

Excessive Screen-Based Media Use and Its Relation to Sleep Pattern of School Age Children

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Abstract

Background: School age children are growing up in an era saturated with screen-based media devices, which affected children's overall health. Sleep is crucial for school age children's healthy development. Excessive screen-based media devices use can disrupt children's sleep habits and pattern. **Aim:** The study aimed to assess the relationship between excessive screen-based media use and sleep pattern of school age children. **Design:** A correlational descriptive research design was used in the study. **Setting:** The present study was carried out in six elementary schools in Ismailia City. **Sample:** A cluster sample (341) of school age children at the previously mentioned settings **Tools of data collection:** The data were collected using two tools namely Children's Sleep Habits Questionnaire (CSHQ) and Screens questionnaire. **Results:** The most frequently screen-based media device used by school age children was TV. Two thirds of the studied children used screen-based media devices excessively and most of them had sleep disorders. There was a statistically significant relationship between excessive screen-based media devices use and children's sleep pattern ($P < .001$). Almost 7 % of the variation of sleep pattern explained by screen media devices use. **Conclusion:** Excessive screen-based media devices use negatively affect children's sleep pattern. **Recommendations:** An urgent intervention to increase awareness of parents is needed to limit their children's screen-based media use and so mitigate its negative effect on their sleep pattern.

Keywords: Excessive screen-based media, School age children, Sleep pattern.

1. Introduction

Screen-based media devices became prevalent and invade the daily life of the children of the twenty-first century. Prompt development of technology and prevalence of portable screen-based media devices as tablet and smartphones in the markets all over the world,

change the way by which children interact with electronic devices and the time spent using such devices (*Rasmussen et al., 2020*).

According to studies and research on television, American Academy of Pediatrics (AAP) has published multiple policy statements regarding screen time and media

use, the first was published in 2011 which suggested that no screen time for children less than 2 years of age and to limit screen exposure to less than 2 hours per day for older children. The new one (2016) has suggested that parents should restrict screen time use to one hour per day and to be of high quality, in addition, inform parents about the importance of reducing screen-based media exposure for the health of their children (*Przybylski, 2019*).

Different international studies have made to detect the amount of time children usually spent using screen-based media devices in everyday life and found that more than 60% of children spent more than 2 hours daily using screen media devices in twenty-seven countries (*Zhao et al., 2018*).

Children aged 8-12 years spend about 6 hours daily using different screen-based media devices for entertainment and this time not include time spent for school activities. So, screen media have an enough time to develop the children's attitude more than parents and teacher can do. Approximately 83% of children have access to internet at their homes and spending a lot of time reading, playing videogames or on social networks as Facebook and Instagram (*Hockenberry, Wilson & Rodgers, 2021*).

One of the areas that affected by children's screen-based media devices use is sleep. Sleep is important for cognitive development as well as physical health of both children and teens. When children get enough sleep according to the recommended amount needed by their age, children will have a better health (*Foy, 2018*).

In spite the importance of sleep during middle childhood for the children's health, children during this period of development report decrease night sleep hours mainly due to screen-based media usage. Different systematic reviews focused on school age children have found that there is a relationship between screen-based media usage and sleep, this include poor quality of sleep, inadequate amount of sleep, shortened sleep duration, increase daytime sleepiness and insomnia (*Brautsch et al., 2022*).

Significance of the study:

Children aged 8-12 years use screen-based media devices on average five and half per day. From 2019 to 2021, the total amount of use of screen-based media devices increased from four hours and forty-four minutes per day to more than five hours per day among tweens (*Rideout, Peebles, Mann*

& Robb, 2022). According to Centers for Disease Control and Prevention (CDC), 57.8% and 72.7% of middle and high school students, respectively, in the United States report short sleep duration. One of the important factors reported to be associated with short sleep duration and poor sleep quality is screen-based media use (Liu *et al.*, 2021). Because of scares data in Egypt about screen-based media use and its effect on children's sleep, this study has been done.

1- Aim of the study:

Assess the relationship between excessive screen-based media use and sleep pattern of school-aged children in Ismailia city.

Research objectives:

- Assess school age children's use of all types of screen-based media (computer, video games, television, and smart phones).
- Determine sleep pattern of school age children.
- Find out the relationship between screen-based media use and sleep pattern of school age children.

Research questions:

-What is the type of screen-based media of

school age children?

-What is the sleep pattern of school age children?

-Is there a relationship between excessive use of screen-based media and sleep pattern of school-age children?

2. Subject and methods:

Study design:

A correlational descriptive research design was utilized in this study.

Study setting:

The study was carried out at six elementary schools in Ismailia city selected from about fifty-four governmental schools that follow two educational directorates, North Ismailia educational directorate and South Ismailia educational directorate.

Study subject:

The study comprised of a cluster sample of 341 school age children with one of their parents (mother or father) to participate in this study.

Tools of data collection:

Tool (1): Children's Sleep Habits

Questionnaire (CSHQ) (Owens, Spirito, & McGuinn, 2000) the questionnaire comprised two parts as the following:

Part 1: Demographic data of the studied children's parent (such as age, participated parent, level of education, economic level, job of the parent).

Part 2: A 35-items parent questionnaire grouped into eight domains: bed-time resistance (6 items), sleep onset delay (1 item), sleep duration (3 items), sleep anxiety (4 items), night waking (3 items), parasomnias (7 items), sleep disordered breathing (3 items), daytime sleepiness (8 items). It was used to examine sleep behavior or pattern in school age children.

Scoring system:

There were 33 out of 35 items are rated on a 3-point scale: "Usually" if sleep behaviors occur 5 to 7 times per week, "Sometimes" for 2 to 4 times per week and "rarely" for 0 to 1 time per week. Answers are converted to a score ranging from 1 to 3. There are 6 questions (Question 1, 2, 7, 9, 10, and 28) scored in reverse. Questions number 34 and 35 are rated as "Not sleepy", "Very sleepy" and "Fall asleep" and scored on (0, 1 and 2). A total sleep disturbance score is calculated as

the sum of all 33 items of Children Sleep Habits Questionnaire scored questions range from 31 to 97 (Noting that two items scored twice on different subscales, Questions 4 and 6 on the Bedtime Resistance subscale were repeated in Sleep Anxiety and should only be counted once in the overall score). Higher scores indicate more sleep problems. CSHQ yields a total sleep disturbance score and eight subscale scores (bedtime resistance, sleep-onset delay, sleep duration, sleep anxiety, night wakings, parasomnias, sleep disorder breathing, and daytime sleepiness). The cutoff point was 41, a total sleep disturbance score over 41 indicates sleep disorder. The CSHQ subscale scores was > 2 standard deviation above the published community control reference mean values.

Tool (2): Screens questionnaire this tool adapted from (Klakk et al., 2020), it comprised of two parts as the following:

Part 1: Demographic data of the studied children (such as age, gender, grade).

Part 2: It contained 15 questions, (7) questions not included in the total score but provide further information regarding to school age child use of screen-based media and (8) questions that cover screen -based

media, school age child's screen-based media use, and early exposure.

Scoring system:

The 4-point scale was recoded into 3 questions, from never (1) to every day (4). Answers was on a 3-point scale, into 5 questions from, Yes, daily (3) to never (1) A total score can be obtained by summing up the scores of the items and can range from 8 to 27. A high score for any item above mean indicated excessive screen-based media use.

Tool validity and reliability:

The tools were evaluated for clarity, content validity, comprehensiveness, and applicability by a jury of three expertise of pediatric nursing at Faculty of Nursing and pediatrics who revised the tools, and modifications were done according to their opinion. The tool reliability was assessed by the researcher for testing the internal consistency of the instrument by measuring the related Cronbach's alpha and it was **0.78** for full CSHQ scale and **0.67** for screens questionnaire.

Field work:

The data were collected from 21 September 2022 to the end of December 2022. The researchers were available at schools two days per week from 9 am to 1 pm. The researchers interviewed the studied children at the predetermined schools. First, the researchers introduced themselves to the studied children and explained the study and its purpose to obtain their cooperation and approval to participate in the study.

Then, the researchers got an assent from the children who agreed to participate in the study and an informed consent sent to their parents to get their approval to participate in the study. In the second day, the researcher distributed a Screen questionnaire to each child in order to collect the required data, the researchers were available for any clarification needed by the studied children. The researchers distributed a Children's Sleep Habit Questionnaire to each child in order to be filled by one of their parents (mother or father) and others were asked to fill the questionnaire electronically using Microsoft Form program which sent via What's app. The parent of the studied child called the researchers for any clarification needed and the researchers were available for them at any

time.

Pilot study:

A pilot study was conducted over a period of two weeks from the beginning of September 2022 till the 15th day of the same month on 10% of the total sample size involving 34 of the school age children and one of their parents to evaluate the research plan, clarity and applicability of the study tools and to estimate the time needed to fulfill these tools. Necessary modifications were carried out as revealed by the pilot study. The study tools were revised, redesigned, and rewritten according to obtained results and acceptance of final form to be used to gather data. The sample of the pilot study was excluded from the study sample.

Ethical consideration:

An official permission was taken from Research Ethics Committee at Faculty of Nursing (committee no. 130/11.2021 at 5-12-2021). An official permission was issued from Dean of Faculty of Nursing Suez Canal University to Central Agency for Public Mobilization And Statistics (CAPMAS). Next, an official permission was issued by CAPMAS to get the official security agreement to collect the data from the

predetermined schools. An official permission was taken from Directorate of Education in Ismailia city to collect the data from the predetermined directorates. An official permission was taken from North and South Ismailia Education Directorates in order to collect the data from the schools. Finally, an official permission was taken from school's directors to collect the data after explaining the purpose of the study. An assent was taken from the participated child and a written approval was taken from their parent to participate in the study and they had the right to withdraw from the study at any time. Confidentiality of the information collected, and anonymity was guaranteed.

Data analysis:

Data collected through the questionnaire were coded, entered and analyzed using Statistical Package for the Social Sciences (SPSS version 23).

The following statistical techniques were used:

- Percentage.
- Mean score degree.
- Standard deviation SD.
- Monte Carlo for Chi square test, fisher exact

test, and Chi-square test

- Pearson Correlation (r test)
- Linear regression model (coefficient of determination and standard error).
- Proportion probability of error (P- value) and confidence interval.

Significance of results:

- When $P < 0.05$, there is a statistically significant difference.
- When $P < 0.01$, there is a highly statistically significant difference.

2- Results:

Table (1): shows that the highest percentage (89.4%) of studied children aged between 10 and 12 years with mean age 10.63 ± 0.94 , slightly more than half (52.2%) of them were females, slightly less than half (47.2%) and more than one third (37%) of them were in fifth grade and sixth grade respectively.

Figure (1): shows that the highest percentage screen-based media devices used at homes of the studied children were TVs and smartphones which represented 97.7% and 95% respectively, while the lowest percentage device was PlayStation representing 2.3%.

Table (2): illustrates that almost half (49.6%) of studied children didn't use screen-based media devices within the first half an hour after waking up in the morning while slightly more than half (53.7%) of them used screen-based media devices within half an hour before bedtime in the evening.

Figure (2): shows that near two thirds (65.4%) of the studied children used screen-based media devices excessively.

Table (3): represents that more than three quarters (79.5%) of the studied children sleep hours were less than 9 hours each night with mean sleep duration of 7.83 ± 1.14 hours/night.

Figure (3): represents that the majority (91%) of the studied children had sleep disorders as a result of excessive usage of screen-based media devices.

Table (4): shows that 6.8% of variation in the total sleep habits domains score can be explained by the total screen-based media devices use.

Table (5): shows that there was a statistically significant correlation between screen-based media devices use and sleep onset delay, sleep duration, sleep-disordered breathing and daytime sleepiness where the p-value is 0.21,

<0.001, <0.001 and <0.001 respectively.

3- Discussion

The development in technology over the last decades result in enhancement in screen-based media usage at all age groups. Many studies assumed that school age children spent almost 7 hours per day using screen-based media devices. Excessive screen media devices use have negative effects on the health as sleep disturbances, poor academic performance and physical inactivity. The percentage of children's access to mobile media devices has been increased from 52% in 2011 to be 75% in 2013 (*Pérez-Chada et al., 2023*).

The results of the current study table (1), illustrated that the highest percentage of studied children were in the age group from 10 to 12 years old, these results were in accordance with a study done by *Sakamoto, Kabaya & Nakayama, (2022)*, whom carried out a study about "Sleep problems, sleep duration, and use of digital devices among primary school students in Japan", which illustrated that school aged children's mean age was 9.0 ± 1.8 years.

Regarding gender, the current study showed that more than half of the studied

children were females table (1). The study result was in agreement with a study done by *Alqarni et al. (2022)*, whom carried out a study about "Prevalence of screen time use and its relationship with obesity, sleep quality, and parental knowledge of related guidelines: A study on children and adolescents attending Primary Healthcare Centers in the Makkah Region", in which the studied sample was more females. While this result was in disagreement with a study done by *Pedersen et al. (2022)*, whom carried out a study about "Recreational screen media use in Danish school-aged children and the role of parental education, family structures, and household screen media rules", which found that more than half of the studied sample were males.

This finding may be explained from the researcher point of view that the higher proportion of females children to males ones in school's classes made the percentage of females participation in the study higher than males. Another reason that females were more curious about the study and more cooperative than males.

Regarding screen-based media devices availability at homes figure (1), the current study results clarified that the most screen-based media devices available at studied

children's homes were TVs and smartphones. These results were in correspondence with a study held by *Lauricella & Cingel, (2020)*, whom carried out a study about "Parental Influence on Youth Media Use", which revealed that the TVs and smartphones were the most prevalent screen-based media devices at homes. Also, *Hinten, Wolsey, Henderson & Scarf, (2023)* whose results showed that TVs and smartphones the most available screen-based media devices at homes.

On the other side, the current study showed that the least screen-based media device available at homes was PlayStation. This result was in contrast to *Hinten et al. (2023)*, whose results revealed that more than half of studied families had a gaming console such as PlayStation at their homes.

These findings could be clarified from the researcher point of view that the moderate financial level of families of the current study and the high cost of PlayStation devices in Egypt, making such devices did not prevalent among studied children.

Regarding usage of screen-based media devices during specific time periods of the day table (2), the current study results illustrated that more than half of the studied children used screen-based media devices half an hour

before bedtime all the days. These findings were consistent with *Pedersen et al. (2022)*, whom results illustrated that 24% and 45% of the studied children used screen-based media devices within half an hour bedtime on all weekdays and all weekend days, respectively.

Regarding excessive screen-based media devices use figure (2), the current study findings illustrated that almost two thirds of the studied children use screen-based media devices excessively. These findings were in accordance with *Amelia & Ramdani, (2019)*, who showed that the majority of the children use screen-based media devices more than 2 hours daily.

In addition, these results also were in the same context with *Cherian, beena & Abraham, (2023)* whom carried out a study about "Sleep pattern and sleep disorders in school-going children aged 6-12 years and its association with screen time: a cross-sectional study from South Kerala during the COVID-19 pandemic" in which slightly less than two thirds (62.2%) of the children spent more than 2 hours of screen time a day.

Regarding sleep duration table (3), the current study results showed that more than three quarters of the studied children slept less than 9 hours each night with mean sleep

duration of 7.83 hours\night which was less than the recommended sleep duration for their age group. These findings were supported by *Amelia & Ramdani, (2019)*, whose results reflected that approximately two thirds (63.9%) of the studied children slept less than the ideal sleep duration of 9 hours recommended for their age group.

These findings were in contrast to *Garmy, Clausson, Nyberg & Jakobsson, (2018)*, whom held a study about "Insufficient Sleep Is Associated with Obesity and Excessive Screen Time Amongst Ten-Year-Old Children in Sweden" in which only two fifths of the studied children slept less than 9 hours each night.

Also, these results were inconsistent with *Hisler, Hasler, Franzen, Clark & Twenge, (2020)*, whom held a study about "Screen media use and sleep disturbance symptom severity in children" whose results showed that the children in the sample were had a fairly healthy duration of sleep as the mean sleep duration was 9 hours\night.

In addition to the study that carried out by *Cherian et al. (2023)*, who reported that the mean duration of sleep each night was 9:06 hours and only 34.4% of the studied children slept less than 9 hours per night and even this

percentage of sleep deprived children which seemed increased in India than it was in the studies done before, it still less than the percentage of sleep deprived children in the current study.

Regarding studied children with sleep disorders figure (3), the current study results revealed that the majority of the studied children had a sleep disorder, as they had a global CSHQ score above the CSHQ cut off. These results were in accordance with *Cherian et al. (2023)*, whose results revealed that more than three quarters of the children were suffering from sleeping disorders that related to excessive use of screen-based media devices use.

Regarding percentage of variance between studied children's total screen-based media use and their sleep habits score table (4), the current study results illuminated that 6.8% of the variance that occur in sleep was explained by change in total screen-based media devices use. The results were in the same context with *Vézina-Im et al. (2022)*, whose results revealed that 12% of variance in sleep quality explained by total recreation screen time.

However, these findings were inconsistent to a study done by *Przybylski, (2019)*, whom held a study about " Digital Screen Time and

Pediatric Sleep: Evidence from a Preregistered Cohort Study", whose results reflected that less than 1.9% of variance in sleep outcomes is accounted for screen-based media use and even the link between screen-based media devices and sleep, digital screen time on its own had little effect on sleep outcomes.

Regarding correlation between screen-based media devices use and children's sleep habits domains table (5) the current study findings declared that there was a statistical significance correlation between total screen-based media devices use and four domains of Children's Sleep Habits, which were sleep onset latency, sleep duration, sleep-disordered breathing and daytime sleepiness. The results were supported by *Hisler et al. (2020)*, whose results illuminated that there was a statistical significant relationship between screen-based media devices use and sleep onset latency, sleep duration and daytime sleepiness. It showed that children who spent 2 hours or more on screen-based media devices had shorter sleep duration, longer sleep onset and excessive daytime sleepiness.

Also, these findings were in similarity to the findings that reflected by *Afonso, Jacinto, Infante & Engana, (2022)*, whom done a study about "Primary School Children's Sleep

Habits: Association with Socioeconomic Factors and Physical Activity Habits" in which presence of screen media devices in the children's bedrooms was significantly and negatively associated with sleep onset delay, sleep duration, sleep-disordered breathing and daytime sleepiness.

4- Conclusion

The results of the current study highlights the relationship between excessive screen-based media devices use among school aged children and their sleep pattern. A strong need exists for developing a plan to mediate healthy sleep practices and healthy screen media habits to the children and their parents.

5- Recommendations

An urgent intervention to increase awareness of parents is needed to limit their children's screen-based media use and so mitigate its negative effect on their sleep pattern. It's also important to replicate the current study on a larger sample and in different Egyptian governorates to make the study findings more generalized and representative.

6- Limitation

This study has several limitations. **First,**

parent-reported children's sleep habits which may be vulnerable to subjectivity and inaccuracy and so differ from data obtained by objective methods such as actigraphy. **Second**, duration of sleep differs from weekdays to weekends, however, this study asked about sleep duration as whole and not separated between weekdays and weekends sleep duration. **Third**, lack of awareness about the

importance of the study by some parents and many schools which included in this study, which resulted in lack of cooperation with the researcher to complete questionnaires and obtain data. **Finally**, this study did not establish causality between two variables and further studied of longitudinal nature is needed using objective methods of data collection.

Table (1): Percentage distribution of the studied children according to their demographic characteristics (n=341)

Items	Number	Percent
Age / Year		
8-<10	36	10.6
10-12	305	89.4
$\bar{X} \pm SD$	10.63±.94	
Range	8-12	
Gender		
Male	163	47.8
Female	178	52.2
Grade		
Third grade	7	2.1

Fourth grade	47	13.8
Fifth grade	161	47.2
Sixth grade	126	37.0

Figure (1): Percentage distribution of the studied children’s Screen-based media devices at home

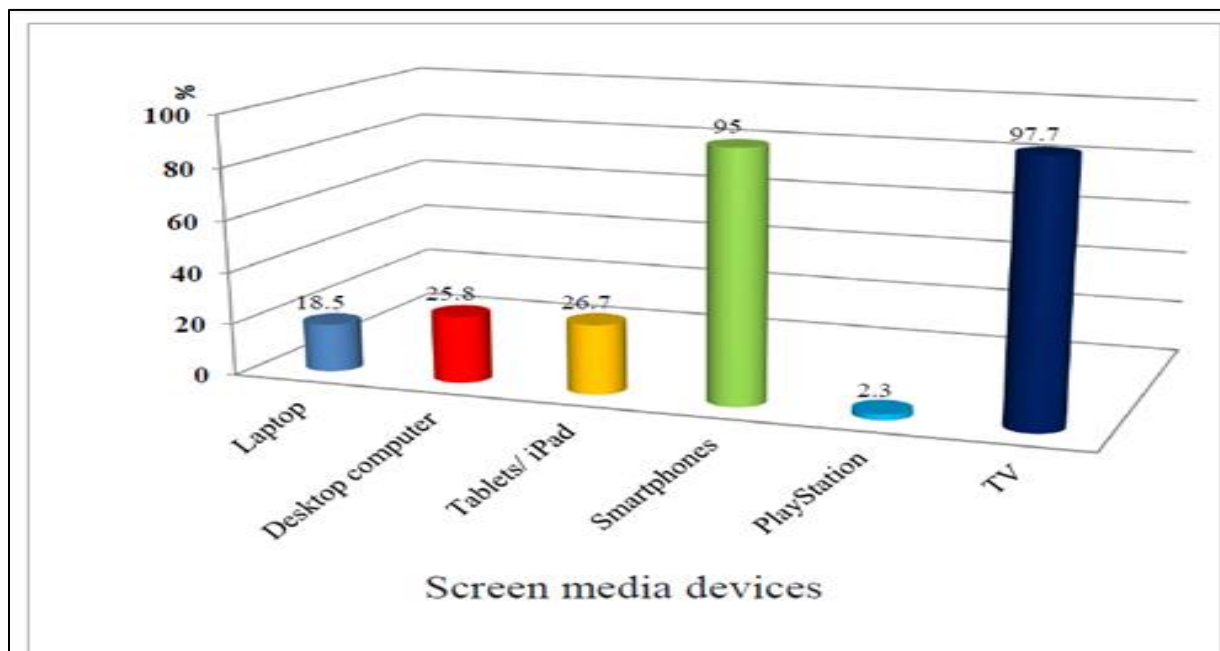


Table (2): Percentage distribution of the studied children regarding time of screen-based media devices use at specific periods of the day (n=341)

Items	Everyday	4-6 times/week	2-3 times/week	Never

	No.	%	No.	%	No.	%	No.	%
Within half an hour after waking up in the morning.	67	19.6	29	8.5	76	22.3	169	49.6
Within half an hour before going to sleep in the evening.	183	53.7	40	11.7	61	17.9	57	16.7

Figure (2): Percentage distribution of the studied children regarding excessive use of screen-based media devices

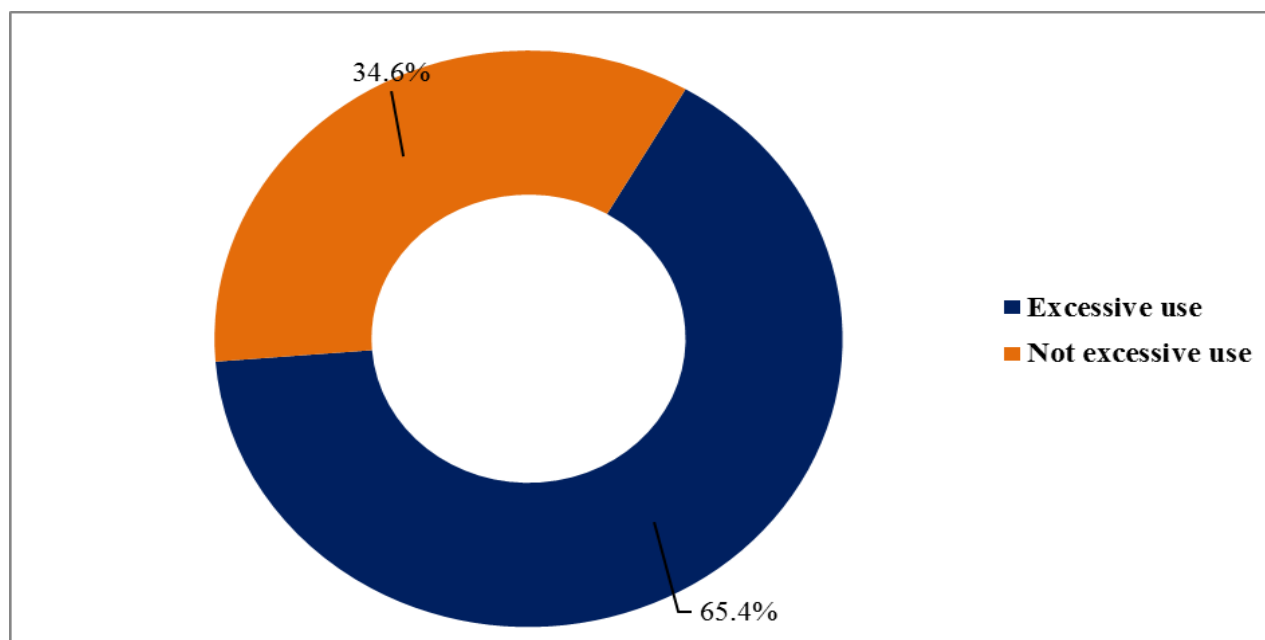


Table (3): Percentage distribution of the studied children regarding sleep duration each night (n=341)

Items	No.	%
Children's sleeping hours each night		

< 9 hours	271	79.5%
9-12 hours	70	20.5%
$\bar{X} \pm SD$	7.83±1.14	
Range	5-12	

Figure (3): Percentage distribution of the studied children with sleep disorders related to screen-based media devices use

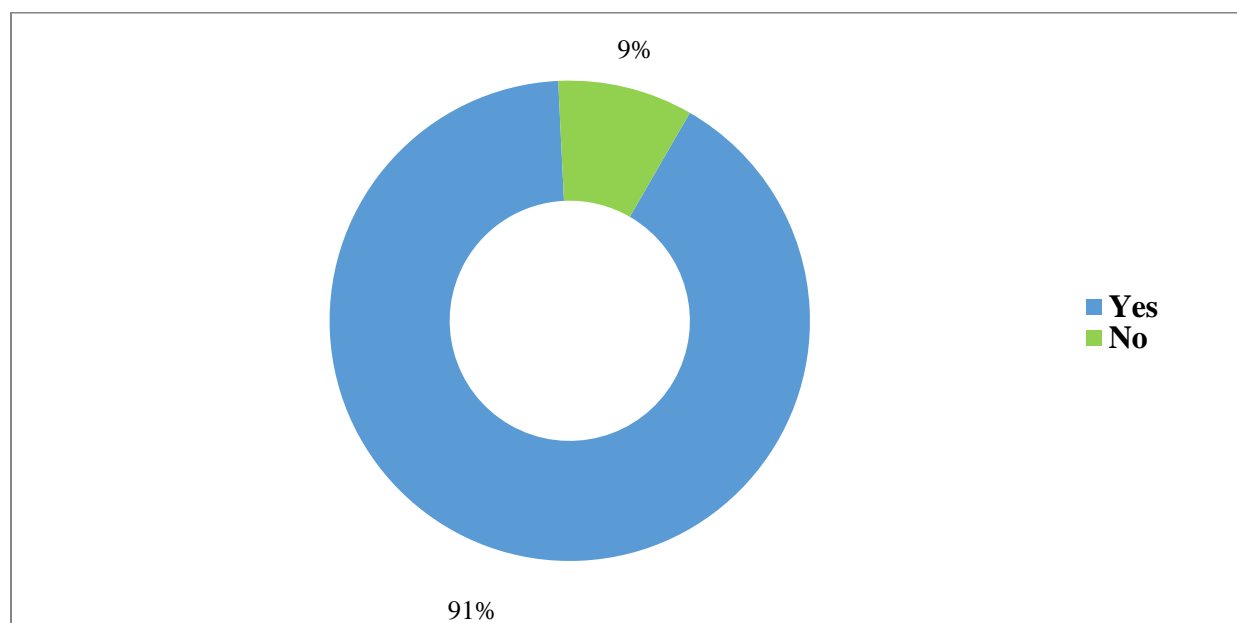


Table (4): Percentage of variance between studied children’s total screen-based media use and their total sleep habits domains score (n=341)

Model	R	R Square	Std. Error of the Estimate	F (P value)
1	0.262 ^a	0.068	7.88	24.85(<.001*)

Table (5): Correlation between screen-based media devices use and children's sleep habits domains (n=341)

Child Sleep Habits domains	Screen-based media use	
	R	P-value
Bedtime Resistance	.055	.311
Sleep onset delay	.125	.021*
Sleep duration	.190	<0.001*
Sleep anxiety	.052	.337
Night waking	.059	.279
Parasomnia	.079	.147
Sleep-disordered breathing	.217	<0.001*
Daytime sleepiness	.271	<0.001*

P value is significant <.05

7- R

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