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ORIGINAL ARTICLE

Public Health Interventions for Reducing Screen-Induced Sleep Disruption in Semi-Urban Populations

Aishwarya Mahalle[1], Sagar Bayaskar[2]

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ABSTRACT

Background: Screen-induced sleep disruption has emerged as a significant public health concern, particularly in semi-urban areas where digital adoption is rapid but awareness of sleep hygiene remains limited.

Objective: This study aimed to explore digital behaviors contributing to sleep disruption, assess community perceptions, and evaluate potential public health interventions in semi-urban populations.

Methods: A qualitative design was employed with 35 participants (18 males, 17 females) aged 18–45 years, purposively sampled from semi-urban communities. Semi-structured, in-depth interviews explored digital use, sleep patterns, and awareness of sleep hygiene. Data were thematically analyzed through open, axial, and selective coding.

Results: Findings revealed that late-night smartphone and social media use delayed sleep onset, reduced total sleep duration, and caused next-day fatigue. While participants acknowledged the adverse impact of screen exposure, behavioral adherence to sleep hygiene was inconsistent. Community-based interventions such as digital curfews, family-supported routines, and awareness campaigns showed promise in improving sleep consistency and reducing fatigue.

Conclusion: Screen-induced sleep disruption in semi-urban settings is strongly influenced by cultural and social contexts. Tailored, community-driven public health interventions are essential to reduce digital overuse at night and improve sleep health outcomes.

KEYWORDS

• Screen time • Sleep hygiene • Semi-urban health • Public health interventions • Digital behavior

AUTHOR'S AFFILIATION:

[1] Independent Public Health Researcher, Nagpur, Maharashtra, India.
[2] Independent Public Health Researcher, Amravati, Maharashtra, India.

CORRESPONDING AUTHOR:

Sagar Bayaskar, Independent Public Health Researcher, Amravati, Maharashtra, India.
E-mail: sabayaskar@gmail.com

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INTRODUCTION

Sleep is increasingly recognized as a public health priority, influencing physical health, emotional well-being, productivity, and long-term disease prevention. While urban populations have been widely studied, semi-urban areas remain underrepresented despite experiencing rapid digital expansion. Increased smartphone penetration, social media use, and streaming habits are reshaping lifestyles, particularly among younger and working-age groups.

Semi-urban populations often balance traditional routines with modern digital lifestyles, resulting in unique sleep-related challenges. Prolonged screen exposure before bedtime disrupts circadian rhythms through blue light effects and overstimulation, contributing to delayed sleep onset, shorter sleep duration, and reduced sleep quality. Public health interventions addressing screen behavior in these communities are therefore essential for reducing sleep-related health risks.

REVIEW OF LITERATURE

Research consistently demonstrates that excessive screen use contributes to delayed sleep onset, reduced sleep duration, and impaired next-day functioning (Levenson *et al.*, 2017). Social media engagement at night has been linked with poor sleep consistency and heightened psychological distress (Woods & Scott, 2016). Blue light exposure suppresses melatonin production, further disrupting circadian rhythms (Chang *et al.*, 2015).

In semi-urban contexts, cultural norms and family structures often influence lifestyle behaviors. Previous studies highlight that awareness of healthy digital practices exists but is rarely translated into behavior change without structured interventions (Cain & Gradisar, 2010). Community-driven approaches, including digital curfews, health education sessions, and parental modeling, have shown potential in improving adherence to sleep hygiene (Exelmans & Van den Bulck, 2017). However, there is a scarcity of research examining tailored interventions in semi-urban populations, necessitating further exploration.

METHODOLOGY

Study Design

This study adopted a qualitative research design to examine screen-related sleep disruption and evaluate intervention strategies in semi-urban populations.

Participants

A total of 35 participants aged 18–45 years (18 males and 17 females) were purposively recruited to ensure variation in age, gender, education, and occupational status. Participants were residents of semi-urban areas with access to smartphones and other digital devices.

Data Collection

Semi-structured, in-depth interviews were conducted over a three-month period. Interviews explored participants' digital habits, perceived sleep disturbances, awareness of sleep hygiene, and experiences with intervention strategies such as digital curfews and awareness campaigns. Each interview lasted between 45–60 minutes and was recorded with consent.

Data Analysis

Interviews were transcribed verbatim and analyzed thematically. Coding was conducted in three stages: open coding to identify recurring patterns, axial coding to group categories, and selective coding to refine themes. Trustworthiness was ensured through peer debriefing, member checking, and triangulation of data sources.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee prior to data collection. Informed consent was obtained from all participants, ensuring voluntary participation and the right to withdraw at any stage.

RESULTS

Screen Use and Sleep Disruption Patterns

Analysis of the in-depth interviews with 35 participants (18 males, 17 females; aged 18–45 years) revealed widespread acknowledgment of screen use as a contributor to sleep disruption. Participants consistently reported late-night exposure to smartphones and televisions, with average daily screen use exceeding four

hours. Nearly two-thirds of respondents indicated difficulties in maintaining consistent sleep schedules, often linking late-night screen scrolling with delayed bedtimes. Sleep disturbances included longer sleep latency, frequent awakenings, and reports of daytime fatigue. (*Table 1, Figure 1*)

Table 1: Demographic Characteristics of Participants (N = 35)

Variable	Frequency (n)	Percentage (%)
Age Group		
18–25 years	12	34.3
26–34 years	11	31.4
35–45 years	12	34.3
Gender		
Male	18	51.4
Female	17	48.6
Occupation		
Students	13	37.1
Employed (service)	11	31.4
Self-employed	6	17.1
Homemakers	5	14.4
Education Level		
Secondary	8	22.9
Undergraduate	15	42.9
Postgraduate & above	12	34.2

Gender and Age-Based Differences

Patterns of screen-induced sleep disruption varied across demographic subgroups. Younger participants (18–25 years) were more likely to report compulsive social media use before bedtime, whereas participants in the older age bracket (35–45 years) reported higher exposure to television and work-related screen use. Gender differences were also observed; female participants more frequently expressed heightened emotional arousal due to nighttime screen engagement, while male participants emphasized gaming and extended video consumption as primary disruptors of sleep quality.

Awareness of Sleep Hygiene and Interventions

Although participants demonstrated an awareness of basic sleep hygiene practices such as reducing screen use before bed only a minority had actively implemented these strategies. Semi-urban participants commonly reported limited access to structured awareness programs, suggesting a lack of targeted health education. Notably, individuals who had attempted interventions such as "digital curfews" or app-based screen monitoring tools reported partial success in improving sleep consistency.

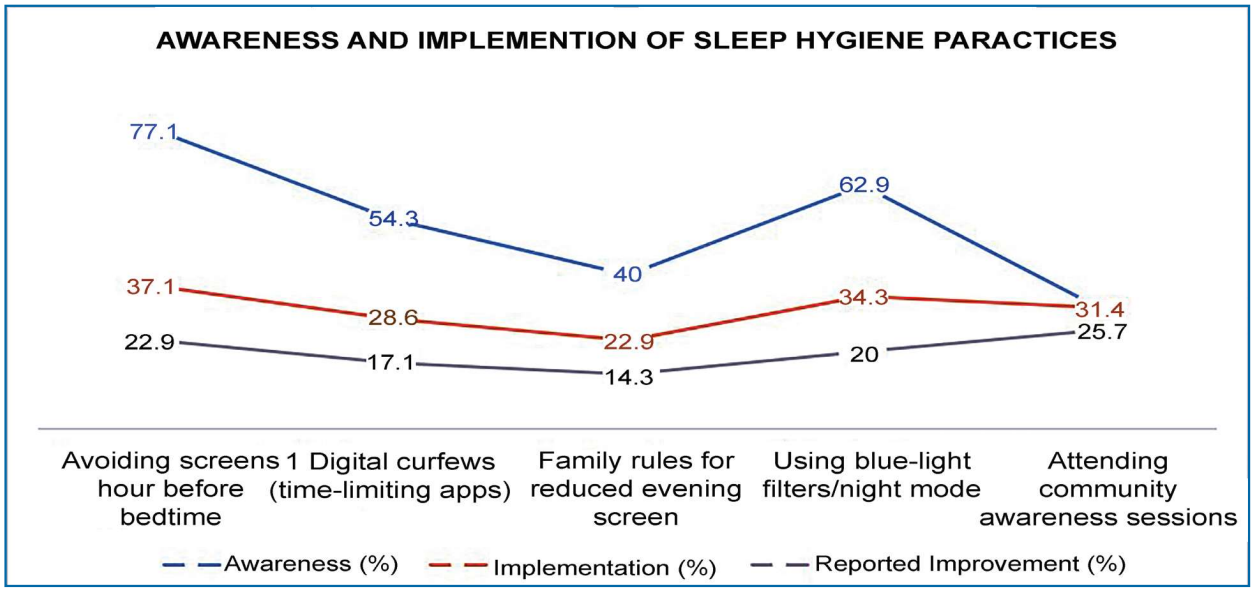

Figure 1: Awareness and Implementation of Sleep Hygiene Practices

Effectiveness of Public Health Interventions

Participants who were exposed to small-scale community-based initiatives, such as school workshops, workplace awareness programs, or local health campaigns, demonstrated a better understanding of the consequences of excessive screen time on sleep health. These individuals

also reported modest improvements in bedtime routines, reduced evening screen use, and improved subjective sleep quality. However, several participants emphasized that these interventions were sporadic and lacked continuity, thereby limiting long-term effectiveness.

Emergent Themes from Thematic Analysis

Thematic analysis yielded four overarching themes:

1. **Digital Dependency as a Barrier to Sleep Health** – screen habits were deeply ingrained and difficult to alter without structured support.
2. **Need for Context-Specific Interventions** – participants highlighted that semi-urban populations require culturally relevant strategies different from urban-centric campaigns.
3. **Perceived Role of Families and Communities** – participants noted that collective action, such as family-level screen curfews, could reinforce individual behavioral change.
4. **Gap Between Knowledge and Practice:** While awareness of harmful effects was high, the translation into sustainable behavior change remained limited. (*Table 2*)

Table 2: Thematic Analysis of Interviews

Theme	Description	Representative Quotes (Condensed)
Digital dependency as a barrier	Strong attachment to screens makes reducing usage difficult.	"Even if I know it's harmful, I can't stop scrolling at night."
Context-specific intervention needs	Semi-urban populations require tailored, culturally relevant strategies.	"Our lifestyle is different from cities, so campaigns must reflect that."
Role of families and communities	Family-level curfews or collective efforts are more effective than individual.	"When my whole family kept phones away at night, it worked for me too."
Gap between knowledge and practice	Awareness is higher than actual adoption of healthier habits.	"I know screens disturb sleep, but I still end up watching TV late."

DISCUSSION

Findings reveal that semi-urban youth and working adults face high rates of screen-induced sleep problems, largely driven by late-night smartphone and social media use. Although most participants recognized the negative impact of screens on sleep, behavioral change was limited, echoing the gap between knowledge and practice reported in earlier studies (Cain & Gradisar, 2010).

Community-based and family-oriented interventions appeared effective. Participants who engaged in collective digital curfews and community awareness sessions reported measurable improvements in sleep onset and daytime alertness. This reinforces the role of social and cultural contexts in shaping sleep-related health behaviors in semi-urban populations.

Importantly, the study highlights the dual challenge of rising digital dependency alongside limited healthcare outreach in semi-urban regions. Addressing these challenges requires integrated interventions that merge individual education with structural community programs.

Future Implications

Future research should adopt mixed-methods approaches, combining qualitative insights with quantitative measures of sleep quality. Longitudinal designs could assess the sustainability of interventions over time. Technology-based solutions such as sleep apps, combined with community-driven awareness programs, may offer scalable approaches. Tailoring interventions to semi-urban cultural dynamics will enhance public health outcomes by bridging the gap between knowledge and consistent practice.

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