ORIGINAL ARTICLE

Blue screen blue mood: investigating the association of daily screen time with sleep quality and mental distress in students

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ABSTRACT

Introduction: The pervasive influence of technology on daily life, particularly through screens, and its implications for sleep quality and mental health is critical.

Objective(s): To evaluate the daily screen time of students from different fields of study and to assess its association with demographic variables as well as sleep quality and mental health symptoms.

Materials & Methods: This Cross-sectional study was conducted in Isra University, Hyderabad from August 2023 to February 2024. A total of 152 participants were included in the study. Data regarding demographic details, sleep quality, mental distress, and daily screen time was collected after informed consent. Statistical analysis, conducted using SPSS (version 22), determined correlations between daily screen time, PSQI, and DAS scores ($p \leq 0.05$, 95% confidence).

Results: The mean age of the participants was 20.59 ± 2.16 years. The vast majority of participants belonged to urban areas (87.5%) and were day scholars (74.34%). The mean daily screen time of the study participants was found to be 5.85 ± 1.14 hours. The mean scores of depression, anxiety, stress, and PSQI were found to be 13.34 ± 12.01, 11.17 ± 9.41, 15.32 ± 11.09, and 6.45 ± 3.48 respectively. There was a statistically significant positive correlation observed between screen time and depression ($r = 0.81$, $p<0.01$), anxiety ($r = 0.78$, $p<0.01$), stress ($r = 0.83$, $p<0.01$), and PSQI ($r = 0.75$, $p<0.01$).

Conclusion: Increased screen time was associated with poorer sleep quality and higher levels of mental distress.

Keywords: Screen Time; Mental Health; Sleep Quality; Depression; Anxiety.

INTRODUCTION

With the advent of internet, smartphones, and social media, people have evolved and become dependent on technology for their recreational activities and work; there is an evident rise in the number of people working on computers and electronic devices for their earnings, hence contributing to screen time.[1] Prolonged and frequent contact with screens radiating blue light disturbs the physiological sleep-wake cycle causing sleep disorders like insomnia and circadian rhythm abnormalities, and hinders sleep initiation.[2] Previous studies indicated that students with increased smartphone usage, both in general and at night, had compromised sleep quality, whereas anxiety issues were also recognized.[3,4]

Sleep, apparently an ordinary and often neglected aspect of our lives, influences our physical health, and mental acuity. However, it is correlated to cardiometabolic diseases like obesity, diabetes, and hypertension, along with psychoneurological deficits, including higher degrees of stress, depression, and anxiety among individuals.[2] Compromised attention, moderate mental processing, impaired logical thinking, and loss of productivity are adverse outcomes of inadequate sleep.[5] The duration of sleep varies with age; the optimal sleep duration for individuals aged 46-60 years is 7 hours or more each night. Similarly, for the age group 18-45 years, sleeping more than 9 hours each night is advisable.[5]

There is growing evidence suggesting a link between excessive screen time and mental distress in adolescents. Being included in the three top factors resulting in health deterioration for the last 30 years, depression is predicted to be causing disability-adjusted life years by 2030 worldwide.[4] Similar to poor sleep, depression is higher among young individuals who consume content on computers for extended periods in comparison to aged people.[1] Research suggests that a key factor contributing to vulnerability of significant individuals to depression is their digital overload combined with elevated expectations from the online community where they seek validation; consequently, the frequency of in-person socializing declines, which is linked to the risk of withdrawal from the outside world because of uninterrupted relation with people on social media.

Hence, people opt for more time spent alone rather than surrounded by people, lacking one healthy and balanced hormone secretions like dopamine, serotonin, and endorphins, which are biologically responsible for pleasure and contentment in oneself.[6]

Digital gadgets have restructured primitive sources and paved the way for advanced learning regardless of the field of study, distance-independent communication, and rapid transmission of information, making screens an imperative part of our daily lives. Despite the undeniable benefits, modern research suggests the association between screen media use and detrimental health effects on students, if continued for a long duration, making them academically less competent, sleep deprived, and prone to abnormal social conduct.[7] The usage of mobile internet devices has escalated by a thousand-fold in the last decade.[8] Advances in technology provide its consumers with a plethora of content choices accompanied by effortless accessibility, therefore contributing to immoderate screen time use of more than 2 hours per day.[9]

The objectives of the current study were to evaluate the daily screen time of students from different fields of study and to assess its association with demographic variables as well as sleep quality and mental health symptoms.

MATERIALS & METHODS

This cross-sectional study was conducted from August 2023 to February 2024. The ethical review committee of Isra University, Hyderabad, approved the study.

The OpenEpi sample size calculator was used for the estimation of sample size. We set the confidence level at 95% ($\alpha = 0.05$) and aimed for a statistical power of 80% ($\beta = 0.20$) to ensure our study could detect significant associations with adequate precision. Based on previous research, we anticipated a moderate correlation coefficient (r) of approximately 0.3 between screen time and mental health outcomes.[10] The calculator estimated a sample size of around 85 participants. To account for potential dropouts and non-responses, we increased the target sample size by approximately 20%, resulting in a final target sample size of around 102 participants. Ultimately, a total of 152 participants from different fields of study were selected using purposive sampling technique, thus providing a robust sample for detecting significant correlations and facilitating subgroup analyses.

Data were collected from diverse students, encompassing medical (and allied) and non-medical disciplines, to ensure a comprehensive assessment of daily screen time and its association with sleep quality and mental distress. The medical and allied students were drawn from the MBBS, BDS, DPT, and Pharmacy programs. In contrast, the non-medical students were selected from the Engineering, MBA, and BBA programs.

The inclusion of students from these varied fields of study allowed for a diverse sample, facilitating the examination of screen time habits and their potential impacts across different academic disciplines. After explaining the study objectives to the participants, informed consents were obtained. The inclusion criteria were students from different fields of study who consented to participate in the study, while those who were already suffering from mental health problems, undergoing treatment for psychological ailments, or who refused to give consent were excluded from the study.

Demographic data regarding the diagnostic age, gender, residence, and campus accommodation were included in the study.

Sleep quality was assessed using the Global Pittsburgh Sleep Quality Index (PSQI), which is a self-rated questionnaire that assesses sleep quality over a 1-month time interval. The total score ranges from 0 to 21 with higher scores indicating poorer sleep quality. The Depression, Anxiety, and Stress Scale (DASS-42) was used to evaluate the levels of mental distress among the study participants. The survey included inquiries regarding the amount of time spent using screens and participants were asked to self-report their daily screen time in hours.

SPSS 22 was used for statistical analysis. Mean and standard deviation values were computed for various parameters. Pearson's correlation coefficient assessed the linear relationship between daily screen time and PSQI and DAS scores. The Chi-square test explored the relationship between screen time and demographic variables. Significance was determined at $p \leq 0.05$ with a 95% confidence level.

RESULTS

The mean age of the participants was 20.59 ± 2.16 years. The majority of the participants i.e. 50% belonged to the 18-20 year age group while only 4.6% of participants belonged to the <18 year age group. The vast majority of participants belonged to urban areas (87.5%) and were day scholars (74.34%). The demographic details of the study participants are given in Table 1.

Table 1. Demographic variables of the study population (n=152)

Variables	Frequency	Percentage
Age group (in years)		
<18	07	04.60
18 - 20	76	50.00
21 - 22	47	30.92
>22	22	14.47
Gender		
Male	73	48.02
Female	79	51.97
Residence		
Urban	133	87.5
Rural	19	12.5
Accommodation		
Day Scholar	113	74.34
Hostelite	39	25.65

The mean daily screen time of the study participants was found to be 5.85 ± 1.14 hours.

As shown in Table 2, there was a statistically significant association observed between daily screen time and participants hailing from the urban population (p<0.05).

However, there was no statistical association observed between daily screen time and gender or campus accommodation (p>0.05).

Table 2. Association of demographic variables with daily screen time

Variables		Daily Screen time in hours		X^2	p value
		<5	≥5		
Gender	Male	19	54	0.21	0.64
	Female	18	61		
Residence	Urban	28	105	6.25	**0.01***
	Rural	9	10		
Accommodation	Day Scholar	29	84	0.41	0.51
	Hostelite	8	31		

The mean PSQI score of the participants was found to be 6.45±3.48. There was a statistically significant positive correlation (r = 0.75, p<0.01) observed between daily screen time and PSQI score. This indicates that higher daily screen time is correlated with poor sleep quality.
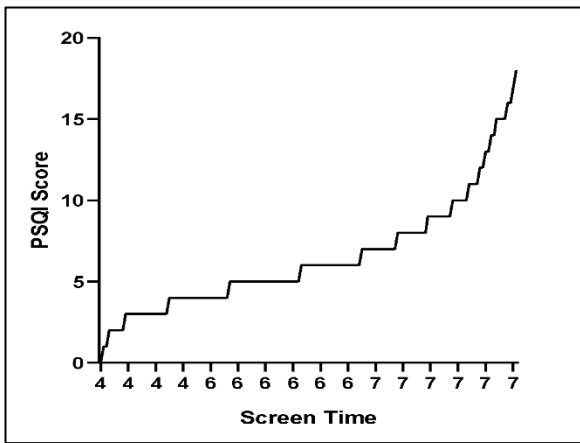

Figure 1. Correlation of Daily Screen Time with Sleep Quality (PSQI Score)

The mean scores of depression, anxiety, and stress were found to be 13.34±12.01, 11.17±9.41, and 15.32±11.09 respectively. Figure 2 shows the correlation of these mental health variables with daily screen time. There was a statistically significant positive correlation observed between screen time and depression (r = 0.81, p<0.01), anxiety (r = 0.78, p<0.01), and stress (r = 0.83, p<0.01).
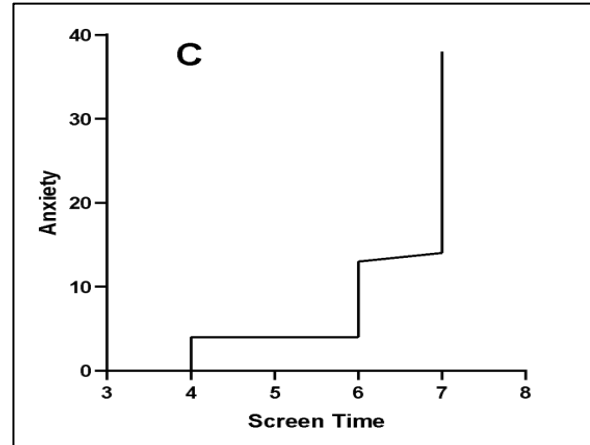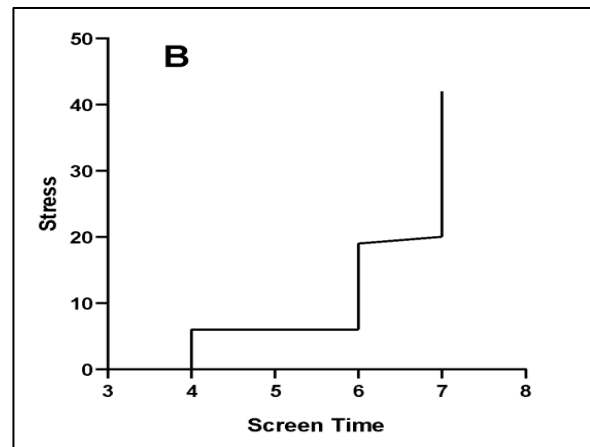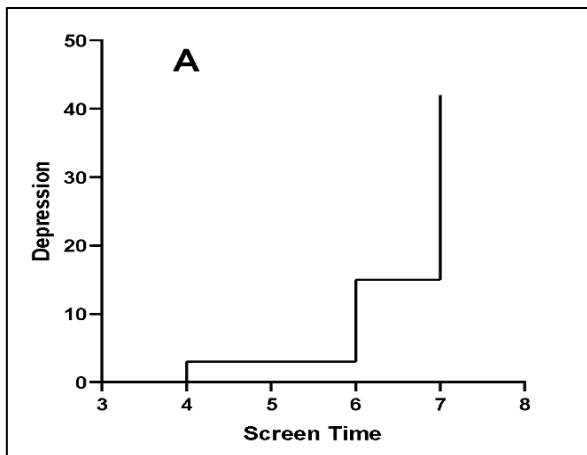

Figure 2. Correlation of Daily Screen Time with A) Depression B) Stress C) Anxiety

DISCUSSION

This study sought to examine the relationship between screen time and depression, including the mediating influence of sleep. The findings of the study discovered a statistically significant association between daily screen time and individuals residing in urban areas. However, this contradicts the findings of Varadarajan et al.,[11] and Wang et al.,[12] whose studies indicated no correlation between high screen time prevalence and residential areas (rural/urban). Nedjar-Guerre et al.,[13] proposed a potential explanation for the correlation consistent with our results, highlighting a reduced number of screen devices in rural families compared to their urban counterparts. A higher

prevalence of screens is associated with increased screen time in urban populations. Urbanization leads to the decline of traditional rural settlements, where private spaces like bedrooms are rare. In urban areas, personal spaces facilitate increased screen time, framing it as a "leisure activity". The findings of the study indicated no significant correlation between gender and daily screen time. In contrast, however, Whiting et al.,[14] revealed that boys tended to have longer daily screen times than girls. Similarly, O'Brien et al.,[15,16] observed that boys accumulated a higher overall screen time (minutes of daily screen time) compared to girls.

The current study's results demonstrate a significant positive correlation between daily screen time and PSQI score. This implies that increased daily screen time is associated with poorer sleep quality. This aligns with the findings of Maurya et al.,[17] where increased screen time among adolescents and young adults was linked to higher odds of experiencing sleep problems. In a recent study,[18] individuals who exhibited elevated smartphone usage recorded higher scores on the daytime dysfunction component of the PSQI scale, contrasting with those who utilized smartphones to a lesser extent. Adamczewska-Chmiel et al.,[18] proposed that individuals categorized as phonoholics tend to have a shorter average sleep duration and encounter sleep deprivation more frequently than their counterparts. This can be attributed to the magnetic field produced by smartphones that can detrimentally influence serum melatonin levels, a crucial element for sleep, and cerebral blood flow, impacting sleep quality of phonoholics. Inadequate sleep leads to both physical and psychological fatigue, disrupting circadian rhythms and inducing hormonal changes. Consistent poor sleep quality results in compromised cognition, mood, and reduced physical activity.[19] Various analyses indicate that prolonged screen time may result in concentration disorders, eye damage due to exposure to blue light which delays sleep onset, and adverse effects on the development of fine motor skills, and if extended before bedtime, can have a detrimental impact on sleep and subsequent body regeneration.[20,21] Thirdly, engaging in activities like watching TV or movies is related to a decrease in sleep duration. This observation aligns with the hypothesis of Guerrero et al.,[20] that extensive Screen Time (ST) behaviors may replace time allocated to other activities, such as sleep. However, Dubey et al.,[22] did not find a significant association between screen time and sleep quality, which is inconsistent with the findings of the current study.

The current study also found a positive significant correlation between ST and depression, anxiety, and stress. Similarly, Li et al.,[4] found a correlation between screen time and an elevated risk of depression. Adamczewska-Chmiel et al.,[18] discovered a positive correlation between anxiety symptoms and problematic smartphone usage, potentially leading to depression and anxiety, which is consistent with the findings of the current study. Individuals spending more than 6 hours per day watching TV and using computers, contributing to overall screen time, had increased odds of developing depressive symptoms. Boers et al.,[23] showed that with additional hours spent on social media, adolescents exhibited a 0.64 unit rise in depressive symptoms. Ma et al.,[24] discovered a correlation between social media use, TV watching, and depressive symptoms. Screen time can lead to a decrease in social interactions, stimulating social isolation and resultantly, manifesting in depressive symptoms and individual experiences negative thinking and feelings of decreased life satisfaction.[4,9] Direct mechanisms supporting an association between excessive ST and mental health problems include the content consumed through screens, creating fragile emotional stability and impulsivity. However, individuals suffering from mental health problems indulge in excessive ST as a coping strategy as well.[25]

In accordance with numerous studies, excessive screen time poses more risks than benefits. With technological progress, people are increasingly immersed in digital activities for education, work, etc. Hence, it is crucial to acknowledge the opportunities and challenges of digital platforms and manage them wisely.

LIMITATIONS

The present study had certain limitations. First, the sample size was relatively small which may prevent the generalizability of the results. Second, other confounding variables such as BMI, body image, self-esteem, familial environment, burnout, etc., were not considered in this study which could also have a significant impact on the findings. Lastly, the duration of the study could have been extended to observe long-term effects and trends, as the short-term nature of the study may not fully capture the dynamics of the variables under investigation. Future research endeavors should aim to address these limitations to provide a more comprehensive understanding of the phenomenon.

CONCLUSION

Screen time is significantly correlated with poorer sleep quality and higher levels of depression, anxiety, and stress, particularly in urban populations. These findings underscore the importance of managing screen time for both physical and mental well-being.

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