



HEALTH PROMOTION

Prevalence of excess screen time among secondary school children in rural India

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School-children • Rural • Screen-time • Sleep • BMI

Summary

Introduction. Screen time has increased during the COVID-19 pandemic, especially among children and teenagers. This has come at the expense of their healthy eating habits, physical activity and adequate amount of quality sleep. The excessive use of screen-device can lead to addiction which starts during adolescent years. Objectives: Primary Objective: to assess prevalence of excess screen time among secondary school children; Secondary Objective: to correlate Body Mass Index (BMI), sleep duration, duration of physical activity and food habits with screen time duration.

Material and Methods. Study settings and design: cross-sectional study was conducted in secondary schools in the rural field

practice area of a private medical college in Pune, India. The study included 184 school children from eighth to tenth standard. Data was collected using a self-administered, questionnaire.

Results. Prevalence of excess screen time among secondary school children was 83.2%. Mobile phone was the most used device (98.9%). There was a significant association between excess screen time and inadequate sleep.

Conclusions. The present study reports high prevalence of excess screen time in rural school going children in rural India. There is a need for strategies to combat this in school health programs on priority.

Introduction

Children of today are surrounded by technological advances and have access to a range of devices, like television, mobile phones and other gadgets [1]. Electronic devices have become part of their daily lives, and young people have begun spending more time than ever before engaging in screen-based activities [2, 3]. Excessive use of devices can lead to technology addiction, which is most likely to start during the adolescent years [4].

Screen time refers to the amount of time spent watching television, including videos, playing games on video consoles or on computers; and using computers for other purpose [5]. The American Academy of Paediatrics (AAP) suggests that youngsters limit their entertainment-related screen time to less than one to two hours a day [6], while the Indian Academy of Paediatrics (IAP) advocates for a more balanced approach that includes both outdoor physical activity and other activities such as school work, meals, hobbies, peer interaction, and family time [7]. The World Health Organization's 2020 global guidelines recommend that children and adolescents should engage in at least 60 minutes of moderate-to-vigorous physical activity each day, and also participate in muscle-strengthening activities at least 3 days a week [8].

The COVID-19 pandemic led to an increase in online education and movement restrictions, which has led to more time in front of screens for education, entertainment and socializing. Although this has helped maintain a sense of normalcy, it has led to screen time beyond the recommended two hours per day [9]. This has been particularly significant among school-aged children and teenagers, and is often at the expense of physical activity [10].

Extended screen time has also been linked to dietary issues, including low consumption of fruits and vegetables and high consumption of high-calorie, high-fat, high-sugar, and high-sodium foods [11]. Some studies even suggest a correlation with eating disorders [12, 13].

Too much screen time can also reduce sleep quality through multiple mechanisms, such as night-time exposure to bright lights, which can decrease melatonin production, and the displacement of other activities that are useful for sleep. According to the American Academy of Paediatrics, it is recommended to avoid screens at least 1 hour before bedtime. This practice will reduce sleep disturbances [14].

The usage of display screens may also add to the danger for mental issues, like, despondency, nervousness, self-destruction, and thoughtlessness among youngsters and young people [15]. With the increased availability of cell phone networks in rural India, young people living in

these areas now have access to more screen time beyond just watching television. This is especially true for rural areas near large cities, where devices such as mobile phones, personal computers, and tablets are more readily available [16]. Expanded smart phone access in rural India is prompting innovation teaching in school. The innovation enslavement possibly adds to poor scholastic presentation [4].

Several studies related to screen time in children had been conducted in countries outside India in the past. A secondary data analysis of international children's accelerometry database conducted in 2013 shows that at least two third of the participants exceeded two hours per day of screen time [17]. A systematic review and meta-analysis conducted in Brazil in 2017 showed that the prevalence of excess screen time in Brazilian adolescents was 70.9% [18]. A comparative study of screen time among urban and rural high school students conducted in Karnataka, India showed a mean total screen time of 177 minutes in urban school students and 93 minutes in rural school students [19]. A study conducted in children aged two to five years showed that 59.5% of children had excess screen time [20]. There are limited studies conducted on the prevalence of screen time in secondary children in rural India.

Screen time has risen during the COVID-19 era due to government-enforced public health protocols [21]. Studies have been conducted in the pre-pandemic times. However, only a few studies have been conducted during the pandemic and post-pandemic time to assess prevalence of screen time. The cut-off criteria according to their studies do not fit AAP criteria. This study was conducted in the post-pandemic times when school education had returned to normal. This study was conducted with following objectives

Primary Objective: to assess prevalence of excess screen time in secondary school children in rural area.

Secondary Objective: to correlate Body Mass Index (BMI), sleep duration, physical activity duration and food habits with screen time duration in these children.

Material and Methods

STUDY DESIGN

Cross-sectional study.

STUDY SETTING

The study was carried out in the three English medium secondary schools located in the villages under the rural field practice area of a private medical college in Pune district of Maharashtra. The schools were selected by convenience sampling method. Study was conducted from May 2022 to July 2022.

STUDY PARTICIPANTS

Students of class 8th-10th were included in the study. Students present on the days of administration of the questionnaire were included in the study.

DATA MEASUREMENT

Tool for data collection

The study was conducted using a validated (by community medicine and Ophthalmology specialists), self-administered questionnaire. It had questions related to:

- Socio-demographic details;
- Details related to screen usage: type of device/s used, duration of usage on an average in a day and the purpose of usage;
- Sleep: bedtime and waking up time on a weekend and weekday;
- Duration of physical activity;
- Food habits: consumption of junk food. These foods are defined as "foods (packed or non-packed, processed or non-processed) which contains little or limited presence of proteins, vitamins, phytochemicals, minerals and dietary fibre but are rich in fat (saturated fatty acids), salt and sugar and high in energy (calories) that are known to have negative impact on health if consumed regularly or in high amounts" [22];
- Anthropometric measurements: height and weight measured by standard techniques.

Methodology for data collection

After obtaining permission from the school, investigators briefed the students about the objectives of the study. Assent form was given to the children. Consent form for their parent to sign and participant information sheet were handed over to them to take home. Those children who submitted the consent form signed by their parents were included in the study. The questionnaire was distributed, discussed and doubts clarified. After the forms were filled, anthropometric measures were taken by standardised procedure.

Sampling size estimation

Considering 68% prevalence of excess screen-time in secondary school children [23], allowing a permissible error of 5% with 95% confidence interval, sample size was calculated to 118 [$n = [(z \times \alpha)^2 \times (SD)^2] \div [d]^2$]. However, data of 184 students was finally included.

Study variable

The primary outcome variable was prevalence of excess screen-time. Other outcome variables were duration of physical activity, adequate sleep, BMI and eating behaviour. The definition of the outcomes measured were as follows:

- Screen time: screen time refers to the amount of time spent watching television, including videos; playing computer games on video consoles or on computers; and using computers for other purposes. As per the recommendation of AAP, the recommended screen-time is not more than two hours per day [6];
- Adequate sleep: children between thirteen to eighteen years of age should sleep eight to ten hours in a day [24];
- Adequate physical activity: the centre for Disease

Control (CDC) recommends sixty minutes of moderate to vigorous physical activity in children between six to seventeen years of age [25];

- Body Mass Index (BMI): BMI is a person’s weight divided by the square of height in meters [6]. BMI of a secondary school child should be between -1SD to +1SD as per WHO BMI chart. +1 to +2 SD is overweight and more than +2 SD is obese;
- Eating behaviour: eating behaviour is a broad term that encompasses food choice and motives, feeding practices, dieting. Here we focussed on their food choice (such as inclusion of junk food and soft drinks in their diet and influence of screen on their diet).

STATISTICAL ANALYSIS

Statistical analysis was done using SPSS software (version 28.0). Continuous variable results were shown by descriptive statistics. Categorical variable result was shown by frequency and percentages. Chi-square test was used to test association between different risk factors, demographic variables with screen time. Throughout results, 5% level of significance was used. All results are shown with 95% level of confidence. P-value < 0.05 was considered as significant.

ETHICS STATEMENT

Study was conducted after obtaining permission from the institutional ethics committee (IEC) [BVDUMC/IEC/51D].

Results

Total 184 children participated in this study of whom 64.7% were males (Tab. I). Their mean age was 14.91 ± 0.98.

Just 3.3% of the parents lacked formal education, while the rest had at least completed their primary schooling. Out of the total, 2.17% female students were obese and

1.63% were overweight. Among the boys, 3.80% were obese and 7.07% were overweight.

All students used some kind of screen-device (television, computer/laptop, mobile phone, tablets or video game device). The most frequently used was mobile phone (98.9%), followed by television (92.9%). Out of all students, 64 (34.8%) owned at-least one of the above-mentioned devices. The majority (39.1%) had been using one of these device for more than 04 years. Majority of the study participants *i.e.*, 120 (65.2%) did not own the device. On an average per day, 63 students spent more than three hours on screen device. The prevalence of excess screen time was 83.2% (Tab. II).

A significant association was present between excess screen time, bed time on a weekday (p value 0.001). No significant association was present between other variables (Tabs. III, IV).

One hundred and thirty-two children consumed junk food and 94 children consumed soft drinks. Eighty children responded that their food habits were influenced by advertisements and shows on screen. All the children had some form of physical activity throughout the day either in school or after school-hours.

Tab. I. Socio-demographic details of the children (n = 184).

Variable		Frequency (Percentage %)
Gender	Male	119 (64.7)
	Female	65 (35.3)
Grade	Eighth	90 (48.9)
	Ninth	70 (38)
	Tenth	24 (13)
Mother’s education	Uneducated	6 (3.3)
	Primary school	7 (3.8)
	Secondary school	119 (64.7)
	Graduate	44 (23.9)
Father’s education	Uneducated	0 (0)
	Primary school	4 (2.2)
	Secondary school	110 (59.8)
	Graduate	67 (36.41)
	Postgraduate	3 (1.6)

Tab. II. Screen usage (n =184).

Variable	Frequency (Percentage %)	
Screen-device used	Mobile phone	182 (98.9)
	Television	171 (92.9)
	Computer/ laptop	89 (48.4)
	Tablet	33 (17.9)
	Video game device	27 (14.7)
Owning a device	Yes	64 (34.8)
	No	120 (65.2)
Years of usage	< 2 years	59 (32.1)
	2-4 years	53 (28.8)
	> 4 years	72 (39.1)
Duration of mobile phone usage in a day	< 1 hour	53 (28.8)
	1-3 hours	65 (35.3)
	> 3 hours	63 (34.2)
	Not used	3 (1.6)
Duration of television usage in a day	< 1 hour	74 (40.2)
	1-3 hours	64 (34.8)
	> 3 hours	33 (17.9)
	Not used	13 (7.1)
Duration of Computer/ laptop usage in a day	< 1 hour	63 (34.2)
	1-3 hours	19 (10.3)
	> 3 hours	6 (3.3)
	Not used	96 (52.2)
Duration of tablet usage in a day	< 1 hour	22 (12)
	1-3 hours	10 (5.4)
	> 3 hours	1 (0.5)
	Not used	151 (82.1)
Duration of video game device usage in a day	< 1 hour	17 (9.2)
	1-3 hours	6 (3.3)
	> 3 hours	2 (1.1)
	Not used	159 (86.4)
Excess screen-time	153 (83.2)	

Tab. III. Association of screen-device with various variables (n = 184).

Variable		Excess Screen time		Total	Chi-square value	p-value
		Yes	No			
Bed-time on a weekday	8 pm-10 pm	49	21	70	13.95	0.001*
	10 pm-12 pm	104	10	114		
Bed-time on a weekend	8 pm-10 pm	26	12	38	7.42	0.006
	10 pm-12 am	127	19	146		
If you sleep after 9 pm, do you sleep late because you use these devices?	Yes	43	7	50	0.4	0.53
	No	110	24	134		
Wake-up time on a weekday	Before 6 am	43	10	53	0.22	0.64
	6 am-8 am	110	21	131		
Wake-up time on a weekend	Before 6 am	6	4	10	4.05	0.04
	6 am-8 am	147	27	174		
Physical activity during school hours	Do not play	0	1	1	5.55	0.06
	< 30 minutes	73	12	85		
	> 30 minutes	80	18	98		
Physical activity after school hours	Do not play	9	3	12	6.91	0.03
	≤ 1 hour	65	20	85		
	> 1 hour	79	8	87		
Type of diet	Mixed	130	25	155	0.36	0.55
	Veg	23	6	29		
Consumption of junk food	Yes	112	20	132	0.96	0.33
	No	41	11	52		
Consumption of soft drinks	Yes	84	10	94	5.29	0.02
	No	69	21	90		
Is the consumption of your food influenced by advertisements or shows on screen?	Yes	67	13	80	0.04	0.85
	No	86	18	104		

* Significant association between excess screen time and bed time on a weekday.

Tab. IV. Association with BMI (n = 184).

	Excess Screen time	N	Mean	SD	t-value	p-value
BMI	Yes	153	19.17	3.67	1.18	0.86
	No	31	19.29	3.67		

Discussion

Our study showed that 83.2% of secondary school children spent more than the recommended two hours on screen-device in a day. This was more than reported in a similar study conducted in other parts of India as discussed further.

A cross sectional study conducted in rural western India among pre-schoolers showed that more than 80% of the children exceeded the recommended screen time [26]. Another study conducted in a rural community of North India showed that prevalence was 61.8% [27]. In an urban study conducted in adolescent children before the COVID-19 pandemic the prevalence was found to be 68% [23]. This can be explained by the less screen-based device usage before COVID-19 pandemic. A study conducted by Pooja et al. (2021) in rural school on children aged 10-19 years found only 17% [16] of students spending excess screen time. The current results were similar to the study conducted in an urban setting in Kerala. It was observed that 87.7% [28] of children engaged in excess screen-time. This similarity in observation between the current study and the latter

can be explained by the close proximity of the current study setting to a metropolitan city. The children in peri-urban area have more access to device and a lifestyle different from the typical villages in India.

The excess screen-time in these children had a negative impact on their sleep. There is a significant association between sleep and late bed-time. A cross-sectional study conducted in 2022 reported that adolescents who spent more than two hours of screen-time had 1.55 times less sleep than others [29]. Cartanyà-Hueso et al. (2021), conducted a study in Spain and found significant association between delayed sleep and excess screen time [30]. A systematic review conducted before 2020 (in 2018) concludes weak evidence between excess screen time and delayed sleep time [31]. However, a systematic review conducted after 2020 (in 2021) contradicts the latter [32].

A study in secondary school children in Tamil Nadu found significant association between screen time and physical activity [33]. This is contradicting a study conducted in Aligarh in 2020 [34]. A similar observation was reported in Stockholm County in adolescent school children [35]. Physical activity period is compulsory in the school curriculum of the children included in our

study. This is why their physical activity has not been affected. This also explains the normal range of BMI. However, a significant association was found between age and physical activity. A decline in physical activity with increase in age was found in a study conducted in children between eight to 13 years of age [36]. Thus, overtime it is likely that their physical activity will be affected which can affect their BMI in the future.

A study conducted by Shang et al. (2015) [37], showed that longer the screen time the increased the odds of unhealthy dietary habits such as consuming junk food. No significant association was found between the diet consumed by them in this study. This can be explained by the habit of eating home cooked food which is followed by every Indian family in the rural areas.

Clear rules have to be laid at home to control the screen time of secondary school children. As evident from this study, excess screen time affects their sleep. This will be evident as irritability, anxiety, inability to concentrate, poor scholastic performance, *etc.* in them. Even though their BMI and diet had not been affected by excess screen time as of now, there are chances of developing unhealthy eating habits and obesity later in future. It is important to give health education to the children regarding the importance of screen time less than two hours.

Conclusions

The prevalence of excess screen time in secondary school children in a rural area in Pune is more than the recommendation of AAP. Mobile phones being the most commonly used device, followed by television. This trend can be attributed to the shift towards online classes brought about by the pandemic, replacing traditional in-person classes. Furthermore, a noteworthy association was observed between prolonged screen time and delayed bedtime.

Limitations

This study was conducted only in secondary school children of English medium schools.

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Conflict of interest statement

The authors have no conflicts of interest associated with the material presented in this paper.

Authors' contributions

RJ, ABP: conceptualization. RJ, SS: data curation. NM:

funding acquisition. RJ ABP: methodology. RJ, SS, APSN: project administration. RJ, ABP, ACR: writing – original draft. RJ, ABP, AC: writing – review & editing. RD: statistical analysis.

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