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Sleep Quality in School-Aged Children: The Role of Environmental Factors and Screen Time

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Abstract

Sleep plays a vital role in the optimal functioning of our body and is crucial for overall well-being. However, many parents are unaware of the negative consequences of sleep deprivation in children. This study examines factors affecting sleep in children and their correlation with screen time. The aim is to evaluate the relationship between screen time and environmental factors impacting sleep quality among school-aged children.A cross-sectional observational study was conducted on children aged 6 to 12 years. Sleep quality was assessed using a 22-item, pre-validated, parent-administered Children's Sleep Habits Questionnaire (CSHQ). Contributing factors, including a screen time questionnaire, were gathered from parents. Children with pre-existing sleep disorders, neurobehavioral disorders, and chronic illnesses were excluded. A CSHQ score above 41 was considered abnormal, indicating a sleep problem. Data were analyzed using the Chi-square test with SPSS version 20.0.In this study, 40.3% of children experienced sleep disturbances. The total mean sleep score was 39.56 ± 14.84, with private school children showing greater disruptions (41.78 ± 12.96) compared to public school children (37.14 ± 16.33; p = 0.001). Significant correlations were found between sleep quality, screen time exposure, and environmental factors such as lower socio-economic status, bed sharing, and room sharing.This study highlights that both excessive screen time and adverse environmental conditions negatively impact children's sleep quality. Efforts to increase awareness among parents, educators, and healthcare providers are needed to reduce sleep disturbances.

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INTRODUCTION

Sleep plays a vital role in the overall growth, cognitive development, and emotional health of school-aged children [1] (ages 6-12). The American Academy of Sleep Medicine recommends that these children sleep for a minimum of 9 to 12 hours daily. Unfortunately, approximately 15% to 75% of schoolchildren fail to meet this recommended sleep duration each night [2]. Lack of proper sleep and poor sleep quality can result in various psychiatric disorders, insomnia, and chronic health issues such as cardiovascular mortality, stroke,

obesity, impaired glucose tolerance, and immune dysfunction [3][4][5]. Adequate sleep is crucial for preventing daytime sleepiness, fatigue, poor concentration, cognitive decline, and emotional dysfunction. These factors can negatively impact children's academic performance and overall well-being.[6][7][8][9][10].

Among the various causes of sleep disturbances, environmental factors and screen time usage have the most impact. Overuse of screens in the form of phones, television, and video games keeps children awake late into the night, contributing to poor sleep quality [11]. Apart from sleep disturbances, children may be exposed to violence, risk-taking behaviors, negative stereotypes, insufficient outdoor or physical activity, and less time spent with family and friends [12]. Various environmental factors also impact sleep patterns in children. Parental conflicts can reduce sleep quality and increase nighttime sleep fragmentation in children. Overcrowding may lead to sharing of beds and rooms with other members, altering sleep patterns in children [14].

The data on factors influencing sleep in children is limited in our country. This study aims to identify the factors affecting sleep quality, including the impact of screen time on sleep quality.

MATERIALS AND METHODS

A one-year cross-sectional study was conducted from January 2021 to January 2022 at a tertiary care hospital in South India. The research received approval from the Institutional Ethics Committee (MGMCRI/RES/01/2020/117/IHEC/331). A total of 502 children aged between 6 and 12 years were selected, excluding those with developmental delay, chronic respiratory illness, or neuropsychiatric disorders.

The study employed stratified clustered randomized sampling to ensure uniformity among urban and rural populations. Participants were recruited from eight schools (four private and four public) in the region. Parents were informed about the study during parent-teacher meetings and provided written consent. For some schools, consent forms and questionnaires were distributed through their children.

Parents were educated about the necessity of this survey and the importance of sleep, the recommended hours of sleep, the negative effects due to lack of sleep, and the benefits of good quality sleep. Counseling on good sleep hygiene was also provided to them. After obtaining informed consent, they were asked to complete a structured questionnaire.

Three types of questionnaires were given to parents, and every parameter was explained to them:

1. Questionnaire on demographic profile
2. Children's sleep habits questionnaire
3. Screen time questionnaire

The demographic profile questionnaire included child data (age, gender, BMI) and family data (socio-economic status, parental education, type of family, number of siblings). The same questionnaire also included factors affecting sleep, such as obesity, frequent respiratory illness, body pain, and family environment, which are modifiable factors contributing to sleep disturbances in children.

The Children's Sleep Habits Questionnaire (CSHQ) is a retrospective 45-item parent questionnaire that has been used in many studies to examine sleep behavior in young children[15].

Parents were asked to recall sleep behavior, sleep onset, behavior during sleep, and night waking, as well as conditions like sleep-disordered breathing, snoring, and morning waking/daytime sleepiness.

Another questionnaire, based on screen time, was a simple survey analyzing the average amount of time children spend on screens (television, phones, computers, or any other electronic screen devices) and the hours used per day on weekdays and weekends.

The data were presented as means with standard deviations (for continuous data) or medians with interquartile ranges (for noncontinuous data). Mean and standard deviation were calculated for continuous variables, while proportions were determined for categorical data.

SPSS software version 20.0 was used to analyze the data. Paired t-tests were employed for comparing related means of biochemical parameters over time, while chi-square and Fisher's exact tests were used to examine qualitative variables. A p-value below 0.05 was considered statistically significant.

RESULTS

Table 1 Distribution of study subjects according to socio-demographic characteristics

Distribution according to socio-demographic characteristics	Category	Type of sector		Frequency n=502 (100%)
		Private n=259(100%)	Public n=243(100%)	
Age	<6 years	65 (58.6%)	46 (41.4%)	111 (22.1%)
	7-8 years	85 (51.2%)	81 (48.8%)	166 (33.2%)
	9-10 years	99 (48.8%)	104 (51.2%)	203 (40.4%)
	11-12 years	9 (69.2%)	4 (30.8%)	13 (2.5%)
	>12 years	1 (11.1%)	8 (88.9%)	9 (1.8%)
Gender	Male	128 (66.7%)	64 (33.3%)	192 (38.3%)
	Female	131 (42.3%)	179 (57.7%)	310 (61.7%)
Parents education	Uneducated	6 (35.3%)	11 (64.7%)	17 (3.3%)
	Primary school	35 (38.9%)	55 (61.1%)	90 (17.9%)
	Secondary school	86 (50.6%)	84 (49.4%)	170 (33.9%)
	College graduate	132 (58.7%)	93 (41.3%)	225 (44.9%)
Socio economic status (Modified Kuppuswamy scale)	Upper class	50 (49.0%)	52 (51.0%)	102 (20.3%)
	Upper middle	34 (35.8%)	61 (64.2%)	95 (18.9%)
	Lower middle	65 (61.9%)	40 (38.1%)	105 (20.9%)
	Upper lower	107 (54.6%)	89 (45.4%)	196 (39.1%)
	Lower class	3 (75.0%)	1 (25.0%)	4 (0.8%)
Type of family	Nuclear family	151 (50.3%)	149 (49.7%)	300 (59.7%)
	Joint family	89 (50.9%)	86 (49.1%)	175 (34.8%)
	Single parent	19 (70.4%)	8 (29.6%)	27 (5.3%)

Table 2 Mean score of sleep parameters based on CHSQ questionnaire

Parameter	Mean Score		TOTAL Mean Score	p-value
	Private sector n=259 (100 %)	Govt. sector n=243 (100%)		
Sleep Behaviour score	10.485 +/- 5.05	9.98 +/- 6.50	10.247 +/- 5.79	0.001
Bed time Behaviour score	22.28 +/- 7.68	20.01 +/- 7.97	21.198 +/- 7.90	0.33
Night Wakening Score	2.936 +/- 2.62	2.156 +/- 2.51	2.563 +/- 2.60	0.001
Morning Wake up Score	6.08 +/- 4.1	4.98 +/- 4.06	5.55 +/- 4.16	0.001
Total Sleep Score	41.78 +/- 12.96	37.14 +/- 16.33	39.56 +/- 14.84	0.001

In the study, the majority of the children were 9-10 years old, with a female predominance of 310 (61.7%). Most of the parents in both groups were graduates (44.9%); 132 (58.7%) from private schools and 93 (41.3%) from government schools. Most of the children belonged to nuclear families (59.7%) in both groups (**Table 1**).

The proportion of sleep disturbances in the study was 43.1% (n = 230).

The total mean sleep score was noted to be 39.56 ± 14.84, with attendees at private schools having a total score of more than 41, indicating sleep disruptions (41.78 ± 12.96) (**Table 2**).

Many socio-environmental factors affect sleep quality in children. In this study, we found that children from lower socio-economic classes had decreased sleep scores. Children who shared a bed (89.0% abnormal; p = 0.03) or room (61.3%; p = 0.01) also had a significant decrease in sleep duration. Although children from nuclear families (58.7%) had higher abnormal sleep scores compared to children from joint families (33.5%), this difference was not significant. Among children

Table 3 Various Factors affecting Sleep Score

Factors attributes		Sleep Score		Total	p-value
		Normal	Abnormal		
Type of family	Nuclear Family	176 (60.7%)	128 (58.7%)	304 (59.8%)	0.095
	Joint family	104 (35.9%)	73 (33.5%)	177 (34.8%)	
	Single Parent	10 (3.4%)	17 (7.8%)	27 (5.3%)	
Bed sharing	Yes	236 (81.7%)	194 (89.0%)	430 (90.1%)	0.03
	No	23 (18.4%)	24 (11.0%)	47 (9.8%)	
Room sharing	Yes	203 (78.4%)	149 (61.3%)	352 (70.1%)	0.001
	No	56 (21.6%)	94 (38.7%)	150 (29.8%)	
Bed time ritual	Drinking milk	36 (13.9%)	43 (17.7%)	79 (15.7%)	0.15
	Call parents to sleep	175 (67.6%)	157 (64.6%)	332 (66.1%)	
	Sleep with lights on	9 (3.5%)	15 (6.2%)	24 (47.8%)	
	Sleep with toy or soft cloth	28 (10.8%)	15 (6.2%)	43(8.5%)	
	Others	11 (4.2%)	13 (5.3%)	24(4.7%)	
Socio economic status (Modified Kuppuswamy scale)	Upper class	69 (24%)	35 (16.4%)	104 (20.8%)	0.04
	Upper middle	63 (22%)	34 (16%)	97 (19.4%)	
	Lowe middle	49 (17.1%)	50 (23.5%)	99 (19.8%)	
	Upper Lower	104 (36.2%)	92 (43.2%)	196 (39.2%)	
	Lower class	2 (0.7%)	2 (0.9%)	4 (0.8%)	
Excessive Daytime sleepiness	Yes	8 (2.76%)	18 (8.18%0	26 (5%)	0.02
	No	282 (97.24%)	202 (91.81)	484 (95%)	
Type of school	Private school	122 (42%)	144 (65.5%)	266 (52.2%)	0.001
	Public school	168 (57.9%)	76 (34.5%)	244 (47.8%)	

from private schools, the abnormal sleep score was significantly higher (65.5%) compared to children attending public schools (34.5%; p = 0.001) (**Table 3**).

A mild correlation was observed between screen time and total sleep scores, with a correlation coefficient of 0.122 (12%), indicating that increased screen exposure is potentially detrimental to sleep quality (**Figure 1**). On weekdays, more than half (145; 62.5%) of the private sector children spent less than 2 hours on TV, compared to 108 (45.6%) children in the government sector. This difference was statistically significant. During weekends, screen time on TV increased to 2-4 hours for both sectors: 77 (32.6%) in the private sector and 93 (39.2%) in the public sector. The difference between the two groups was statistically significant, which is well above the recommendation by the AAP.

DISCUSSION

This study successfully identifies significant associations between environmental factors, screen time, and sleep quality in school-aged

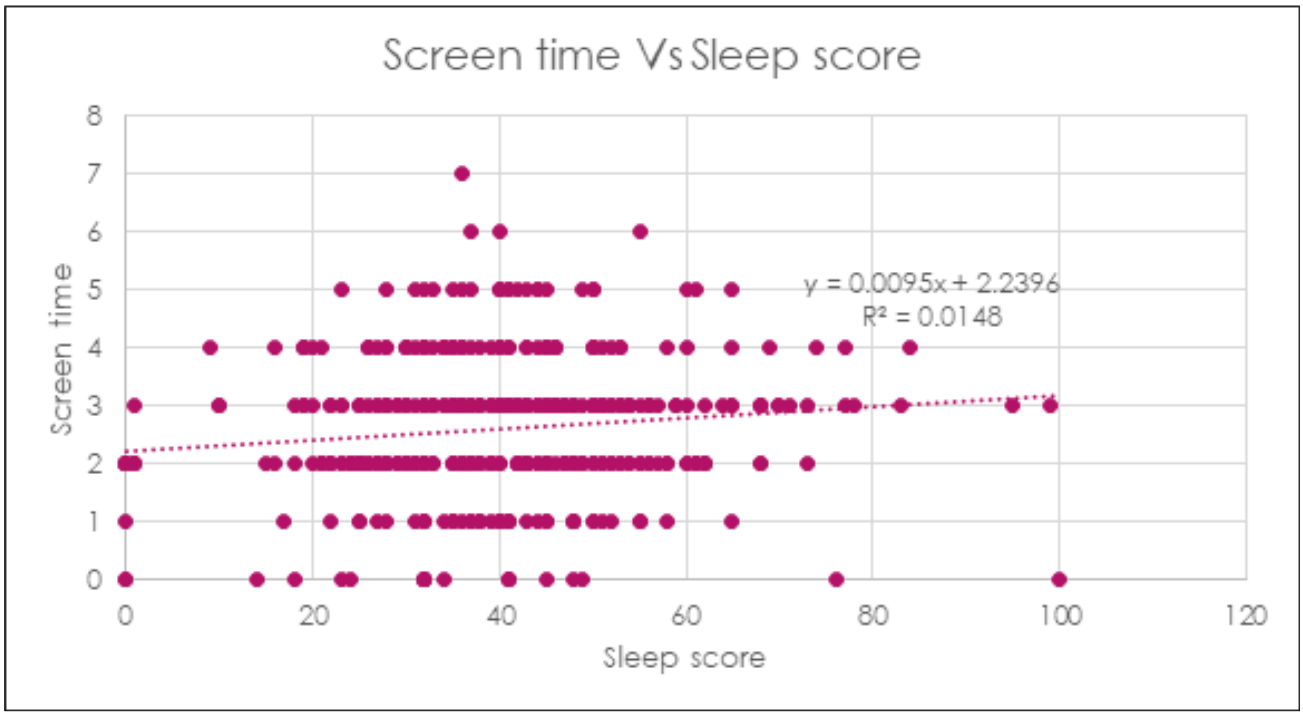

Figure 1 Correlation between screen time and total sleep score:

children. Our findings reveal that children exposed to higher screen time, especially those exceeding two hours daily, reported poorer sleep quality, shorter sleep duration, and a greater incidence of sleep disturbances. Additionally, environmental factors such as lower socio-economic class, room sharing, and bed sharing were shown to further exacerbate sleep issues.

Environmental factors such as low socio-economic status, room sharing, and bed sharing contributed significantly to poor sleep quality. In our study, we found that 253 (50.3%) children moved to their parents' bed during sleep. Many studies have observed that while co-sleeping with parents (67.4%) can result in increased sleep duration, it may also have negative effects. For instance, when one parent goes to bed late, it increases bedtime resistance, delays bedtime and wake-up time, and reduces nighttime sleep duration[14].Socio-economic status emerged as a critical factor influencing both screen time and sleep quality. Children from lower socio-economic backgrounds exhibited more pronounced sleep disturbances linked to screen time and environmental stressors, mirroring findings by Afonso A et al. (2011), which indicated that socio-economic disparities lead to uneven access to healthy sleep Environments[16]. Increased screen time is correlated with poor sleep quality and increased sleep disturbances among children. On average, 50.3% of children had screen time usage of less than 2 hours, and one-quarter of the population had screen time between 2 to 4 hours. According to IAP guidelines, it has been emphasized that children below 2 years of age should not be exposed to any screen, and screen time for children between 2-5 years should not exceed 1 hour, while adolescents should have a maximum of 2 hours of screen time [17].

Our analysis demonstrates a correlation between increased screen time, particularly beyond two hours a day, and diminished sleep quality.We found that children exposed to higher screen time not only reported shorter sleep durations but also a higher incidence of sleep disturbances, such as insomnia and frequent night awakenings[18]. This is consistent with the work of Hale and Guan (2015), who found that children with significant screen time were 1.5 times more likely to report sleep disturbances compared to their counterparts with limited screen exposure[12][13]. Such disturbances are concerning, as they have been linked to obesity, anxiety, cognitive deficits, behavioral problems, and emotional challenges, worsening children's overall health[19][20].

CONCLUSION:

Promoting appropriate screen time guidelines and encouraging families to create conducive sleep

environments, such as not sharing a bed, are essential strategies for enhancing sleep health. There is a need for increased awareness among parents, educators, and healthcare providers regarding the critical importance of sleep in children's overall development and well-being. Creating community-based programs that encourage tech-free zones in bedrooms and educate families about healthy dynamics will be instrumental.

ETHICAL APPROVAL

YES - MGMCRI/RES/01/2020/117/IHEC/331.

AUTHOR CONTRIBUTION

All authors made substantial contributions to the conception, design, acquisition, analysis, or interpretation of data for the work. They were involved in drafting the manuscript or revising it critically for important intellectual content. All authors gave final approval of the version to be published and agreed to be accountable for all aspects of the work, ensuring its accuracy and integrity.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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