

Original Research Article

Prevalence of poor sleep quality and its association with screen time among adults: a cross-sectional study in Nagpur city of Central India

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ABSTRACT

Background: Poor sleep quality is an emerging public health concern and has been linked to excessive screen use and psychological distress. With the increasing use of smartphones and other digital devices, understanding their impact on sleep quality has become increasingly important. The present study was conducted to estimate the prevalence of poor sleep quality and assess its association with screen time and psychological factors among adults.

Methods: A cross-sectional study was conducted among 350 adults aged 18-40 years attending an Urban Health Training Centre (UHTC) in Nagpur, Central India, from January to April 2026. Data were collected using a pre-designed semi-structured questionnaire. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), perceived stress using the Perceived Stress Scale-10 (PSS-10), and anxiety and depression using the Patient Health Questionnaire-4 (PHQ-4). Chi-square test was used to assess associations, with $p < 0.05$ considered statistically significant.

Results: The prevalence of poor sleep quality was 49.4% (173/350). Poor sleep quality was significantly associated with total daily screen time ($\chi^2=11.2$, $p=0.011$) and bedtime screen use ($\chi^2=9.93$, $p=0.002$). Significant associations were also observed between poor sleep quality and perceived stress ($\chi^2=9.44$, $p=0.009$) and anxiety ($\chi^2=19.2$, $p<0.001$). No statistically significant association was found between depression and sleep quality ($\chi^2=1.10$, $p=0.295$).

Conclusions: Nearly half of the study participants had poor sleep quality. Longer daily screen time, prolonged bedtime screen use, higher perceived stress, and anxiety were significantly associated with poor sleep quality. Health education regarding responsible screen use, sleep hygiene, and stress management may help improve sleep quality among adults.

Keywords: Sleep quality, Screen time, Pittsburgh sleep quality index, Perceived stress, Anxiety, Adults

INTRODUCTION

Sleep is a fundamental biological state essential for optimal functioning during wakefulness. It plays a vital role in cognitive restoration, immune defence, hormonal regulation, metabolic homeostasis, and various cognitive and behavioural functions such as attention, memory, emotional regulation, and interpersonal interactions.¹ The World Health Organisation recommends seven to nine hours of sleep per night for adults, and poor sleep quality-characterized by difficulty in initiating or maintaining sleep, frequent nocturnal awakenings, or non-restorative

sleep-is recognized as a significant global public health concern. Poor sleep quality can adversely affect these functions, leading to impairments in daily activities, occupational performance, and public safety.

Globally, poor sleep quality is estimated to affect approximately 40% of community-dwelling adults, representing a substantial and growing public health burden.² In India, studies have reported a high prevalence of poor sleep quality among the general adult population, ranging from 50% to 70% across various urban settings.³ Poor sleep quality is associated with impaired cognitive

performance, increased risk of anxiety, depression, non-communicable diseases, and reduced quality of life.⁴

Over the past decade, rapid technological advancement and widespread internet accessibility have substantially increased the use of electronic devices, including smartphones, laptops, tablets, and televisions, among adults.⁵ India is one of the largest smartphone markets in the world, with more than 750 million smartphone users in 2021, reflecting the rapid expansion of telecommunication, internet services, and digital technology adoption in the country.⁶ Excessive screen time adversely affects sleep primarily through blue-wavelength light emitted by electronic screens, which suppresses melatonin secretion, delays circadian phase, and prolongs sleep onset latency.⁷

Additionally, increased screen time is significantly associated with higher levels of perceived stress, anxiety, and depression—well-established determinants of poor sleep quality.⁸ Despite increasing smartphone use, evidence regarding sleep quality and screen time among adults from Central India remains limited. With this background, the present study was conducted with the following objectives: to estimate the prevalence of poor sleep quality among adults and to determine the association of screen time and psychological factors such as anxiety, depression, and perceived stress with sleep quality among adults attending an UHTC in Central India.

METHODS

This cross-sectional study was conducted at the UHTC of a medical college in Nagpur, Central India, over a period from 1 January 2026 to 30 April 2026. Institutional ethics committee approval was obtained. Informed consent was taken from all participants in their vernacular language before data collection. Adults aged 18–40 years attending the UHTC were enrolled using convenience sampling. Those unwilling to give consent were excluded.

The sample size was calculated using a prevalence of 72% poor sleep quality. With an absolute precision of 5% and 95% confidence interval, the calculated sample size was 310. After adding 10% for non-response, the final sample size was 341 participants. A total of 350 participants were recruited and included in final analysis.

Data were collected through face-to-face interviews using a pre-designed semi-structured questionnaire covering sociodemographic details, screen time behaviour (total daily screen time, bedtime screen use, purpose of use, blue light filter use, phone near pillow), and lifestyle factors (physical activity, caffeine intake at night, and tobacco use).

PSS-10

Perceived stress was assessed using the PSS-10 developed by Cohen et al.⁹ It is a validated 10-item self-

report questionnaire measuring the degree to which life situations are perceived as stressful over the preceding month. Each item is rated on a 5-point Likert scale (0=never to 4=very often). Scores for positively worded items are reverse-scored. The total score ranges from 0 to 40; scores of 0–13 indicate low stress, 14–26 moderate stress, and 27–40 high perceived stress.

PHQ-4

Mental health was screened using the PHQ-4, a validated ultra-brief 4-item tool developed by Kroenke et al.¹⁰ It comprises two items assessing anxiety (GAD-2) and two items assessing depression (PHQ-2), each rated from 0 (not at all) to 3 (nearly every day). A subscale score of ≥ 3 indicates probable anxiety or depression. The total score ranges from 0 to 12, categorized as normal (0–2), mild (3–5), moderate (6–8), and severe (9–12).

PSQI

Sleep quality was assessed using the PSQI, developed by Buysse et al.¹¹ The PSQI is a validated 19-item self-report instrument evaluating sleep over the preceding one month across seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Each component is scored from 0 to 3 and summed to give a global score of 0–21. A global PSQI score of >5 indicates poor sleep quality.

Data were entered into Microsoft Excel, checked for completeness and consistency, and analysed using Jamovi software (Version 2.6.26). Categorical variables were summarized as frequencies and percentages. The association between sleep quality and study variables, including total daily screen time, bedtime screen use, perceived stress, anxiety, and depression, was assessed using the Chi-square test. A *p* value of less than 0.05 was considered statistically significant.

RESULTS

A total of 350 adults were included in the analysis.

The sociodemographic, screen-use and lifestyle characteristics of the participants are presented in Table 1. Of the 350 participants, 208 (59.4%) were males and 142 (40.6%) were females. Regarding daily screen time, 148 (42.3%) participants reported using screens for 2–4 hours per day, while 131 (37.4%) reported 5–7 hours of daily screen use. Screen time exceeding 7 hours per day was reported by 57 (16.3%) participants. More than half of the participants [233 (66.6%)] used screens for more than 30 minutes before going to sleep.

Social media was the most reported purpose of screen use [292 (83.4%)], followed by study/work-related activities [194 (55.4%)]. Night mode or blue light filter was used by 182 (52.0%) participants. Most of the participants [284

(81.1%)] reported keeping their phone near the pillow while sleeping. Physical activity was reported by 119 (34.0%) participants. Night-time coffee or caffeine intake was reported by 52 (14.9%) participants; while smoking or tobacco use was reported by 92 (26.3%) participants.

The prevalence of poor sleep quality is shown in Table 2. Out of 350 participants, 173 (49.4%) had poor sleep quality (PSQI score >5), whereas 177 (50.6%) had good sleep quality.

Table 3 shows the distribution of psychological factors among the study participants. Most participants [291 (83.1%)] had moderate perceived stress, while 35 (10.0%) had high perceived stress. Anxiety was present in 113 (32.3%) participants and depression was present in 136 (38.9%) participants.

The association between screen time and sleep quality is shown in Table 4. Sleep quality was significantly associated with total daily screen time ($\chi^2=11.2$, $p=0.011$).

Participants with poor sleep quality more frequently reported screen use of more than 7 hours per day compared with those having good sleep quality (20.8% vs. 11.9%). A significant association was also observed between bedtime screen use and sleep quality ($\chi^2=9.93$, $p=0.002$). Screen use for more than 30 minutes before sleep was more common among participants with poor sleep quality than among those with good sleep quality (75.0% vs. 59.3%).

Table 5 presents the association between psychological factors and sleep quality. Perceived stress showed a significant association with sleep quality ($\chi^2=9.44$, $p=0.009$). The proportion of participants with high perceived stress was greater among those with poor sleep quality than among those with good sleep quality (13.3% vs. 7.0%). Anxiety was also significantly associated with sleep quality ($\chi^2=19.2$, $p<0.001$). Anxiety was present in 43.4% of participants with poor sleep quality compared with 21.5% of those with good sleep quality. No statistically significant association was observed between depression and sleep quality ($\chi^2=1.10$, $p=0.295$).

Table 1: Sociodemographic, screen-use and lifestyle characteristics of the study participants (n=350).

Variables	N	Percentage
Gender		
Male	208	59.4
Female	142	40.6
Daily screen time		
<2 hours	14	4.0
2-4 hours	148	42.3
5-7 hours	131	37.4
>7 hours	57	16.3
Screen time before sleep		
<30 minutes	117	33.4
>30 minutes	233	66.6
Main purpose of screen use*		
Social media	292	83.4
Study/work	194	55.4
OTT	123	35
Gaming	48	13.7
Use of night mode/blue light filter		
Yes	182	52.0
No	168	48.0
Keeping phone near pillow during sleep		
Yes	284	81.1
No	66	18.9
Physical activity		
Yes	119	34.0
No	231	66.0
Coffee/caffeine intake at night		
Yes	52	14.9
No	298	85.1
Smoking/tobacco use		
Yes	92	26.3
No	258	73.7

*Multiple responses allowed for purpose of screen use.

Table 2: Prevalence of poor sleep quality among study participants (n=350).

Sleep quality	N (%)
Good sleep quality (PSQI $\leq$ 5)	177 (50.6)
Poor sleep quality (PSQI >5)	173 (49.4)

Table 3: Distribution of participants according to perceived stress, anxiety and depression (n=350).

Variables	N (%)
Perceived stress	
Low	24 (6.9)
Moderate	291 (83.1)
High	35 (10)
Anxiety	
Present	113 (32.3)
Absent	237 (67.7)
Depression	
Present	136 (38.9)
Absent	214 (61.1)

Table 4: Association between screen time and sleep quality among study participants (n=350).

Variables		Good sleep quality, (n=177) N (%)	Poor sleep quality, (n=173) N (%)	X ²	P value
Total daily screen time	<2 hours	10 (5.64)	4 (2.31)	11.2	0.011
	2-4 hours	69 (39)	79 (45.67)		
	5-7 hours	77 (43.5)	54 (31.22)		
	>7 hours	21 (11.86)	36 (20.80)		
Bedtime screen use	<30 minutes	72 (40.68)	43 (25)	9.93	0.002
	>30 minutes	105 (59.32)	130 (75)		

Table 5: Association of psychological factors with sleep quality among study participants (n=350).

Psychological factor		Good sleep quality, (n=177) N (%)	Poor sleep quality, (n=173) N (%)	X ²	P value
Perceived stress (PSS-10)	Low stress	18 (10)	6 (3.46)	9.44	0.009
	Moderate stress	147 (83)	144 (83.24)		
	High stress	12 (7)	23 (13.30)		
Anxiety (PHQ-4)	Present	38 (21.46)	75 (43.35)	19.2	<0.001
	Absent	139 (78.54)	98 (56.65)		
Depression (PHQ-4)	Present	64 (36)	72 (41.62)	1.10	0.295
	Absent	113 (64)	101 (58.38)		

DISCUSSION

In the present study, 49.4% of the participants had poor sleep quality, indicating that disturbed sleep is common among adults. A nearly identical prevalence (49.9%) was reported by Desai et al suggesting that poor sleep quality is an important and growing public health concern among Indian adults.¹² The high prevalence observed in the present study may be attributed to increasing digital device use, urban lifestyle, and work-related stress among adults in Nagpur, all of which are known to adversely affect sleep quality.

A significant association was observed between total daily screen time and sleep quality ($\chi^2=11.2$, $p=0.011$).

Participants with higher screen exposure were more likely to have poor sleep quality. Similar findings were reported by Aggarwal et al who found that higher screen time was associated with almost three times greater odds of insomnia (OR=2.84; 95% CI: 1.78-4.58; $p=0.001$). Likewise, Patel et al reported a moderate positive correlation between screen time and poor sleep quality ($r=0.518$, $p<0.001$). Prolonged exposure to blue light from digital devices may suppress melatonin secretion and disrupt the normal sleep-wake cycle.^{8,13}

The present study also found a significant association between bedtime screen use and sleep quality ($\chi^2=9.93$, $p=0.002$). Participants using screens for more than 30 minutes before sleep had poorer sleep quality. Patel et al similarly reported a significant association between

bedtime screen use and poor sleep quality ($p < 0.001$). Screen use before bedtime may increase cognitive arousal and delay sleep onset.¹³

Perceived stress was significantly associated with poor sleep quality ($\chi^2 = 9.44$, $p = 0.009$). This finding agrees with Patel et al who observed a significant positive correlation between stress and poor sleep quality ($r = 0.530$, $p < 0.001$). Increased stress may impair both sleep initiation and maintenance through activation of stress-related neuroendocrine pathways.¹³

Anxiety also showed a significant association with poor sleep quality ($\chi^2 = 19.2$, $p < 0.001$). Similar findings were reported by Sivashankari et al while Mohd Saat et al found that screen time had a significant positive effect on anxiety ($\beta = 0.123$, $p < 0.01$) and poorer sleep quality ($\beta = 0.117$, $p < 0.05$). Anxiety can increase cognitive hyperarousal, thereby interfering with normal sleep.^{14,15}

Although depression was more common among participants with poor sleep quality, the association was not statistically significant ($\chi^2 = 1.10$, $p = 0.295$). In contrast, Mohd Saat et al reported a significant association between screen time and depression ($\beta = 0.194$, $p < 0.01$). This difference may be due to variations in study population, sample size, and assessment tools.¹⁵

Overall, the findings suggest that higher daily screen time, prolonged bedtime screen use, increased perceived stress, and anxiety are important factors associated with poor sleep quality among adults. Promoting healthy screen-use habits, good sleep hygiene, and psychological well-being may help improve sleep quality in this population.

Limitations

The present study has certain limitations. As it was a cross-sectional study, only associations could be identified and a causal relationship between screen time and poor sleep quality cannot be established. Information on screen time and psychological factors was self-reported and may be subject to recall bias. In addition, the study was conducted at a single UHTC using convenience sampling, which may limit the generalizability of the findings

CONCLUSION

Nearly half of the adults included in the study had poor sleep quality. Longer daily screen time, screen use for more than 30 minutes before bedtime, higher perceived stress, and anxiety were significantly associated with poor sleep quality, whereas depression did not show a statistically significant association. These findings highlight the importance of promoting responsible screen use, healthy sleep practices, and stress management through health education and community-based interventions to improve sleep quality among adults.

Recommendations

Health education on responsible screen use and good sleep hygiene should be promoted at primary healthcare settings. Adults should be encouraged to limit screen use before bedtime and adopt healthy sleep practices. Stress management and mental health awareness activities may help improve sleep quality among adults.

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