Screen Time and Its Association with Body Adiposity and Hypertension among the School-Going Adolescents of Manipur, Northeast India

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Abstract

Objectives The objective of the study was to examine the association of screen time with body adiposity and hypertension among the school-going adolescents of Manipur.

Methods Data were collected from 728 school-going adolescents of both sexes aged between 15 and 19 years. Anthropometric measurements, blood pressure, and self-response to screen time were collected. Chi-squared test and odds ratio were done to check the association between screen time and overweight/obesity and hypertension.

Results About 78.8% of males spent less than or equal to 6 hours at the screen, while 21.3% spent more than 6 hours at the screen. Eighty-six percent of females spent less than or equal to 6 hours at the screen, and 14% spent more than 6 hours at the screen. Chi-squared analysis shows a significant association between abdominal obesity (waist circumference, WC) and screen time in males ($p < 0.05$), while no association is observed in females. However, screen time shows no correlation with body mass index, weight-to-height ratio, and hypertension.

Conclusion This study highlights a high percentage of adolescents engaged in longer screen time, more than 6 hours. Furthermore, the study put forth the association of abdominal obesity as measured by WC with the screen time among the adolescents of Manipur. Longer screen time may deteriorate adolescents' health status as it reduces physical activity time.

Keywords
- screen time
- body adiposity
- hypertension
- adolescents
- Northeast India

Introduction

With technological advancement, the use of electronic devices, including televisions, computers, smartphones, and other mobile devices, has increased. In the past few years, this increased access to electronic equipment has resulted in a long time spent sitting in front of the screen (screen time, ST) among children.[1] Researchers usually define ST as the total amount of time spent using a TV, video, smartphone, computer, or video game. According to the Indian Academy of Pediatrics,[2] ST is the same as the balanced food we eat, and we need to choose and consume it in the right amount and at the right time; how we use the screen determines whether the screen is normal or unhealthy.

Exposure to longer ST may increase the risk of overweight/obesity due to the lack of physical activity and the tendency to select high calorie foods,[3,4] which creates an "obesogenic environment." Globally, the prevalence of overweight in

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children and adolescents aged between 5 and 19 increased from 4% in 1975 to over 18% in 2016, and 39 million children under the age of 5 were overweight in 2020.[5] Obesity in childhood causes a wide extent of genuine complications and increments the hazard of untimely sickness and death later in life, raising public health concerns.[6] Therefore, longer ST may be one of the important risk factors for overweight/obesity.[7]

It can also be ascribed to chronic noncommunicable diseases such as hypertension, heart disease, and diabetes mellitus in adulthood to childhood overweight/obesity.[8] There have been few publications regarding ST and hypertension. Of the scant research, Martinez-Gomez et al examined video game use for 13 to 17 years old and found that console video games, but not computer games, were positively associated with diastolic blood pressure (BP), mean arterial pressure, triglycerides, and a clustered cardiometabolic risk score.[9] The scenario in India is not much different from other developing countries that are encountering the digital era. However, information from developed nations may not be applicable to countries like India, which are undergoing economic and social transition. In the northeastern states of India, particularly Manipur, hardly any publications on ST have been produced.

Hence, ST can be considered one of the important risk factors for lifestyle-related health complications. Longer ST hints at a shorter physical activity that could be linked with these lifestyle-based health complications. Considering the significance of ST in health and the possibility of adolescents being exposed to longer ST, this study was conducted to fill up this knowledge gap with an objective to examine the association of ST with body adiposity and hypertension among the school going adolescents of Manipur.

Materials and Methods

Sample Size

A total of 728 adolescents (470 boys and 258 girls) have participated in the study. Data were collected from the school-going adolescents aged between 15 and 19 years in Imphal city. Sample size was determined using the software EpiInfo, at 95% confidence level and 5% confidence limits with 50% expected frequency of child obesity among the Manipur adolescents, counting to 384 samples. Purposive sampling was done for this study. The school was selected based on simple random sampling. The participants have been selected primarily based on their consent given via the school authority. The study was ethically approved by the Institutional ethical committee, Manipur University.

Anthropometric Measurement

Height, weight, waist circumference (WC), and hip circumference were measured following the standard procedure. Body mass index (BMI) was calculated as weight in kg per height in meter squared. BMI for age greater than or equal to 85th percentile and 95th percentile was treated as overweight and obese.[10] WC of age sex-specific 90th percentile was used to define abdominal obesity.[11] To assess the proportion of central fat by height, waist-to-height ratio (WHtR) was calculated in the study with a cutoff value of 0.5.[12]

For BP analysis, BP was measured by using a mercury sphygmomanometer. The BP of adolescents was classified based on American Academy of Pediatrics (AAP) 2017.[13] In 13 years and above adolescents, BP of less than 120/80 mm Hg is considered normal and is elevated between less than 120/80 mm and 129/80 mm Hg. Stage I hypertension is those with BP ranging from 130/80 to 139/89 mm Hg, and those above are stage II hypertension. Both stages I and stage II hypertension are denoted here as hypertension.

Screen Time

The assessment of ST was first explained to the participants. The data were recorded based on the self-response given by the participant. ST was evaluated using the question: How much time do you spend watching smartphone, computer, TV on an average per day? Response categories of ST were combined into two categories: less than or equal to 6 (hr/day) and more than 6 (hr/day). On average, 6 hours of ST are spent per day, as reported by Dunham and Dunham,[14] Psych News daily,[15] and Active Health.[16] Madhav et al[17] also reported more than 6 hours of ST as a risk factor for health in their study.

Statistical Analysis

Data were compiled in Microsoft Excel. The mean value and percentage of the anthropometric variables were calculated. The association of ST with body adiposity and hypertension was analyzed through chi-squared test. The predicted risk of ST in the development of obesity and hypertension in both genders was measured as an odds ratio (OR).

Results

►**Table 1** shows the association of ST with BMI, abdominal obesity, central obesity, and hypertension in both males and females. About 78.8% of males spent less than or equal to 6 hours at the screen, while 21.3% spent more than 6 hours at the screen. Eighty-six percent of females spent less than or equal to 6 hours at the screen, and 14% spent more than 6 hours at the screen. Analysis of chi-square shows a significant association of abdominal obesity (WC) with ST in males ($p < 0.05$), while the association is not visible in females. Overall, there is a significant association between abdominal obesity and ST in the total observed value. No other significant associations are found to correlate ST with other body adiposity measures such as BMI, central obesity, and hypertension.

►**Table 2** shows the OR of the studied variable concerning ST. The table shows no statistical significance. However, among the males, those who have spent more than 6 hours ST are 2.46 and 1.06 times more likely to be obese and overweight than those who spent less than or equal to 6 hours. But in the total value, males and females who spent more than 6 hours ST are 1.89 times more likely to be obese than those who spent less than or equal to 6 hours. Male

Table 1 The association between screen time with BMI, abdominal obesity, central obesity, and blood pressure by χ^2 (chi-square) analysis

Variables	Male			Female			Total		
BMI	>6 hr, *n* (%)	≤6 hr, *n* (%)	χ^2	>6 hr, *n* (%)	≤6 hr, *n* (%)	χ^2	>6 hr, *n* (%)	≤6 hr, *n* (%)	χ^2
Obese	10(2.1)	16(3.4)	4.93	2(0.8)	12(4.7)	2.47	12(1.6)	28(3.8)	4.44
Overweight	10(2.1)	37(7.9)		3(1.2)	23(8.9)		13(1.8)	60(8.2)	
Thinness	5(1.1)	22(4.7)		0	13(5.0)		5(0.7)	35(4.8)	
Normal	75(16)	295(62.8)		31(12)	174(67.4)		106(14.6)	469(64.4)	
Abdominal obesity (WC)									
Abdominal obese	18(3.8)	32(6.8)	7.24*	6(2.3)	21(8.1)	1.72	24(3.3)	53(7.3)	8.84*
Normal	82(17.4)	338(71.9)		30(11.6)	201(77.9)		12(15.4)	539(74)	
Central obesity (WHtR)									
Risk	20(4.3)	50 (10.6)	2.61	7(2.7)	45(17.4)	0.01	27(3.7)	95(13)	1.15
No	80(17)	320 (68.1)		29(11.2)	177(68.6)		109(15)	497(68.3)	
Blood pressure									
Normal	43(9.1)	135(28.7)	2.51	28 (10.9)	161(62.4)	0.73	71(9.8)	296(40.7)	1.53
Elevated	30(6.4)	105(22.3)		1(0.4)	13(5)		31(4.3)	118(16.2)	
Hypertension	27(5.7)	130(27.7		7(2.7)	48(18.6)		34(4.7)	178(24.5)	

Abbreviations: BMI, body mass index; WC, waist circumference; WHtR, weight-to-height ratio.
*significant at 0.05

Table 2 The association between screen time with BMI, abdominal obesity, central obesity, and blood pressure by odds ratio

BMI	Total	Male	Female
Obese	1.89	2.46	0.93
Overweight	0.96	1.06	0.73
Thinness	0.63	0.89	0
Normal	0	0	0
Abdominal obesity (WC)			
Abdominal obese	1.81	1.84	1.71
Normal	0	0	0
Central obesity (WHtR)			
Risk	1.23	1.49	0.956
No	0	0	0
Blood Pressure			
Hyper	0.65	0.65	0.84
Elevated	0.89	0.89	0.44
Normal	0	0	0

Abbreviations: BMI, body mass index; WC, waist circumference; WHtR, weight-to-height ratio.

adolescents who spent more than 6 hours on screens are 1.84 times more likely to have abdominal obesity than those who spent less than or equal to 6 hours on screens. Females who spent more than 6 hours ST are likely to have 1.71 times more abdominal obesity than those females who spent less than or equal to 6 hours. Overall, the risk of having abdominal obesity in those who spent more than 6 hours ST is 1.81 times more likely to be abdominally obese than those who spent less than or equal to 6 hours. Males who spent more than 6 hours ST are 1.49 times more likely to have central obesity (WHtR) than those who spent less than or equal to 6 hours. In total, the risk of having central obesity is 1.23 more likely among those who spent more than 6 hours ST in both sexes than those who spent less than or equal to 6 hours. ST fails to predict the risk of adolescent hypertension in the study.

Discussion

As per our knowledge, this study is the first attempt in Manipur to investigate the association of ST with body adiposity and hypertension among adolescents living in Manipur. The study shows that 21.3% of males spent more than 6 hours watching the screen, while 14% of females spent more than 6 hours watching the screen. According to different sources, the average time spent on screen is approximately 4 to 6 hours per day. Psych News Daily[15] reported a generational divide in how much time people spend on screen. Normally, GenZ (born in 1997 and after) used 6 to 8 hours per day, while Millennials (born between 1981 and 1996) and GenX'ers (born between 1965 and 1980) used 4 to 6 hours per day, and Boomers (born between 1946 and 1964) used 0 to 2 hours per day. The Centers for Disease Control and Prevention[18] also reported average daily ST by age groups: 8 to 10 years old used 6 hours, 11 to 14 years old used 9 hours, and 15 to 18 years old used 7 and ½ hours, and these do not even include the time spend on screen for their school works.

The lack of proper cutoff to define ST is of utmost concern in this digital era, as more prolonged exposure to ST can be detrimental to health.

The study further reveals that there is a significant association between ST and abdominal obesity among males and no significant association among females. But in total observed value, there is a significant association between ST and abdominal obesity. The rationale behind such association in male adolescence might be that males tend to spend more time in sedentary behavior like watching smartphones or playing video games longer than female adolescents. Usually, sedentary behavior involves energy expenditure at the level of less than 1.5 proportionate metabolic assignments and incorporates exercises such as sitting or lying down, in any case of whether ST (TV, video games) is happening. Sedentary behavior with lower energy dissipation and intake of unhealthy dietary behaviors increases the risk of obesity.[19,20]

BMI is often used to examine the relationship between physical activity or ST and obesity.[8,21] No evidence of significant association was found between BMI and ST in the study. Savva et al[22] reported that central obesity has a stronger link to metabolic risk variables and is a strong indicator of cardiometabolic risk. According to a comprehensive study, adiposity and cardiometabolic risk indicators are positively correlated with sedentary behavior, particularly sitting time related to computer usage and television viewing. These relationships appear to be conciliated by the influence of sedentary behavior and food intake.[23] However, no evidence of a significant association between central obesity and ST was found in this study.

In India, the impact of ST on child development was studied for the first time[24] and reported 2.39 hours/day as mean ST, with a 73% prevalence of excessive ST. Excessive ST could delay the child's development, particularly in language acquisition and communication, and it was significantly associated with the mothers' ST, screen usage at bedtime, birth order (in children < 2 years), and attending school (in children $\geq$ 2 years).[24] Recently, a news article published in the daily local reported that the average ST in India is 6 hours and 36 minutes.[25] About 98% of Delhi adolescents used screen-based media with television being the most common one.[26] In contrast, mobile has become the main screen-based media among the adolescents of Mysusru.[27] However, the lack of such a comparative study from Northeast India, to our understanding, makes the study unique in this region.

In new research from Dunham and Dunham[14] and Psych News Daily,[15] the average ST is now 4 to 6 hours per day or 3 to 4 months per year. Based on this concept, the analysis of on-screen time and its correlations were identified in this study. But as per the guidelines of the AAP[28] an average ST is 2 hours per day. So, based on the AAP parameter, the timeframe to determine the association between ST and its correlations may help explain the lack of significant associations in our findings.

Although many studies show that sedentary behavior is associated with adiposity[29,30] and adiposity is related to BP,[31,32] only a few have studied the association between ST and BP. Guillaume et al[33] found a positive association between TV viewing and systolic BP in 6 to 12-year-old Belgium boys. Ekelund et al[34] examined the association between TV viewing and metabolic risk among 9- and 15-year-old children from the European Youth Heart Study. However, the authors did not find any significant associations between TV viewing and systolic and diastolic BP. In contrast, 1 hour per day of TV viewing was associated with an increase of 0.35 mm Hg in systolic BP and 0.25 mm Hg in diastolic BP among 10- to 12-year-old Brazilian children.[35] Independent of adiposity, a longitudinal study also found no association between TV viewing in childhood and BP in adulthood.[36] Similarly, our results also indicate that there is no significant association between ST and BP. But, Pardee et al[37] found that ST (TV viewing) was associated with the risk of hypertension in severely obese children. There could be several explanations for these associations. First, isolated physical inactivity like watching TV may directly affect BP. Second, unhealthy behaviors like eating during ST may indirectly affect BP. Furthermore, inactivity and related unhealthy behaviors during ST may produce combined effects on BP. However, these explanations cannot be explained from the present results since it is in the line of the physical inactivity paradigm, and the present findings are only limited to ST, and BP may be varied because of the diet and sleeping patterns of the individuals too.

Limitation

The study does concern with sedentary-based ST. Purposive sampling was done for this study. However, mixed behavioral patterns such as activity pattern (low/high ST with high physical activity) and inactivity pattern (low/high ST with low physical activity) need to be studied. In our study, dietary patterns and food consumption (which normally affects body weight) were not considered, which should also be considered a limitation.

Conclusion

In summary, there is a significant association between abdominal obesity and ST among male adolescents. No evidence of significant associations is found to correlate ST with BMI, central obesity, and hypertension. Nonetheless, reducing sedentary behavior, especially ST, is an important and good strategy to prevent obesity and hypertension among adolescents. Excessive screen use may lead to sleep deprivation, poor performance in school grades, less time with family and friends, and less outdoor activity. Therefore, it seems important to create favorable conditions to increase physical activity and less ST for all, regardless of the place of residence or socioeconomic status. In Manipur, where students are overburdened with academic work and the culture of private tuition and online classes where their parents want to boost their academic work, adolescents need to be encouraged to increase accessibility to free public spaces. Therefore, a proper cutoff for ST is needed to develop better physical and mental health, particularly the children,

as their brains are still developing, and excessive ST might alter development. The same can also apply to adults because it can reduce productivity and limits the quality of life.

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Conflict of Interest
None declared.

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