Research Article

Digital dependency: Exploring the health consequences of excessive screen time among Indian youth

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Abstract

Digital technology use has surged, especially among younger generations, raising concerns about its impact on health. This study examined the effects of increased screen time on the health of college students in Gujarat, India. A random sample of 452 students (ages 17-23) from urban and rural backgrounds participated in a Google Forms survey covering socio-demographic data, screen time, physical health, mental health (depression, anxiety, mood swings), and sleep quality. Among participants, 98.89% used mobile phones, 78.09% watched television, 73.67% used laptops, and 54.20% used tablets. Notably, 10.42% spent over 8 hours daily on mobile devices. Many primarily used screens for academic work and social media. While 52.22% had a normal body weight, 34.07% were underweight, and 13.71% were overweight, possibly due to screen use during meals. Common physical issues included body aches, eye strain, and sleep disturbances, while mental health concerns involved insomnia, anxiety, and depression. The Pittsburgh Sleep Quality Index (PSQI) revealed that 44.46% had poor sleep quality (PSQI≥5), with an average score of 4.53 ± 2.32. Overall, excessive screen time negatively affected both physical and mental health. Promoting balanced screen use and increased physical activity is essential for improving student well-being.

1. Introduction

The modern digital era has advanced the comfort of human life through the use of devices like televisions, computers, and mobile electronics. The digital world connects people, putting everything at their fingertips. The coronavirus pandemic has led to the widespread adoption of work-from-home practices and online education, significantly increasing screen time and negatively impacting health [1]. Since the COVID-19 pandemic, a drastic rise in screen time has been observed, particularly among college students, which

has adversely affected mental health, sleep patterns, overall well-being, and academic activities [2].

Most studies have found links between excessive screen exposure and its effects on various aspects of physical, mental, and psychological health. The physical hazards of excessive screen time include eye strain, neck and shoulder pain, and back pain. Consequences for physical health include risk factors for obesity and cardiovascular conditions such as hypertension, impaired stress regulation, low levels of



HDL cholesterol, and insulin resistance. Mental health hazards include increased levels of depression, anxiety, fear of missing out, and other mood disorders. Psychological health impacts include suicidal ideation and depressive symptoms, which are linked to digital device dependency, poor sleep quality caused by excessive screen time, and negativity influenced by online content [3-6].

Excessive screen time is also linked to lower self-esteem, worsened mental health, addiction, slower learning, and a higher risk of early cognitive decline [7]. Radiofrequency-modulated electromagnetic fields emitted by mobile phones are predominantly absorbed by the user's head, impacting cerebral glucose metabolism and altering neuronal excitability [8]. Rising passive entertainment has coincided with a sharp decline in youth participation in sports, exercise, and outdoor activities over the last 10–15 years, leading to weakened social skills, isolation, and rising teen suicide rates. Creativity has declined as less time is dedicated to hands-on, problem-solving activities [9].

With screens now nearly ubiquitous, the issue is unlikely to be resolved on its own, especially as the use of portable devices continues to rise rapidly. Research on the impact of digital screen usage (television, mobile phones, computers, and other portable devices) on the youth is limited in India. Hence, the present study examined the impact of excessive screen time on the health of college students in Gujarat, India.

2. Materials and methods

A cross-sectional online survey was conducted involving college students of both genders from Gujarat, with data collection taking place from February 2024 to April 2024. A structured, validated, self-administered Google Form questionnaire was developed after an extensive literature review. The questionnaire underwent content validation by a panel of subject matter experts and was pilot-tested on a small group of students to ensure clarity, reliability, and relevance before wider distribution. The final version was disseminated via social media platforms for data collection. The form comprised four sections. Section I included six questions on the sociodemographic characteristics of respondents. Section II

contained seven questions related to screen time activities, including type of screen time, screen time for different devices, changes in screen time after COVID-19, activities contributing to screen time, commonly used apps, the specific absorption rate of mobile phones, and internet speed. Section III focused on the physical impacts of screen time with five questions, while Section IV addressed mental health impacts with three questions and included two questions on participants' opinions regarding screen time reduction. Further, the sleep quality of the college students was assessed using Pittsburg Sleep Quality Index (PSQI) questionnaire, which is a validated questionnaire developed by the University of Pittsburgh, addresses 7 components, i.e. subjective sleep quality, latency, duration, efficiency, disturbance, need for medications to sleep and day dysfunction due to sleepiness, with the maximum score of 21 points. A global score of more than 5 indicates poor sleep quality [10]. Incomplete Google forms data was excluded from the study. Data collected in Google Form were analyzed using Microsoft Excel spreadsheet. Descriptive statistics were calculated using frequencies and percentages. The data were analyzed through SPSS 20.0 and the Chi-square test was used to find out the association between variables at a significance level of p < 0.05.

3. Results

Demographic data of the total of 452 students who participated in the study are shown in Table 1. Of the total participants, 57.3% were males and 42.6% were females. Additionally, 61.9% of participants were from rural areas, while 38.1% were from urban areas. Most students came from lower and middle-class backgrounds, with only 17.92% from high-income families. A total of 52.22% of participants had normal body weight, while the remaining participants were either underweight (34.07%) or overweight (13.71%). Data related to screen time activities are shown in Tables 2 and 3. A total of 63.05% of respondents engaged in both active and passive screen time, while 10.84% engaged only in active screen time and 5.75% engaged only in passive screen time. After COVID-19, screen time increased for 78.09% of participants. The devices used for screen time included mobile phones (98.89%), laptops (73.67%), tablets (54.20%), and

Table1. Demographic data of the college students

Variables	Frequency	Percentage		
	(n=452)	(%)		
Gender				
Male	259	57.3		
Female	193	42.6		
Residence				
Rural	280	61.95		
Urban	172	38.05		
Socioeconomic status				
< 2 lacs (Lower class)	94	20.79		
2-4 lacs (Upper lower)	31	6.86		
4-8 lacs (Lower middle)	99	21.90		
8-16 lacs (Upper middle)	147	32.52		
>16 lacs (Upper class)	81	17.92		
Basal Metabolic Index (BMI)				
Underweight (<18.5 BMI)	154	34.07		
Normal (18.5-24.9BMI)	236	52.22		
Overweight (25.0-29.9 BMI)	35	7.74		
Obese (≥30.0 BMI)	27	5.97		

Table 2. Distribution of digital devices usage time in the college students.

Usage time	Mobile	Laptop	Tablet	Television
< 1 hour	67	188	184	184
	14.82%	41.59%	40.71%	40.71%
1-2 hour	91	82	32	87
	20.13%	18.14%	7.08%	19.24%
2-4 hour	121	30	32	48
	26.77%	6.64%	7.08%	10.62%
4-8 hour	121	27	23	28
	26.77%	5.97%	5.09%	6.19%
>8 hour	47	6	6	6
	10.39%	1.33%	1.33%	1.33%
Not use at all	5	119	173	99
	1.11%	26.32%	38.27%	21.90%

televisions (78.09%). The screen time activities of students included college work (72.56%), social media (67.26%), watching movies/TV series/streaming platforms (46.02%), playing video games (32.52%), video calls (30.53%), and other activities (0.88%). Instagram was the most used app among participants (58.84%), followed by YouTube (29.21%), WhatsApp (18.58%), Chrome (11.72%), and Snapchat (8.85%). The specific absorption rate (SAR) of cell phones was found to be <1.60 W/kg in 98.23% of participants and >1.60 W/kg in 1.76% of participants.

Data regarding the impact of screen time on the

Table 3. Distribution of screen time activities in the college students

Variables	Frequency	Percentage		
	(n=452)	(%)		
Types of Screentime use				
Active	49	10.84		
Passive	26	5.75		
Both	285	63.05		
Scrrentime increase after				
COVID-19				
Yes	353	78.09		
No	99	21.91		
Activities contribute to screen				
time				
College work	328	72.56		
Social media	304	67.26		
Watching movies/T.V	208	46.02		
series/Streaming plateform				
Playing video	147	32.52		
Video call	138	30.53		
Others	4	0.88		
Apps most used				
Instagram	266	58.84		
YouTube	132	29.21		
Whats App	84	18.58		
Chrome	53	11.72		
Snapchat	40	8.85		
Other	33	7.3		
Specific absorption rate (SAR)				
>1.60 W/kg	8	1.76		
<1.60 W/kg	444	98.23		
Internet speed				
< 1 mbps	128	28.32		
1-5 mbps	200	44.24		
6-10 mbps	56	12.38		
>10 mbps	68	15.04		

physical health of participants is shown in Table 4. The per-day physical activity levels were as follows: <1 hour in 37.83%, 1-2 hours in 34.07%, 2-4 hours in19.91%, and >4 hours in 8.19% of respondents.

Additionally, 28.54% of participants used screens every day while eating, while 36.28% used screens occasionally during meals. Of those using screens during meals, 81.85% used them for up to 30 minutes, while 18.14% did not use screens at all during meals. A total of 17.04% of participants reported eye defects, including short-sightedness, long-sightedness, or both. Physical complaints due to excessive screen time

Table 4. Distribution of physical impact of screen time on the college students

Variables	Frequency	Percentage		
	(n=254)	(%)		
Physical work time				
<1 hr	171	37.83		
1-2 hrs	154	34.07		
2-4 hrs	90	19.91		
>4 hrs	37	8.19		
Screen time frequency during				
meal				
Everyday	129	28.54		
Sometimes	164	36.28		
Rarely	77	17.03		
Never	82	18.14		
Screen time during meal				
<10 min	134	29.65		
>30 min	19	4.20		
10-15 min	140	30.97		
16-25 min	50	11.06		
26-30 min	27	5.97		
None of these	82	18.14		
Eye Defect				
Yes	77	17.04 %		
No	375	82.96%		
Short sightedness (Myopia)	66	14.60 %		
Long sightedness	74	16.40		
(hypermetropia)				
Both	30	6.70		
Not at all	282	62.30		
Body pain while using screen				
Eye pain (redness of eyes)	59	13.05		
Headache	170	37.61		
Lower back pain	40	8.84		
Neck and shoulder pain	89	19.69		
Back pain	149	32.97		

included eye pain (13.05%), headaches (37.61%), lower back pain (8.84%), neck and shoulder pain (19.69%), and back pain (32.97%).

Data regarding the mental impacts of screen time on college students is shown in Table 5. A total of 46.24% of participants had the habit of watching screens while falling asleep. Additionally, 41.59% interacted with screens as soon as they woke up, 39.38% used screens within an hour of waking, and 19.03% used screens several hours after waking. Mental health changes, such as behavior changes, anxiety, depression, insomnia, guilt, irritability, eating

Table 5. Distribution of mental impacts of screen time on the college students

Variables	Frequency	Percentage		
	(n=452)	(%)		
Fall asleep while watching screen				
of devices				
Yes	209	46.24		
No	243	53.76		
Interact screen while waking up				
As soon as wake up	188	41.59		
Within an hour of waking up	178	39.38		
Several hours after waking up	86	19.03		
Mental changes observed	92	20.35		
Trauma	2	0.44		
Thoughts of suicide	3	0.66		
Irritability	21	4.65		
Guilty	22	4.86		
Behaviour changes	50	11.06		
Depression	15	3.32		
Eating disorder	21	4.65		
Insomnia	27	5.97		
Anxiety	35	7.74		

disorders, trauma, and thoughts of suicide, were observed in 20.35% of participants.

Sleep quality was assessed using the validated Pittsburgh Sleep Quality Index (PSQI), which has seven components. The results are shown in Table 6. Based on responses to the PSQI questionnaire, 7.52% of students rated their subjective sleep quality as "fairly bad" or "very bad." A total of 10.6% of students had a sleep latency of >30 minutes, and 20.79% of participants had a sleep duration of <6 hours per day. Habitual sleep efficiency of <75% was observed in 23.67% of respondents. Approximately 40.26% of respondents reported sleep disturbances, such as waking at night, getting up to use the bathroom, difficulty breathing, snoring, feeling too hot or cold, bad dreams, pain, or other reasons. About 23.23% reported using sleep medications, and 33.62% reported daytime dysfunction reduced and enthusiasm in the past month due to sleep disturbances and inadequate sleep. A total of 201 (44.46%) participants had a global PSQI score ≥5, indicating poor sleep quality, while 251 (55.53%) participants had a global PSQI score <5. The mean global PSQI score was 4.53 ± 2.32 .

Table 6. Pittsburg sleep quality index of the college students

	Grad	e '0'	Grade '1'		Grade '2'		Grade '3'			
PSQI	(Very §	good)	(Fairl	y good)	(Fair	rly bad)	(Ve	ry bad)	Mean	SD
	n	%	n	%	n	%	n	%		
Sleep quality	304	67.3	114	25.2	23	5.1	11	2.4	0.41	0.33
Sleep latency	230	50.9	126	27.9	48	10.6	48	10.6	0.81	0.42
Sleep duration	209	46.2	149	33	66	14.6	28	6.2	0.80	0.39
Habitual sleep efficiency	200	44.2	145	32.1	56	12.4	51	11.3	0.91	0.34
Sleep disturbance	270	59.7	87	19.2	55	12.2	40	8.8	0.70	0.44
Sleep medication	347	76.8	59	13.1	33	7.3	13	2.9	0.36	0.19
Day time dysfunction	300	66.4	78	17.3	61	13.5	13	2.9	0.54	0.21
Global score: 0 – 21									4.53	2.32

4. Discussion

Recent data show that 67% of the global population, or 5.4 billion people, are using the internet [11]. The Digital India initiative and growing internet access have led to over 751 million active users in India as of January 2024. Notably, 96% of internet users aged 16 to 64 in India own a mobile phone, and 5% own virtual reality devices. There are 462 million active social media users in India [12, 13]. The affordability of internet access is increasing across regions and income groups, with no significant differences in digital device usage across gender, socioeconomic status, or urban/rural areas in our study.

Mobile phones are the most widely used digital devices among youth participants (95%), with most spending over 2 hours daily on screens, which is consistent with other Indian studies [13-15]. Most participants reported increased screen time post-COVID, using devices for academic work and social media. Instagram was the most popular app, followed by YouTube, WhatsApp, Chrome, and Snapchat [16]. Nearly all participants (98.6%) used mobile phones with a SAR below 1.60 W/kg, complying with international safety standards [17]. The lack of physical activity among participants may lead to cardiovascular issues, obesity, and chronic conditions like diabetes and heart disease [3]. Prolonged screen exposure was linked to eye pain, myopia, hypermetropia, and headaches [18-21], as well as musculoskeletal pain in the neck, shoulders, and back [22-24]. Blue light exposure at night may impair sleep quality and duration [25, 26]. Mental health issues such as insomnia, depression, anxiety, eating

disorders, and suicidal thoughts were reported by some participants, aligning with previous studies [5, 27, 28].

Sleep disturbances are increasingly prevalent, especially among young people, and worsened by technology use. The Pittsburgh Sleep Quality Index (PSQI) revealed that 7.5% of participants had poor sleep quality, while 20% faced issues with sleep latency, duration, and disturbances. Increased screen time was linked to shorter sleep duration, poor sleep quality, and longer sleep latency. A global PSQI score ≥5, indicating poor sleep, was reported by 44.46% of participants, while 55.53% scored <5, indicating good sleep quality. The mean PSQI score for college students was 4.53 ± 2.32, suggesting overall good sleep quality, though still influenced by excessive screen time, in line with findings from other studies in India [29, 30].

The findings highlight the need to reduce screen time and promote healthier lifestyles. The government should set screen time guidelines, integrate digital detox into public health campaigns, and promote digital literacy in schools and colleges. Educational institutions can regulate screen exposure through structured breaks and a balanced digital-traditional approach. Employers should adopt wellness policies with screen breaks, ergonomic setups, and blue light reduction. Implementing these measures can help India foster a healthier digital lifestyle while ensuring technology benefits overall well-being.

5. Conclusions

Excessive screen time among Gujarat college students

negatively impacts physical and mental health, causing eye strain, headaches, musculoskeletal pain, anxiety, depression, and poor sleep. High usage, mainly for academics and social media, underscores the need for balanced screen time, physical activity, and better sleep hygiene. Implementing guidelines, digital literacy, and wellness policies can help foster healthier lifestyles and maximize technology's benefits.

Authors' contributions

Concept and wrote manuscript, V.G., T.G.; Collected data and analyzed, K.M., A.M., H.S., V.J.

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Availability of data and materials

All relevant data are within the paper and its supporting information files. Additional data will be made available on request according to the journal policy.

Conflicts of interest

Authors declare that there is no conflict of interest.

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