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Effect of Electronic Media Use on Sleep Quality in Adolescents: A Cross-Sectional Study

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Background and Objective Adolescent sleep deprivation, increasingly driven by digital media, poses a significant threat to cardiovascular health by promoting risks like obesity and hypertension. To address these modifiable factors, this study measures daily screen time duration and sleep patterns among adolescents to identify behavioural precursors to early heart disease.

Methods In this cross-sectional study, 483 adolescents aged 12–17 were participated. Pittsburgh Sleep Quality Index and an Electronic Media Use Questionnaire were applied to assess sleep and screen pattern. Chi-square tests and regression analysis were employed to evaluate associations between screen exposure and sleep quality, with significance set at $p<0.05$.

Results Of the 483 participants, 49.7% exhibited poor sleep quality. Poor sleepers reported significantly higher daily media duration and social media frequency compared to good sleepers. Logistic regression identified device usage before sleep (odds ratio [OR]=1.64, p=0.008), obsessive urge to use devices (OR=1.81, p=0.002), and next-morning tiredness (OR=1.73, p=0.006) as significant predictors of poor sleep quality.

Conclusions Excessive and compulsive electronic media use, particularly before bedtime, significantly degrades adolescent sleep quality. Given the established link between sleep deprivation as an early cardiometabolic risk factor, the study founds limiting evening screen exposure creates a vital preventive cardiology strategy to mitigate the future burden of cardiovascular disease.
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Keywords Adolescent; Sleep quality; Electronic media; Screen time; School students.

INTRODUCTION

Adolescence is a crucial developmental period characterized by quick changes in social, psychological, and physical aspects of life. During this time, getting enough good-quality sleep is essential for maintaining physical, mental, and emotional well-being. However, a lot of teenagers fail to obtain enough sleep because of biological, social, and environmental factors like early school schedules, academic demands, and disturbed circadian rhythms. Sleep deprivation has been connected to mood swings, behavioral and cognitive deficits, and early metabolic risks like obesity [1].

The American Academy of Sleep Medicine advises that adolescents aged 13–18 years should aim for 8–10 hours of sleep within a 24-hour period to support their overall health and well-being. Adhering to this recommendation improves focus, learning capabilities, emotional control, and general health, while persistent lack of sleep heightens the likelihood of obesity, high blood pressure, diabetes, and depression [2]. The duration of sleep is a crucial factor influencing cardiovascular, metabolic, immune, and neurobehavioral health. In the current digital age, the widespread use of screens in the evening has led to a significant rise in sleep deprivation among adolescents, presenting a growing public health issue with both short-term and long-term effects.

Chronic insufficient sleep during adolescence is associated with emotional dysregulation,

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depression, anxiety, and diminished cognitive performance, which ultimately impacts attention, learning, and academic achievement [3]. A significant amount of evidence indicates a robust correlation between screen media usage and sleep disturbances in adolescents. Approximately 90% of studies indicate that screen exposure, particularly within 1 hour prior to sleep or when devices are present in the bedroom, results in delayed sleep onset and decreased total sleep duration. The mechanisms involved consist of time displacement, psychological stimulation, and the alerting effect of blue light emitted by screens [4]. Systematic reviews and meta-analyses indicate that access to or use of portable screen-based devices at bedtime correlates with reduced sleep duration, diminished sleep quality, and increased daytime sleepiness. The mere presence of devices in the bedroom, even without active use, correlates with an increased risk of insufficient sleep [5]. In the Indian context, increased smartphone use among adolescents has been linked to shorter sleep duration, delayed sleep onset, and a higher prevalence of sleep disturbances, with evening screen exposure emerging as a key behavioral predictor [6]. Similar global evidence supports the notion that excessive screen time leads to later bedtime, shorter sleep duration, and poorer sleep quality, highlighting electronic media exposure as a modifiable and universal factor influencing adolescent sleep patterns [7]. Inadequate sleep during adolescence not only impairs cognitive and emotional functioning, but it also promotes the early development of cardiometabolic risk factors that predispose people to cardiovascular disease later in life. Short or disrupted sleep stimulates the sympathetic nervous system, raises blood pressure, impairs glucose metabolism, alters appetite-regulating hormones (ghrelin increases, leptin decreases), and promotes systemic inflammation. These physiological disturbances cause obesity, insulin resistance, dyslipidemia, and hypertension in school-aged children and adolescents, hastening their progression to adult cardiovascular disease [8].

Short sleepduration is significantly correlated with heightened adiposity and increased blood pressure in children and adolescents. Meanwhile, the evidence connecting sleep deprivation to insulin resistance and lipid abnormalities is moderate yet important. Enhancing sleep duration and quality is acknowledged as a crucial approach to fostering cardiovascular health in youth [9]. Adolescents who sleep less than the recommended duration exhibit significantly increased odds of developing elevated blood pressure relative to their adequately rested counterparts, with a more pronounced association observed in males [10]. Additionally, inadequate sleep quality is associated with increased body mass index, higher blood pressure, and unfavorable lipid profiles, indicating the early development of cardiometabolic risk factors in adolescents [11].

Sleep thus plays an important role in maintaining cardiovascular health from an early age. Inadequate or poor-quality sleep in childhood and adolescence has been linked to adiposity, hypertension, insulin resistance, and unfavorable lipid profiles—all of which are risk factors for cardiovascular disease [12]. Chronic disruption of sleep patterns may initiate and exacerbate cardiometabolic risk at a young age, emphasizing the long-term importance of getting enough restorative sleep [13].

Given the increasing prevalence of electronic media use and its impact on adolescent sleep patterns and health outcomes, it is critical to investigate its effect on sleep behavior and cardiometabolic well-being among schoolchildren. Comprehending this relationship will yield essential insights for formulating effective interventions and public health strategies designed to foster healthy sleep habits and mitigate early cardiovascular risk. Consequently, this study aims to evaluate the influence of electronic media usage on sleep quality among students. Therefore, the objective of this study was to assess the association between electronic media use and sleep quality among school-going adolescents aged 12–17 years in Coimbatore, Tamil Nadu.

METHODS

Study Design and Setting

A cross-sectional study was conducted in 2024 among school-going students aged 12–17 years in Coimbatore, Tamil Nadu.

Study Population and Sampling

A total of 500 students were approached for participation. Children aged 12–17 years were selected as the target population, as adolescence is a period associated with increased electronic media exposure and vulnerability to sleep disturbances. Students appearing for board examinations were excluded to avoid academic stress as a potential confounding factor. Of the 500 students contacted, 12 did not obtain parental consent and child assent, and 5 were absent on the day of data collection. The final sample comprised 483 students who met the eligibility criteria and participated in the study.

Ethical Considerations

The study protocol received prior approval from the Institutional Ethics Committee of PSG Institute of Health Sciences and Research (IRB approval number: PSGIHECI2023/Appr/Exp/394, dated 16.11.2023). Written informed consent was obtained from parents or legal guardians, and assent was obtained from the participating children. Consent forms were distributed 2–3 days prior to data collection, and only students who returned duly signed consent forms were included in the study.

Measurement

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI) [14], a validated self-administered questionnaire that measures sleep quality over the preceding month. The PSQI consists of 19 items grouped into seven components, with a global score ranging from 0 to 21; a score greater than 5 indicates

poor sleep quality.

Electronic media use was assessed using a structured Electronic Media Use Questionnaire [15], which captured information on patterns, timing, duration of electronic device use, emotional dependence, usage before bedtime, perceived impact on well-beingand screen-time awareness.

Survey Procedure

After obtaining parental consent and child assent, data were collected using a paper-and-pencil-based, self-administered questionnaire, as participants were below 18 years of age. Questionnaires were distributed to eligible students during school hours and clear instructions were provided on how to complete the survey. Completed questionnaires were collected on the same day to ensure completeness.

Statistical Analysis

Data were analysed using SPSS version 28 (IBM Corp.). Descriptive statistics were used to summarise socio-demographic characteristics and study variables. Bivariate analysis was initially performed to assess the association between electronic media use variables and sleep quality, and crude odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. Variables with $p<0.20$ in bivariate analysis and those of biological and theoretical relevance were included in a multivariable logistic regression model to adjust for potential confounding. Adjusted ORs (aORs) with 95% CIs and corresponding p-values were reported. A p-value <0.05 was considered statistically significant.

RESULTS

Sleep Quality among Participants

Among the 483 adolescents studied, 240 (49.7%) had poor sleep quality, while 243 (50.3%) had good sleep quality based on the PSQI (Supplementary Table 1 in the online-only Data Supplement).

Sociodemographic Characteristics and Electronic Media Use

The majority of participants were aged 12–14 years (n=447, 92.5%), with the remaining 36 (7.5%) aged 15–17 years. Males constituted 284 (58.8%) of the study population, while females accounted for 199 (41.2%) (Supplementary Table 2 in the online-only Data Supplement).

Regarding electronic media use, 245 participants (50.7%) reported less than 1 hour of daily use, followed by 171 (35.4%) who reported 1–2 hours of use. Only 67 (13.9%) reported usage exceeding 2 hours per day. The mean daily duration of electronic media use was 1.72±0.94 hours.

Device Ownership and Primary Online Activities

Smartphones were the most commonly used device, reported by 340 participants (70.4%), followed by smart televisions in 94 (19.5%). Other devices such as laptops, tablets, and gaming devices were used by a smaller proportion of participants (Supplementary Table 3 in the online-only Data Supplement).

Video streaming was the most frequently reported primary online activity (n=286, 59.2%), followed by social media use (n=94, 19.5%). Activities such as online gaming, reading articles, video conferencing, and homework-related use were less commonly reported.

Social Media Usage Patterns and Digital Content Consumption

Social media was checked once daily by 182 participants (37.7%) and 2–3 times daily by 158 (32.7%). A total of 118 participants (24.4%) reported checking social media more than 6 times per day. The mean frequency of social media checking was 2.16± 1.18 times per day (Table 1).

Instagram was the most frequently used platform (n=150, 31.1%), followed by Facebook (n=98, 20.3%). Video content constituted the most commonly consumed digital content (n= 343, 71.0%), followed by music or streaming audio (n=91, 18.8%).

Table 1. Social media usage frequency, preferred platforms, and type of digital content consumed (n=483)

Variable	Value
Frequency of checking social media	
Once	182 (37.7)
2–3 times	158 (32.7)
4–6 times	25 (5.2)
More than 6 times	118 (24.4)
Platforms used - majorly	
Facebook	98 (20.3)
Instagram	150 (31.1)
Twitter	27 (5.6)
Snapchat	65 (13.5)
LinkedIn	2 (0.4)
Others	141 (29.2)
Most common type of content consumed	
Videos	343 (71.0)
Podcasts	6 (1.2)
News articles	17 (3.5)
E-books	13 (2.7)
Music/streaming audio	91 (18.8)
Online courses	10 (2.1)
Others	3 (0.6)

Values are presented as number (%).

Awareness and Night-Time Use of Electronic Devices

More than half of the participants (n=273, 56.5%) reported being aware of their screen time, while 130 (26.9%) were sometimes aware and 80 (16.6%) were unaware (Supplementary Table 4 in the online-only Data Supplement).

Device use before bedtime was reported by 171 participants (35.4%), while 166 (34.4%) reported occasional use and 146 (30.2%) reported no use. Among users, 125 (25.9%) used devices for less than 30 minutes before sleep, whereas 47 (9.7%) reported usage exceeding 2 hours. The mean duration of electronic device use before bedtime was 1.51±1.34 hours.

Table 2. Digital well-being, self-regulation, and dependence on electronic devices (n=483)

Variable	Value
Impact on well-being/productivity	
Yes	88 (18.2)
No	252 (52.2)
Sometimes	143 (29.6)
Ability to stay without gadgets	
Yes	242 (50.1)
No	139 (28.8)
Sometimes	102 (21.1)
Feeling tired after night use	
Yes	92 (19.0)
No	336 (69.6)
Sometimes	55 (11.4)
Use of apps/strategies for control	
Yes	105 (21.7)
No	378 (78.3)
Obsessive urge to use devices	
Always	52 (10.8)
Sometimes	240 (49.7)
Never	191 (39.5)
Regret after usage	
Always	39 (8.1)
Sometimes	268 (55.5)
Never	176 (36.4)

Values are presented as number (%).

Digital Well-Being and Device Dependence

A total of 88 participants (18.2%) reported a definite negative impact of device use on well-being or productivity, while 143 (29.6%) reported occasional impact. Half of the participants (n=242, 50.1%) reported the ability to remain without electronic devices for a day, whereas 139 (28.8%) reported inability to do so (Table 2).

Feelings of tiredness after night-time device use were reported by 92 participants (19.0%), while 55 (11.4%) reported occasional tiredness. Only 105 participants (21.7%) reported using applications or strategies to regulate screen time.

Comparison of Electronic Media Use between Sleep Quality Groups

Participants with poor sleep quality reported significantly higher daily electronic media use compared to those with good sleep quality (Mann–Whitney U=26,815.5, p=0.011). Similarly, the frequency of social media checking differed significantly between the two sleep quality groups (Mann–Whitney U=25,766.5, p=0.019) (Table 3).

Factors Associated with Poor Sleep Quality

Bivariate analysis showed that an obsessive urge to use electronic devices (OR=1.81, 95% CI: 1.25–2.61, p=0.002), feeling tired the next morning (OR=1.73, 95% CI: 1.17–2.57, p=0.006), and device use before sleep (OR=1.64, 95% CI: 1.11–2.43, p=0.008) were significantly associated with poor sleep quality (Table 4).

Variables such as remorse after device use, awareness of screen time, perceived impact on well-being, and ability to remain without gadgets did not show statistically significant associations with sleep quality.

On multivariable logistic regression analysis, after adjusting for potential confounders, obsessive urge to use electronic devices showed a statistically significant association with poor sleep quality, with a 71% higher odds among affected participants (aOR=1.71, 95% CI: 1.15–2.53). Feeling tired the next morning following bedtime gadget use was also independently associated with poor sleep quality (aOR=1.67, 95% CI: 1.11–2.51). Additionally, use of electronic devices before bedtime increased the odds of poor sleep quality by 41% (aOR=1.41, 95% CI: 1.12–1.78).

Other electronic media use–related variables, including remorse about device use, ability to stay without gadgets for a day,

Table 3. Comparison of electronic media usage between sleep quality groups (n=483)

Variable	Sleep quality category	N	Mann–Whitney U	p-value
Daily media use (hours/day)	Poor quality sleep	240	26,815.5	0.011*
	Good quality sleep	243		
Social media usage (number of times checked per day)	Poor sleep quality	240	25,766.5	0.019*
	Good sleep quality	243		

*p-value <0.05 consider statistically significant.

Table 4. Distribution of electronic media use variables and their association with sleep quality, with corresponding unadjusted ORs, 95% CIs, and p-values (n=483)

Variable	Category	Poor sleep (n)	Good sleep (n)	Unadjusted OR	95% CI	p-value
Remorse about device use	Always & sometimes	162	145	1.40	0.97–2.04	0.074
	Never (reference)	78	98	1.00	-	
Obsessive urge to use devices	Always & sometimes	162	130	1.81	1.25–2.61	0.002*
	Never (reference)	78	113	1.00	-	
Feeling tired next morning	Yes & sometimes	87	60	1.73	1.17–2.57	0.006*
	No (reference)	153	183	1.00	-	
Ability to stay without gadgets for a day	Yes & sometimes	174	170	1.13	0.76–1.68	0.537
	No (reference)	66	73	1.00	-	
Negative impact on well-being/ productivity	Yes & sometimes	123	108	1.31	0.92–1.88	0.134
	No (reference)	117	135	1.00	-	
Usage before sleeping	Yes & sometimes	180	157	1.64	1.11–2.43	0.008*
	No (reference)	60	86	1.00	-	
Screen-time awareness	Yes & sometimes	197	206	0.82	0.51–1.33	0.426
	No (reference)	43	37	1.00	-	

The hyphen (–) indicates the reference category for which OR and CI are not applicable.
*p-value <0.05 consider statistically significant.
OR, odds ratio; CI, confidence interval.

Table 5. Multivariable logistic regression analysis of factors associated with sleep quality (n=483)

Predictor variable	Adjusted odds ratio	95% CI	p-value
Remorse about electronic device use	1.28	0.86–1.91	0.223
Obsessive urge to use electronic devices	1.71	1.15–2.53	0.008*
Feeling tired next morning after bedtime gadget use	1.67	1.11–2.51	0.013*
Ability to stay without gadgets for a day	1.28	0.85–1.93	0.246
Perceived negative impact on well-being/productivity	1.19	0.81–1.74	0.380
Use of electronic devices before bedtime	1.41	1.12–1.78	0.004*
Screen time awareness and attempt to limit use	0.71	0.43–1.16	0.184

*p-value <0.05 consider statistically significant.
CI, confidence interval.

perceived negative impact on well-being or productivity, and screen-time awareness, did not show a statistically significant association with sleep quality in the adjusted model (Table 5).

DISCUSSION

The current study found that adolescents exhibiting poor sleep quality engaged with electronic media at significantly higher levels across various behavioral domains. Individuals exhibiting an obsessive compulsion to utilize devices demonstrated 1.8 times greater odds of experiencing poor sleep (OR=1.81). This observation is consistent with the findings of Levenson et al. [16], who similarly noted that emotionally motivated engagement with social media markedly heightened sleep disturbances in young adults. Students reporting fatigue the following morning after nighttime gadget use exhibited 1.73 times greater odds of poor sleep (OR=1.73). This finding aligns with Hale and Guan's (2015) systematic review [17], which identified bedtime screen exposure as a significant factor contributing to delayed sleep onset, decreased sleep duration, and subsequent daytime fatigue.

In our study, bedtime electronic device use emerged as a strong predictor, with adolescents who used devices before bedtime having 1.64 times higher odds of poor sleep. This finding mirrors the results of Scott et al. [18], who reported that nighttime social media use was associated with delayed sleep onset and poorer overall sleep patterns. These findings show that the timing and intensity of device use—particularly close to bedtime—play an important role in sleep disruption.

Despite certain variables exhibiting non-significant associations, their directional trends align with established evidence. Remorse regarding device use (OR=1.40) indicated a trend toward higher odds of poor sleep, aligning with Przybylski [19],

who observed a weak but positive correlation between perceived problematic screen use and sleep loss. The perception that electronic media negatively impacts well-being (OR=1.31) was not statistically significant in our sample; however, prior literature, including LeBourgeois et al. [20], indicates that such subjective disruptions frequently correlate with poor sleep hygiene. Awareness of screen-time limits demonstrated a protective yet non-significant trend (OR=0.82), reflecting research that suggests adolescents may acknowledge healthy behaviors while still facing challenges in effectively managing media consumption.

Overall, our findings substantiate the increasing evidence that high-intensity, emotionally charged, and nighttime digital media engagement markedly disrupts adolescent sleep health. Importantly, persistent sleep disruption during adolescence has been linked to early cardiometabolic changes—including increased resting heart rate, heightened sympathetic activity, and a greater likelihood of developing hypertension in the future-underscoring that managing nighttime screen use is essential not only for enhancing sleep quality but also for mitigating long-term cardiovascular risk. Furthermore, the Copenhagen Prospective Studies on Asthma in Childhood study cohort indicates that each additional hour of screen time correlates with an increased cardiometabolic risk in both children (β=0.08 [0.01–0.14], p=0.021) and adolescents (β=0.13 [0.07–0.20], p=0.001) [21].

The current study indicates that a significant percentage of adolescents exhibit problematic digital media usage patterns, characterized by a compulsive desire to engage with devices (10.8% always, 49.7% sometimes) and experiencing fatigue following nighttime usage (19%). The findings are consistent with the systematic review by Hale and Guan [17], which reported that evening screen exposure results in delayed sleep onset and increased daytime sleepiness due to melatonin suppression and cognitive arousal. Levenson et al. [16] observed that young adults using social media near bedtime had significantly higher odds of sleep disturbance. This supports our finding that 19% of participants reported feeling tired after nighttime device use, with compulsive engagement being prevalent.

Additionally, the significant occurrence of regret following usage in our sample (8.1% always, 55.5% sometimes) reflects the trends identified by LeBourgeois et al. [20], who observed that adolescents frequently undergo emotional dysregulation and guilt after extended device use, consequently interfering with their sleep patterns. The finding that merely 21.7% of students in our study indicated using apps or strategies to manage screen time underscores the issues highlighted by Przybylski [19], who discovered that adolescents typically do not make full use of digital well-being tools, even while acknowledging their adverse impacts on sleep. Our findings align with global evidence indicating that problematic and emotionally driven device use—particularly compulsive and nighttime usage—significantly correlates with adverse sleep outcomes in adolescents.

Conclusion

This study demonstrates a significant association between electronic media use and poor sleep quality among adolescents aged 12–17 years. After adjusting for potential confounders, adolescents exhibiting an obsessive urge to use electronic devices had higher odds of poor sleep quality. These findings highlight electronic media use as an important behavioural factor influencing adolescent sleep health. Addressing unhealthy media use patterns through school-based education, parental guidance, and public health interventions may help promote healthier sleep practices and improve overall well-being among adolescents.

Limitations

This study has certain limitations that should be considered when interpreting the findings. The cross-sectional design allows assessment of associations but does not permit causal inferences between electronic media use and sleep quality. Information on electronic media use and sleep quality was obtained through self-reported questionnaires, which may be influenced by recall and reporting biases. In addition, the study was conducted among school-going adolescents from a single geographic area, which may affect the generalizability of the results to other populations or settings.

Supplementary Materials

The online-only Data Supplement is available with this article at https://doi.org/10.17241/smr.2026.03370.

Availability of Data and Material

The datasets generated or analyzed during the study are available from the corresponding author on reasonable request.

Author Contributions

Conceptualization: Abinaya Dhandapani, Ananya Sundararajan. Data curation: Ananya Sundararajan. Formal analysis: Abinaya Dhandapani, Alif Lam NM. Investigation: Ananya Sundararajan. Methodology: Abinaya Dhandapani, Ananya Sundararajan. Project administration: Abinaya Dhandapani. Supervision: Sudha Ramalingam. Writing—original draft: Ananya Sundararajan, Abinaya Dhandapani. Writing—review & editing: Abinaya Dhandapani, Alif Lam NM, Sudha Ramalingam.

Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

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