RESEARCH ARTICLE

Screen time and its relationship with attention deficit hyperactivity disorder among children attending a tertiary care hospital

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Abstract

Objective: To estimate the frequency of attention deficit hyperactivity disorder and its relationship with screen time and sociodemographic characteristics among children.

Method: The cross-sectional study was conducted at the National Institute of Child Health, Karachi, in June-July 2022, and comprised children of either gender aged 5-10 years visiting the paediatric outpatient department. Screen time was measured using a pretested questionnaire, while attention deficit hyperactivity disorder was measured using ADHD rating scale IV. The relationship of sociodemographic characteristics and screen time with the disorder was explored through multiple linear regression analysis. Data was analysed using SPSS 20.

Results: Of the 247 participants, 126(51%) were boys and 121(49%) were girls. The overall mean age was 7.84±1.87 years. There were 149(60.3%) children at the primary level of education, while 76(30.8%) had no formal education. There were 139(56.3%) children having screen time >2 hours/day with a mean of 3.36±3.14 hours. There were 15(6.1%) children with attention deficit hyperactivity disorder score >26 with a mean of 11.58±9.27. Boys were more frequently affected by attention deficit hyperactivity disorder compared to girls (p=0.026), and there was a significant positive correlation between screen time and attention deficit hyperactivity disorder (p<0.001).

Conclusion: The majority of children were found to be spending more than the recommended time on screen. Male gender and screen time were associated with attention deficit hyperactivity disorder.

Keywords: Screen time, Attention deficit hyperactivity disorder, Child. (JPMA 73: 1847; 2023)

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Introduction

Attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder defined as persistent hyperactivity and inattention negatively impacting developmental, academic and social functioning. ADHD has a highly polygenic inheritance pattern, including defects in dopaminergic, serotonergic, adrenergic and glutamate receptor pathways. Along with genetics, ADHD can be due to other factors, like low birthweight (LBW), epilepsy, teratogen exposure during intrauterine life, and hypoxic and traumatic brain injury.[1]

The new era is the era of electronics, and the increasing use of gadgets, like smartphones, computers and other electronic devices, has raised concerns regarding children's behavioural, mental and physical development.[2] Studies have found a strong association between screen time (ST) and mood disorders, attention deficit, aggression, negative mood and irritability. Guidelines recommend ST <2 hours per day for ages 5-17 years, but being born in the era of electronic devices, younger generations are consistently in touch with these gadgets, either cell phones or other devices, leading to increased ST.[3]

The global prevalence of ADHD among children is about 2-7%.[4] A globally conducted systematic review and meta-analysis showed that ADHD prevalence is about 7% among children and adolescents.[5] ADHD affects 1 in every 20 children in the United States, with an increasing prevalence rate from 6.1% to 10.2%.[6] According to a cross-sectional case review in Karachi, ADHD prevalence was 76.9 % among boys and 23.1% among girls aged 3-14 years.[7] In another study conducted in Rawalpindi among children aged 6-16 years, 34.5% were diagnosed with ADHD.[8] A study including 200 children aged up to 14 years in Karachi showed 17% ADHD prevalence, with the most common age group being 5-10 years.[9]

The current study was planned to estimate the frequency of ADHD, and its relationship with ST and sociodemographic characteristics among children.

Subjects and Methods

The cross-sectional study was conducted at the National Institute of Child Health (NICH), Karachi, in June-July 2022. After approval from the ethics review board of Jinnah Sindh Medical University, Karachi, the sample size was calculated using OpenEpi calculator[10] with confidence level 95%, error

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limit 5%, and the anticipated frequency of total screen exposure time greater than the recommended standards as 80.4%.[4] The sample was raised using non-probability convenience sample technique from among those visiting the outpatient department (OPD). Those included were children of either gender aged 5-10 years who had internet access. Those suffering from any mental disorder other than ADHD and whose parents/guardians could not understand the form either in Urdu or English language were excluded.

After taking informed consent from the parents of the subjects enrolled, data was collected face-to-face and through social platforms. The researchers personally visited the study site and approached parents/guardians for filling out the study questionnaire. The questionnaire was also made on Google Forms for dissemination via the internet. Networks like Facebook, WhatsApp and email, were used to disseminate the questionnaire.

The well-structured questionnaire was divided into 4 sections. The first section consisted of informed consent. The second section explored demographic characteristics of the child, including gender, age, class of study, approximate family household income, and the mother's and father's education status. The third section assessed ST through a free-to-access questionnaire adopted from another article asking questions regarding the time spent using different devices like television, computer, mobile phone, iPad and others.[11] The last section was based on the assessment of ADHD symptoms using the ADHD rating scale (RS) IV. Cronbach alpha coefficients for the total score and subscores have been reported to be between 0.93 and 0.97.[12] Cronbach's alpha for the current questionnaire was 0.839, indicating good reliability score.

The term 'screen time' referred to the amount of time spent working, learning or playing on any screen device, such as laptop, cell phone, television and any other similar device. It was measured by asking questions from parents/guardians, such as: "On weekdays and weekends, how many hours a day does your child usually spend (a) watching TV; (b) playing games on the computer (other than homework); (c) using a mobile phone; (d) using an iPad and other electronic devices?" During weekdays and weekends, total weekly screen time was calculated as the sum of television, computer, mobile phone, iPAD and other electronic devices. The average daily ST (5/7 [screen time on weekdays]+2/7 [screen time on weekends]) was calculated. ST was categorised as low (<2h/day) or high (≥2h/day), according to the recommendation of the American Academy of Paediatrics.[11] The questionnaire was also translated into Urdu for the convenience of the participants.

The ADHD RS-IV is an assessment tool designed to be responded to by a parent or guardian. Three measurements were taken from the scale: attention deficit, from items 1 to 9; impulsivity and hyperactivity, from items 10 to 18; and ADHD total, from items 1 to 18. The items are scored on a Likert-type scale, where 0 = never or rarely, 1 = sometimes, 2=often, and 3=very often. Children were classified as having ADHD symptoms or not using a cut-off point of 26.[12] The questionnaire was also translated in Urdu for the convenience of the participants.

Independent variables were screen time, age, gender, class of study, household income, the mother's education and the father's education. The dependent variable was ADHD.

Data was analysed using SPSS 20. Frequencies and percentages were calculated for socio-demographic characteristics, while mean and standard deviation were calculated for ST and ADHD. Data normality was checked for all tests. To analyse the relationship between independent and dependent variables, multiple linear regression analysis was performed. Pearson correlation was done to find the correlation between ST and ADHD. All analyses were conducted with 95% confidence interval (CI). For all tests, significance was determined at $p \leq 0.05$.

Results

Of the 300 subjects approached, the questionnaire was filled out by 247(82.3%). Of them, 126(51%) were boys and 121(49%) were girls. The overall mean age was 7.84±1.87 years. There were 149(60.3%) children at the primary level of education, while 76(30.8%) had no formal education. Also, 105(42.5%) subjects had a household income ranging from Pak rupee (PKR) 15,000 to PKR35,000. There were 139(56.3%) children having ST >2 hours/day with a mean of 3.36±3.14 hours. There were 15(6.1%) children with ADHD score >26 with a mean of 11.58±9.27 (Table 1).

Boys were more frequently affected by ADHD compared to

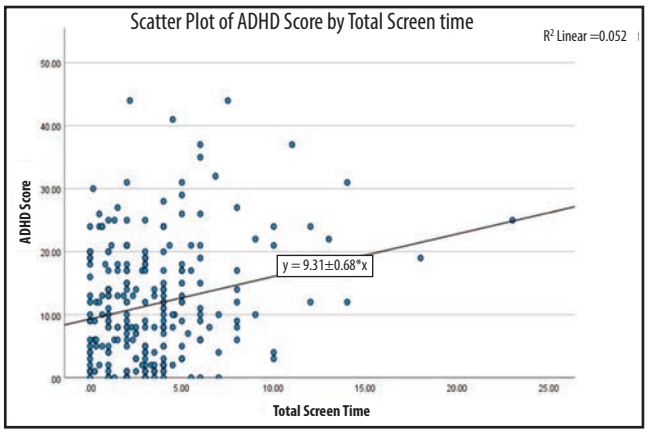

Figure: Pearson correlation between attention deficit hyperactivity disorder (ADHD) and screen time.

Table-1: Socio-demographics characteristics, frequency of screen time and ADHD among the study participants (n=247).

Variable	n (%)
Mean Age (year)	7.84 ± 1.87
Gender	
Male	126 (51)
Female	121 (49)
Education level	
Pre-primary	59 (23.9)
Primary	149 (60.3)
Secondary	3 (1.2)
Tuition	7 (2.8)
Not studying	29 (11.7)
Household income (PKR)	
15,000 or less	46 (18.6)
15,000 to 35,000	105 (42.5)
35,000 to 50,000	31 (12.6)
50,000 or more	65 (26.3)
Child's mother education	
No formal education	76 (30.8)
Matriculation	74 (30.0)
Intermediate	29 (11.7)
Graduate	49 (19.8)
Masters	18 (7.3)
Child's father education	
No formal education	63 (25.5)
Matriculation	65 (26.3)
Intermediate	33 (13.4)
Graduate	50 (20.2)
Masters	31 (12.6)
Mean Screen time	3.36 ± 3.14
> 2 hours	108 (43.7)
< 2 hours	139 (56.3)
Mean Frequency of ADHD	11.58 ± 9.23
Yes	15 (6.1)
No	232 (93.9)

ADHD: Attention deficit hyperactivity disorder, PKR: Pak rupee.

girls (p=0.026), and there was a significant positive correlation between ST and ADHD (p<0.001) (Table 2, Figure).

Discussion

The findings of the current study were consistent with studies conducted in the US and India where the average ST was >2 hours.[2,4] The results, however, differ from those reported form Greece, where the average daily ST was <2 hours.[3] The lower ST observed in some countries may be a result of parents being more informed about the potential negative effects of excessive ST on children's health, such as addiction and unresponsiveness.[13] On the other hand, the higher ST observed in the current study may be attributed to some parents believing that it could be beneficial for their children's education and socialisation needs, or simply due to a lack of awareness about the potentially harmful consequences of excessive ST on their children's health.[4,13] Awareness sessions regarding the adverse effects of excessive ST should be conducted to avoid the harmful consequences in children.

Table-2: Regression analysis of ADHD with socio-demographic variables.

Factors	Adjusted beta coefficient (95% CI)	p-value
Gender of your child		
Male	Ref	
Female	-.146 (-5.072 to -0.317)	0.026
Age of your child (years)	-.045 (-0.847 to 0.406)	0.489
Grade of study		
Pre-primary	Ref	
Primary	-0.031 (-3.424 to 2.257)	0.686
Secondary	-0.088 (-18.513 to 3.658)	0.188
Tuition	-0.097 (-12.811 to 1.994)	0.151
Not studying	-0.038 (-5.333 to 3.162)	0.615
Approx family household income (PKR)		
15,000 or less	Ref	
15,000 to 35,000	0.055 (-2.447 to 4.509)	0.350
35,000 to 50,000	0.116 (-1.475 to 7.964)	0.177
50,000 or more	0.117 (-1.827 to 6.744)	0.260
Child's mother education		
No formal education	Ref	
Matriculation	0.049 (-2.360 to 4.324)	0.563
Intermediate	-0.018 (-5.124 to 4.098)	0.827
Graduate	-0.090 (-6.486 to 2.332)	0.354
Masters	-0.001 (-5.906 to 5.870)	0.995
Child's father education		
No formal education	Ref	
Matriculation	0.119 (-.901 to 5.915)	0.350
Intermediate	0.102 (-1.604 to 7.134)	0.214
Graduate	0.193 (.294 to 8.575)	0.036
Masters	0.021 (-4.532 to 5.679)	0.825
Total screen time	0.219 (.259 to 1.028)	0.001

ADHD: Attention deficit hyperactivity disorder, PKR: Pak rupee.

In the current study, 6.1% children had ADHD scores above the cut-off value i.e. >26. According to a systematic review and meta-analysis, the worldwide prevalence of ADHD was found to be 7% in children.[5] Globally, ADHD prevalence rates are found to be higher in the Middle East and North American regions compared to African and Asian countries[14] A study conducted in Qatar and the United Arab Emirates (UAE), however, showed higher prevalence rates of ADHD 9.4% and 14.9% respectively.[15,16] The difference in prevalence rates between the current study and the studies conducted in Qatar and the UAE could be due to the reason that they used Conners' Classroom rating scale for measuring ADHD which was distributed among the teachers[15,16] while the current study used ADHD RS-IV which was distributed among the parents of the children. In addition to the influence of the study tools, research suggests certain other factors behind the ADHD prevalence rates.[17]

The current study found that ADHD scores were higher

among boys compared to girls. Worldwide estimates of boys-to-girls ratio for childhood ADHD was found to be 3:1.[18] Other studies have also reported similar findings.[19,20] The reason for low prevalence rates in girls in all the studies could be under-diagnosis as girls show the symptoms of hyperactivity and inattention in more structured educational environments, such as college and university. Moreover, working hard to maintain classroom performance could be another reason for ADHD under-diagnosis among girls.[19] Higher levels of androgens in boys both prenatally or perinatally contribute to the development of ADHD.[21] There should be multiple sources of information and more advanced methods of assessment to diagnose ADHD at an early stage.

The present study revealed that ST was positively correlated with ADHD. Results from China, Canada and India reported a similar positive correlation between the two.[4,22,23] However, a study in the Netherlands showed no association between ST and ADHD, which is in contrast with the current findings.[24] The reason for no association between ST and ADHD could be that increased ST is associated with ADHD symptoms later in life in some children.[25] Increased ST leads to decreased sleep which is positively associated with ADHD symptoms. Bright light from the screens disturbs melatonin secretion which disrupts sleep patterns in children[26] and this disturbed and decreased sleep may explain the positive association between ST and ADHD found in the study. Parents should avoid allowing screens in their children's bedrooms or prolonged use of electronic devices, as this may have adverse effects on their child's mental health.

The current study has its limitations as it was carried out in the paediatric OPD of a single centre, which affected the generalisability. Additionally, the study relied on parent-reported data which is susceptible to recall and social desirability biases. Besides, the study did not analyse whether or not watching violent content on screens had a bigger impact on ADHD symptoms than other types of media.

Conclusion

Boys were affected more by ADHD compared to girls. ADHD and ST exhibited a direct positive correlation. Children with ST greater than the recommended standard relatively suffered from ADHD symptoms. Parents should be cautioned regarding the harmful impact of increased ST and its positive relation with ADHD and other psychiatric disorders.

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