ORIGINAL ARTICLE

The Digital Garden: Investigating the Impact of Screen Time on BMI and Physical Activity Among School Children

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ARTICLE CYCLE
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Abstract

Introduction: Due to increased screen exposure in today's digital age, there is rising trend in childhood obesity and decreased physical activity duration. This study aims to explore these relationship in children. **Objectives**: To estimate the prevalence of screentime among school-going children and explore the relationship between screen time, BMI, and physical activity levels. **Materials And Methods:** This cross-sectional observational study was conducted in government and private schools of Meerut. A total of 240 children were included based on a calculated sample size using a presumed prevalence of 18%. A structured, validated questionnaire was administered to collect data which was assessed to evaluate associations between screen time, physical activity, and BMI across different demographic and socioeconomic segments. **Results:** Excessive screentime (≥2 hours/day) was more prevalent among children from private schools and those belonging to higher socioeconomic classes. Children with longer screen exposure were significantly more likely to be overweight and obese (P=0.003). Physical activity was inversely related to screen time, with 43.5% of children in the high screen time group engaging in less than one hour of daily physical activity (P<0.001). Furthermore, frequent junk food consumption was also associated with longer screen exposure (P<0.001), likely contributing to elevated BMI in this group. **Conclusion:** The present study underscores the adverse health impacts of excessive screen time on young minds, especially regarding increased BMI and reduced physical activity. This highlights the urgent need for targeted interventions by parents, educators and public health authorities to cultivate healthier lifestyle patterns and digital habits among children.

Keywords

Screen Time, Body Mass Index (BMI), Physical Activity, Children, Sedentary Lifestyle, Childhood Obesity, Digital Behaviour, School-going Children, Socioeconomic Status, Cross-sectional Study, India

Introduction

In today's digital era, screen exposure has become an integral part of daily life. According to recent global estimates, individuals worldwide spend an average of nearly 6 hours and 45 minutes per day on screen-based activities, with even higher usage reported in countries like the United States(7 hours 2 minutes) and South Africa(9 hours 24 minutes). (1) Among children, screen engagement has increased markedly over the past decade, particularly following the COVID-19 pandemic, which accelerated reliance on digital platforms for education and recreation. Recent reports indicate that children aged 5-8 years spend average 2.5 hours per day on digital screen activities, while tweens with age group 8-12 years spend 5 hours daily in front of screens. (2)

India, currently one of the fastest-growing digital consumer markets, has witnessed a sharp rise in internet penetration. According to telecom subscription data released on 31st dec,2025 by TRAI, India has 1003.65 million internet subscribers, with approximately 14-15% comprising children. (3) This rapid digital adoption has raised concerns regarding its impact on child health, especially in relation to sedentary behaviour, reduced physical activity, and rising trends of childhood overweight and obesity. (4) Despite updated global and national data highlighting increased screen exposure, contemporary Indian studies examining its association with BMI and physical activity among young school-going children remain limited. (5)

Although international studies have consistently demonstrated a link between prolonged screen time, increased Body Mass Index, and reduced physical activity, evidence from low and middle income countries, particularly India, remains limited and

fragmented. Existing Indian studies predominantly focus on adolescents or urban populations, with relatively fewer investigations targeting younger school-going children aged 5–12 years. (6)

Disparities in screen exposure and lifestyle behaviours between government and private school students reflecting socioeconomic differences are underexplored in the Indian context. Understanding these variations is crucial for designing targeted interventions. Therefore, the present study was undertaken to estimate the prevalence of screen time among school-going children in Meerut city and to examine its association with BMI and physical activity levels, thereby generating region-specific evidence to inform parents, educators, pediatricians, and public health policymakers.

Aim & Objective

- To estimate the prevalence of screen time among school-going children aged 5 to 12 years in Meerut city.
- To compare screen time patterns between students of government and private schools.
- To explore the relationship between screen time, BMI, and physical activity levels.

Material & Methods

The present study titled *"The Digital Garden: Investigating the Impact of Screen Time on BMI and Physical Activity Among School Children"* was designed as a school-based cross-sectional observational study. It was conducted in both government and private schools of Meerut, Uttar Pradesh. The objective was to estimate the prevalence of screen time among children aged 5 to 12 years and to explore its correlation with their body mass index and physical activity levels. The required sample size was calculated using the standard formula $4pq/L^2$, assuming a prevalence rate of 18% for excessive screen time as reported in a previous study by Jain S et al.(2023)(9), with a 95% confidence interval and a 5% permissible error. This yielded a sample size of 236, which was rounded off to 240 children, 120 each from government and private school.

Eligible participants included children aged 5 to 12 years enrolled in the selected schools and present on the survey days, provided that parental consent was obtained. Children were excluded if their parents declined consent or if the children had known medical or genetic conditions such as congenital glaucoma, diabetes, hypothyroidism, intellectual disability, or autism spectrum disorders. The sampling process involved the random selection of one government and one private school from a prepared list of all schools within the defined radius. Prior permission was obtained from school authorities, and the study team conducted visits to the selected institutions.

To gather data relevant to screen time exposure and its association with physical activity and BMI, a structured questionnaire was designed in simple language. A pilot study was conducted to validate the feasibility and clarity of the questionnaire. After approval, the questionnaire was distributed randomly to the students from each school to be completed at home, primarily by their mothers with input from fathers and the children themselves. To enhance understanding, a WhatsApp group was created, and a Zoom meeting was held for parents to clarify doubts regarding the questionnaire. The completed questionnaires were collected within 3 to 4 days.

All responses were compiled in Microsoft Excel, and data analysis was carried out using SPSS software. The prevalence of screen time was assessed, and comparisons were made between government and private school children. Statistical tests were applied to explore associations between screen time and health-related parameters, specifically BMI and levels of physical activity, thereby addressing the central theme of how digital screen exposure influences the physical health and lifestyle habits of young minds.

Operational Definitions:

Screen Time: Total daily duration (in hours) spent on screen-based activities including television, smartphones, tablets, computers, and laptops for educational and recreational purposes, as reported by parents.

• **Excessive Screen Time:** Screen exposure of ≥2 hours per day, in accordance with the Indian Academy of Paediatrics and WHO recommendations.

• **Physical Activity:** Time spent in moderate to vigorous physical activity per day, including outdoor play, sports, and structured exercise.

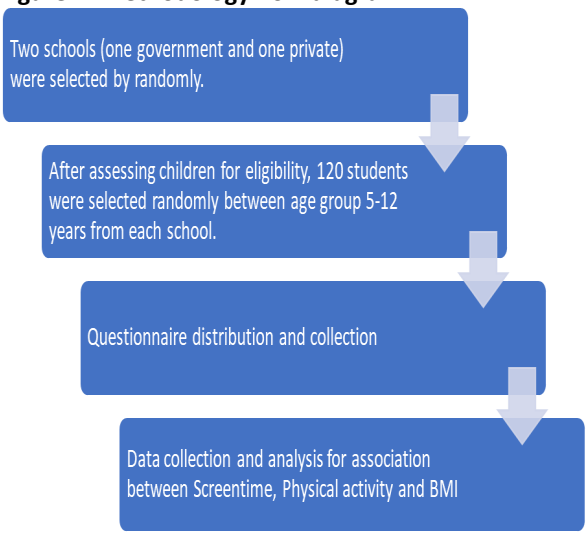
• **Low Physical Activity:** Physical activity duration of <1 hour per day.

• **Body Mass Index (BMI):** BMI was calculated using weight (kg) divided by height (m^2) and categorized according to WHO age and sex-specific BMI percentiles as underweight (<5th percentile), normal (5th–85th percentile), overweight (85th–95th percentile), and obese (>95th percentile).

Sampling strategy: Total sample size was 240. One government and one private school each was selected randomly within a radius of 5km. Total questionnaires to be distributed in each school were 120. Since the average age of students in schools usually follows a standard progression with kindergarten having students aged 5-6 years till seventh grade having students of 12-13 years. So 120 questionnaires were distributed into 8 classes, 15 in each class. In each class 15 students were selected by simple random sampling.

Flow Diagram: Two schools (one government and one private) were selected randomly. After assessing children for eligibility, 120 students were selected randomly between age group 5-12 years from each school and Questionnaire was distributed to them to be filled primarily by mother with input from father and children themselves. Possible measures were taken to help in problems associated with questionnaire and it was collected and analysed for screen time, BMI, and physical activity.(Figure 1)

Figure 1: Methodology flow diagram



Results

The present study done in government and private schools of Meerut revealed that Prevalence of Excessive Screen Time (≥2hrs) was very high (45%, 108), being 61.7% (74) in private schools and 28.3% (34) in government schools as shown in Figure 2.

The table no. 1 depicts mean age of school going children and sex wise distribution among study participants. It shows that there was no significant difference in age and sex distribution in government and private schools.

Table-1 Sociodemographic Profile of Participants (N=240)

Variable	Government School (n=120)	Private School (n=120)	P-value
Age (Mean ± SD)	8.4 ± 2.1	9.1 ± 1.9	0.07
Gender			0.32
- Male	54.2% (65)	58.3% (70)	
- Female	45.8% (55)	41.7% (50)	

Demographic details

The table no. 2 depicts that Children with screen time ≥2 hours/day had significantly higher odds of being overweight or obese compared to those with screen time <2 hours/day (OR = 3.27; 95% CI: 1.65–6.47; P = 0.0004). as shown figure no 3.

Children exposed to screen time ≥2 hours/day were more than three times as likely to engage in low physical activity (<1 hour/day) compared to their counterparts with lower screen exposure (OR = 3.44; 95% CI: 1.95–6.05; P < 0.001). These findings indicate that excessive screen time is a significant risk factor for increased BMI and reduced physical activity among school-going children.

Figure No. 2: Prevalence of Screen Time by school type.

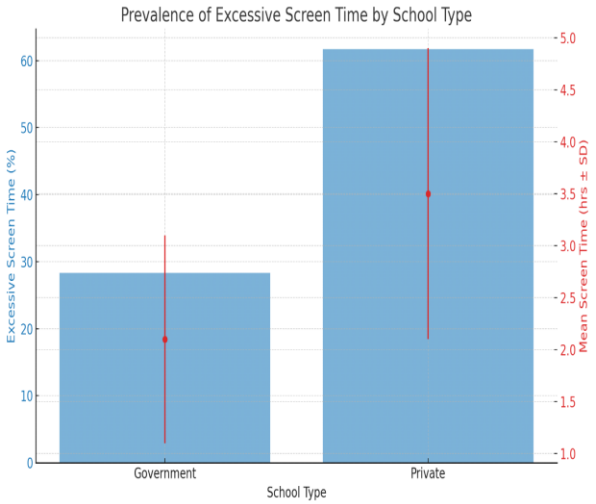


Table-2 Association of Screen Time with BMI and Physical Activity

Outcome Variable	Category	Screen Time <2 hrs (n=132)	Screen Time ≥2 hrs (n=108)	Odds Ratio (95% CI)	P-value
BMI Status	Overweight/Obese	15 (11.4%)	32 (29.6%)	3.27 (1.65–6.47)	0.0004
	Normal/Underweight	117 (88.6%)	76 (70.4%)		
Physical Activity	≤2 hr/day	24 (18.2%)	47 (43.5%)	3.44 (1.95-6.05)	<0.001
	>2 hr/day	108 (81.8%)	61 (56.5%)		

***Higher screen time is associated with increased prevalence of overweight, obesity, BMI & decreased Physical Activity*

Discussion

The present study was conducted among 240 school-going children aged 5 to 12 years in Meerut. The findings revealed a significant correlation between excessive screen time (≥2 hours/day) and negative health outcomes such as increased BMI and reduced physical activity. The higher prevalence of excessive screen time was seen in private schools

Findings from the present study align with the study by Mohan et al. (10), which reported greater screen exposure and higher obesity prevalence (21.3% overweight, 8.3% obese) in children from upper and upper-middle socioeconomic classes with ≥2 hours of screen time daily. Rocka et al. (11) reported that during the COVID-19 lockdown in Poland, 89% of children used screens during meals and exhibited frequent snacking behaviours. This mirrors our findings, where children with higher screen exposure had significantly elevated BMI. Saha et al. (12) identified media exposure as key risk factors for childhood obesity in their NFHS-based assessment. Our data support this by linking screen exposure with higher rates of overweight and obesity,

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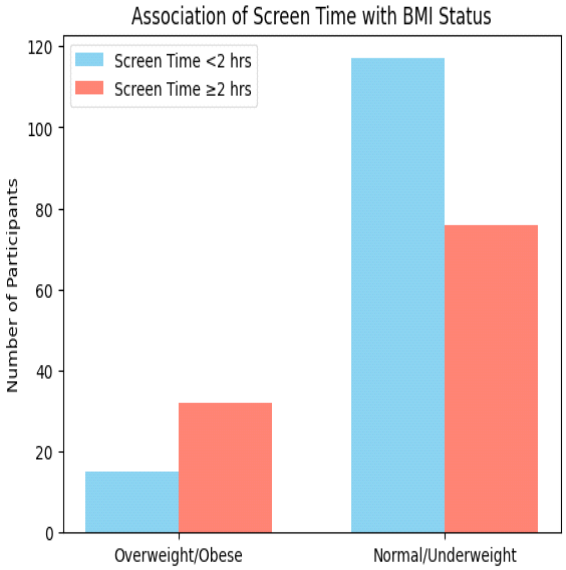
reinforcing screen time as a proxy for unhealthy lifestyle patterns.

Figure no 3- Association of Screen Time with BMI and Physical Activity



The present study displayed the correlation between screen time and physical activity levels. Among children with less than 2 hours of screen time, 18.2% (24) reported engaging in less than 1 hour of physical activity. The P-value of <0.001 indicated a strong correlation between higher screen time and lower physical activity levels. Kaul et al.(13) also corroborated this, noting a decrease in physical activity in children with screen time above 2 hours per day, which aligns with our findings. This trend was similar to Kumar et al. (14), who found that increased screen time was associated with reduced physical activity in children in cross-sectional observational study which was conducted among 139 middle school children aged 11 to 13 years at the state of Tamil Nadu, India. Additionally, Mineshita et al.(15) conducted a survey of 7419 elementary school students in Tokyo, Japan and found a similar pattern where children spending excessive time on screens had lower engagement in physical activities. These studies further validate the observation that children with increased screen time tend to have lower levels of physical activity, a concerning issue for public health.

Conclusion & Recommendation

The present study estimated a high prevalence of excessive screen time (≥2 hours/day) among school-going children aged 5–12 years in Meerut city, with nearly half of the participants exhibiting screen exposure beyond recommended limits. Excessive screen time was significantly more prevalent among students attending private schools compared to government schools, highlighting the influence of socioeconomic factors on digital behaviour patterns. The study demonstrated a significant association between prolonged screen time and adverse health outcomes. Children with screen exposure of ≥2 hours per day had markedly higher odds of being overweight or obese and were significantly more likely to engage in low levels of physical activity (<1 hour/day). These findings confirm that excessive screen time is an important risk factor for increased BMI and reduced physical activity among young children.

Overall, the study fulfils its objectives by establishing the prevalence of screen time, identifying disparities between school types, and demonstrating a clear relationship between screen exposure, BMI, and physical activity levels, thereby underscoring the need for early preventive strategies to promote healthier digital habits and active lifestyles among school-going children.

The findings of the present study are well-aligned with national and international evidence. The consistent relationship between prolonged screen time, physical inactivity, dietary indiscretions, and higher BMI reiterates the urgent necessity for school and community based preventive strategies. These should target screen use moderation, promotion of active lifestyles, and nutritional education to ensure a healthier trajectory for young children in both private and government school settings.

Limitation of the study

The present study has included an adequate sample size with representation from both government and private schools, allowing meaningful comparison across different socioeconomic backgrounds. The focus on younger school-going children aged 5–12 years addresses an important research gap, as most existing Indian studies have primarily concentrated on adolescents. the use of standardized BMI classification and analytical measures such as odds ratios strengthens the validity of the observed associations between screen time, BMI, and physical activity.

The cross-sectional study design limits the ability to establish causal relationships between screen time and health outcomes. Screen time and physical activity data were collected using parent-reported questionnaires, which may be subject to recall bias and reporting bias. the study was conducted in selected schools within a single city, which may limit the generalizability of the findings to other regions. Despite these limitations, the study provides valuable region-specific evidence highlighting the adverse health implications of excessive screen exposure among school-going children.

Authors Contribution

All authors have contributed equally.

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Nil

Conflict of Interest

There are no conflicts of interest.

Declaration of Generative AI and AI Assisted Technologies in the writing Process

The authors haven't used any generative AI/AI assisted technologies in the writing process.

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