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A Cross-Sectional Study On Association Of Screen Time Usage With Overweight And Obesity Among Rural School-Going Children Aged 10-15 Years In Kolar

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ABSTRACT

Introduction: The rapid rise in childhood obesity is closely linked to lifestyle changes, especially increased screen time due to technological advancements. Screen-based sedentary behaviours have become a major contributor to reduced physical activity in children. This study explores the relationship between screen time and Body Mass Index (BMI) among middle school children aged 10–15 years in Kolar, Karnataka.

Materials and Methods: A cross-sectional study was conducted among middle school children aged 10–15 years who met the inclusion criteria, with parental consent and child assent obtained. Data were collected using a predesigned questionnaire covering screen time habits, followed by anthropometric measurements. BMI was calculated using standard procedures and categorized based on IAP 2015 charts. Average daily screen time was derived from reported usage across school days and holidays.

Results: The study included 196 children, with 53.57% males and 46.43% females. Most participants (50.51%) reported screen time between 61–120 minutes/day, while 36.22% exceeded 121 minutes/day. The highest mean BMI (21.70) was observed in the ≥121 minutes group, compared to 16.25 and 15.72 in the moderate and low screen time groups, respectively. Overall, 27.69% of children were either overweight or obese. Females had a slightly higher mean BMI than males. However, the Chi-square test showed no statistically significant association between screen time and BMI categories ($p = 0.136$).

Conclusion:

The study observed a trend of higher BMI with increased screen time among rural school children in Kolar, though the association was not statistically significant. These findings underscore the need to reduce screen time and promote active lifestyles. Future research with larger samples is needed to explore this relationship further. Public health efforts should target screen use, physical activity, and nutrition to combat rural childhood obesity.

Keywords: *Ursodeoxycholic acid, alcoholic liver disease, hypertension, Spironolactone, Rifaximin, human albumin.*

1. INTRODUCTION

In recent years, rapid technological advancements and socio-demographic changes have emerged as key factors contributing to the rising prevalence of obesity. These developments have led to increasingly sedentary lifestyles and the creation of what is often referred to as an "obesogenic environment"—a setting that promotes excessive calorie intake and discourages physical activity.[1]

One of the important sedentary behaviours among children is screen time, which collectively refers to the time spent on watching television, playing video games, and working with a computer .[2] Screen time is dramatically increased as a result of increased use of technology, such as electronic media, TV, video, computer, tablet, and internet games, or the use of cell phones full of built-in games .[3]

Paediatric obesity has become a significant health concern, largely driven by lifestyle changes like increased screen time, reduced physical activity, and unhealthy eating habits. Childhood obesity often leads to serious health issues, including metabolic syndrome, physical health problems, mental disorders, and insulin resistance.[4]

One of the major contributors of sedentary time in children and adolescents in recent times is increasing screen time.[5]objective of this study was to find the association of screen time with BMI in middle school children in the age group of 10 to 15 years in kolar (Karnataka, India)

2. METHODOLOGY

All children who fulfilled the inclusion criteria were included in the study. After receiving permission from the school, the investigators briefed the students on the objectives of the study. Consent form was instructed to take home. Only those children who returned the consent form signed by their parents were included in the study , An assent form was provided to the children, along with participant information sheet.

A semi-structured, predesigned questionnaire was administered by the investigators to each student. The contents of the questionnaire were discussed with the students, and any doubts were clarified. After the forms were completed, anthropometric measurements were taken using standardized procedures.

The children were asked to self-report details regarding their screen time usage. Information on screen time during a typical school day and a typical holiday was collected. From this, the average screen time per day over one week was calculated.

The height of the children was measured using a stadiometer, and their weight was recorded using a digital weighing scale. Body Mass Index (BMI) was calculated using the formula: BMI = weight (kg) / height² (m^2). The results were plotted on the sex-specific IAP BMI charts (2015) for boys and girls. Based on their BMI, children were categorized as having thinness (less than the 3rd percentile), normal BMI, overweight, or obesity.

3. RESULTS

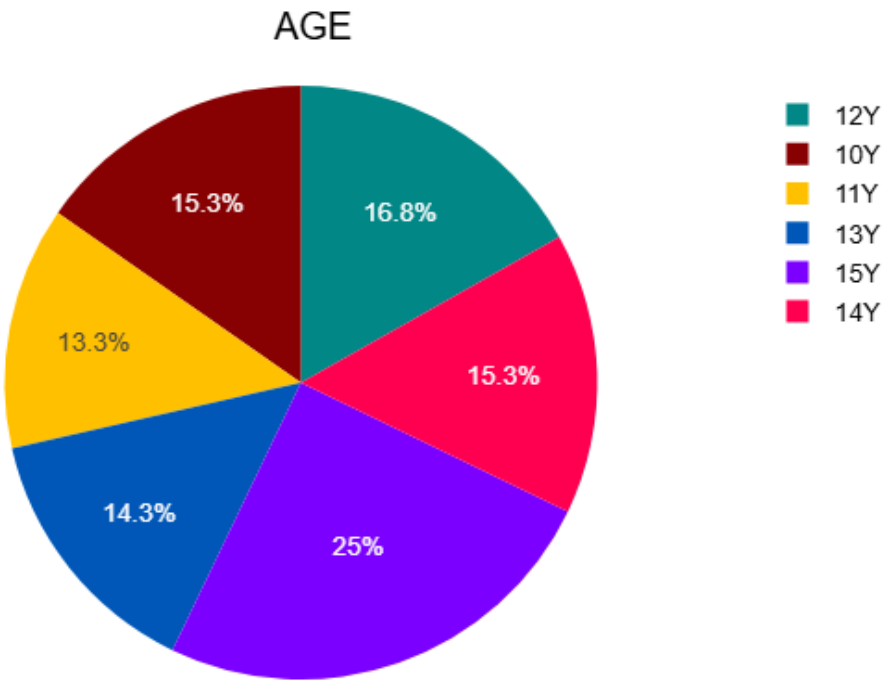

Figure 1: Age distribution of study participants

GENDER	Frequency	%
MALE	105	53.5714%
FEMALE	91	46.4286%
Total	196	100%
Invalid	0	0%
Total	196	100%

Table 1: Gender distribution of study participants

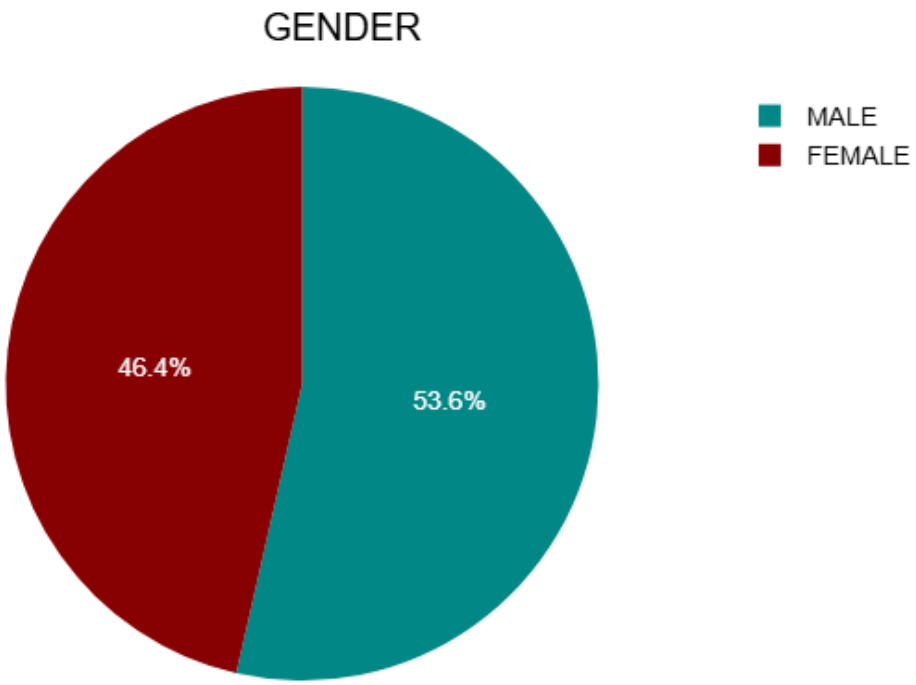

Figure 2: Gender distribution of study participants

The study included 196 participants, with 53.57% males (105) and 46.43% females (91).

		GENDER					
		MALE		**FEMALE**		**Total**	
		N	**%**	**n**	**%**	**n**	**%**
SCREEN TIME	**≥121 minutes**	39	19.898%	32	16.3265%	71	36.2245%

		GENDER					
		MALE		FEMALE		Total	
		N	%	n	%	n	%
	61 - 120 minutes	52	26.5306%	47	23.9796%	99	50.5102%
	≤60 minutes	14	7.1429%	12	6.1224%	26	13.2653%
	Total	105	53.5714%	91	46.4286%	196	100%

Table 2: Screen time among study participants with reference to Gender

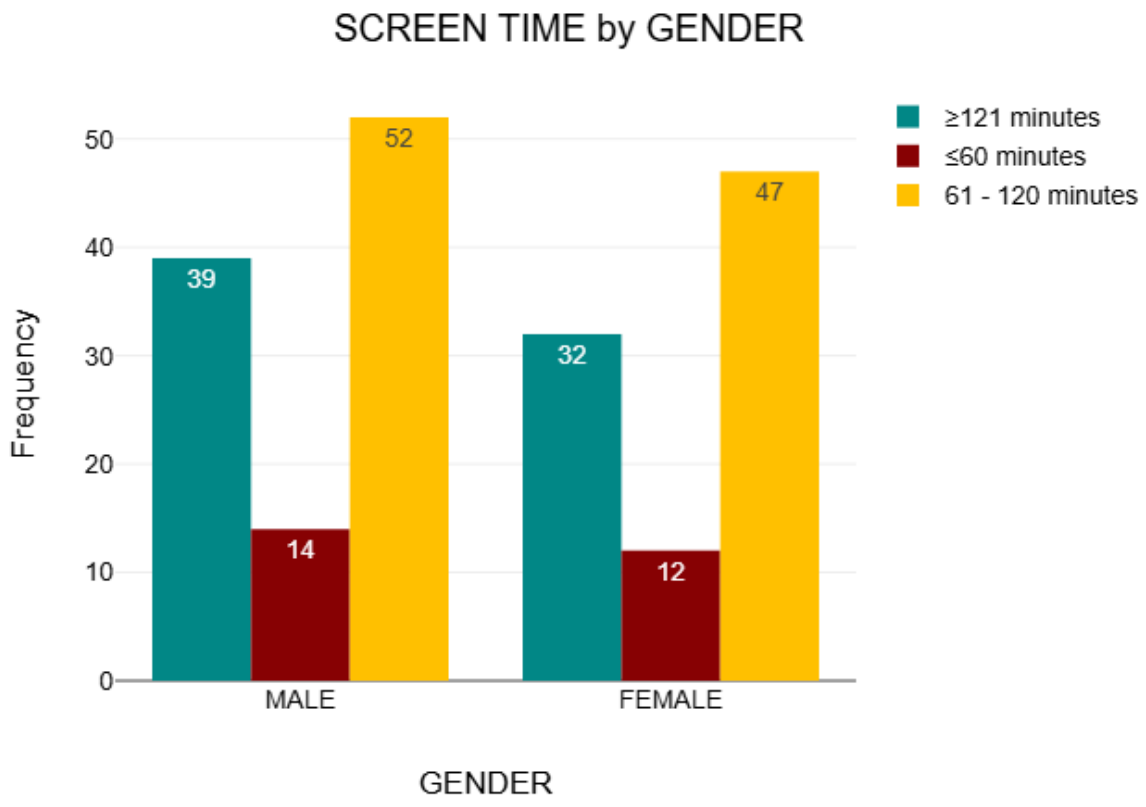

Figure 3: Screen time among study participants with reference to Gender

Screen time among participants was categorized into three groups: 36.22% reported ≥121 minutes/day, 13.27% had ≤60 minutes/day, and the majority (50.51%) fell within the 61–120 minutes/day range, with comparable distribution across both genders.

		Frequency	%	Mean	Std. Deviation	Minimum	Maximum
BMI-	MALE	105	53.5714%	17.8666	4.2918	11	30.9
	FEMALE	91	46.4286%	18.4824	4.4738	12.03	33.6

Table 3: Mean BMI values in both Males and Females

The study included 105 males (53.57%) and 91 females (46.43%). The mean BMI was slightly higher in females (18.48 ± 4.47) than in males (17.87 ± 4.29), with BMI ranges of 12.03–33.6 and 11–30.9, respectively.

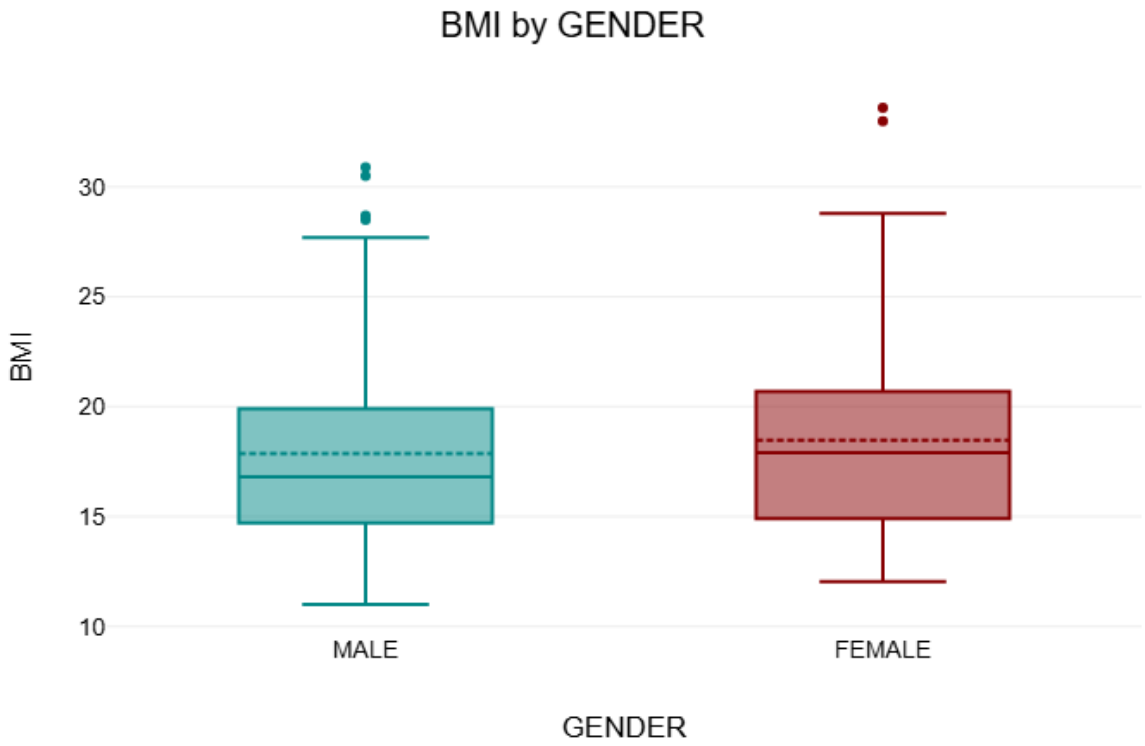

Figure 5: Mean BMI values in both Males and Females

	n	Mean	Std. Deviation
≥121 minutes	71	21.701	4.3858
61 - 120 minutes	99	18.1525	2.9825
≤60 minutes	26	15.7154	2.0936
Total	196	18.1525	4.3768

Table 4: Distribution based on average daily screen time.

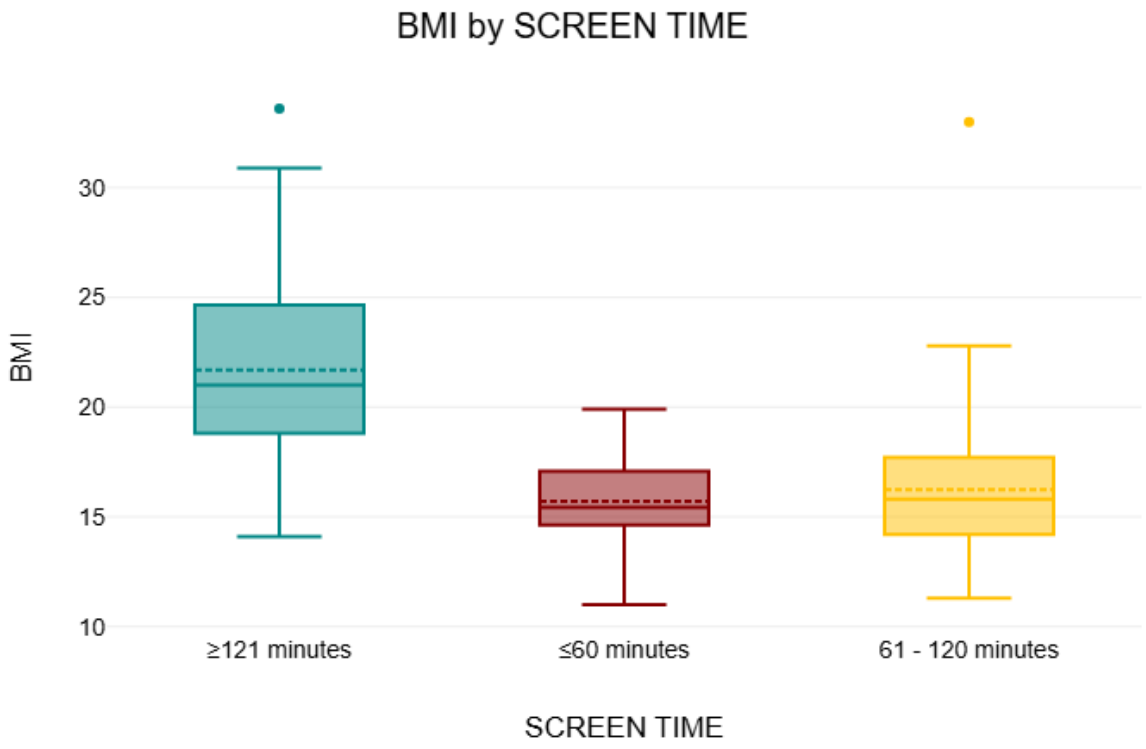

Figure 6: Association between screen time and BMI

The study analysed 196 observations distributed across three screen time groups: ≥121 minutes (71), ≤60 minutes (26), and 61–120 minutes (99). The mean BMI for these groups was 21.70, 15.72, and 16.25 respectively, with an overall mean BMI of 18.15.

Participants were categorized into three screen time groups. The 61–120 minutes/day group, comprising 50.51% of participants, had a mean BMI of 16.25 (SD ±2.98). Those with ≥121 minutes/day (36.22%) had the highest mean BMI of 21.70 (SD ±4.39), while the ≤60 minutes/day group (13.27%) showed the lowest mean BMI of 15.72 (SD ±2.09).

BMI INTERPRETATION	Frequency	%
overweight	**32**	**16.4103%**
obese	**22**	**11.2821%**
Total	**54**	**27.6923%**

Table 5: Frequency of overweight and obesity among study population

Among the total participants, 32 children (16.41%) were overweight and 22 (11.28%) were obese, resulting in a combined prevalence of 27.69% for overweight and obesity based on BMI.

		BMI INTERPRETATION		
		overweight	**obese**	**Total**
SCREEN TIME	≥121 minutes	24	21	45

		BMI INTERPRETATION		
		overweight	**obese**	**Total**
	61-120 minutes	7	1	8
	≤60 minutes	1	0	1
	Total	32	22	54

Table 6: Frequency of overweight and obesity in 3 groups

	Chi^2	**df**	**p**
SCREEN TIME - BMI INTERPRETATION	3.9848	2	0.136

Table 7: Statistical correlation (Chi square test).

A Chi-square test was conducted to assess the association between screen time and BMI interpretation. The test yielded a Chi-square value of 3.98 with 2 degrees of freedom and a p-value of 0.136. Since the p-value exceeds the 0.05 threshold, the association is not statistically significant, indicating insufficient evidence to suggest a meaningful relationship between screen time and BMI categories.

4. DISCUSSION

This cross-sectional study explored the association between screen time usage and overweight/obesity among rural school-going children aged 10–15 years in Kolar. Our results revealed that 16.41% of participants were classified as overweight and 11.28% as obese, reflecting the growing concern about childhood obesity. Nearly 28% of the sample exhibited elevated BMI values, suggesting that excess screen time could be contributing to this obesity epidemic**.**

Screen Time and Obesity: Global and Indian Comparisons

Our findings that children with ≥121 minutes of screen time per day had the highest prevalence of overweight (44.44%) and obesity (38.89%) align with numerous studies globally. For instance, a systematic review and meta-analysis by Carson et al.[6] (2014) found that increased screen time was significantly associated with higher central adiposity in children, which mirrors the association observed in our study. Similarly, Biddle et al.[7] (2010) found a consistent link between sedentary behaviour (including excessive screen time) and obesity in children.

In India, several studies have drawn similar conclusions. A study conducted in Uttar Pradesh found that children with higher screen time and lower levels of physical activity had a significantly higher risk of being overweight or obese (Sahoo et al., 2015).[8] The study highlighted that screen time, combined with sedentary lifestyles and unhealthy eating patterns, was a major contributing factor to childhood obesity. Similarly, Vijayan et al. (2017) observed a positive relationship between screen time and BMI in rural children in Tamil Nadu, reinforcing our findings that screen time is a critical risk factor for childhood obesity, particularly in rural settings.

Moreover, the prevalence of childhood obesity in Indian children was extensively discussed in a systematic review by Sharma et al.[9] (2017). Their study indicated that childhood obesity rates in India have been rising steadily, especially in urban areas, though rural areas are not immune to this growing epidemic. Our findings in rural Kolar suggest that even in less urbanized areas, screen time may be contributing to the rising rates of overweight and obesity among schoolchildren.

The comparative study on obesity prevalence conducted in Vadodara found that urban children had a significantly higher prevalence of obesity than rural children. However, the study also emphasized the growing concern in rural settings, where increasing screen time and decreased physical activity were contributing to a rise in obesity rates(Patel et al., 2018).[10] This finding aligns with our own results, which showed that rural children who spent more time on screens were more likely to exhibit higher BMI values**.**

Screen Time, Physical Activity, and Childhood Obesity

The relationship between screen time, physical activity, and BMI is well-documented in various studies. A study conducted

in Tamil Nadu explored the combined effects of screen time and physical activity on BMI in middle school children. It found that children who spent more than two hours on screens were more likely to have a higher BMI and a sedentary lifestyle compared to those who engaged in physical activity (Sahoo et al., 2015).[8] Similarly, the study on screen media exposure by Zimmerman et al.[11] (2007) found that increased screen time displaced time spent on physical activities, leading to weight gain in children.

A comprehensive study from Chennai analysed screen time and its relationship with obesity and mental health among schoolchildren, concluding that increased screen time was a major contributor to childhood obesity and also adversely impacted mental health (Vijayan et al., 2017). Their findings further support our study, which found a significant association between screen time and higher BMI, although the statistical significance was not reached in our Chi-square test.

Gender Differences and Screen Time

Our study found that females had a slightly higher average BMI (18.48) compared to males (17.87). This gender disparity in obesity has been consistently observed in previous studies. Sharma et al. (2014) found that girls were more likely to be overweight compared to boys, particularly in urban Indian settings, due to gender-specific constraints on outdoor play and physical activity. In rural India, where outdoor play is often more accessible, gendered differences in physical activity may still be influencing obesity rates.

Interestingly, LeBlanc et al.[12] (2015) found that gender differences in childhood obesity related to screen time may also be influenced by social factors such as parental monitoring, access to safe play areas, and cultural expectations, which may differ in rural versus urban contexts. In this study, the slightly higher BMI in females could be partially attributed to lower levels of physical activity among girls in rural areas, which could contribute to higher rates of overweight and obesity.

Statistical Analysis: Chi-square Test Results

Although trends were observed between screen time and BMI interpretation in our study, Chi-square analysis revealed no statistically significant relationship ($\chi^2(2) = 3.9848$, $p = .136$). This finding mirrors results from several other studies that also found weak or non-significant relationships between screen time and obesity. For instance, Zimmerman et al. (2007) observed a weak correlation between television viewing and childhood obesity, emphasizing that the association might be affected by various confounding factors such as dietary patterns, physical activity, and socioeconomic status. Similarly, Li et al.[13] (2019) found that while screen time was correlated with obesity, other factors such as diet and socioeconomic background were stronger predictors of childhood obesity.

A study by Hale and Guan [14](2015) also found no significant association between screen time and obesity in some settings, suggesting that the relationship is more complex and may vary based on socioeconomic status and access to resources. Our study's failure to reach statistical significance could also be due to the limited sample size and the cross-sectional design, which prevents us from establishing causal links between screen time and BMI.

Guidelines and Recommendations

Several guidelines have been proposed to mitigate the negative effects of screen time on children's health. The Indian Academy of Paediatrics [15] (2019) has emphasized the importance of limiting screen time for children, recommending no more than one to two hours of screen exposure per day to reduce the risk of obesity and related health issues. Our findings support this recommendation, as children in the ≥121 minutes screen time group showed the highest rates of overweight and obesity.

Additionally, Indian Paediatrics Guidelines on Digital Wellness stress the importance of integrating physical activity with screen time usage. Promoting outdoor play and reducing screen exposure are key strategies in combating childhood obesity in India, particularly in rural areas where access to sports facilities and recreational spaces may be limited.

Conclusion

This study's findings highlight the association between increased screen time and higher BMI among rural school-going children in Kolar. Although the relationship was not statistically significant, the observed trends suggest that reducing screen time and promoting physical activity could play a critical role in addressing the rising rates of obesity in rural populations. Future longitudinal studies with larger sample sizes are needed to better understand the causal relationship between screen time and childhood obesity. Public health initiatives should focus on reducing screen time, encouraging physical activity, and improving dietary habits to tackle the growing obesity crisis in rural India.

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