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Original Article

Digital Screens and Their Impact on Children's Mental and Physical Health

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ABSTRACT

Screens on electronic devices have become a fundamental part of children's lives, which might affect their well-being. This study aims to assess the prevalence of screen use addiction (SUA) and its related short-term and long-term health complications. This cross-sectional study was conducted among children under 12 years old in the Kurdistan region of Iraq. Data were collected through parent-reported questionnaires, including the Screen Use Disorder Questionnaire (SUDQ), Short-term Health Complications Scale (SHCS), and Long-term Health Complications Scale (LHCS). We used Pearson's correlation, regression, t-test, and ANOVA as statistical tools. The participants were 655 children under 12 years old, representing both genders. In which 53.89% of the participants were classified as screen abusers, while 12.82% fell into the addiction category. Children from high economic status and rural areas were more likely to suffer from screen use addiction (SUA). Moreover, 87.94% of participants developed short-term health complications, and 97.09% had severe long-term health complications. A significant correlation was found between screen addiction and both short- and long-term complications; consequently, screen addiction predicts both SHC and LHC (57.7% and 26.2%, respectively). The current study highlights the significant effects of excessive digital screen exposure on children under twelve, pointing out that the sample reported screen addiction, which led children to suffer severe long-term and short-term health consequences.

Keywords: Digital Devices, Screen use, Addiction, Child health, Health complications, Screen use addiction.

1 Introduction

Digital media is one of the fundamentals of current human life, and children engage with numerous electronic devices primarily for recreational purposes. One of the symbols of modern life is the screens of smartphones, televisions, iPads, tablets, and computers [1]. Correspondingly, screen use occupies a huge area in a child's life [2]. Screen-based activities are increasing gradually and will replace other physical and educational activities, especially in children [3]. There has been a rapid increase in children's screen use. Children's average daily screen time increased from 6.21 hours in 2000 to 7:38 hours in 2009. Similarly, it was reported that in 2011, 52% of 1–8-year-old children had access to mobile devices, while this figure increased to 75% of children in 2013 [4]. Additionally, a French survey showed that 90% of 2-year-old children touch interactive screens [5]. Several organizations and authorities, such as the American Academy of Pediatrics (AAP), have published guidelines and recommendations for professionals and child caregivers regarding the use of screen devices. These guidelines aim to maximize their positive roles while minimizing any undesirable adverse effects [6]. In the last two decades, the AAP recommendations to parents, caregivers, and professionals include limiting screen time, paying attention to content and context, and co-viewing to deal with advancing digital screens [7].

Numerous studies have attempted to identify the positive and negative effects of screens exposure [2, 7, 8]. Research indicates a correlation between screen exposure in children and documented health conditions, including obesity [8]. Furthermore, screen

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exposure has deleterious effects on cognitive [9], learning [10], language [9], and behavior in children [11]. There are limited studies about screen exposure and health-related complications, particularly in low- and middle-income countries, including Iraq and the Kurdistan region [1]. This study aims to investigate the physical and mental health consequences of digital screen exposure and identify the potential risk factors for short- and long-term complications and excessive screen use among children under twelve.

2 Materials and methods

2.1 Study design and setting

We conducted this prospective cross-sectional study in the Kurdistan region of Iraq from August 1, 2024, to November 1, 2024. Kurdistan is located in the northern part of the Republic of Iraq and encompasses the four governorates of Erbil, Sulaymaniyah, Dohuk, and Halabja [12,13].

2.2 Participants

The study was conducted on children of both sexes in the Halabja governorate. They were collected in different settings like schools, health institutions, markets, homes, gardens, playgrounds, and outpatient clinics. Inclusion criteria include children under the age of 12, those living in the Halabja governorate, those with parental consent, and only one child involved in the same family. While those children have health conditions affecting growth (e.g., failure to thrive, cystic fibrosis), children are already diagnosed with autism spectrum disorder, attention deficit hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), and conduct disorders, and those children above 12 years old were excluded.

2.3 Data collection

Before data collection and direct interviews, parents provided written consent, having received an explanation regarding the purpose of the study and their right to withdraw and have a satisfactory response to any question raised. Parents were defined as biological parents, and the parents signed the informed consent. The parents then filled out the questionnaires either directly or through recollection.

2.4 Questionnaires

We developed three main questionnaires to identify the effects of digital screen use on children, taking into account general demographic variables. We created all of them specifically for this study.

2.4.1 General Demographics

In this part, the main demographic variables of children, including age, sex, educational stage, birth order, economic status, residency, and number of siblings, were taken.

2.4.2 Screen use disorder questionnaire (SUDQ)

For this study, a specific scale was made to measure screen use addiction and abuse. The scale consisted of 28 statements. All the statements were prepared according to the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR) criteria for substance use and gambling disorders [14].

The researchers prepared the first draft of the scale, which is composed of 28 items addressing 11 key features of addiction. Then, to determine the overall adequacy of the instrument and the relevance of each item, the scale was assessed by fourteen experts, including psychiatrists, psychologists, and pediatricians. After taking the face validity of the statements, the items changed to 30. Lastly, a pilot study was performed with 15 children to ensure the feasibility and understanding of questions from the parents and to identify any ambiguous items in the questionnaire. For this research, we only accept items where loading is good and above, so after exploratory factor analysis for SUDQ, only two items were below (0.55), and they were removed (the specifics of the factor analysis are provided in the supplementary material). In conclusion, the final version of the SUDQ has 28 items.

We calculate the answers using a 5-point Likert scale, which includes the following options: Always: 4, Often: 3, Sometimes: 2, Rarely: 1, Never: 0. Only 3 items (6, 10, and 17) were calculated reversely. The scores of a scale designed from 0 to 35 are regarded as normal screen use, between 36 and 75 as screen abuse, and between 76 and 112 as screen use addiction (SUA). The final version of the questionnaire is displayed in Appendix A. The reliability of this scale for 28 items using Cronbach's Alpha is ($\alpha = 0.95$).

2.4.3 Short-term Health Complications Scale (SHCS)

This study employed this tool to evaluate the short-term health risks associated with screen use. The questions are about the health problems of children when they use the devices. The SHCS encompasses the following 8 health complications: 1. Fatigue, 2. Hand pain 3. Eye pain and discomfort, 4. Shoulder pain, 5. Headache, 6. Back pain, 7. Suffocation by food stuck in the throat, and 8. Anger and irritability. The development procedures for this questionnaire adhered to the same methodology as the SUDQ. Exploratory factor analysis of this tool shows that all of the items have loadings above 0.55, so all of the items remain. (The details of the factor analysis can be found in the supplementary material.) The reliability of this scale for (8) items using Cronbach's Alpha is ($\alpha = 0.91$).

We calculate responses using a 5-point Likert scale, which includes the following options: Always: 5, Often: 4, Sometimes: 3, Rarely: 2, and Never: 1. The highest score was 40, while the lowest one is 8. Scores lower than 11 are regarded as no health

complications, between 11 and 20 are considered Mild short-term health complications, from 21 to 30 are considered Moderate short-term health complications, and scores above 31 are considered severe short-term health complications.

2.4.4 Long-term Health Complications Scale (LHCS)

The final version of LHCS included 14 long-term health adverse effects, and the parents answered Yes/No. Long-term in this tool means having these symptoms for more than 6 months. The answers were verified as yes if the child visited health care professionals for treatment of the problems. Questions are: 1. Does the child get insufficient sleep for their age? 2. Does the child have any eye disease? 3. Does the child wear corrective lenses (glasses or contact lenses)? 4. Does the child have any hearing problems? 5. Has a psychiatrist seen the child? 6. Is the child experiencing a depressive mood? 7. Does the child become easily angered or irritable? 8. Does the child prefer to stay isolated? 9. Is the child aggressive? 10. Does the child disobey parents? 11. Has the child's academic performance declined? 12. Has the child's appetite decreased? 13. Has the child's ability to express themselves verbally decreased? 14. Does the child have problems with attention or concentration?

The development procedures for this questionnaire followed the same methodology as those used for the SUDQ and SHCS. However, after exploratory factor analysis for LHCS, only two items were below 0.55, and they were removed (the specifics of the factor analysis are provided in the supplementary material). In conclusion, the final version of the LHCS has 14 items. The reliability of this scale for (14) items using Cronbach's Alpha is (α= 0.89).

We scored all 14 items together. Answering No for all questions means there is No Long-term health complication; if the answer is between 1 and 4, it is considered a Mild Long-term health complication, from 5 to 9 responses with Yes regarding Moderate Long-term health complications, and above 9 is considered severe complications.

2.5 Ethical consideration

Before undertaking the research, the ethical committee at Halabja University approved the current study protocol (code number 03-2024/7). Before completing the questionnaires, the parents signed a written informed consent form. The consent form contains information about the purpose of the study. Participation in the study is voluntary, and the data will be used solely for research purposes. The names will be kept anonymous, and participants can withdraw at any stage of the study.

2.6 Statistical analysis

We used IBM SPSS version 27 for data analysis. Kaiser-Meyer-Olkin's measure of sampling adequacy (KMO) was used to assess sampling adequacy for factor analysis. Cronbach's alpha was used for internal consistency. We used the mean and standard deviation to determine the average for each variable. An independent samples t-test was used to find the statistical differences between gender and age. One-way ANOVA was used to see the statistical differences between stages, birth order, economic status, and residency. The Pearson correlation coefficient was employed to recognize the relationship between Screen Use Addiction (SUA), Short-term Health Complications (SHC), and Long-term Health Complications (LHC). Simple regression analysis was utilized to find the amount of screen use disorder that predicts short-term health complications and long-term health complications.

3 Results

3.1 Demographic characteristics of participants

As shown in Table 1, a total of 655 children participated in the study. The population distribution of the study is nearly the same for both genders, with 328 males (50.1%) and 327 females (49.9%). The highest age group was 7-12 years old, and the majority, 422 (64.4%), was labeled under the "sufficient" economic category, while the dominant group was urban residents with 445 (67.9%).

Table 1: Demographic characteristics of participants.

Category	Groups	Frequency	Percent
Gender	Male	328	50.1%
	Female	327	49.9%
Age	4-5 (preschool)	170	26.0%
	7-12 (school ages)	485	74.0%
Educational Stage	Kindergarten	160	24.4%
	1-3 primary school	300	45.8%
	4-6 primary school	145	22.1%
	7-9 primary school	50	7.6%
Birth Order	First	229	35.0%
	Second	174	26.6%
	Third	106	16.2%
	Fourth	74	11.3%
	Fifth	49	7.5%
	Sixth	15	2.3%
	Seven or less	8	1.2%
Economic Status	Insufficient	160	24.4%
	Sufficient	422	64.4%
	High	73	11.1%
Residency	City	445	67.9%
	District	173	26.4%
	Village	37	5.6%

3.2 Prevalence of Screen Use Addiction (SUA), Short-term Health Complications (SHC), and Long-term Health Complications (LHC)

The high rate of participants, 353 (53.89%), was labeled as a category of screen abuse, and 84 (12.82%) of children fell into the addiction category. In addition, the prevalence of SHC is high, with 516 (78.78%) of participants under mild to moderate levels of complications, and only 60 (9.16%) had severe SHC. Furthermore, 97.09% of the participants with LHC had severe complications. (See Table 2)

Table 2: Prevalence of SUA, SHC, and LHC.

Categories		N (%)
Screen use addiction	Normal	218 (33.28%)
	Abuse	353 (53.89%)
	Addiction	84 (12.82%)
Short-term Health Complications (SHC)	No SHC	79 (12.06%)
	Mild SHC	312 (47.63%)
	Moderate SHC	204 (31.15%)
	Severe SHC	60 (9.16%)
Long-term Health Complications (LHC)	No LHC	4 (0.61%)
	Mild LHC	10 (1.53%)
	Moderate LHC	5 (0.76%)
	Severe LHC	636 (97.09%)

3.3 Differences in SUA by Demographics

Regarding the connection between SUA and demographic factors, Table 3 shows that SUA is significantly linked to both economic status and residency. None of the other demographic factors is significant. Regarding economic status, compared to participants with sufficient economic status, results show higher SUA among individuals of high levels of economic status. Moreover, SUA is approximately higher among district and village residents than urban populations.

Table 3: Differences in SUA by Demographics

	Mean (SD)	t / F	p-value
Age	47.47(27.67)	t = -.63	.44
4-5	49.06(21.61)		
7-12			
Gender		t =.94	.34
Male	49.51(24.71)		
Female	47.78(21.85)		
Education		F= .36	.77
Kindergarten	48.67(28.56)		
1-3 First Circle	47.86(22.74)		
4-6 second Circle	49.35(20.03)		
7-9 Third Circle	51.26(16.31)		
Birth order		F= 1.76	.10
First	46.42(25.9)		
Second	48.02(22.92)		
Third	48.44(23.65)		
Fourth	51.09(18.21)		
Fifth	53.28(17.4)		
Sixth	62.73(19.88)		
Seven or less	51.37(21.28)		
Economic Status		F= 11.03	**.000**
Insufficient	53.96(27.11)		
Sufficient	45.52(21.57)		
High	55.08(20.85)		
Residency		F= 11.04	**.000**
City	45.71(24.50)		
District	55.17(19.37)		
Village	53.43(18.72)		

3.4 Health complications in relation to demographic variables

Results of multiple comparisons using post hoc tests showed significant effects of economic status and residency on SHC prevalence, indicating that insufficient economic resources, as well as living in rural areas, are significantly correlated with higher SHC (all results are shown in Table 4).

Table 4: Differences in SHC by Demographics.

	Mean (SD)	t / F	p-value
Age		t = .70	0.48
4-5	19.37(9.45)		
7-12	18.87(7.52		
Gender		t =-.62	.53
Male	18.8(8.45)		
Female	19.19(7.66)		
Education		F= 2.54	.505
Kindergarten	19.45(7.16)		
1-3 First Circle	18.21(7.53)		
4-6 second Circle	19.34(7.16)		
7-9 Third Circle	21.28(6.97)		
Birth order		F= 1.88	.08
First	18.27(8.75)		
Second	18.97(7.92)		
Third	18.59(8.17)		
Fourth	19.1(6.04)		
Fifth	21.65(7.23)		
Sixth	22.46(8.36)		
Seven or less	21.87(6.53)		
Economic Status		F= 13.48	**.000**
Insufficient	20.65(9.07)		
Sufficient	17.84(7.41)		
High	22.06(8.02)		

Residency		F= 24.53	**.000**
City	17.53(8.02)		
District	22.05(7.26)		
Village	22.32(7.38)		

Regarding LHC, significant predictors were economic status, residency, and education. As shown in Table 5, participants with an insufficient economic status, as well as those living in non-urban areas, were associated with worse LHC results. Additionally, more severe LHC complications were observed among older students.

Table 5: Differences in LHC by Demographics.

	Mean (SD)	**t / F**	**p-value**
Age		t = 1.22	.21
4-5	17.98(4.58)		
7-12	17.5(4.22)		
Gender		t =.54	.58
Male	17.52(4.5)		
Female	17.53(4.13)		
Education		F= 8.5	**.000**
Kindergarten	18.35(4.8)		
1-3 First Circle	17.16(3.79)		
4-6 second Circle	17.01(4.8)		
7-9 Third Circle	19.9(3.05)		
Birth order		F= 2.58	**.018**
First	17.39(4.64)		
Second	16.96(4.07)		
Third	17.93(4.17)		
Fourth	18.25(3.31)		
Fifth	18.61(5.02)		
Sixth	18.73(3.65)		
Seven or less	21.00(3.81)		
Economic Status		F= 13.91	**.000**
Insufficient	18.21(5.04)		
Sufficient	17.05(3.93)		
High	19.67(3.96)		
Residency		F= 23.57	**.000**
City	16.86(4.27)		
District	19.32(3.89)		
Village	18.91(4.32)		

3.5 Correlation between SUA and Health Complications

The Pearson correlation coefficient indicates that excessive screen use is closely tied to health issues, signifying a strong correlation between SUA and both SHC ($r = 0.757$, $p < 0.001$) and LHC ($r = 0.511$, $p < 0.001$). In addition, there is a moderate correlation between SHC and LHC ($r = 0.502$, $p < <0.001$) as shown in Table 6.

Table 6: Correlation between SUA, SHC, and LHC.

	Screen use addiction	Short-term Health Complications
Short-term Health Complications	.757**	
Long-term Health Complications	.513**	.502**

**. Correlation is significant at the 0.01 level (2-tailed).

3.6 Prediction of Health complications in relation to SUA

Multiple regression results between SUA and SHC show that SUA significantly predicts SHC with ($F = 1,653$) = 889.43 and ($R^2 = 0.577$); it means that SUA predicts 57.7% of SHC variance (Figure 1).

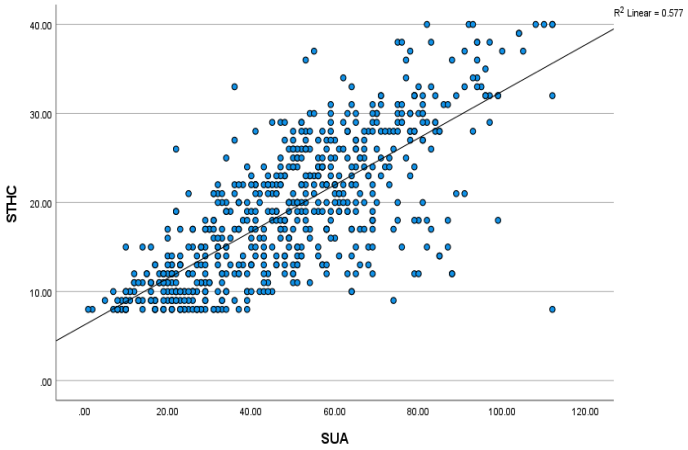

Figure 1: Prediction of SHC by SUA.

However, the effects of SUA on LHC are lower than its effects on SHC; still, the effects are countable with ($F = (1,653) = 231.26$), and it accounts for 26.2% of LHC variance ($R^2 = 0.262$) (Figure 2).

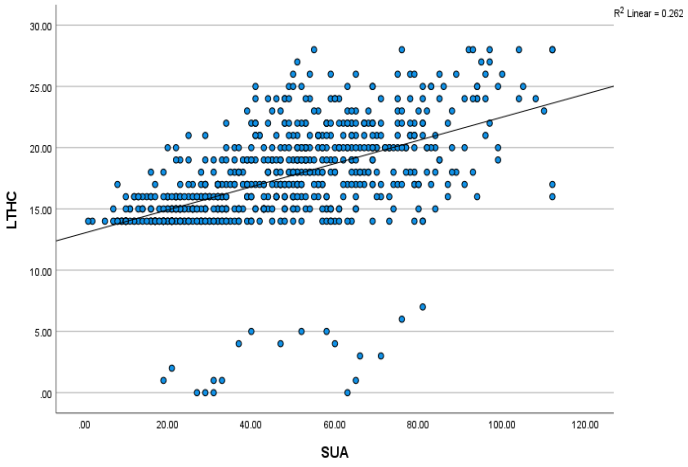

Figure 2 Prediction of LHC by SUA.

4 Discussions

4.1 Main Findings

The main aim of this research was to evaluate the prevalence of screen use addiction (SUA) and its related short-term and long-term health complications among children below 12 years old while exploring the relationship between SUA and health outcomes. The results discovered a high prevalence of SUA, with 12.82% categorized as addicted to screen use. At the same time, 97.09% of participants experienced severe LHC, while 9.16% reported severe SHC. There was a strong link between SUA and both SHC and LHC. Regression analyses revealed that SUA accounted for 57.7% of SHC and 26.2% of LHC. Additionally, demographic features such as economic status and residency were significantly associated with differences in SUA and health complications.

4.1 Screen Use Addiction (SUA)

The study found a high prevalence of screen use addiction among children. Studies conducted in various settings have detected differences in prevalence rates. The frequency of screen addiction among children and adolescents differs greatly from other countries [15]. For instance, 48% of internet users in the United States reported being addicted to digital devices, while globally, 6% reported internet addiction, with the Middle East having the highest rates at approximately 10.9% [16]. Ali et al. (2024) found that more than half of Egyptian preparatory students between the ages of 11 and 15 were addicted to multiscreen use [17]. Likewise, Rao et al. (2023) found that 13.1% of the general population in India was addicted to screen use, 34.5% were problematic users, and 52% were normal; likewise, screen addiction was significantly higher amongst the 13-25 age groups [18]. Discrepancies in terminology (technology addiction, mobile addiction, screen addiction, …), diagnosis, and assessment scales have led to the variation in prevalence [19,20]. Correspondingly, variations exist due to differing cultural norms [5], technological accessibility [19], and study sample [17].

The high prevalence of addiction in the present study could be attributed to many factors, including, first, the advances of technology [19,21] and increased screen availability [7,17,22]. For example, a study conducted in India found that 77.9% of children have access to smartphones [23]. Even though these devices have distinct design features that can stimulate their compulsive use, parents often lack education on using digital devices [18]. According to Przybylski & Weinstein (2017), children with less educated caregivers tend to use devices for extended periods [24]. Second, nowadays children are using screens for a long time; a study in Bangladesh found that children from grades 2–8 (ages 6 to 14 years) used different forms of digital screens for 4.6 hours every day [25]. A study in India shows that individuals watch screens daily routinely for about 2.99 ± 2.01 hours, and during the holidays, it rises to 4.45 ± 2.02 hours [18]. In Iran, 33.4% of students watch TV daily for more than two hours; this rises to 53% during holidays [15]. Tekeci (2024) indicates that excessive screen use among children aged 6–10 years leads to increased screen addiction [26]. Third, poor parental control [1,7,25], and family dynamics make the problem bigger [15,16]. The Kakon et al. (2024) study reveals that 56% of children used digital devices without parental supervision or monitoring, and they experienced higher levels of mental health problems [25]. Similarly, bad parental role modeling is another vital factor [20], as children had a higher affinity toward screen addiction when their parents showed problematic screen media use [27]. Fourth, students in the Kurdistan region allocate relatively limited time to school activities, which leads to an increase in free time availability. Kakamad and Fatah (2018) argued that in the Kurdistan region of Iraq, there are few educational programs for students. As a result, students spend more time watching television and spend several hours playing video games [28]. Correspondingly, our study used a new tool for diagnosis, which is different from other questionnaires used in other studies, and there is not a unique and standard assessment tool or criteria for this disorder, because it is still not present in DSM and international classifications of disease (ICD) classifications [14,29]. Though it is not yet considered an addiction in classification systems, it is usually recognized by field researchers that excessive and uncontrolled use of these devices can cause addiction [30].

The present study discovered that higher economic levels are considerably associated with higher SUA rates. However, having a high economic status allows more access to personal and screen-based entertainment devices [5,27]; the association with high economic status is inconsistent with other studies, where SUA is more common among low-income families [24,31]. Hussein & Albanna (2024), in a study at Duhok City in Iraq, found that secondary school students from middle-income families watched screens more than their peers from low- and high-income families [1] . In addition to economic status, living in rural areas is associated with a high prevalence of self-harm (SUA). These regions have limited extracurricular activities, and recreational settings are scant; this leads to increased screen use [16].

4.3 Health Complications

Unpredictably, almost all participants (97.09%) reported severe LHC, highlighting the intense influence of SUA. Higher educational stage, higher birth order, insufficient economic status, and living in rural areas are associated with higher mean scores of LHC. According to the current study, 31.15% of individuals had moderate SHC, while 9.16% reported severe SHC. Furthermore, individuals with insufficient economic status and rural residency are more likely to have SHC. Previous studies recognized long- and short-term health complications, including obesity [31,32], musculoskeletal problems [33], low self-control [17], eye discomfort [23], headaches and backache [31], sleep disturbances [17,23,31], reduced physical activity [23], aggressive behavior [33], attention deficit[26] and poor academic performance [28]. Nearly universal prevalence was reported, such as in Donthu et al. (2022), in a study about mental health and physical effects of screen use on children (5-15 years old), which reported that the most common complaints are sleep disturbance (43.3%),

followed by avoiding outside play activity (43.3%), dryness of eyes (40.5%), and increased weight (25.9%) [23]. Moreover, a review regarding the effects of screen exposure on cognitive development among children younger than 3 years old concluded that screen viewing is linked with lower cognitive development when viewing is not supervised by parents or the content is not appropriate for the age [7].

This high rate of LHC could be linked to long-term exposure to screens without enough health interventions [31]. Other factors related to screen use, like sedentary behavior [26,34], wrong posture, and chronic exposure to blue light, are contributing to the high rate of long-term complications [16,33]. Griffiths et al. (2010) found that 61% of 5-year-old children used screen entertainment for more than 2 hours per day, and it is linked to emotional and conduct problems in girls [34]. Screens produce blue light, which reduces the production of melatonin in human bodies and disrupts the body's circadian rhythms [16]. Exposing infants to screens increases their risk of health complications. Tomopoulos et al. (2010) looked at how babies were exposed to screens and how that affected their development as toddlers. They found that babies who were exposed to screens as babies had lower levels of cognitive and language development at 14 months [9].

Our study showed that LHC is affected by socioeconomic and environmental factors. This is because low-income families and rural areas don't have easy access to health care and preventative measures, as well as a lack of recreational facilities [16]. Moreover, increased academic pressure among higher stages of school leads to reduced opportunities for physical activity [1] . Higher birth orders frequently relate to decreased parental attention, possibly leading to greater screen time, and lastly, cultural factors, including decreased household and community involvement, limited time presence of children in school, make them rely on digital devices, further intensifying these complications [5,28].

4.4 Health Complications and SUA

Both short-term and long-term health complications significantly correlate with screen use addiction. Regression analysis further indicated that SUA was a strong predictor (57.7%) of short-term health complications and a moderate predictor (26.2%) of long-term complications. These results are consistent with former studies that associate extreme screen use with both immediate and late health effects [17]. Studies in Western populations often highlight mental effects [7,35], whereas this study highlights physical and mental health effects in a Middle Eastern milieu.

The strong predictive correlation can be related to the direct impact of screen time and manner on general health. This is made more evident by the fact that prolonged screen time causes physiological stress that leads to tiredness and musculoskeletal issues [33]. There is also evidence that long-term sensory stimulation from too much screen time may have adverse effects on brain development [35]. Similarly, blue light contact [33] and decreased physical activity due to sedentary behavior have a serious role in these outcomes [26,34,36]. Cao et al. (2011) concluded that the combination of high screen time and inadequate physical activity was linked with the highest frequency of various psychological problems in Chinese adolescents [36]. Psychological factors, including addiction and stress from misuse, likely exacerbate these complications. A systematic review by Li et al. (2020) supports that excessive screen use, primarily engaging in more than 2 hours of daily screen time, has harmful health impacts in both the long and short term [33]. Similarly, children and adolescents who spent more time using screens were more likely to exhibit reduced emotion regulation, an inability to finish tasks, lesser curiosity, and more trouble making friends [37].

4.5 Implications

The present study brings many significant implications for public health and education, clinical practice, and future research:

1. Educational strategies: Constructing school programs to integrate structured packages promoting responsible digital device use, enhancing physical activity, and decreasing sedentary behavior.

2. Public health interventions include both educational awareness campaigns and establishing local policies. Awareness campaigns to raise parental knowledge about screen time use and its health complications, and educate families on managing screen time effectively and formulating regulatory policies such as age-appropriate screen time guidelines, incentives for outdoor activities for children, and collaborations with the technology industries, particularly social media networks.

3. Clinical practice: routine assessments for children about screen time use by healthcare professionals, especially pediatricians.

4. Future research: The current study emphasizes the need for longitudinal studies to identify the causal relationship between health complications and screen addiction. Likewise, studies essential for developing standard diagnostic tools for screen addiction are designed for varied cultures and developmental ages.

4.6 Study Limitations

The study has some significant findings about the link between kids' screen time and health issues, but it also has some problems that should be pointed out. For example, because it was cross-sectional, it's not possible to prove a direct link between SUA and health effects. Similarly, parent-reported questionnaires used in the study could announce recall bias or social desirability bias. Thus, including objective measures and longitudinal research would strengthen future studies. Conducting a study in a specific geographical location is another limitation, which may limit the

generalizability of the findings to other regions. Similarly, potential parental bias may lead to over- or underreporting of screen use due to individual beliefs, resulting in recall or social desirability bias. Moreover, the study did not consider contextual factors, such as the COVID-19 pandemic and recent school boycotts in the Kurdistan Region, which likely contributed to an increase in screen time use [38]. Lastly, the study lacks some potentially confounding variables, including the content of the screens children watch and the screen use habits of their parents.

5 Conclusions

The current study highlights the significant effects of excessive digital screen exposure on children under twelve, pointing out that 12.82% reported screen addiction and 97.09% suffered severe long-term health consequences. The short-term issues include physical fatigue, hand pain, eye pain, shoulder and neck pain, headache, anger, and agitation; in addition, the long-term problems include sleeping late, disrupted sleep, nightmares, depression, isolation, anxiety, poor performance in school, worse ability to express and speak, and reduced concentration. Moreover, robust predictions between screen addiction and both short-term and long-term issues underscore the overall mental and psychological health hazards, including musculoskeletal discomfort, exhaustion, and psychological and cognitive difficulties associated with excessive usage. Village residency, high economic status, and inadequate parental involvement further intensify these issues. Right now, children often have more devices to be addicted to than before; misusing these devices leads kids to experience screen addiction and negatively affects their overall psychological and physical well-being. Furthermore, public health campaigns, education of parents, and policies encouraging well-adjusted screen use and physical activity are essential to challenging these complications. Future research should prioritize longitudinal research and standardized diagnostic tools to enhance comprehension and alleviate these influences. Future studies should also look at older children and teenagers to understand how screen use changes as they grow up and examine how social status affects screen time use.

Appendix A: Screen Use Disorder Questionnaire (SUDQ)

	During the last 12 months, how often does your child display this behavior?	Always	Often	Sometimes	Rarely	Never
1	Violates the time limit for using electronic devices.					
2	The child uses their parents' Smartphones in addition to their own device.					
3	Excessive use of electronic devices has negatively impacted the child's academic performance.					
4	The child's use of electronic devices has caused conflicts or strained the parent-child relationship.					
5	The child misrepresents or lies about the duration of their device usage.					
6	The child engages in conversation and interacts socially with visitors.					
7	The child has experienced physical problems (such as headaches, sleep and constipation ...) as a result of electronic device use.					
8	Upon waking up in the morning, the child immediately starts using electronic devices.					
9	The child uses electronic devices while in bed.					
10	When meal is prepared, the immediately stop using the devices and promptly come to eat.					
11	The child has experienced mental health challenges (e.g., anxiety, fear, anger) as a result of electronic device use.					
12	The child disobeys caregiver instructions due to being preoccupied with electronic devices, often refusing requests because they are unwilling to stop using the device.					
13	The child displays repetitive and obsessive thoughts about using electronic devices, and continually thinking about when they can use them again.					

14	The child takes electronic devices along during home visits and trips.					
15	The child spends progressively more time using electronic devices over time.					
16	Despite understanding the complications and side effects of excessive device use, the child continues to use them and is unable to stop.					
17	The child avoids participating in social and logical games unrelated to electronic devices and shows little interest in them.					
18	When away from electronic devices, the child persistently thinks about them or eagerly anticipates resuming their use.					
19	The child feels uncomfortable, restless, and bored when not connected to electronic devices.					
20	Consistently uses the device more than the allotted time.					
21	The child's use of electronic devices has interfered with daily activities such as bathing, eating, and sleeping.					
22	The child shows a persistent wish to use electronic devices at any time and in any setting.					
23	The child has shown a reduced interest in previously enjoyable activities, such as drawing, sports, travel, and exploration.					
24	The child continues to use electronic devices despite being aware of the mental and physical harm caused.					
25	The child Persistently thinking about using electronic devices?					
26	When using devices, if you assign him a question or a task, the child gets angry and avoids completing tasks.					
27	The child is constantly charging their device and ensures it never runs out of battery.					
28	The child doesn't eat without having access to their electronic device.					

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Authors' contributions

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Conflict of interest

The authors declare that they have no competing interests.

Ethics approval and consent to participate

The scientific and ethical committee of Halabja University approved the proposal of the study. A written consent taken from all participant parents

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Supplementary Information

Exploratory Factor analyses of the scales used in the study are present in the Supplementary material file.