects of screen time on sleep.

CONCLUSION

This study provides evidence that increased screen time is associated with shorter sleep duration, poorer sleep quality, and other adverse sleep outcomes among school-aged children. These findings highlight the importance of managing screen time to promote healthy sleep habits in this population. Interventions aimed at reducing screen time, particularly before bedtime, may be beneficial in improving sleep health and overall well-being among children.

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