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Socioeconomic Inequality in Screen Time, Phone, and Tablet Use among Iranian Adolescents: Results of A National Study

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Abstract

Background: Excessive screen time has been associated with a variety of negative health outcomes. We aimed to evaluate screen time and phone and tablet use in Iranian adolescents and their relation to the socioeconomic status of adolescents' families in 2018.

Methods: This descriptive-analytical study was carried out on 10-12-year-old adolescents from Kurdistan, Fars, and Markazi provinces. Cluster sampling was used for sampling. Data were collected by completing demographic questionnaires, calculating the BMI of adolescents and phone and tablet use, screen time, and socioeconomic status of the families. We used linear and logistic regression to estimate the final model. The concentration index was used to measure inequality and the Oaxaca decomposition to examine the different determinants of the inequality.

Results: 1590 adolescents (52.58% boys) were enrolled in our study. Screen time activities were significantly higher in boys, older adolescents, higher BMIs, more educated mothers, and 35< year-old fathers ($P < 0.05$). The use of mobile phones and tablets was significantly higher among boys, ten-year-olds, families with four or fewer members, higher BMIs, adolescents with higher levels of parental education, and more educated mothers ($P < 0.05$). In addition, the concentration index for screen time activities (C = 0.083) and phone and tablet use (C = 0.536) showed that screen time and phone and tablet use activities were higher in adolescents with high socioeconomic status.

Conclusion: Screen time, phone and tablet use were higher in adolescents with high socioeconomic status. Also, many other factors like gender, age, BMI, parents' education and age can affect screen time, phone and tablet use in adolescents.

Keywords: Adolescents, Digital screen use, Screen time, Socioeconomic inequality, Iran

Conflicts of Interest: None declared
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Introduction

The use of digital screens is very common among teenagers. Most of them use smartphones, tablets, game consoles, computers, and televisions regularly (1). The common view is that too much screen time is bad for the health and well-being of teenagers. Screen time is negatively associated with sleep period and quality, weight status, physical fitness, mental health, and health-related quality of life (2). Evidence suggests a relationship between high screen time with harmful effects on mood, cognitive and social-emotional development, which in turn leads to poor educational performance (3).

Adolescents spend 50-80% of their day hours on sedentary behaviors. One type of these behaviors is screen time (4, 5). Since 2011, the usage of smartphones has dramatically increased among adolescents (6). As recommended by World Health Organization (WHO), screen time activities such as watching TV and playing electronic games

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↑What is "already known" in this topic:
Overuse of screen time, phone, and tablet use can lead to adverse health consequences such as sleep disorders, stress, depression, physical inactivity, obesity, and chronic neck and back problems.

→What this article adds:
There are socioeconomic inequalities in screen time, phone and tablet use among adolescents.

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should not be more than 2 hours per day (7); however, nowadays, 2-5-year-old kids spend 32 hours per week and 6-11-year-old adolescents spend about 28 hours a week watching TV (8). Also, the average time for using phones among teens is seven hours and 22 minutes per day (9).

Individual variables such as the family history of obesity, general obesity, socioeconomic status of the family, and age can increase screen time activities in adolescents. Besides, boys use phones much more than girls (10, 11).

There is no clear association between phone use and screen time, with socioeconomic status. Recent studies have shown that screen time activities, owning a mobile phone, and phone use are much more common among adolescents with lower socioeconomic status (11, 12). On the other hand, another study showed an utterly different result that owning a phone and phone use is more in teenage adolescents with higher socioeconomic status (13).

Excessive Phone use can have many complications in adolescents. Recent studies have shown that health status gets worse in adolescents who use mobile phones regularly. In addition, behavioral problems, headaches and migraine, skin itches, depression, and anxiety increase significantly by using mobile phones in adolescents. Also, it is associated with higher stress and poor sleep quality in adolescents and young people (14-16).

Decreasing screen time, boosting physical activity, and having quality sleep in children will positively affect their physical and mental health and well-being and reduces health-related problems such as obesity and related diseases in their life in the future (17).

Considering the side effects of screen time activity and phone use on adolescents' mental and physical health, identifying the factors that increase screen time activity and phone use is essential to prevent harm to adolescents by modifying these factors. Therefore, this study aimed to evaluate screen time and phone use in Iranian adolescents and their relation with the socioeconomic status of adolescents' families.

Methods

Study design

This cross-sectional study was performed in three provinces of Iran in 2018.

Study setting and participants

Cluster sampling was used for sampling. The provinces of the country were divided into three clusters: the western and northeastern provinces (including 9 provinces), the north and north-facing central areas (including 13 provinces), and the south and south-facing central areas (including 9 provinces. Since the sampling was performed with a combination of systematic classification, cluster, and random methods to reduce the error, the sample size selected from each cluster was proportional to the volume of that cluster. Multi-stage sampling was performed as follows:

Step 1: The provinces of the country were divided into three clusters.

Step 2: Kurdistan from cluster No.1, Markazi from cluster No.2, and Fars province from cluster No.3 were randomly selected.

Step 3: Marivan city from Kurdistan province, Saveh city from Markazi province, and Gerash city from Fars province were randomly selected.

Step 4: The Vice Chancellor for Research and Technology of Kurdistan University of Medical Sciences contacted the education department of all provinces of Kurdistan, Markazi, and Fars in order to set the arrangements for the study.

Step 5: The list of primary schools in the cities of Marivan, Saveh, and Gerash was obtained from the education department in each city. Then, six primary schools (three girls and three boys' primary schools) were randomly selected from all primary schools in each city.

Step 6: 526 samples (263 girls and 263 boys) were selected from the schools of each city from among 10 to 12-year-old adolescents (grades 5 and 6). The study population included 1590 male and female adolescents aged 10-12 years old.

In this study, d=0.05 (minimal detectable deference), α =.05 (type 1 error), and p=0.5 (proportion of the adolescents using digital screen time more than 2 hours) were considered in order to estimate the largest sample size. Based on the formula in Equation 1, the sample size was estimated to be 384 subjects. Since cluster sampling was used for the selection of the samples; therefore, a coefficient of 1.38 was considered in order to increase the accuracy of the sampling. The final sample size was determined to be 530 people.

$$n = \frac{z^2_{1-\alpha/2}(P.(1-P))}{d^2} \qquad \text{(Equation 1)}$$

Six elementary schools (three for girls and three for boys) were randomly selected from the primary schools in each city, and 530 samples (265 female students and 265 male students) were randomly selected from each of the 10 to 12-year-old students (grades 5 and 6). To collect the required data, the adolescents answered one part of the questionnaire, and then they took the questionnaire home and their parents answered the other part of it at home, and the next day, they brought back the questionnaire. Trained public health professionals measured demographic variables including height, weight, and BMI for adolescents.

Data collection

The individual body mass index (BMI) (weight in kilograms divided by height in meters) was calculated as well. According to WHO, a set of sexual BMIs was used to define obesity and overweight, which is a standard to measure obesity in adolescents aged 2-29 years worldwide (18).

In addition, screen time and phone or tablet use were evaluated by asking the adolescents how much time they spent each day watching TV or playing with the computer, using smartphones or tablets (for playing the game, talking, texting, or some other use). Spending more than two hours per day was considered high screen time, phone and tablet use (19).

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Statistical analysis

We used a questionnaire developed by O'Donnell et al. to determine the socioeconomic status of the families. These questionnaires were used to measure various variables such as education, the job of the head of the household, different house stuff, etc. Based on the Principal Component Analysis (PCA) method, the variables that had the most significant impact on the variance of all variables were identified at first. Then a new variable (SES) was created based on these variables. According to this index, the population was divided into five quintiles of very poor, poor, moderate, rich, and very rich (20-24). Moradi et al. have reported the statistical analysis in detail (25).

In this study, a total of 1590 questionnaires were completed, and each questionnaire was given a numeric code between 1 and 1590. The data were entered into SPSS software version 20 by two trained experts. In this study, the concentration index and curve along with the odds ratio, were used to measure inequality. After inequalities were measured, the next step was to decompose them. The decomposition of the concentration index was used to determine the share of each variable in existing inequalities. Each of the indicators of screen time, activity and phone and tablet use was considered as the response variable. To analyze the level of screen time, and using phone and tablet, the Chi-Square test was used to estimate the prevalence of response variables in each level of demographic variables and then multiple logistic regression was used to estimate the final model based on variables with $P < 0.1$ in Chi-Square test. All analyzes were performed with Stata / SE 14.0 software.

Results

Out of a total of 1590 participants in the study, 836 (52.58%) were boys, 224 (14.10%) of them were fourth-grade students, 768 (48.33%) were fifth-grade, and 597 (37.57%) were in sixth grade.

Screen time activities and using phones and tablets were divided into two groups based on the time spent; less than two hours or more and equal to two hours. 594 (74%) boys and 420 (56%) girls had daily screen time activities for more than two hours. 388 (48.20%) boys and 211 (28.20%) girls used mobile phones and tablets for more than two hours a day. Screen time activities were significantly higher in boys, older adolescents, higher BMIs, more educated mothers, and 35≤year-old fathers ($P < 0.05$). The use of mobile phones and tablets was significantly higher among boys, ten-year-olds, families with four or fewer members,

Table 1. The relationship of demographic variables with screen time and using cell phone / tablets among Iranian adolescents

Total population characteristic	Number (%)	Screen time <2h/day Number (%)	Screen time >2h/day Number (%)	*P*_value	Using cell phone and tablet <2h/day Number (%)	Using cell phone and tablet >2h/day Number (%)	*P*_value
Sex							
Male	836 (52.58)	209 (38.78)	594 (58.58)	<0.001	417 (43.66)	388 (64.77)	<0.001
Female	754 (47.42)	330 (61.22)	420 (41.42)		538 (56.34)	211 (35.23)	
Age groups							
10	224 (14.10)	85 (15.80)	134 (13.21)	0.002	98 (10.27)	119 (19.87)	<0.001
11	768(48.33)	282 (52.42)	464 (45.76)		491 (51.47)	256 (42.74)	
12	597 (37.57)	171 (31.78)	416 (41.03)		365 (38.26)	224 (37.39)	
Household size							
≤4	927(60.99)	326 (64.17)	580 (59.06)	0.055	529 (57.50)	377 (66.02)	0.001
> 4	593(39.01)	182 (35.83)	402 (40.94)		391 (42.50)	194 (33.98)	
BMI							
Under 5 percentiles	102 (6.47)	44 (8.22)	57 (5.67)		72 (7.62)	29 (4.87)	<0.001
5-50 Percentiles	484 (30.71)	190 (35.51)	288 (28.63)		347 (36.72)	131 (21.98)	
50-85 Percentiles	561 (35.60)	177 (33.08)	370 (36.78)	0.002	304 (32.17)	243 (40.77)	
Overweight and Obese	429 (27.22)	124 (23.18)	291 (28.93)		222 (23.49)	193 (32.38)	
Parents' level of education*							
Non-academic	1241(79.50)	427 (80.26)	795 (79.42)	0.696	808 (85.77)	415 (70.22)	<0.001
Academic	320 (20.50)	105 (19.74)	206 (30.58)		134 (14.23)	176 (29.78)	
Mother's education							
Illiterate and primary	591(38.06)	234 (44.32)	349 (35.01)	0.002	435 (46.47)	149 (25.30)	<0.001
Middle school and high school	397(25.56)	126 (23.86)	265 (26.58)		257 (27.46)	135 (22.92)	
Diploma and academic	565(36.38)	168 (31.82)	383 (38.42)		244 (26.07)	305 (51.78)	
Mother's age							
<35	507 (35.41)	179 (37.06)	321 (34.93)	0.603	312 (36.84)	188 (33.87)	0.005
35-44	759 (53.00)	246 (50.93)	494 (53.75)		456 (53.84)	284 (51.17)	
>45	166 (11.59)	58 (12.01)	104 (11.32)		79 (9.33)	83 (14.95)	
Father's age							
<35	111 (7.67)	50 (10.37)	60 (6.41)	0.011	73 (8.47)	37 (6.65)	0.052
35-44	916 (63.26)	286 (59.34)	614 (65.60)		560 (64.97)	340 (61.15)	
>45	421 (29.07)	146 (30.29)	262 (27.99)		229 (26.57)	179 (32.19)	

*The highest level of parenting education

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Table 2. Bivariate and multivariate logistic regression for screen time and using cell phone / tablet among Iranian adolescents

Variable		Screen time				Using cell phone and tablet			
		Model 1		Model 2		Model 1		Model 2	
		OR (95% CI)	*P*_value	OR (95% CI)	*P*_value	OR (95% CI)	*P*_value	OR (95% CI)	*P*_value
Sex									
	Female*	1.00		1.00		1.00		1.00	
	Male	2.23 (1.8–2.8)	<0.001	2.31 (1.81–2.94)	<0.001	2.37 (1.92–2.93)	<0.001	2.58 (2.02–3.31)	<0.001
Age groups									
	10*	1.00		1.00		1.00		1.00	
	11	1.04 (0.76–1.42)	0.768	1.07 (0.76–1.51)	0.686	0.43 (0.32–0.58)	<0.001	0.42 (0.30–0.60)	<0.001
	12	1.54 (1.1–2.13)	0.009	1.39 (0.98–1.98)	0.068	0.51 (0.37–0.69)	<0.001	0.38 (0.27–0.55)	<0.001
Household size									
	4≤*	1.00		1.00		1.00		1.00	
	> 4	1.24 (0.99–1.55)	0.056	1.58 (1.22–2.05)	0.001	0.7 (0.56–0.86)	0.001	0.88 (0.68–1.15)	0.364
BMI									
	Under 5 percentiles	0.62 (0.40-0.95)	0.030	0.71 (0.44–1.12)	0.142	0.50 (0.32–0.80)	0.004	0.50 (0.30-0.85)	0.011
	5-50 percentiles	0.73 (0.56-0.94)	0.014	0.78 (0.58-1.04)	0.088	0.47 (0.36-0.61)	<0.001	0.53 (0.39-0.72)	<0.001
	50-85* percentiles	1.00		1.00		1.00		1.00	
	Overweight and Obese	1.12 (0.85-1.48)	0.412	1.14 (0.83–1.55)	0.418	1.09 (0.84-1.41)	0.521	0.99 (0.73-1.34)	0.958
Mother's education									
	Diploma and academic*	1.00		1.00		1.00		1.00	
	Illiterate and primary	0.65 (0.5–0.8)	0.001	0.68 (0.51–0.90)	0.007	0.27 (0.21–0.35)	<0.001	0.23 (0.17–0.30)	<0.001
	Middle school and high school	0.92 (0.7–1.22)	0.571	0.96 (0.70–1.31)	0.795	0.42 (0.32–0.55)	<0.001	0.36 (0.26–0.49)	<0.001
Mother's age									
	<35*	1.00				1.00			
	35-44	1.1 (0.9–1.4)	0.352			1.03 (0.82–1.31)	0.782		
	>45	1 (0.7–1.4)	1.00			1.74 (1.22–2.49)	0.002		
Father's age									
	<35*	1.00		1.00		1.00		1.00	
	35-44	1.8 (1.2–2.7)	0.004	1.74 (1.13–2.67)	0.012	1.2 (0.79–1.82)	0.397	1.14 (0.71–1.83)	0.594
	>45	1.5 (1–2.3)	0.064	1.35 (0.85–2.15)	0.204	1.54 (0.99–2.40)	0.054	2.07 (1.24–3.45)	0.005

*Reference category
Model 1: univariate logistic regression model, model 2: multiple logistic regression model including variable with *p*-value < 0.2

higher BMIs, adolescents with higher levels of parental education, and more educated mothers ($P < 0.05$) (Tables 1 & 2).

The concentration index for screen time activities (C = 0.083) showed that the screen time activities were higher in adolescents with high socioeconomic status (Table 3). The concentration curve for screen time was below the equation line, indicating that the screen time was more in the rich group of society (Figure 1).

The concentration index was positive for the use of phones or tablets (C = 0.536), which indicates the higher use of phones or tablets in adolescents with high socioeconomic status (Table 3). The concentration curve for phone or tablet use was below the equality line, indicating that the use of phone or tablet was more in the rich group of society (Figure 1).

The decomposition of the concentration index was used to determine the contribution of each of the determinants in existing inequality. Table 4 shows the decomposition analysis results for phone/tablet use and screen time activity.

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Table 3. The concentration index for screen time and phone/tablet use

Variable	95% Confidence interval	*P*-value
Screen Time	0.083 (0.018,0.147)	0.011
Phone/Tablet use	0.536 (0.480,0.591)	< 0.001

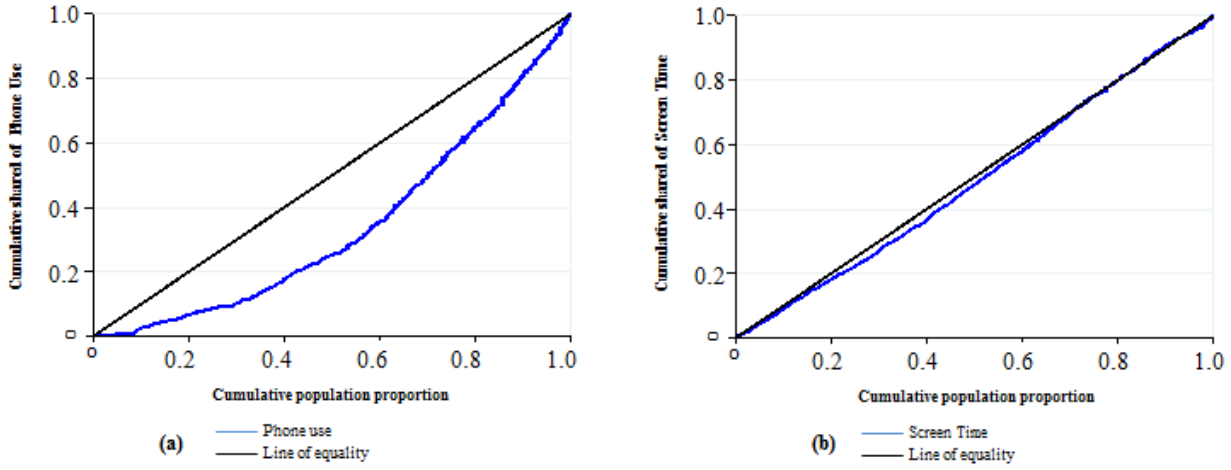

Figure 1. Concentration curve for screen time and phone/tablet use

The first column shows the partial effect regression coefficients for each determinant on the outcome variable (phone/tablet use or screen time activity) in the presence of other variables. The second column shows the elasticity for phone/tablet use and screen time activity for each determinant. The third column shows the concentration index for each determinant. The positive or negative sign of this index indicates the concentration of the relevant determinant in the rich or poor group. For example, family size >4 is concentrated in poor people and middle and high school education is concentrated in rich people. The last two columns show the absolute value of the contribution and the concentration index of each determinant compared to the overall concentration index. The positive (negative) absolute value of a determinant's contribution indicates the contribution of that determinant to the pro-poor (pro-rich) inequality. A low economic status played the most critical role in creating inequalities in the use of phones and tablets (137.08%). Its absolute value of the contribution had a positive sign and showed a pro-poor contribution in inequality. Gender plays the most critical role in creating inequalities in screen time activities, accounting for 74.16% of the total concentration index (Table 4).

Discussion

More than 74% of boys and 56% of girls had an average of more than 2 hours of screen time per day. In a similar study conducted in 2015 by Moradi et al. in Sanandaj, 50% of boys and 45% of girls had an average of more than 2 hours of screen time activity per day (26). In other similar studies, the reported values are lower than the present study (11, 27, 28), which can be due to the effects of time and the tendency of adolescents to use television, computers, and various methods of using them. In most studies related to comparing screen time activity between girls and boys, similar to the results of our study, a higher proportion of this activity was reported in boys (11, 29); in some of them, the differences were statistically significant (26, 27, 30).

Factors like being a boy, being in a family with more than four members, having an educated mother, and having a middle-aged father were all effective in increasing screen time. However, body mass index and mother's age did not show a significant relationship. In a study conducted by Moradi et al. in Sanandaj in 2015 (26) and a study conducted by LeBlanc et al. in Canada in 2015 (29), screen time activity was significantly associated with body mass index. Moreover, LeBlanc et al. reported a significant relationship between a father's literacy and screen time activity. In contrast, in the study of Moradi et al., there was no significant relationship between parents' age and parental literacy with screen time activity (26, 29).

In this study, more than 48% of boys and 28% of girls used mobile phones and tablets for more than two hours a day. In the study of Moradi et al., this ratio was reported less (23% in boys and 17% in girls) (26). Of course, the fact that we are in a period of transition, and the use of new technologies is increasing day by day, can be a justification for this difference created in the last few years. In the present study, adolescents' use of mobile phones and tablets had a significant relationship with age, gender, family dimension, literacy, and maternal age. In contrast, in a similar study, it had a significant relationship only with gender and the mother's age (26).

The concentration index and curve in the present study showed a high ratio of obesity, screen time, and tablet and mobile phone use in high socioeconomic groups. Improving the ability of households to access new technologies and reducing working time for working parents can be one

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Table 4. Decomposition of concentration index for phone/tablet use and screen time among Iranian adolescents

Variable	Phone/tablet use					Screen Time activities				
	Coef	E*last*	CI	Cont to C	C%	Coef	Elast	CI	Cont to C	C%
Sex										
Male										
Female	0.251¥	0.625	0.049	0.031	14.04	0.361¥	0.831	0.049	0.041	74.16
Age										
10										
11	0.005	-0.008	-0.004	0.000	0.01	-0.011	-0.016	-0.004	0.000	0.13
12	0.016	0.024	-0.076	-0.001	-0.84	0.000	0.001	-0.076	-0.000	-0.15
Economic statue										
Poorest SES	-0.487¥	-0.410	-0.741	0.304	137.08	0.009	0.007	-0.741	-0.005	-10.45
2th SES	-0.263¥	-0.231	-0.362	0.083	37.77	-0.024	-0.021	-0.362	0.007	13.92
Middle SES	-0.212€	-0.183	0.015	-0.002	-1.24	0.013	0.011	0.015	0.000	0.31
4th SES	-0.152£	-0.128	0.380	-0.049	-22.08	0.007	0.006	0.380	0.002	4.46
5th SES										
Size of family										
4≤										
> 4	-0.050	-0.072	-0.126	0.009	4.15	0.058	0.079	-0.126	-0.010	-18.13
Mother's Education										
Uneducated and Elementary	0.145£	0.336	0.123	0.041	18.79	0.037	0.078	0.123	0.009	17.39
Middle and High school	-0.050	-0.059	0.047	-0.002	-1.28	-0.009	-0.010	0.047	-0.000	-0.88
Diploma and academic										
Father's Education										
Uneducated and Elementary	-0.046	-0.130	0.118	-0.015	-6.97	-0.032	-0.081	0.118	-0.009	-17.20
Middle and High school	-0.081	-0.084	-0.037	0.003	1.43	0.038	0.038	-0.037	-0.001	-2.60
Diploma and academic										
Mother's age										
<35										
35-44	-0.020	-0.049	-0.046	0.002	1.03	0.021	0.045	-0.046	-0.002	-3.83
>45	-0.031	-0.023	-0.010	0.000	0.10	0.013	0.012	-0.010	-0.000	-0.22
Father's age										
<35										
35-44	0.132	0.353	0.030	0.010	4.77	0.168£	0.409	0.030	0.012	21.93
>45	0.205€	0.369	-0.052	-0.019	-8.66	0.112	0.172	-0.052	-0.008	16.08

Coeff Marginal effects, Elast elasticity, CI Concentration index of the social determinants, Cont to C Contribution to the overall concentration index, C% unadjusted percentage calculated on the overall explained portion of the C
£0.01≤p<0.05; €0.001≤p<0.01; ¥p<0.001

of the reasons for the increase in screen time indicators and the use of tablets and mobile phones, and obesity in families with better socioeconomic status.

The gender variable was the most critical factor that explained the difference between screen time activities, so this activity was much higher in girls. Perhaps the Iranian culture, more family control on girls, and a lack of female access to physical activity are among the controversial justifications for girls having more screen time. Gender, socioeconomic, and father's age were among the variables affecting inequality in tablet and phone use in the present study, which naturally increased with socioeconomic status as well as increasing father's age. On the other hand, perhaps in wealthy families, less time is given to adolescents due to both parents' employment.

In our study, being a girl, older age, and better socioeconomic status of households were the most important variables affecting the inequality observed among adolescents in terms of overweight and obesity. In similar studies that looked at the factors influencing inequality in overweight and obesity in adolescents, some in the decomposition model said that age and gender were the essential components of the observed differences (31), while other studies have introduced residence and level of mother's education as a more important factor (32).

Limitations

In this study, sampling was done within each province from one of the cities of the province and may not be representative of the entire province.

Conclusion

A significant percentage of adolescents spend more than two hours on screen time, phone, and tablet use. Screen time activities, and phone and tablet use are higher in adolescents with high socioeconomic status. Moreover, many other factors like gender, age, BMI, parent's education, and age can affect screen time activities and phone and tablet use in adolescents. It is recommended that further studies be performed on other factors that may affect screen time

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and phone and tablet use in adolescents, and it is also recommended to measure the effectiveness of the changeable factors by modifying and controlling each of these factors in future studies.

Compliance with ethical standards

Written consent was obtained from a parent or guardian for participants under 16 years old. This manuscript was approved by the ethics committee of Kurdistan University of Medical Sciences (IR.MUK.REC.1396.164).

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The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Conflict of Interests

The authors declare that they have no competing interests.

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