كليـــــــة الـطـب
والصيدلة - مراكش
FACULTÉ DE MÉDECINE
ET DE PHARMACIE - MARRAKECH
MARRAKECH
جامعة القاضي عياض
UNIVERSITÉ CADI AYYAD

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Survey among Tiznitian parents about the use of digital technology by their children

THESIS

PRESENTED AND PUBLICLY DEFENDED ON 15/06/2023

BY

Mrs. Hajar LADNANY

Born on the 23th of August 1997 in Tiznit

FOR OBTAINING A DOCTORATE IN MEDICINE

KEY WORDS

Digital Technology – Children – Health Symptoms – Parent's Attitudes

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بسم الله الرحمن الرحيم

قالوا سبحانك لا علم لنا الا ما علمتنا انك أنت العليم الحكيم

صدق الله العظيم

"سورة البقرة الآية(٣٢) "

Serment d'Hippocrate

***Au** moment d'être admis à devenir membre de la profession médicale, je m'engage solennellement à consacrer ma vie au service de l'humanité.*

***Je** traiterai mes maîtres avec le respect et la reconnaissance qui leur sont dus. Je pratiquerai ma profession avec conscience et dignité.*

***L**a santé de mes malades sera mon premier but.*

***Je** ne trahirai pas les secrets qui me seront confiés.*

***J**e maintiendrai par tous les moyens en mon pouvoir l'honneur et les nobles traditions de la profession médicale.*

***L**es médecins seront mes frères.*

***A**ucune considération de religion, de nationalité, de race, aucune considération politique et sociale, ne s'interposera entre mon devoir et mon patient.*

***J**e maintiendrai strictement le respect de la vie humaine dés sa conception.*

***Même** sous la menace, je n'userai pas mes connaissances médicales d'une façon contraire aux lois de l'humanité.*

***Je** m'y engage librement et sur mon honneur.*

Déclaration Genève, 1948

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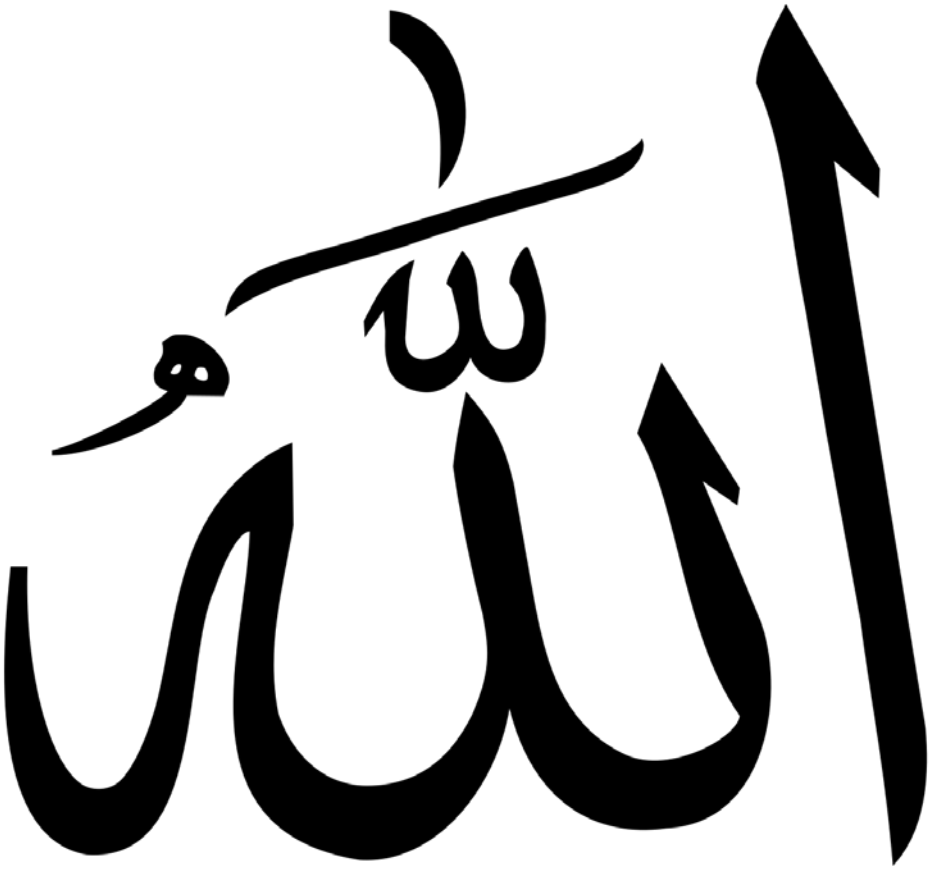
LISTE ARRETÉE LE 03/04/2023

DEDICATION

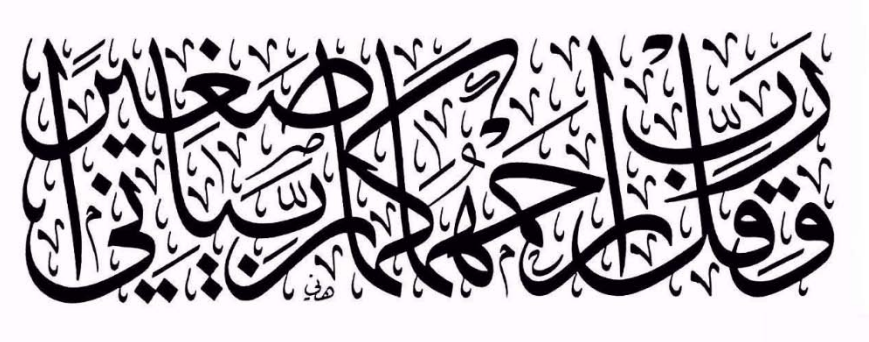
Toutes les lettres ne sauraient trouver les mots qu'il faut… Tous les mots ne sauraient exprimer la gratitude, l'amour, le respect, la reconnaissance que j'ai pour toutes les personnes qui m'ont soutenue pendant mon parcours. Aussi, c'est tout simplement que

Je dédie cette thèse à



Le tout puissant et miséricordieux, qui m'a aidé et qui m'a donné la force, le courage et la patience d'accomplir ce modeste travail.

Louanges et remerciements à Allah.



A Mes Parents, Les Êtres Les Plus Chers,

Je vous remercie pour tous les sacrifices et le soutien que vous m'avez apporté pendant ma maladie et tout au long de mes années d'études. J'espère que vous serez fiers de moi.

A MON TRES CHER PERE Mohamed LADNANY

Permets-moi de te rendre hommage en étant le premier à qui je dédie ce travail, qui est l'aboutissement de tes efforts en premier, et représente le couronnement de tes sacrifices généreusement consentis, que ce travail puisse exprimer mon immense gratitude et mon éternelle reconnaissance, si grande qu'elle puisse être, elle ne sera jamais à la hauteur de tes sacrifices et tes prières pour moi. A celui qui était toujours présent pour moi, à mon cher père qui a su me conforter durant mes moments difficiles, à la première personne à qui je parle lorsque je suis désorientée.Tu es la droiture, la générosité et l'homme à qui je dois absolument tout.

Je suis véritablement béni d'avoir un père qui a constamment démontré l'importance du travail acharné, de la détermination et du sacrifice. Je lui suis éternellement redevable pour ses conseils, son amour et les innombrables sacrifices qu'il a consentis pour moi et mon frère.

Cher père, tous les mots qui existent ne peuvent en aucun cas exprimer ma gratitude envers toi, tu as été et tu resteras pour toujours ma fierté, mon essentiel. Vous résumez si bien le mot père qu'il serait superflu d'y ajouter quelque chose. Que Dieu tout puissant vous garde et vous procure santé, bonheur et longue vie pour que vous demeuriez le flambeau illuminant le chemin de vos enfants.

Je t'aime papa

A MA PLUS DOUCE MERE Khadija NOUREDDINE

La femme de ma vie, je resterai à jamais endettée à ton amour inconditionné, à toutes les nuits que tu as dues passer à mes côtés durant ma maladie, à ta patience et à ta générosité. Tu es la bonté, la patience, la douceur, et la joie de vivre incarnées. Tu as fait énormément de sacrifices pour nous, tu nous as inculqués tant de valeurs, et tu nous as toujours poussés à nous surpasser pour être les meilleures personnes qu'on puisse être. C'est à travers tes encouragements que j'ai porté cette noble profession, et c'est à travers tes critiques que je me suis réalisé. Si j'ai pu surpasser toutes mes souffrances c'est parce que j'ai toujours puisé de votre amour et de votre tendresse. Tu m'as toujours donné de ton temps, de ton énergie, de ton cœur et de ton amour. Ta droiture, humanisme, sérieux et bonté me serviront d'exemple dans la vie.Je t'en serai à jamais reconnaissante. Ma mère, le bonheur de ma vie et ma meilleure amie, je serais toujours ta petite fille

En ce jour j'espère réaliser chère mère l'un de nos rêves, et j'espère ne jamais te décevoir, sachant que tout ce que je pourrais faire ou dire ne pourrait égaler ce que tu m'as donné. Puisse Dieu le tout puissant te préserver de tout mal, te combler de santé, de bonheur et t'accorder une longue et heureuse vie afin que je puisse te rendre un minimum de ce que je te dois.

Je t'aime ma maman d'amour

To my brother El Mekki LADNANY

Even though we fight almost all the time, and even though we are way too different, deep down we are very similar at heart. I will only say this here, and never in real life, so enjoy it while it lasts, thanks for being my big brother. I want you to know that our bond remains strong and constant, and I am grateful for the countless memories we have made together. Our shared values, humor, and unbreakable bonds make us a team that can conquer anything that comes our way. May Allah bringyou all happiness and success and help you achieve all your dreams.

A MON ARRIERE GRAND-MERE Hajja Rkia AGNAOU

Le symbole de notre famille.

A la femme forte que vous êtes, vous êtes la guerrière de notre famille, celle qui s'est battue pour le bonheur de ses enfants. Je vous dédie ce travail en témoignage de mon profond amour et admiration. Puisse Dieu, le tout puissant, vous accorder le plus haut degré de son Paradis.

A LA MEMOIRE DE MES GRANDS-PERES MATERNEL ET PATERNEL

Que ce travail soit une prière pour le repos de vos âmes. Puisse Dieu le tout puissant, le grand miséricordieux, vous récompenser et que vos âmes reposent en paix.

A LA MEMOIRE DE MA GRANDE-MERE MATERNELLE ET PATERNELLE

Vos images demeurent toujours présentes à mon esprit. Tellement vous me manquez ce jour-là. J'aurais tant aimé que vous soyez présents. Que Dieu ait vos âmes dans sa sainte miséricorde.

A khali lhajj Ahmed AGNAOU

Que ce modeste travail, soit l'expression de l'estime, le respect que je porte à votre égard
Que Dieu vous préserve santé et longue vie.

A Nanna HAJJA Fadma NOUREDDINE

Ton grand cœur a fait de toi mon refuge préféré. Tu m'as comblée d'amour depuis mon enfance. Tes prières et ton grand soutien m'ont accompagné tout au long de ma vie. Que Dieu te protège, et te procure santé et longue vie.

A mes tantes Aicha NOUREDDINE et Latifa NOUREDDINE

Toutes les expressions aussi éloquentes soient-elles ne sauraient exprimer ma gratitude et ma reconnaissance de m'avoir accueillie avec grand cœur au sein de votre maison sans hésitation. Je vous suis très reconnaissante pour le soin que vous me portez et pour l'amour que vous exposez. Qu'Allah vous bénisse et vous récompense pour votre gentillesse et générosité.

A ma tanta Rkia NOUREDDINE

Je vous dédie ce travail en témoignage de mon profond amour et de ma grande considération et en espérant être une source de fierté pour vous. Que Dieu, le tout puissant, vous protège, et vous procure longue vie, santé et bonheur.

To my uncle Houcine NOUREDDINE

Your place in our family is exceptional, we cherish you and respect your altruism and endless support. I've never told you this, but you have always been a role model whom I deeply admire and appreciate. May Allah protect you and grants you a long life to witness Amine fulfilling all hisdreams.

A la mémoire de mon oncle Mohamed NOUREDDINE

Cela fait maintenant cinq ans que tu nous as quitté, mais je suis convaincue que tu es désormais dans un endroit meilleur. Sache que ton absence laisse un grand vide dans mon cœur. Je garderai à jamais gravée dans ma mémoire ton affection, tendresse et « nabigha ».

Paix à votre âme Khali Mohamed, qu'Allah protège Aziz et l'aide à réaliser ses rêves.

A mes oncles et tantes : Aicha LADNANY, Abdellah LADNANY, Noufissa LADNANY, Ali LADNANY, Hassan LADNANY, et Mustapha LADNANY

Aucune dédicace ne saurait exprimer le respect que je vous apporte. Je vous remercie pour tout le soutien exemplaire. Que ce travail vous apporte l'estime, et le respect que je porte à votre égard, et soit la preuve du désir que j'aie depuis toujours pour vous honorer. Tous mes vœux de bonheur et de santé... Je vous aime.

A mes cousins et cousines

Pour tous les moments qu'on a passés ensemble, que ça puisse continuer éternellement comme ça. Que ce travail soit témoignage mes sentiments les plus sincères et les plus affectueux. Puisse Dieu vous procurer bonheur et prospérité.

A toute la famille LADNANY, NOUREDDINE et AGNAOU grands et petits

J'espère que vous trouverez à travers ce travail, le témoignage de mes sentiments sincères et de mes vœux de santé et de bonheur. Que Dieu le tout puissant, vous protège et vous garde

To my brothers and sisters from another mothers and their families

Rania ENNEJARI, Hamza EZZOUBAIHI, Reda Ennejari, Soukaina EZZOUBAIHI , Ilyass BKHIBKHI, Aya et Islam BKHIBKHI

To our memories together at les amicales! we don't meet so often but you will be forever in my memory, I am super proud of all of your achievements this far.May Allah bless you all.

To my BFFs Meryem KRAIM et Hafssa LAYOUNE and their families

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LIST OF ABBREVIATIONS

List of abbreviations

ANRT	**:**	National Telecommunications Regulatory Agency
AAP	:	American Association of Pediatrics
SP	:	Smartphone
MP	:	Mobile phone
PC	:	personal computer
TV	:	Television
N/A	:	Non applicable
IA	:	Internet addiction
IGD	:	Internet gaming disorder
PSU	:	problematic smartphone use
Kbps	:	Kilobits
Mbps	:	Megabits
SNS	:	Social Networking Sites
SAS	:	smartphone addiction scale
SAS-SV	:	smartphone addiction scale short version
ACC	:	anterior cingulate cortex
PCC	:	posterior cingulate cortex
PFC	:	prefrontal cortex
OFC	:	Orbitofrontal cortex
ACD	:	Allergic contact dermatitis
ADHD	:	Attention Deficiency and Hyperactivity Disorder
ASD	:	Autistic Spectrum Autism
RF-EMF	:	electromagnetic radiofrequency field effect
IARC	:	International Agency for Research on Cancer
GPA	:	Grade Point Average
DES	:	Digital Eye Strain
CVS	:	computer vision syndrome

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PLAN

INTRODUCTION

Digital technology has become an integral part of our daily lives, replacing many devices, and have revolutionized our lives over a few decades. Children are no exception to this trend, as they were “born digital”. This term is used by Palfrey and Gasser in their book Born Digital: Understanding the First Generation of Digital Natives(1). “Digital natives” is a term coined by Prenksy to refer to individuals who were born after 1980 and who have grown up immersed in a culture of computers and mobile technologies, as opposed to “digital immigrants” who have had to learn to use these devices later in life(2).

The use of mobile phones among children can have both positive and negative effects. On the positive side, mobile phones can provide a way for children to stay connected with family and friends, access educational content, and learn valuable digital skills. However, excessive use of mobile phones can lead to negative effects such as on children's health, well-being, and social development.

With the increasing availability and accessibility of smartphones, tablets, and other digital devices, children are becoming more immersed in the digital world from an early age. A study done in Morocco in 2018 by the ANRT (National Telecommunications Regulatory Agency) showed that nearly 91% of Moroccan children under the age of 15have internet access. Additionally, it is observed that 87.24% of children in the same age group possess a smartphone. (3)

This increased use of mobile phones among children has raised questions about potential health effects, especially since children are starting to use digital devices early. And the main difference between today’s children and adults concerning the use of these devices is the longer lifetime exposure of children when they grow older, even if this chronic effect from exposure to these devices use is still under debate.

In Morocco, the available information regarding the prevalence of digital technology use in young Moroccan children is very limited, additionally, it is still inclusive concerning the potential chronic health symptoms resulting from digital devices’ usage.

To shed light on this issue, the present study aims to:

- Carry out links between the use of smartphones between children and health symptoms from a medical and psychological perspective, and raise concerns about possible adverse health effects of digital technologies 'use among children.
- Investigate the prevalence of mobile phone use among Moroccan children aged between 3-15 years old.
- Appraise the impact of covid19 and online learning on the purchase of smartphones.
- Evaluate the awareness of Moroccan parents about the negative effects of mobile phone use on their children.
- Compare the results collected with those of similar studies.
- Set clear guidelines for parents on the optimal use of digital supplies, to ensure that the children can enjoy the benefits from mobile phones while minimizing the drawbacks.

This study is a call for reasoned vigilance, and thus stimulating reflection on this topic that can help parents and educators to surround their children for an adapted exposure to the screens and to better live in this new ''digital world''.

PARTICIPANTS AND METHODS

I. Study presentation:

Our research is a cross-sectional observational study, conducted using an anonymous questionnaire, where we explored digital technology use among children between the ages of 3-15 years old in the city of Tiznit (south of Morocco). We restricted our target to this range of age essentially due to a higher likelihood of starting smartphone use in this age group, and to compare our study's results to other studies that have also concentrated on this particular age group.

For that purpose, a questionnaire comprising 26 questions was made and delivered online, printed in paper form, and distributed to the target population at various locations: Hassan I hospital Tiznit, healthcare centers, and public garden. (Annex 1)

II. Time of collection:

The study took place over a period of four months: between November 2022 and February 2023.

III. Population:

Since children may not fully understand the validity of the study, which is a fundamental part of ethical concern, parents were chosen as the survey's interviewers.

Our sample consisted of 162 parents, and 6 cases with at least one item of missing data were excluded, resulting in 156 cases entered in the final database. After sorting the answers, it was revealed that we obtained a sample size of 272 children. The research was carried out in the city of Tiznit, located in the Souss Massa region of Morocco.

1. Inclusion criteria:

Tiznitian parents of a child(ren) from the age of 3 to 15 years old. Parents of both sexes with different social and intellectual classes, from different regions of Tiznit and willing to participate in this study

2. Exclusion criteria:

Any parent of a child under the age of 3 YO or over 15 YO, a foreigner, or those who refuse to answer the questionnaire.

IV. Questionnaire:

The survey was elaborated using an anonymous questionnaire, developed from questionnaires of similar studies consulted during the literature review. To avoid any information bias, the questionnaire was written in French and Arabic, using simple and understandable vocabulary. After completing the questionnaire on Google Forms, an introduction was added to orient the respondent and establish a first contact. (Annex 1)

The distribution of the survey utilized two methods: an online form through social networks such as Facebook and WhatsApp, and a printed form distributed in person at different locations. The questions were asked directly in Arabic dialect or Tamazight according to the choice of the person questioned.

It contains 26 questions: 3 multiple-choices, 20 single-choices, and 3 open-ended questions.

It is divided into four parts dealing respectively with the general characteristics of the population studied and the characteristics of the use of mobile phones by children, as well as their effects on children's health according to parents. The questionnaire, which can be completed in 5 minutes, was tested with 4 people before being finalized.

The first part aims to collect data on the personal and professional characteristics of the parent, including gender, age, and level of education of the parent. Also the age, gender, type of school, and housing area of their children.

The second part aims to assess the characteristics of the use of mobile phones among children.

The third part aims to appreciate the effects of screens on children's health according to parents.

The last part aims to evaluate the awareness of Moroccan parents about the negative effects of mobile phone usage on their children.

V. Digital technologies:

In this study, when we refer to Digital technologies, we mean the use of electronic devices (such as mobile phones not connected to the internet, smartphones, tablets, and computers. And we didn't include other devices since they are less used by the children.

VI. Ethical considerations:

The form is provided by Google Forms, this application respects the anonymity of the participants and the confidentiality of their information and it doesn't mention any personal elements of the respondent.

Participation in the study is unique, each participant is asked for a sincere answer.

VII. Statistical Data Entry and Analysis:

Results were recorded on a Microsoft Office Excel Plus 2019 database and analyzed with SPSS (Statistical Package for the Social Sciences) version 23.

The analysis included a descriptive study of qualitative and quantitative parameters with the calculation of percentages.

The bivariate analysis was conducted to determine the factors associated with digital devices' usage among children and the impact of Parental' concern on the children's pattern of the use. These analyses involved comparing percentages for qualitative variables using the Fisher's exact test.

The test was considered significant at a value of $p<0.05$.

The results were expressed as a percentage. They are reported in tables or represented in the form of histograms and sectors.

RESULTS

I. Demographic Data of the participants:

Our sample consisted of 156 parents, with more mothers 126 (80.8%) than fathers 30 (19.2%), and the age group between 30 and 49 years is the most represented in our sample (68.6%). Most of the participants 84% (131) were from the urban region of Tiznit.

It was determined that all participants have child(ren); 46,8% (n:73) had 1 child, 35.9% (n:56) had 2 children, 13.5% (n:21) had 3 children, and 3.8% (n:6) had 4 children.

Table I presents the demographic Data of the interviewed parents.

Table I: Demographic Data of the participants (N= 156).

Characteristic	N	%
Total		
Sex	156	100
Female	126	80,8
Male	30	19,2
Age group		
18-29	25	16,0
30-49	107	68,6
>50	24	15,4
Educational level		
Unschooled	16	10,3
Primary/middle school	23	14,7
High school	18	11,5
College	99	63,5
Region		
Urban	131	84,0
Rural	25	16,0

II. Evaluation of children using the devices:

1. Frequency of usage:

After the general socio-demographic data, the percentage of the use of digital devices among Tiznitian children between the age of 3-15 years old was examined. It was determined that 94.1% of children use a digital device with a 95% confidence interval [90.5%, 96.5%] (figure 1).

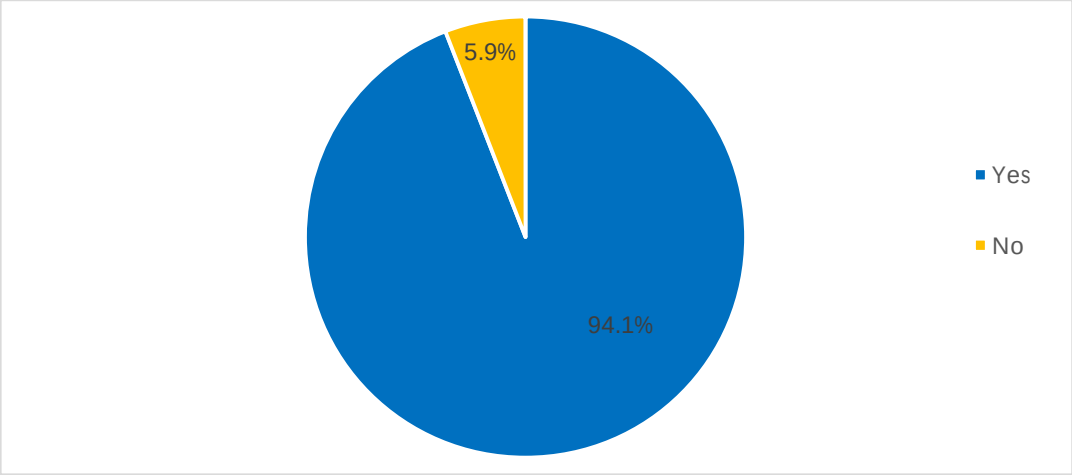


Figure 1: Frequency of usage of digital devices among Tiznitian children

2. Analysis of the use according to different socio-demographic variables and other general criteria:

2.1. Age:

The age group that uses digital devices the most is between 10 and 15 years old (37.6%) (Figure 2).

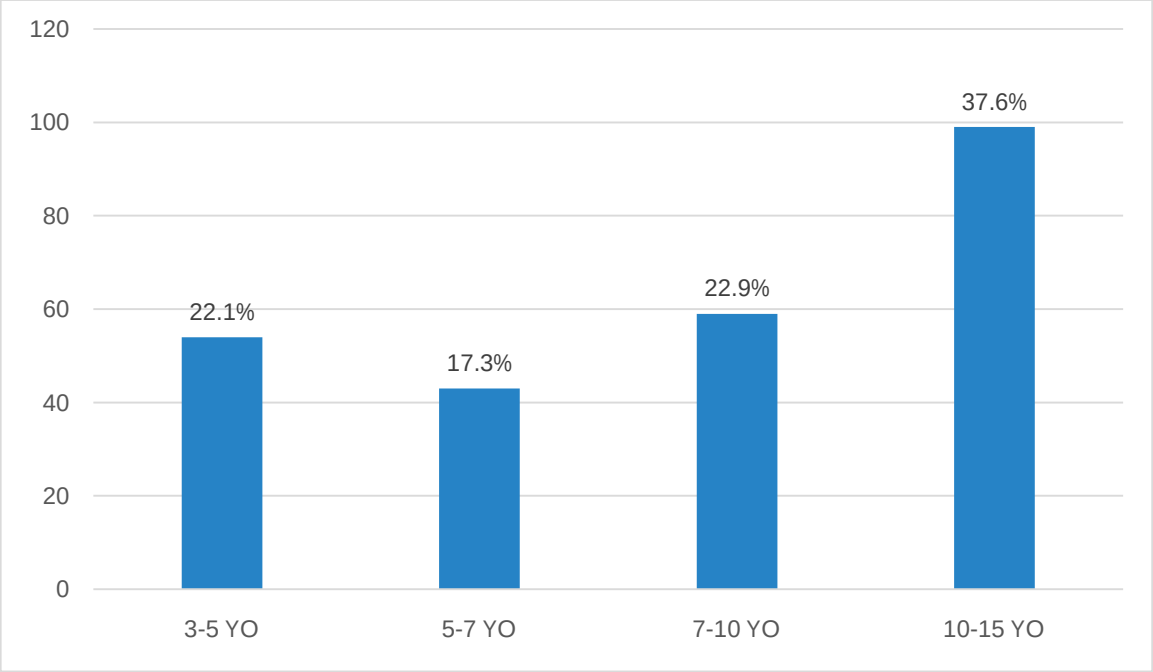


Figure 2: Age distribution of children

2.2. Gender

Boys use digital technologies more than girls, with a sex ratio of 1.14 (Figure 3).

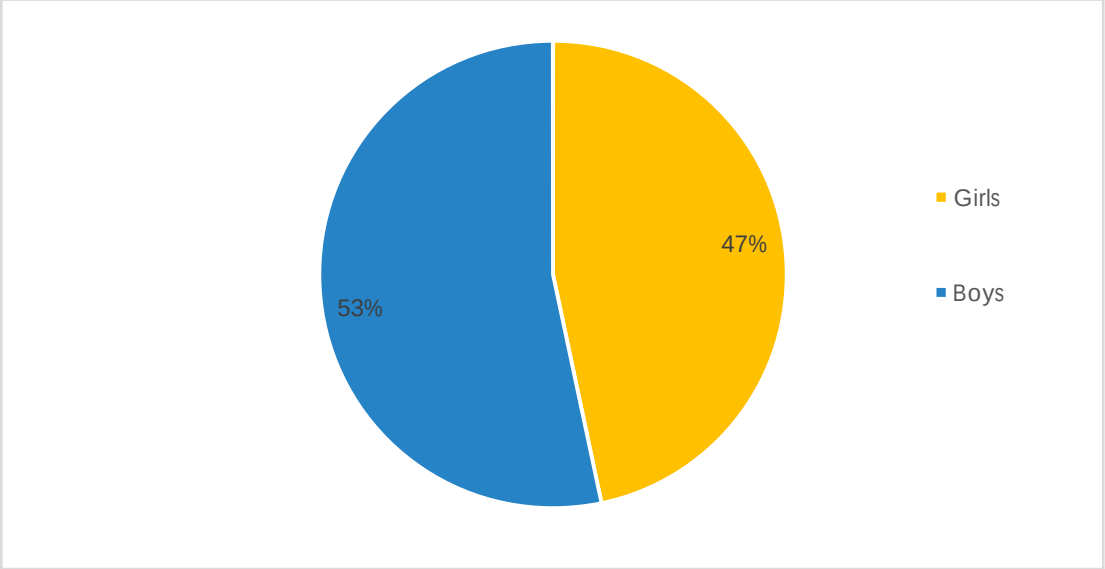


Figure 3: Gender distribution of children

2.3. Housing area:

The majority of digital technology users are from the urban region (86%), with a significant correlation between the urban region and the use of digital devices (Figure 4).

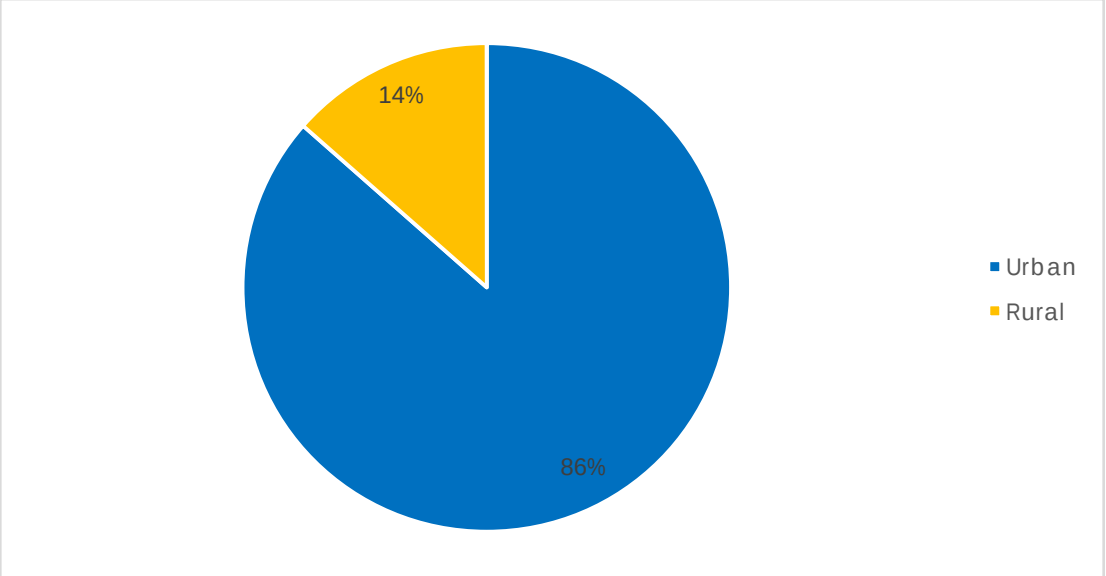


Figure 4: Housing area distribution of children

2.4. School Attendance:

Most digital device users attend a private school (54%) (Figure 5).

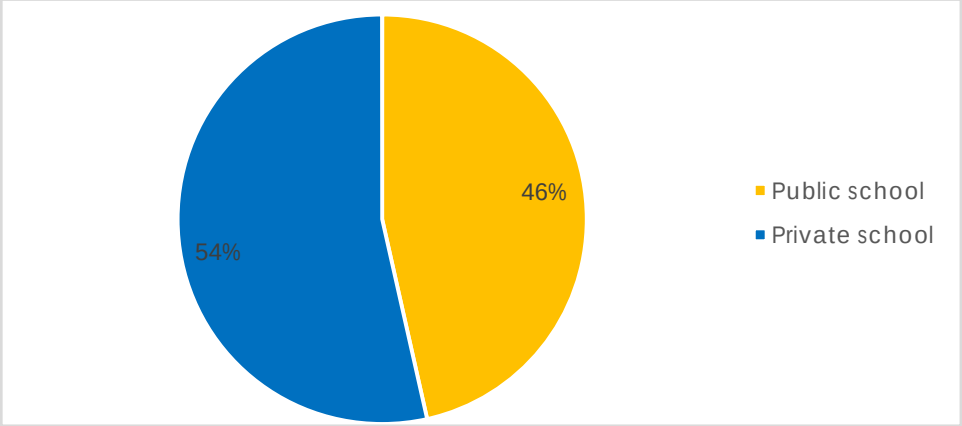


Figure 5: Distribution of children according to their schools

Table II: An overall table of the relationship between the usage of digital devices and different social demographic characteristics of children.

	The usage of digital devices n(%)		P
	Yes	No	
Age of children			
3-5 YO	54(90.0)	6(10.0)	0.16
5-7 YO	43(91.5)	4(08.5)	
7-10 YO	59(95.2)	3(04.8)	
10-15 YO	99 (97.1)	3(02.9)	
Gender of the children			
Girl	119(92.2)	10(07.8)	0.16
Boy	136(95.8)	06(04.2)	
Housing area			
Rural	35(74.5)	12(25.5)	<0.001
Urban	220(98.2)	04(01.8)	

3. The use of electronic devices:

3.1. Duration of the use:

Regarding the time spent by children on digital devices, 91.6% of children used them daily, (41.4% used them for less than 1 h, 27.5% used them for 1 h to less than 2 h, and 22.7% used them for more than 2h). Less than 1 h of use was the most common, and 8.4% only for weekends. (Figure 6)

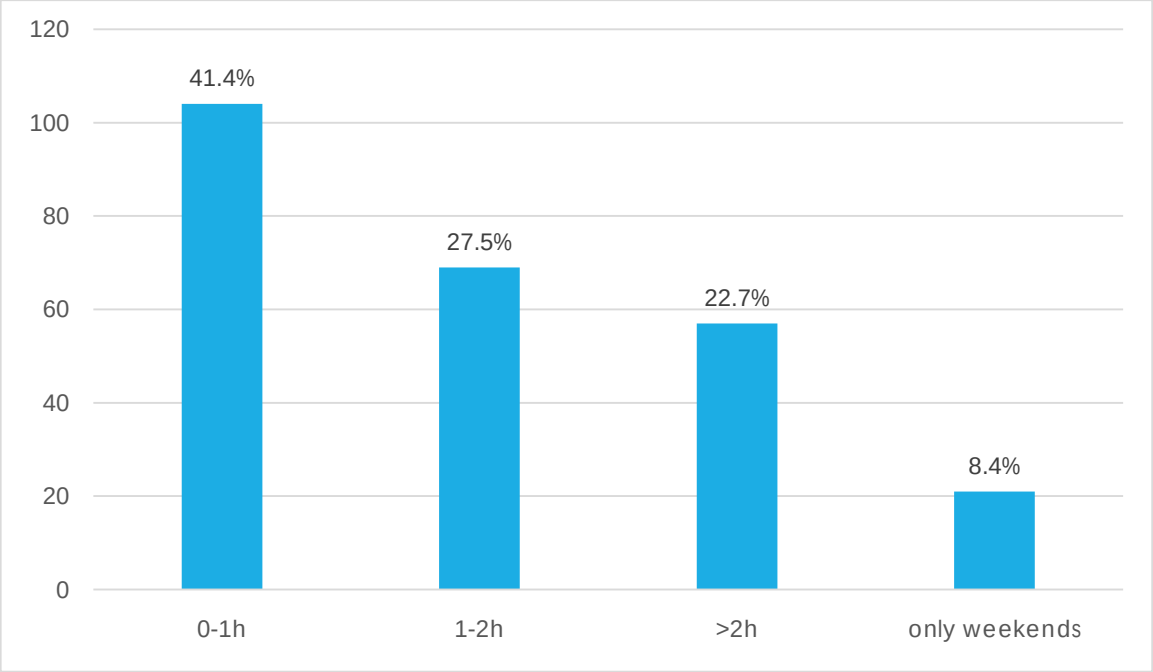


Figure 6: The time spent by children on their digital devices

3.2. Most used devices by children

We also examined the type of digital technologies that Tiznitian children use, accordingly,28.2% of the children have a smartphone, whereas, 17.6% own a tablet, 11.0% have a personal computer, and only 5.5% were using a classical touchtone mobile phone. (Figure7)

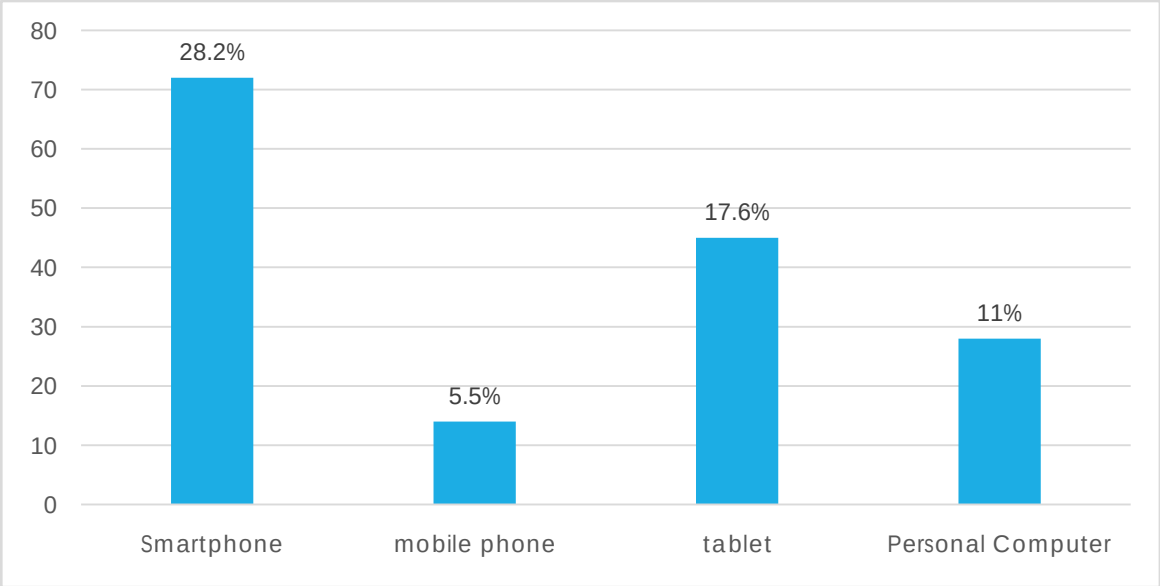


Figure 7: Type of devices owned by Tiznitian children

3.3. Number of children who have their own device:

Most children in Tiznit only share their devices with their families (50.2%), while 43.9% personally own them (Figure 8).

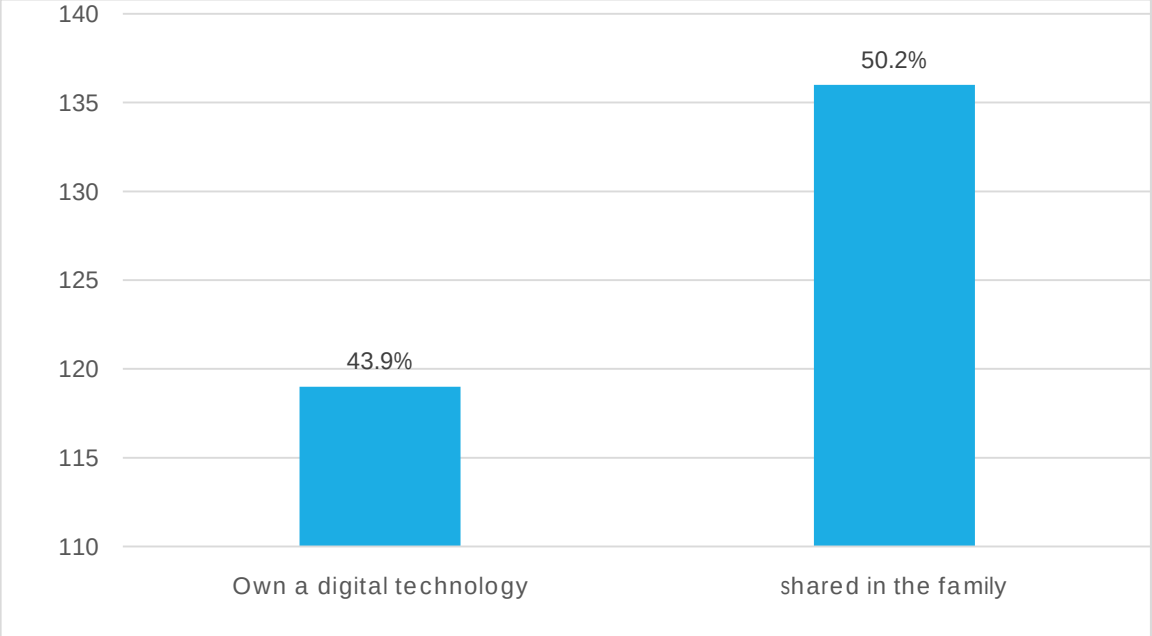


Figure 8: Percentage of children who have their own devices and those who share them with their family

3.4. Influence of Covid on the purchase of devices for children

In this study, we also examined the impact of COVID-19 on the purchase of digital devices. It was observed that 52.1% of the purchase was after the pandemic (Figure9).

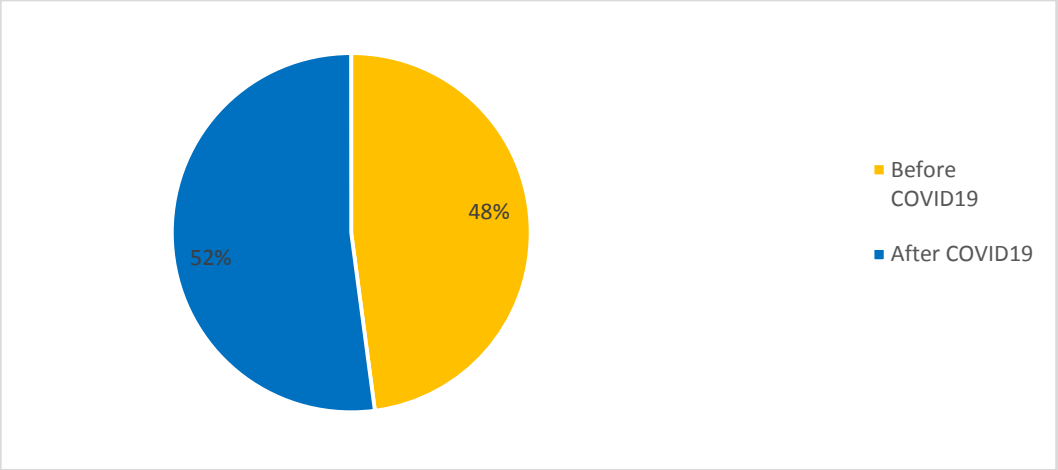


Figure 9: The purchase of digital devices and COVID-19

3.5. The activities for which children use their devices

The activities performed by children using media were more for entertainment than for educational reasons (Figure10).

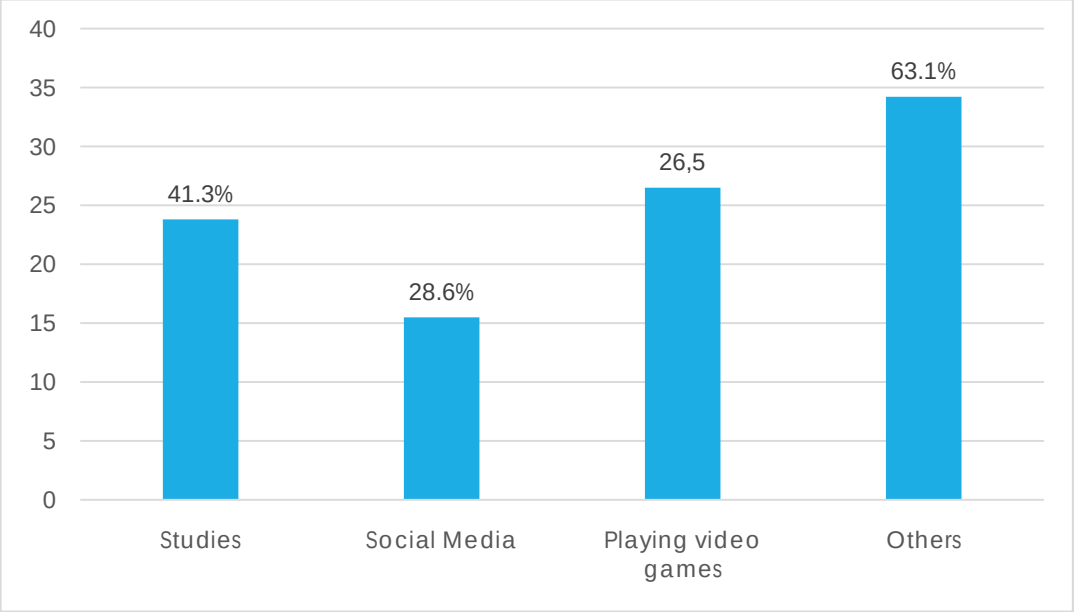


Figure 10: Activities for which children use their devices

III. Monitoring children's activities on their devices:

1. Predefined screen time:

The majority of Parents (54%) predefined screen time for their children (figure 12).

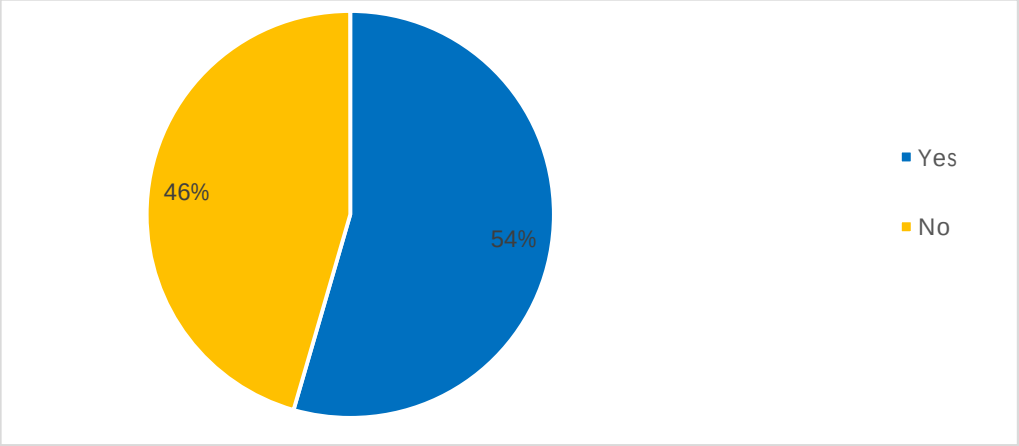


Figure 11: Predefined Screen Time by Parents

2. Means used by parents for monitoring:

The results revealed that 73.1% (114) of the parents supervise their children's activity on their devices. The majority of parents (57%) choose to control their children's activity by being present by their side (co-viewing), while 21% review the history, 13% use applications, 6% choose themselves the content, and 3% have the password of their children's device. (Figure 13)

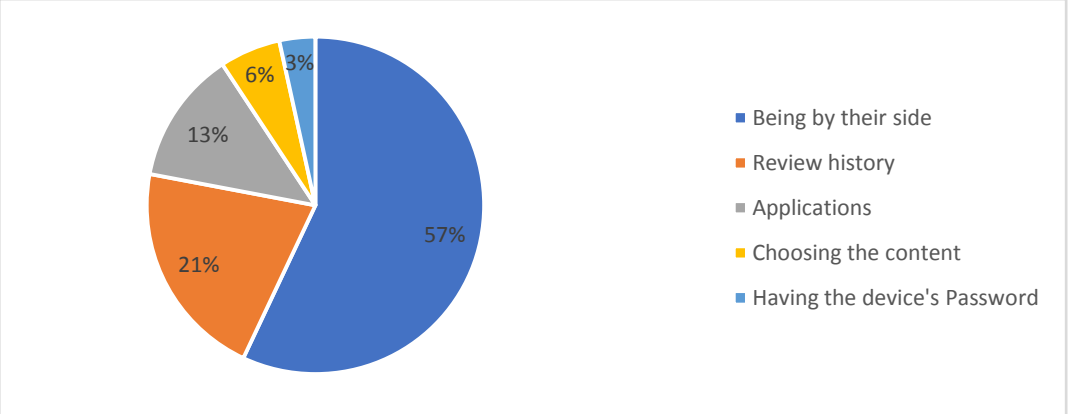


Figure 12: Means used by parents for supervision of children's activity on their devices

IV. Children's activities outside of the use of their digital devices:

1. Exploring alternative activities for children instead of screens:

The majority of children engage in activities other than playing with their devices. (82%) (Figure 14).

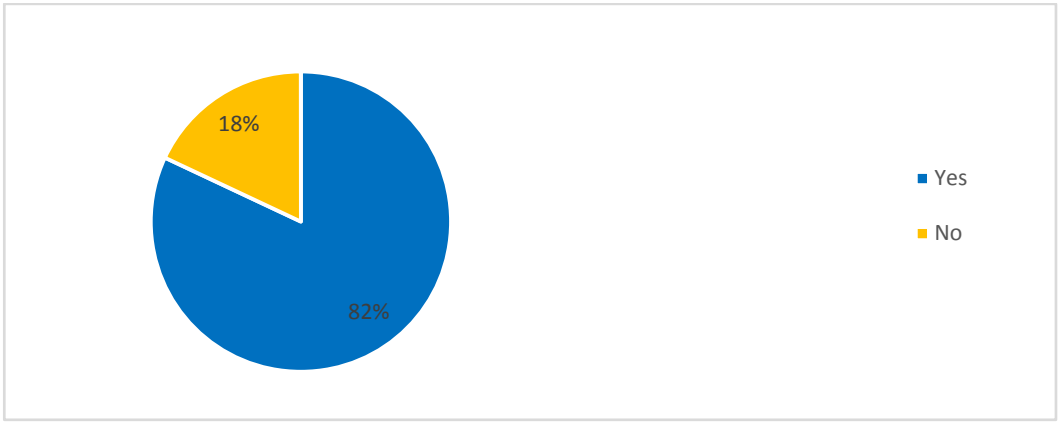


Figure 13: Alternative activities of children beyond screens

2. Children's Preferences: Non-Digital Activities vs. Device-based Play:

Almost half of the children prefer spending their free time using electronic media as their preferred leisure activity, more than any other single free-time activity (Figure 15).

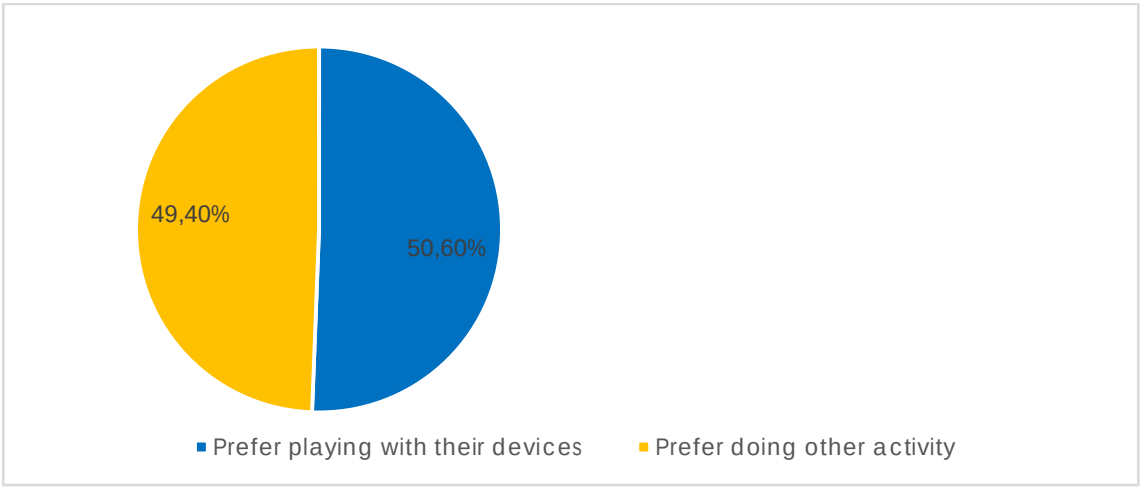


Figure 14: The most preferred leisure activities among children

V. Devices and health symptoms:

1. Reported physical and mental health problems in children due to the use of digital technologies:

The participants had noticed specific health complaints among their children due to the use of digital devices(Figure 15), the majority of which were anger (45.1%) and loss of concentration (38.0%), in addition, complaints related to the children's physical health have been noticed like insomnia (12.20%), eye complaints (19.10%) and lower back pain (17.10%).

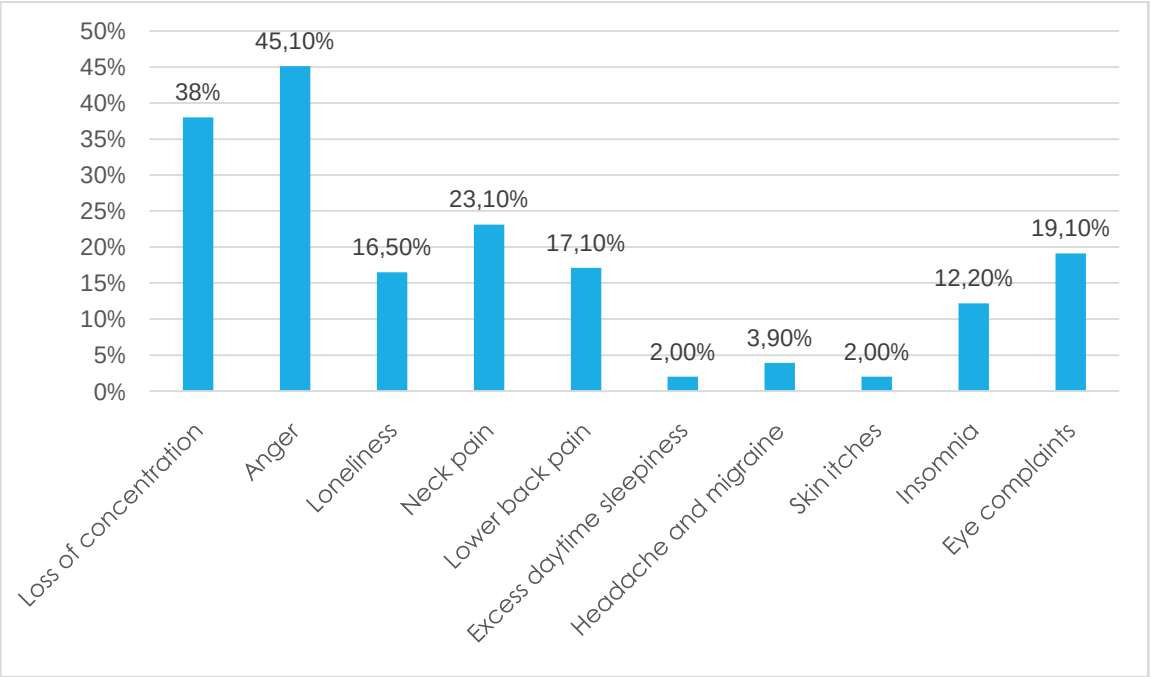


Figure 15: Reported physical and mental health problems in children due to the use of digital technologies

2. Parental Observations: Detecting deterioration in Children's Health after one year of digital devices' usage:

Only 30.2% of parents noticed a deterioration in their children's health after one year of digital devices usage (Figure 17).

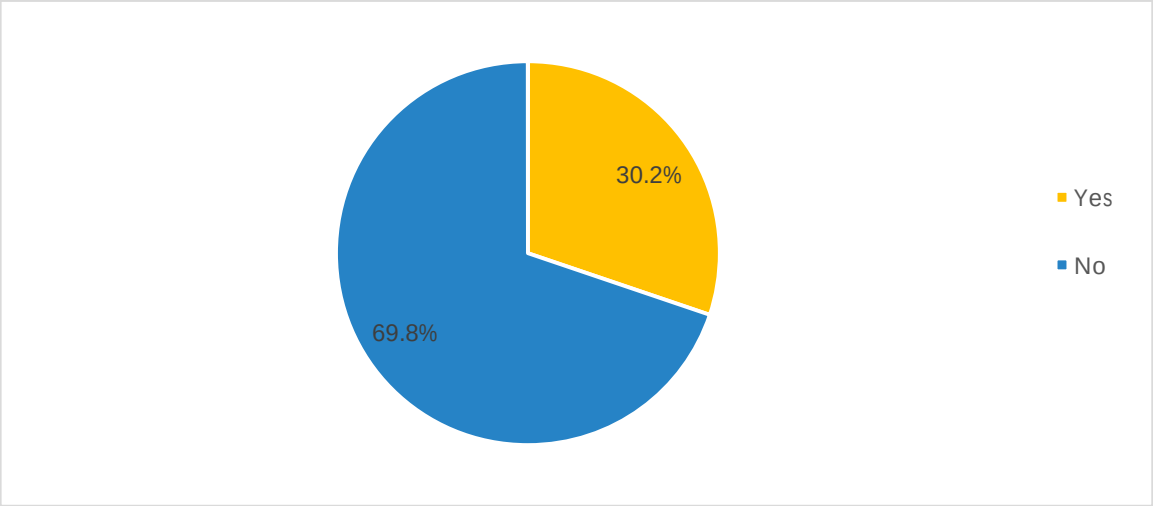


Figure 16: Detecting deterioration in Children's Health after one year of digital devices' usage

VI. Parents 'concern about the Detrimental Impacts of digital technologies' usage:

1. Parental concerns about digital technology use among their children:

the majority of parents were concerned about the detrimental effects of digital technologies (83%), while 17% were unbothered(figure 18).

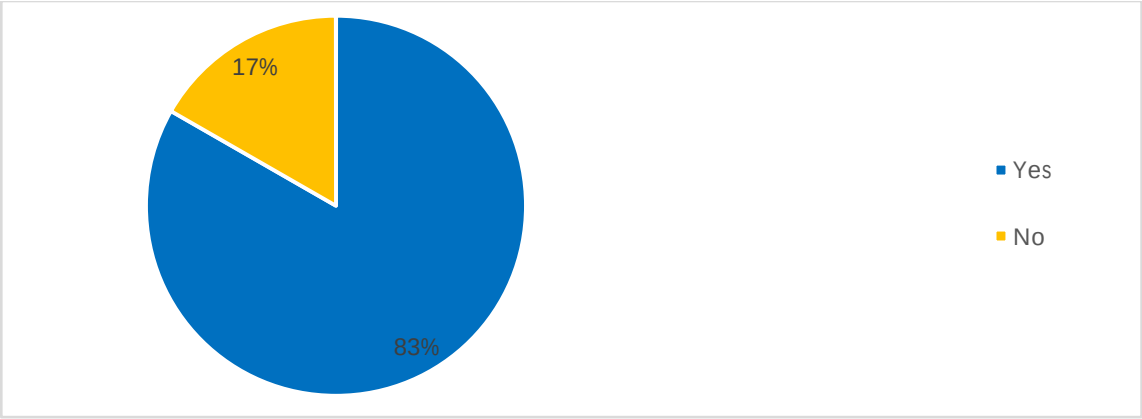


Figure 17 : Parental' Concern about the detrimental effects of digital technologies.

Most parents were worried that there could be side effects on their children's physical health (26.2%), The other reasons for parents' concern regarding the use of digital technologies are presented in the figure below (figure 19).

According to the findings, many parents experienced distress as their kids frequently ignored the opportunity to engage in physical play and social interactions in the real world, but instead they prioritized their online activities on digital devices.

- One parent expressed her dissatisfaction by noting the following:

"I am worried because our children are no longer sociable,
their virtual life has become more important than the real one"

- Another mother added:

"My child is completely isolated from the family atmosphere as if she does not live with us"

- Furthermore, some parents had noticed that their children are becoming addicted to smartphones:

"I think my kid is becoming addicted and I am especially concerned about his mental health. There seems to be a problem with communication. Concentration while studying has become almost non-existent. When I try to pull the phone away from him, I find a fierce resistance, anger, and crying. I do not know what to do sometimes."

- However, some parents find themselves obliged to give their children a mobile phone:

"Because the fact that I let him use a computer does not mean that I agree, but I am obliged to do so, he must learn to use the new technologies and must also develop immunity against their dangers, finally, we don't really have a choice."

"I am worried about its many psychological and physical negative aspects.

If it wasn't for the necessity (to study and to keep in touch with family), my daughter would not have her own phone."

-Most of the interviewed parents in this study stated that keeping abreast of technology is crucial for their children, but that the pattern of use must be well controlled to avoid harmful consequences:

"The phone has become an essential item in today's world. It is not something that children can be easily deprived of, and it is important for them to be supervised until they are capable of using it responsibly as adults."

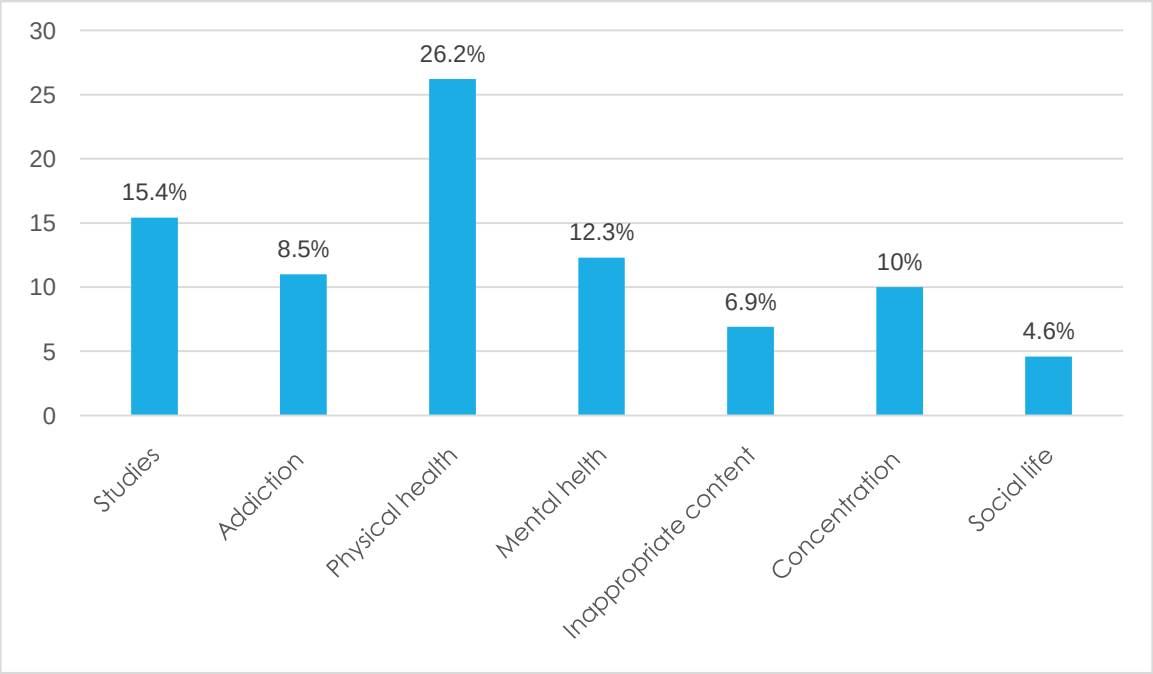


Figure 18: Reasons for parents' displeasure regarding the use of digital technologies

2. Vulnerability to sickness among digital technology users according to parents

Most parents don't think that their children are more vulnerable to sickness than other kids of the same age and do not use digital technology (58%)(Figure 20).

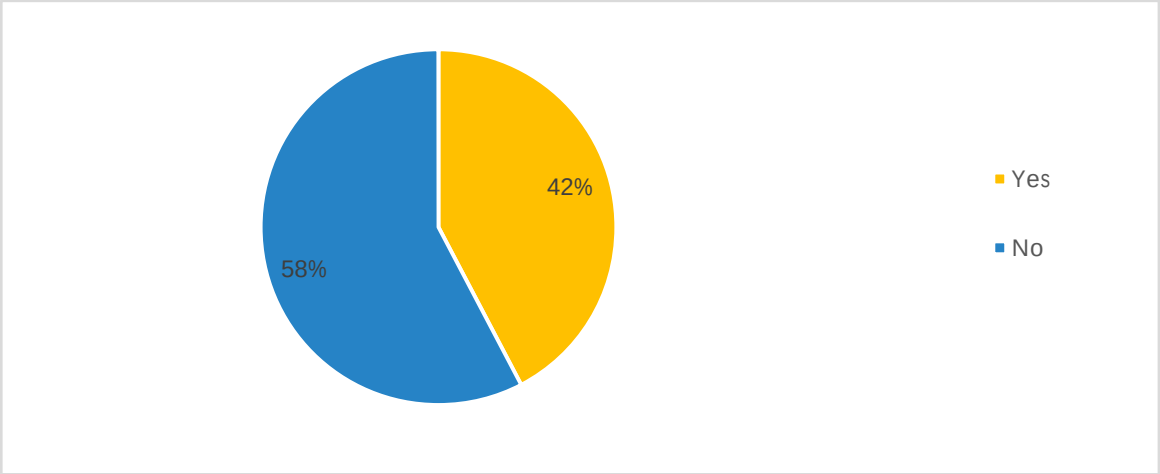


Figure 19: The thoughts of parents about the vulnerability of their children to sickness.

3. Influence of parents' age, gender, education level, or region on their levels of concern about the detrimental impacts of digital technology:

The results revealed that the parents' gender, educational level, and region had an influence on their concern about the detrimental effects of digital technologies. Mothers between the age of 30-49 years, educated and residing in urban region were the most concerned.(Table III)

Table III: Concerns of parents about children's health in relation to demographic characteristics of parents.

	The concern of parents about children's health n (%)		P
	Yes	No	
Gender			
Female	103(81.7)	23(18.3)	0.21
Male	27(90.0)	03(10.0)	
Age			
18-29 YO	19(76.0)	06(24.0)	N/A
30-49 YO	91(85.0)	16(15.0)	
>50 YO	20(83.3)	04(16.7)	
Education			
Not schooled	14(87.5)	02(12.5)	0.48
schooled	116(82.9)	24(17.1)	
Primary	13(86.7)	02(13.3)	N/A
Secondary	22(84.6)	04(15.4)	
Post-secondary	81(81.8)	18(18.2)	
Housing area			
Rural	24(96.0)	01(04.0)	0.048
Urban	106(80.9)	25(19.1)	

4. Examining the Potential of Parental concern in Reducing Children's Digital Device Usage:

Children use digital technology, regardless of their parents' level of concern about its negative impacts. (Table IV)

Table IV: Parental concern of detrimental impacts in relation to the overuse of digital devices among children

	Overuse of digital devices n(%)		P
	Yes	No	
The concern of parents about children's health			
Yes	215(93.9%)	14(6.1%)	0.304
No	40(97.6%)	01(2.4%)	

DISCUSSION

I. History of digital technologies:

1. Invention of the phone:

Communication has always been very important since the beginning. The revolution of communication reached a very different point On February 1876, when the American of English origin Alexander Graham Bell filed a patent for a voice transmission system. These are the research conducted from 1870 to transmit simultaneously several messages on the same messages simultaneously on the same telegraph line (invented in 1837), using alternating current and not continuous, which were to lead to the invention of the telephone.(4)

The history has retained March 10, 1876, as the date for the first transmission on electric wires of a voice message, when Bell managed to transmit to a room on another floor, where his assistant Thomas Watson was standing, a sentence that has remained famous "Mr. Watson, come here, I need you!".(5)

2. The evolution of the technology:

The introduction of cellular phones by MOTOROLA at the end of the 20th century (1983), further revolutionized communication opportunities. Thus, the first-generation analog cellular telephony (1G) began, though we didn't call it that at the time. But, as time goes by, users' needs encourage professionals to design and develop new technology to meet customers' requirements.(6)

Most recently, in three decades, rapid growth was marked in the field of wireless communication concerning the transition of 1G to 4G. This decomposition of the history of mobile telephony into several technological generations (1G, 2G, 3G, 4G) can be reviewed from the perspective of the quest for speed.

First generation (1G): 1G cell phone was launched between the 1970s and 80s, based on analog technology, which works just like a landline phone. It suffers in various ways, such as poor battery life, voice quality, and dropped calls. In 1G, the maximum achievable speed was 2.4 Kbps.

Second Generation (2G): In 2G, the first digital system was offered in 1991, providing improved mobile voice communication over 1G. In addition, Code-Division Multiple Access (CDMA) and Global System for Mobile (GSM) concepts were also discussed. In 2G, the maximum achievable speed was 1 Mpbs.

Third Generation (3G): When technology ventured from 2G GSM frameworks into 3G universal mobile telecommunication system (UMTS) framework, users encountered higher system speed and quicker download speed making constant video calls. 3G was the first mobile broadband system that was formed to provide the voice with some multimedia.

Fourth Generation (4G): 4G is the enhancement of 3G technology in which data speed enhances, with the improvement in QoS and internet facilities. It provides video calling and fast internet.

Fifth Generation (5G): 5G is a pillar of digital transformation; it is a real improvement on all the previous mobile generation networks. It promises to change the field of wireless communication with higher data rates to transfer the data from source to destination in real-time. It would also offer artificial intelligence (AI) features and unmatched speed with better performance along with a battery life of the devices.(6)

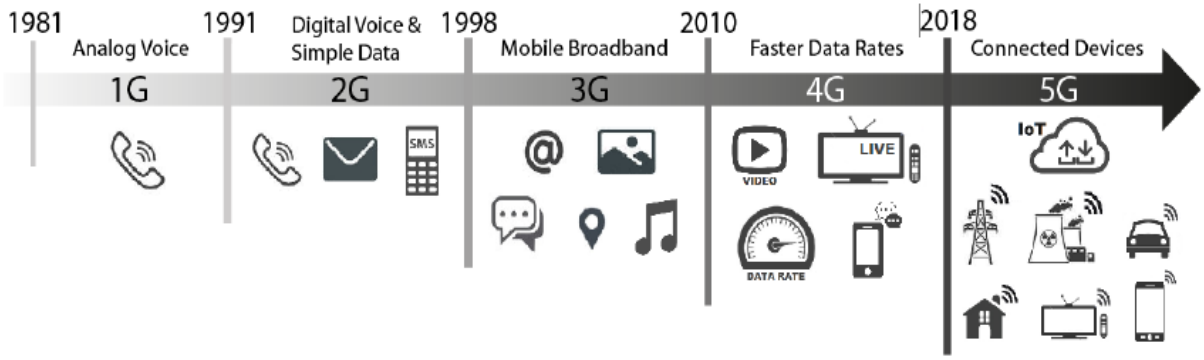


Figure 20: Evolution of Mobile Communication, from 1G to 5G(7).

Figure 21: Evolution of 1G to 5G technology(8).

II. Epidemiology:

1. International:

Over the last years, there has been a rapid worldwide increase in the use of digital technologies. According to Global System for Mobile Communications, the global number of mobile phone subscribers hit by the end of 2021, 5.3 billion people subscribed to mobile services, representing 67% of the global population, and this is expected to climb to 8 billion by 2025. (9)

Young people (15 to 24 years old) are the most connected age group. Globally, 71% of them use the Internet compared to 48% of the total population.(8,9)

Common Sense Media, declared that children between the ages of 8 and 12 spend an average of 4.5 hours a day using screens, with about half of that time spent on a mobile device.(12) . It is estimated that one in three Internet users worldwide is a child or adolescent under the age of 18.(10). However, the children from the lowest income countries use the internet least (figure 22). For example, in Africa, approximately 3 out of 5 young people don't have an access to the internet (figure 23).

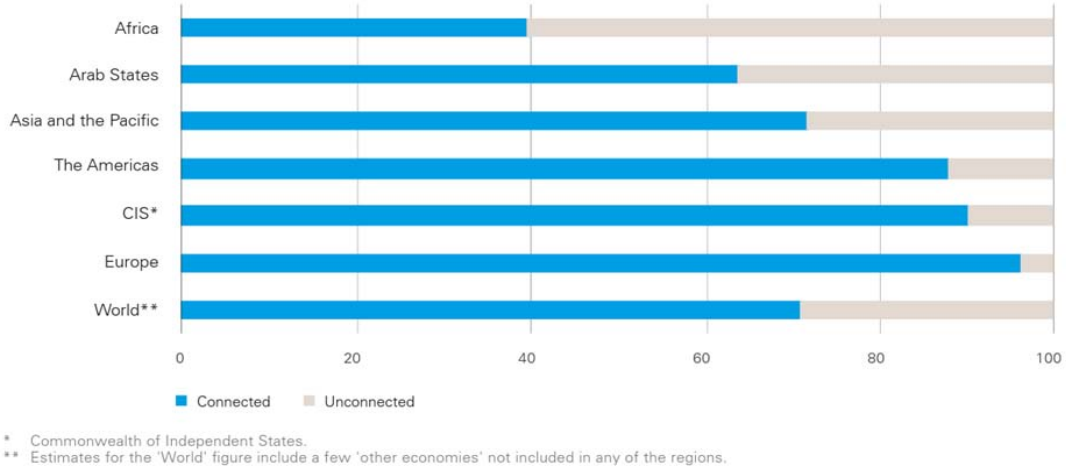


Figure 22: Percentage of 15-24-year-olds who are non-internet users by region, 2017.(10)

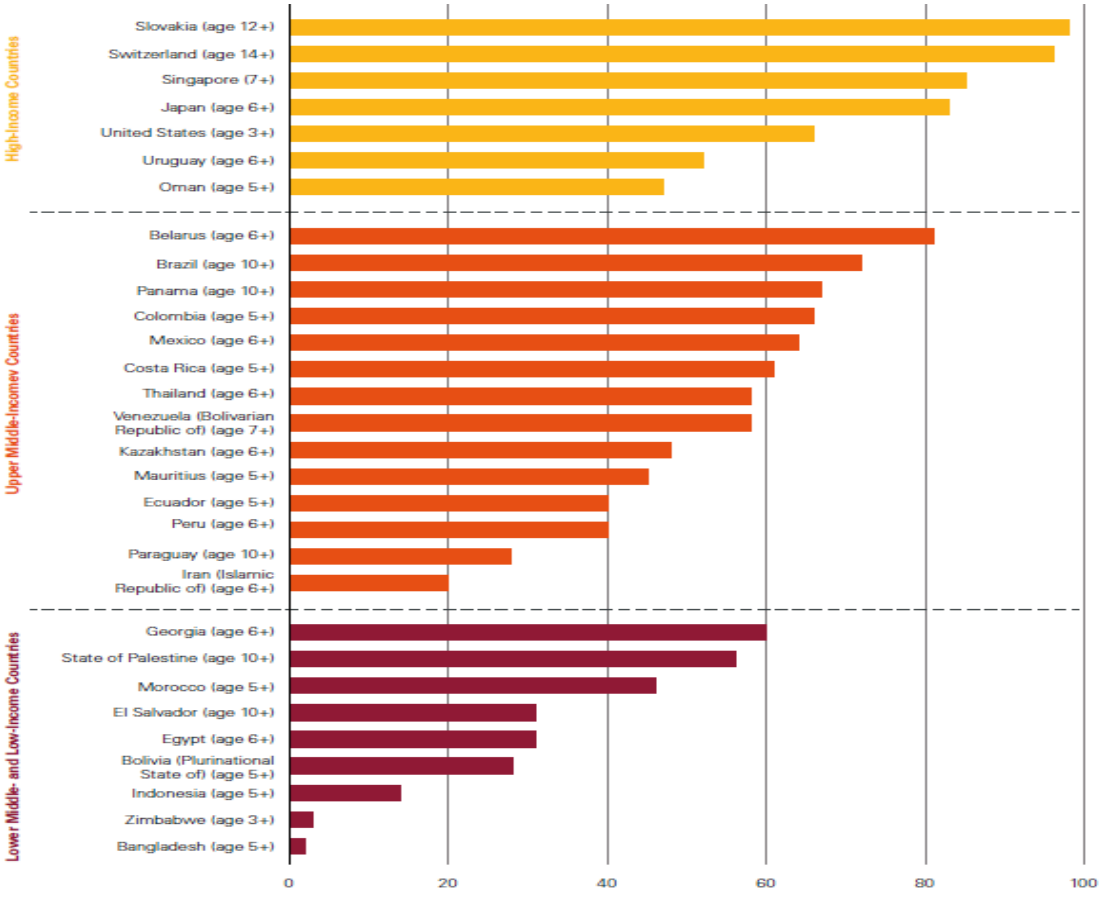


Figure 23: The percentage of under 15 years old using the internet, selected countries and territories, 2012-2016.(10)

2. National:

In Morocco, the latest report (2020) of the National Telecommunications Regulatory Agency (ANRT) (13), showed that there is an increase in the number of subscribers in:

Mobile telephony: + %10 per year on average; 49.2 million subscribers by the end of 2020;

Mobile internet: + %71 per year on average; 27.7 million internet users in 2020;

Fixed-line internet: %13+ per year on average, corresponding subscribers reached 1.6million by the end of 2020, including 218,000 FTTH (fibers to the home) lines.

The number of Internet subscribers is around 30 million, bringing the Internet penetration rate to 83%. Mobile internet is predominant in Morocco, accounting for more than93% of connections. As for fixed-line internet, about 99.93% of ADSL subscriptions are operated by Maroc Telecom.

In terms of fixed internet, Morocco is ranked 66th out of 206 countries with the lowest average monthly subscription cost of 324 dirhams per month. Additionally, Morocco is the 6th cheapest country in Africa in this respect.(14)

While neither Internet nor smartphone addiction prevalence was previously reported in Morocco, data revealed that 13 million are active mobile social users (37% penetration), 14 million are monthly Facebook users, 93% of them have access from their smartphones, and 45% are daily basis users.(15)

Moroccan children have more access to technology than ever before. According to the report of the National Telecommunications Regulatory Agency (ANRT)(3):

In 2020, 87.24% of children under the age of 15 years old own a smartphone, whereas, 27.5% own a PC or tablets, and 91% of Moroccan children under the age 15 years old have access to internet.

III. Digital technology and addiction:

1. Internet addiction:

Addiction, once limited to drugs and substances, now includes behavioral addiction, classified as impulse control disorder with a behavioral focus that resembles substance addiction in many domains such as phenomenology, natural history, neurobiological mechanisms, tolerance, comorbidity, and overlapping genetic contribution.(16,17)

Technological addiction, defined by Griffiths (1995) as a non-substance addiction that involves human-machine interaction, is a subset of behavioral addiction that shares similarities with the five core components of addiction including salience, mood modification, tolerance, withdrawal, conflict, and relapse.(18)

Several studies have addressed different technological addictions and corresponding instruments have been developed to assess these addictions. (19) These technological addictions include Internet addiction or problematic Internet use(20), social networking sites (SNS) addiction, and in particular Facebook addiction(21), online gaming addiction or problematic Internet gaming and online gambling.(22)

Internet addiction for Shaw et al. is characterized by "excessive or poorly controlled preoccupations, urges or behaviors regarding computer use and internet access that lead to impairment or distress".(19)

Internet addiction as defined by Hawi et al. is "repetitive usage of Internet-related apps driven by a need, inflicting problems primarily on oneself." (20)As for Internet gaming disorder, it was introduced as a psychiatric diagnosis in the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5). (23)

With the evolution of mobile phones to smartphones and by encompassing all of the internet features and mobile applications, the technological addictions cited above have been shifting gradually to smartphones. Several terminologies have been used by different researchers

to express the phenomenon of problematic mobile phone use (PMPU), (24)(25)such as mobile phone dependency(26), mobile phone addiction(27), and smartphone addiction(28). Nevertheless, it was argued that more research is needed before PMPU can be considered behavioral addiction.(25)

It is not the smartphone or the mobile apps that are addictive in nature. Instead, it is the academic deficiency that leads to smartphone addiction (20). For instance, Chinese young adults who were mobile phone addicts or possibly mobile phone addicts were found to be more vulnerable to have negative emotions compared to non-addicts. Students may turn to smartphone use to cope with stress, depression, anxiety, strained relationships, loneliness, and bad academic achievement. (29)

Studies conducted in Egypt and America showed that the risk for problematic Internet use was significantly increased among those who meet the criteria for severe depression(30,31). Other studies conducted in South Korea and Lebanon showed that those who have lower self-control and those who have greater stress were more likely to be addicted to smartphones(32,33). Whether a cause or an effect, smartphone addiction is detrimental to productivity in general and learning in particular.

2. The Dual Processing Model:

One of the most comprehensive of established neurobiological models explaining how addictive behavior relates to dysfunction within the brain is the dual processing model.

This paradigm describes addiction as an imbalance between the “go” network and the “stop” network. The go network, also called the reactive system (RaS), mediates immediate outcomes from behavior. The stop network, also called the reflective system (RfS), provides inhibitory control based on long-term projections (Figure24).

Key structures involved in the go network are the bottom-up mesolimbic and mesocortical dopamine pathways (including the nucleus accumbens), other parts of the striatum, and the amygdala.

Along the top of these pathways are key structures of the stop network, areas associated with control of impulses and attention, such as the ventromedial, dorsolateral, and anterior cingulate prefrontal cortices. Other vital stop network structures are associated with memory and affective states, such as the somatosensory cortex, the insula, and the hippocampus. The dual processing model allows clinicians to understand addiction as an imbalance of 2 competing forces, which parallels the ambivalence that patients with addictions typically display(34). A stronger go network and weaker stop network have been found in patients with substance use disorders (SUDs) as well as ADHD. The adolescent brain has an imbalance between the go and stop networks when compared with that of the adult brain, which may help explain why the onset of SUDs and IVGA often occurs in adolescence.(35)(36)

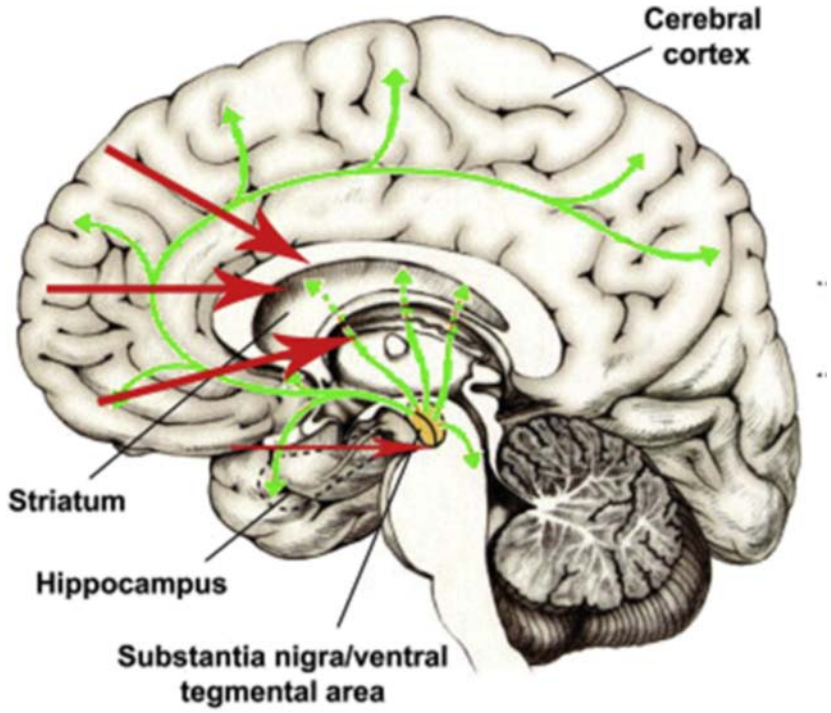


Figure 24: Dual processing reward system model. The green arrows show the direction of the bottom-up "go" network (reactive) and the red arrows show the direction of the top-down "stop" network (reflective). An imbalance between these 2 systems is implicated in addiction.(35)

3. Smartphone Addiction Scale (SAS):

Despite the lack of consensus in diagnostic criteria, many tools of screening and assessing the degree of Internet-related problems have been developed and used in research around the globe. Kwon et al. developed and validated the SAS (Smartphone Addiction Scale) based on the Internet Addiction Test (Young, 1998) which was modified to include features specific to smartphones. It consists of 33 questions that assess smartphone use primarily to identify the level of smartphone addiction risk, but not to diagnose smartphone addiction. and has a short version SAS-SV that comprises ten items.(28,37) .The SAS-SV responses are given on a 6-point Likert scale ranging from:

- Strongly Disagree to 6 - Strongly Agree. The total scores ranged from 10 to 60.

Neurobiological effect of internet addiction:

Neurobiological research has provided increasing evidence to support the idea that the prefrontal cortex (PFC) is closely linked to the development of Internet addiction (IA). This suggests that adolescents may be particularly susceptible to IA due to this brain region's incomplete yet rapid development during this stage of life(38). To give few examples, Using MRI, adolescents with Internet Gaming Disorder (IGD) have been scanned. Compared with controls, a decreased thickness was reported in key cortical regions of IGD subjects: the orbitofrontal cortex (OFC), the insula, and the entorhinal cortex (39). It is tempting to link this structural finding with an impaired cognitive control, resulting – for these IGD adolescents – in a decreased ability to voluntarily drive their own Internet-related activities. On the other hand, increased cortical thickness was also observed in the precuneus and inferior/middle temporal cortices (39). These brain regions, associated with visual imagery and memory, have been related to craving as induced in addicts by drug-related cues (40). It is tempting to speculate that, in people suffering from IGD, a 'true' craving for Internet may be elicited by stimuli associated with gaming (e.g., commercial ads, or other cues).

In other studies, adolescents with IGD or otherwise addicted to Internet had less grey matter in the anterior cingulate cortex (ACC), posterior cingulate cortex (PCC), dorsolateral PFC, OFC, and insula(41)(39).

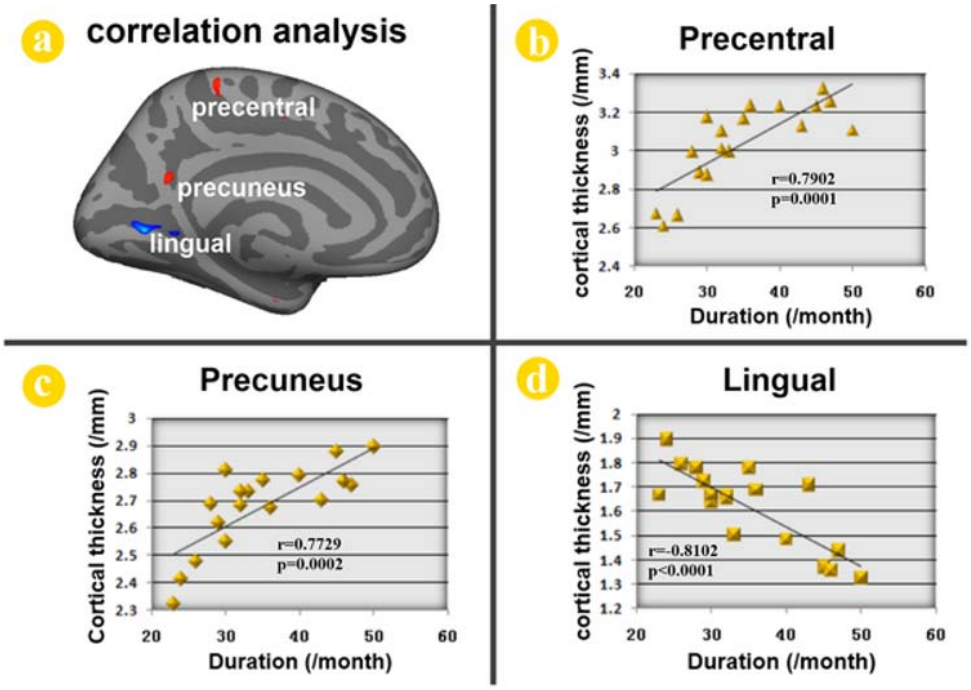


Figure 25: Correlation analysis results between cortical thickness and duration of online gaming addiction in late adolescence with online gaming addiction(39).

Weinstein et al. studied neurobiological mechanisms underlying internet gaming disorder, and found that adolescents with IGD share, to a large extent, neurobiological alterations that are typical for other addictions, such as:

- Activation in brain regions associated with reward, as evident from cue exposure and craving studies and neurotransmitter systems studies that indicate an involvement of dopamine-mediated reward mechanisms
- Reduced activity in impulse control areas and impaired decision making
- Reduced functional connectivity in brain networks that are involved in cognitive control, executive function, motivation, and reward.

Furthermore, there are structural changes, mainly reduction in gray-matter volume and white-matter density. Additionally, according to Park et al. Smart phone addiction among young children degrades function of right brain by brain balance according to brain wave test. Furthermore, smart phone does not fit early childhood development stage because it is a very passive tool which you just sit down and absorb the knowledge. The function of frontal lobe in brain which relates to the ability to think, judge, and concentrate is damaged, so that normal brain development is hindered(42).

IV. Discussion of descriptive results:

1. Children's patterns of digital technology use:

1.1. Number of users:

Although there is an increasing trend of digital technologies use in children and adolescents in most parts of the world, there is a variation in the prevalence of mobile media use in young people in different countries. In our study, it was determined that 94.1% of children use a digital device with a 95% confidence interval [90.5%, 96.5%].This result is in agreement with a Moroccan study conducted by the National Telecommunications Regulatory Agency (ANRT), in 2020, that showed that 90.34%of Moroccan children aged 5-15 use digital devices(3). In a study carried out by Kucuk et al., it was reported that approximately 92.8% of the children involved in their study had mobile phones(43).A Belgian study revealed that 95.6% of the children surveyed have or have access to smartphones (44).approximately one-quarter of American teenagers describe themselves as "constantly connected" to the Internet (45).

Table V: Number of digital technology users according to the literature.

Author	Country	Year	Number of digital technology users
Kucuk(43)	Turkey	2020	92.8%
Bernard(44)	Belgium	2016	95.6%
ANRT(3)	Morocco	2020	90.3%
Our study	Morocco	2023	94.1%

1.2. Analysis of the use according to different socio-demographic variables:

a. Age:

In our study, the age group with the highest frequency of digital technologies use was between 10 and 15 years old. As the age range decreases, the frequency of use decreases as well. This result aligns with The National Telecommunications Regulatory Agency (ANRT) reports in 2020.(3)(Figure 26) (Figure 27).

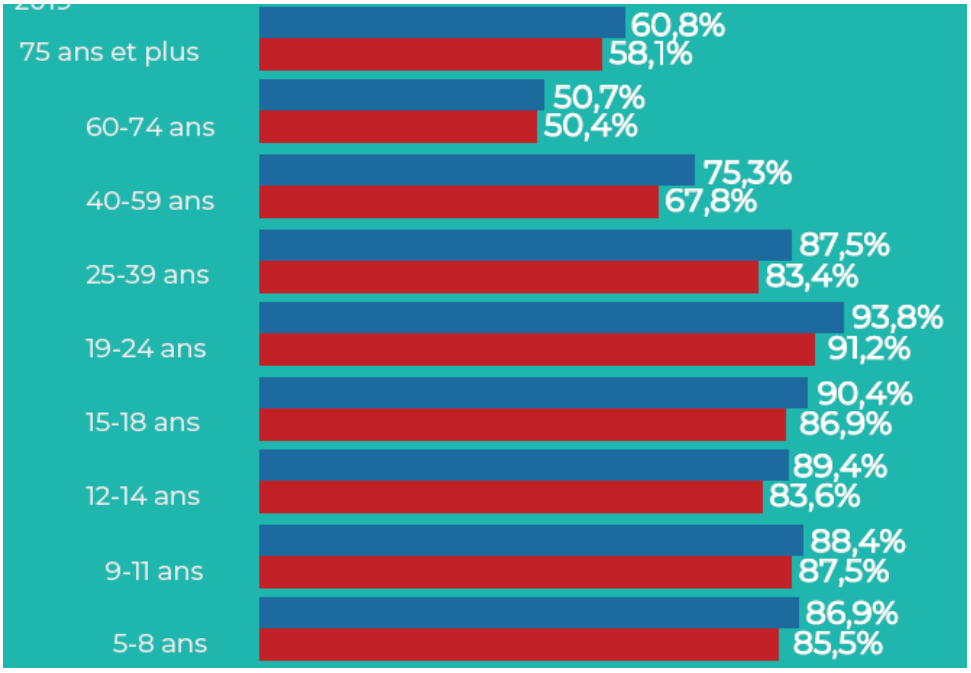


Figure 26: Smartphone equipment by age in Morocco.(3)

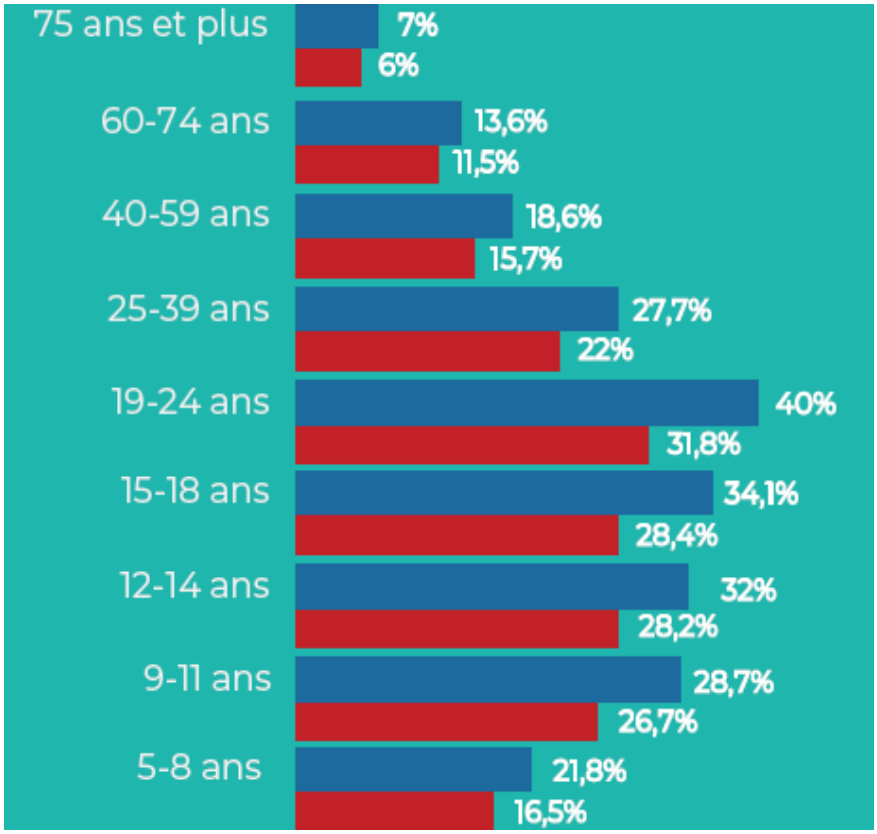


Figure 27: Computer and/or tablet equipment by age in Morocco.(3)

Internationally, a study on Turkish children reported that the mean age of a child at the moment they have been given a mobile phone was 12.1±2.5 years (min: 3.0, max: 18.0). Further, Mobile technology is becoming increasingly available to younger children, and they are starting to own their own mobile devices at a younger age. According to a recent study, 89.79% of American preschoolers use digital devices (46). Kabali et al. found that most American children started using digital devices before age 1, and three-fourths of them had their own device by age 4 (47).In a study carried out in Canada, it was found that The older the child, the greater the likelihood that they will have their own digital device.(48)

Moreover, some studies found age to predict problematic usage(49,50) or to be associated with it (51,52,46).Some studies have shown that older adolescents(49,50), or older girls (52)are more prone to problematic usage, while others indicate a higher prevalence among younger pupils (aged 11-14)(51)or high school students as opposed to university students(46).

However, others found no correlation between age and problematic usage(47,53).Additionally, a study conducted in South Korea showed that the rate of smart phone addiction among children reaching twice of adults.(53)

b. Gender:

Findings of this study stated that there were more male users of digital technologies than females with no significant relation between gender of children and digital technologies' frequency of usage ($p<0.01$). This is in contrast to a Saudi study among college student(54) that found that 61.4% of users were male. Additionally, According to UNICEF's recent report, girls are least likely to go online in low-connectivity countries(10).(Figure 28)

Moreover, a study in Romania(46) showed that boys and girls use their phones for different reasons: Girls spend more time on social media or text messaging, while boys are more interested in video gaming, media sharing, and Internet searches.

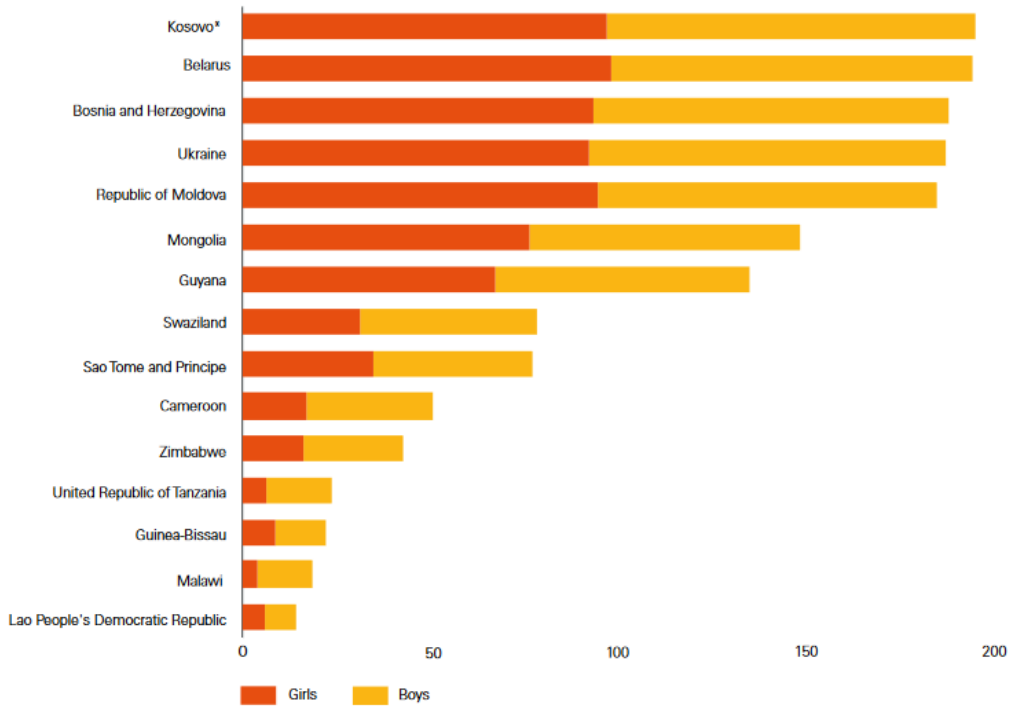


Figure 28: Percentage of 15-19-years-old who used the internet in selected countries, between 2012-2016.(10)

Some studies linked gender to smartphone addiction and showed that males were usually more addicted to phones than females((55),(56),(57)).

Actually, we should focus not only on the gender differences in the prevalence of Internet addiction, but also on the gender differences in the formation mechanism of Internet addiction. social role theory provides a theoretical basis for understanding gender differences. It argues that different social divisions of labor can make a difference in the shaping of gender roles(58). Specifically, men are socialized to be independent problem-solvers, while women are socialized as warm, compassionate, sensitive, and emotionally expressive(59). Thus, these gender roles can result in different coping strategies and levels of tolerance when faced with uncertain situations, which in turn may affect their levels of Internet addiction. In addition, girls are asked to manage their behavior effectively in the social contexts, so they may prioritize self-control in their daily activities more than boys. For example, girls may pay a greater emphasis on avoiding losses than males and exhibiting greater self-control (60, 61). However, it was not common finding and several studies showed that females were actually more addicted to phones than males(62,63,64).In contrast, other studies revealed that male and female are equally susceptible to smartphone addiction(65,66). Exploring gender differences among internet addict is helpful for understanding the mechanism of Internet addiction more accurately and providing more effective guidance for the Internet addiction intervention among children.

c. Region:

Region plays a role in children's access to digital devices. In our results, children from urban region have greater access to digital devices than those from rural region, with a significant relation between the region and digital devices frequency of usage (<0.01).

This finding is in agreement with ANRT's report, as they also noted that there is still a disparity in terms of internet and digital devices access between urban and rural areas(3).Another study carried out in Italy revealed that 82.6% of children residing in urban areas were the privilege of using digital devices.(67) (Figure 29, 30, 31)

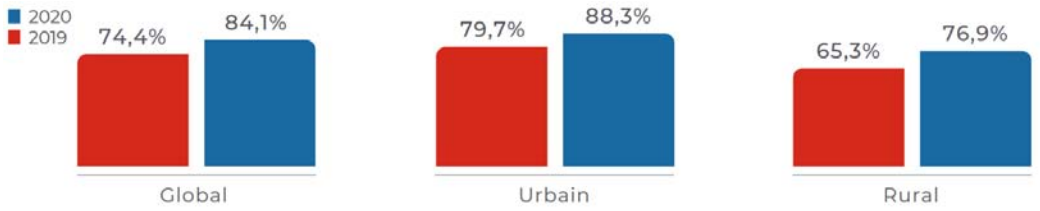


Figure 29: Distribution of Moroccan internauts aged 5 years old and above based on the housing region.(3)

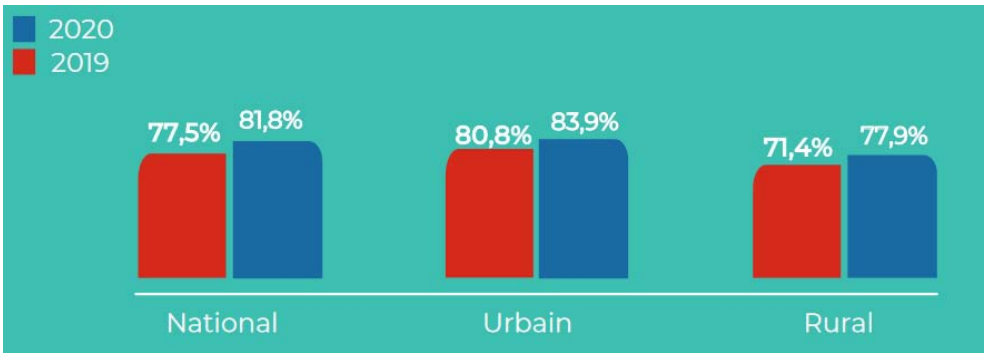


Figure 30: Distribution of smartphones' ownership among Moroccan individuals aged 5 years old and above based on the housing region.(3)

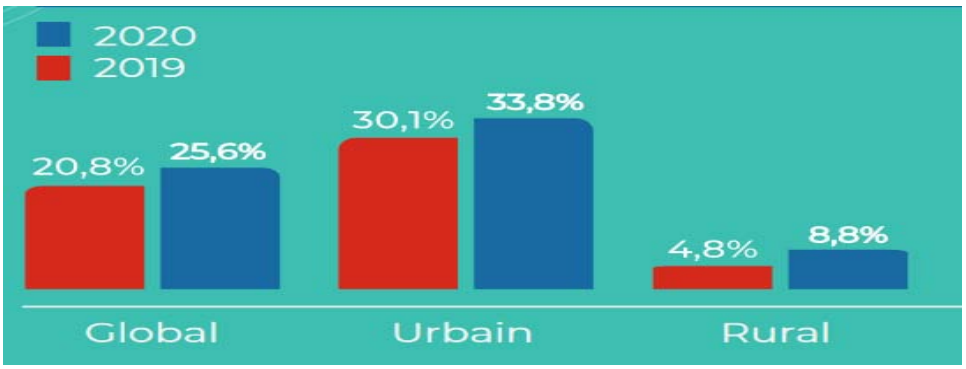


Figure 31: Distribution of computer and/or tablets' ownership among Moroccan individuals aged 5 years old and above based on the housing region.(3)

However, after Covid19 pandemic, the access to digital devices in rural areas has increased significantly by over 83%, against + 12% for the urban world.(3)

The low access to internet and digital devices in rural regions is not limited to Morocco, as UNICEF has also noted that youth in rural areas are less likely to go online.(10) (Figure 31)

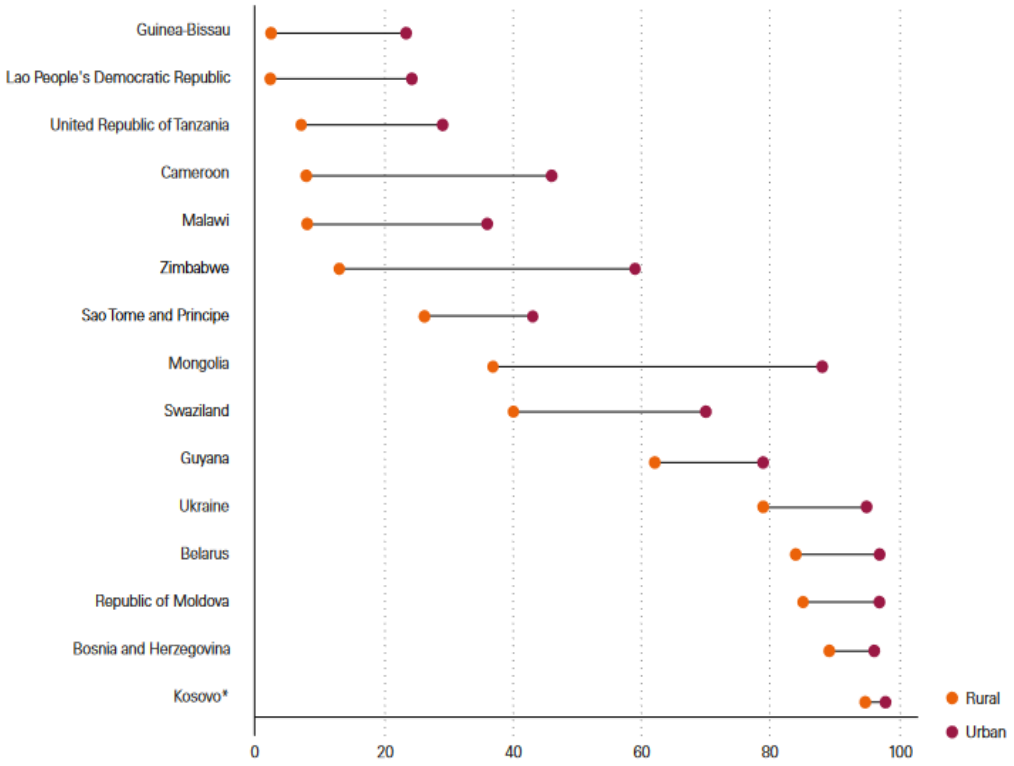


Figure 32: Percentage of 15-24-years-old who used the internet in selected countries, between 2012-2016.(10)

d. Type of school:

In our sample 54% of digital devices users studied in private schools, this result aligns with results of an Indian study among 760 students in five private and five public high schools, they stated that60.95% of internet users were from private schools, while 39.05% were from public schools(68).The high socio-economic status and purchasing of private school student can explain this disparity. Moreover, a study(51) identified going to a private school as a predictor for excessive mobile phone use.

1.3. Number of children who have their own devices:

According to our findings, 43.90% of parents reported that their children have their own digital device. This result is consistent with a study conducted in Korea, where 32.6% of elementary school students own a personal smartphone (69). In America, a study conducted among preschoolers revealed that 35.0% of them had their own device (70),and among

adolescents 91% report having access to a smartphone, while 84% have their own device(12). According to a recent British study, More than six in ten (63%) children aged 3-17 had their own mobile phone in 2021(71).(Table VI)

Table VI: The number of children who own a digital device in the literature.

Authors	Country	Target Population	Year	Number of children who own a digital device
Ridout (12)	USA	Adolescents	2015	84%
Radesky (70)	USA	Preschoolers	2020	35%
Buckingham (71)	UK	Children aged 3-17	2022	63%
Baek (69)	South Korea	Children aged 7-12	2014	32.6%
Our study	Morocco	Children aged 3-15	2023	43.9%

1.4. Duration of use:

There is a general consensus among health authorities that excessive screen time has an adverse impact on childhood development.

The current American Academy of Pediatrics (AAP) guidelines(72), discouraged children under2 years to spend any time using electronic media, except for video calls. While children over 2 years of age should be restricted to less than 2 h per day. The Brazilian Society of Pediatrics and The Australian Department of Health have stricter criteria, recommending children from two to five years old to not spend more than an hour/ day in front of a screen(73).Therefore, children investigated in this study respected the recommendation (41.4%)similar to the children surveyed by Kucuk et al. (24.0%) (43), and Cho et al. where87.8% of children uses digital devices for less than one hour(74). (Table VII)

However, most of children did not meet guidelines for screen time. For example, US children aged0 to8 years, spend on average 2 hours and 19 min a day on screens and the average US teen consumes 9 h and 33 min of digital media per day(75).In addition, the average

time spent in front of digital devices in a study conducted by Mohan et al. was 3.9 h per day(76), which was similar to a study done in the United kingdom(77), in which the participants spent approximately 4h a day on digital devices.Moreover,41% of British children aged between 5-16 years stated that they could not live without their mobile phone(71).

Table VII: Distribution of the average duration of digital technologies usage in the literature review.

Author	Country	Year	<1 hour	1-2 hours	>2 hours
Kucuk (43)	Turkey	2020	41.4%	27.5%	22.7%
Cho (74)	South Korea	2017	24.0%	25.5%	16.9%
Our study	Morocco	2023	87.8%	07.3%	05.0%

1.5. Most used devices by children:

The device that is most commonly owned by childrenin Tiznit is a smartphone (28.2%).

In fact, smartphones have become more accessible than computers and have replaced them. Smartphones are a new type of media that combines the internet and communication. In addition to computers and traditional cellular phones functions, smartphones offer a wide variety of functions such as video, music, games and social networking.

An epidemiological study with parents and children in Morocco revealed that 27.5% of children between 5-14YO own a tablet and/or a computer, while, 83.2% own a smartphone (Figure 26) (Figure 27)(3), another study that evaluates nomophobia's (No mobile Phone Phobia) prevalence among adolescents in Morocco, found that Smartphones are more used with 86.7% than laptop 13.3%(78).

Previous study suggests that older age groups prefer using laptops and desktops to browse the internet, whereas younger adults/children are more likely to use smartphones for this purpose(79).

Smartphones are also commonly used in early childhood, as Rideout et al.(12), in 2013, pointed to a growth in smartphone use by children aged 8 and under in the United States, with a prevalence of 52% in 2011, and 75 % in 2013. In a related context, a study conducted in Brazil among preschoolers Smartphone and tablets were the most used digital device with a prevalence of86.7% and19.3% respectively.(73)

Studies such as that of Prince et al. show that the use of touch-screen devices can enhance fine motor skills in children aged two to three years old(80). The French Academy of Sciences, in 2013,pointedout that the visual and tactile functions of tablets can be useful or the sensory and motor development of children, increasing their learning(81). However, these devices may pose risks in that they keep children from doing physical, social and emotional activities related to their age. Lin et al., report that activities using tablets can lead to improper physiological changes in the wristand finger joints(82). The literature is still in controversy regarding the effects of these media on child development and, therefore, more studies are needed.

1.6. COVID-19 and the purchase of digital devices:

The novel coronavirus (COVID-19) was initially reported in China, then spread to create a global pandemic that imposed lockdown to break the chain of virus transmission that resulted in changes in the way of living of all individuals, including children. Children were required to stay at home and spend more time using technological devices such as smartphones or tablets for school learning and entertainment(83,84). As a result, many studies have shown higher rates of online activity and higher rates of Internet addiction than in the pre-pandemic period(85)as this excessive usage was a way to fight boredom and self-isolation while staying home(86), as well as a way to cope with negative feelings and stress(87). Since the research has also revealed that anxiety levels in children and teenagers were significantly higher during the pandemic than before(87), particularly in regards to fears of physical injury in children and social phobia in adolescents. This may be due to the fact that at the initial stage of the outbreak, protective and therapeutic responses were not yet in place, and the rising number of confirmed cases and

deaths caused children to become excessively worried about their own and their family's physical well-being due to exposure to the virus.

According to the National Telecommunications Regulatory Agency's recent reports(3),during lockdown in Morocco, there was a remarkable surge in the purchase of laptops and tablets, with a 64.2% equipment rate, this increase demand of laptops and tablets is due to tele-working and online learning in the era of Covid 19.This aligns with our findings, as we observed 52.1%increase in digital devices purchases, indicating that the purchase and the overuse of digital technologies represents an outcome of the COVID-19 pandemic.

1.7. The activities for which children use digital technology:

In our study, most children use media for entertainment (63.1% watch videos, 49.0% play video games, and 28.6% check their social media) and 43.9% for educational reasons. This is consistent with the previous findings that reported that The most common preference for smartphone usage by the child was for watching children's videos (38.7%)(74).A further study detailed the leading smartphone uses among Iranian elementary and middle school students were for social networking (77.9%), web-surfing (53.3%), and camera activities(50.9%)(88).

According to the smartphone application use rates in 2018, the use rate of game apps (38.3%) was the highest in elementary school higher graders, followed by the use rate of instant messenger apps (17.9%). In contrast, the most frequently used apps by middle school students were instant messenger apps (24.3%), followed by game apps (20.1%)(89). These results suggest that smartphone usage patterns differ depending on the grade (90).

Higher graders of elementary school are in the stage of "industry vs. inferiority" according to Erikson's psychological development theory, and experiencing a sense of accomplishment by making efforts has an important influence on them. As many of the smartphone games are designed for single players rather than for group players, it seems that smartphone games stimulate a sense of accomplishment in higher graders of elementary school, engrossing them in these games.

As middle school students are in a stage of “identity vs. role confusion” that characterizes adolescence, peer relationships are important to them. Therefore, they seek to be part of a community where they can share culture and play together with their peers rather than engaging in smartphone games that are relatively more focused on a single play. Therefore, computer games in computer cafes where they can interact with their peer community are more preferred by adolescents to smartphone games. This suggests that research on which platform each age group mainly plays games with their developmental age is also necessary.

2. Monitoring children's activities on their devices:

2.1. Predefining screen time:

Screen time (defined as television viewing, computer/electronic game playing, or use of portable screen-based devices) remains an important aspect of studying how to use media in a healthy way. Screen media parenting practices are defined as the set of parental behaviors or interactions with their child that influence the latter’s screen media use (91) in terms of the three dimensions recommended by the AAP guidelines: amount, content and context (92). For example, parenting practices include setting rules that limit total viewing, content restriction and viewing context (co-viewing with parents, no screen in bedrooms, etc…).

In our study, the majority of the parents interviewed (54%) had set a screen time for their children. According to the Canadian Pediatric society, three-quarters of Canadian parents are concerned about how much time children spend using media (48), but only 49% set a predefined screen time(93).

According to several studies on parenting practices, children engage in less screen time when there are parental rules governing screen media use(94)(95)(96).For instance, children from low restrictive families exceeded the two hours per day by more than 2 times compared to children from high restrictive families (97).In a study conducted among Kuwaiti parents, Buabbas et al. found that many parents were apathetic to their children's excessive use of electronic devices, as they found it challenging to control (98).Moreover, past research suggests that rules for monitoring screen time decrease as children increase in age (99,100).

It has been frequently mentioned that parents act as examples for their children, and previous studies indicate that the way parents use media directly affects how often their children use media(101)(102).Additionally, Matthes et al. found that parents who excessively use smartphones were unable to control their children's smartphone use, and that was fostering the conflict between parents and children(103).According to Santrock, based on social learning theory, children learn by observing what other people do (modelling) and then cognitively presenting the behavior of the other people who are observed(104).Therefore, one of the most effective ways to decrease children screen time is to focus on modifying the behavior of parents.

2.2. Means used by parents to control their children's activity on digital devices:

The term "digital parenting" refers to the way parents control their children's interactions with digital media, which includes parental mediation and integrating media into their parenting strategies, Parents adopt different practices to manage children's media use(105). In our study, we asked parents about their interventions to decrease and control their children's activity on digital devices. Accordingly, the majority (57%) choose to co-view the content with their children, but the co-viewing strategies are common for TV watching, and the rise of mobile devices such as smartphones and tablets, which are often individually owned, makes it more difficult to supervise and co-use, however, research in this area is sparse.21% of parents review the browser history, 6% of parents choose themselves the content, while 3% have the password of their children's devices.

In fact, the use of tools such as parental control software still struggle to impose itself in Morocco, according a Moroccan study (106), 9 out of 10 parents feel overwhelmed when it comes to managing their children's digital activity. Additionally, 60% of parents have stated that they lack confidence in their child to use digital devices and content responsibly. However, only 16.30% of parents have used parental control software. This is consistent with our finding, where 13% of parents use applications to monitor their children's activity on their devices, while in South Korea 43.3% use parental control software, because South Koreans are the world's largest tech users, plus this software is offered for free(49).However, findings suggest that smartphone

parental-control software programs may not be the best resource to prevent smartphone addiction, as children often know more about technology than do their parents because of a lifetime of access to the equipment. Children have been known to use proxy sites, which allow users to bypass filters like parental control software in a smartphone.

Our study showed that 26.9% of the parents in Tiznit did not pay attention to what their children were doing on their devices. Leaving children to use digital devices without parental control leaves them susceptible to unknown risks that could expose them to physical and/or mental health problems, especially during periods of behavioral development and physical growth, when parents play a vital role in taking care of them. Hence, parents' support via close supervision and participation with their children is of paramount importance for the safe use of digital technologies and healthy online participation.

Surprisingly, some studies suggest that limiting access to digital devices is not very effective and may exacerbate smartphone addiction(107,108). In a previous study that examined parental control of bad behaviors, children tended to hide rather than improve their behavior when faced with strict restrictions (109).conversely, permissive parenting, which is characterized by inconsistency, full of affection, and laissez faire, has been associated with higher rates of smartphone addiction in children(110). On the other hand, active management such as parents discussing with their children the smartphone use's pros and cons has been found to be more effective(49). Maintaining a good relationships and open communication between parents and children has also been shown to help children to voluntarily discuss their behavior with their parents.(109)

3. Children's activities outside of the use of their digital devices:

Although 82% of children surveyed engage in activities other than playing with their devices. Nearly, half of them prefer spending their free time using electronic media as their preferred leisure activity, surpassing any other single free-time activity. This is in agreement with other findings indicating that American Children and adolescents spend more time with media than any other activity except for sleeping(111).

In high-income countries, children are experiencing less contact with nature, or "Green Time", than previous generations. (112)(113). For example, twelve-year-old children in the U.S. spend less than six hours per week outdoors on average(114), which is less than their daily screen time. Similarly, in England less than a quarter of children visit their local nature areas, and fewer than one in ten regularly play in wild spaces, compared to previous generations(115). Likewise, in a survey of Australian adults, 73% reported playing outdoors more often than indoors when they were children, compared to only 13% of their own children today (116). Rapid urbanization has contributed to this trend, reducing access to urban green spaces and private gardens. (117). Benefits of natural environments could be gained through increased physical activity(118)(119) and social connections experienced in green spaces like parks(118)(120). Natural areas also tend to be less crowded, with reduced air and noise pollution, which is beneficial for overall health (118). Furthermore, time spent exposed to natural sunlight helps to regulate the circadian rhythm.

In addition, practicing a physical activity can serve as a means to reduce screen time, as Veitch et al. showed when they examined strategies to reduce screen time among children, they found that children who are physically active, and prefer spending time playing outside or sport, spent less time on their digital devices(121). Similar to a number of other results(33,122).

4. Devices and health symptoms

Although Tiznitian children had a relatively low prevalence of digital devices use, most parents reported health symptoms related to these technologies.

4.1. Loss of concentration:

Our results revealed that 38% of the interviewed parents declared that their children had difficulties in concentration. This association could be linked to digital multitasking.

When children are exposed to multiple digital devices and platforms simultaneously, their attention becomes divided, making it difficult to concentrate on any one task for an extended period. Multitasking has an immediate negative impact on both concurrent learning (in class or at home) and academic outcomes in children aged 12 years and younger. It can disrupt reading efficiency, impair problem-solving, and may undermine children's confidence in their own ability to do homework (111)(123).

A study by Mrazek et al. suggested that students may be spending approximately 204 h per year trying to complete homework but unintentionally distracted from it(124), another study by Gezgin et al. stated that the adolescents who expressed a distraction each time reading a book reported higher smartphone addiction levels. Consequently, a significant negative relationship was found between the high school students' smartphone addiction level and their reading behaviors(125).

Finally, the scattered-attention hypothesis claims that poor performance is rooted in developed deficits of cognitive control that result from habitual digital multitasking (126).

Previous study in India by Acharya JP et al., have also reported that two hundred and nine (47.4%) of the students answered positively when asked about their lack of concentrating. Related to this they experienced learning disabilities and stated that their level of academic success decreased(127).

In a study carried out by Kucuk et al., 17.85% of the participants stated that their children had a loss of concentration(43).

A polish study among university students showed that 56% of respondents complained of difficulties in concentration(128).

In a study carried out by Akbulut et al., it was observed that 20.8% of university students reported an impaired concentration (129).

This has also been reported by Alkhateeb et al. 32.0% loss of concentration(130).

An earlier American population study estimated that 66.7% of high school students surveyed believed that smartphones are hurting teenagers' ability to concentrate(124).

Another Kuwaiti study reported that 10.0% of parents noticed a loss of concentration among their children(98).(Table VIII)

Table VIII: Loss of concentration reported by authors.

Authors	Country	Year	Loss of concentration
Mrazek (124)	USA	2021	66.7%
Szyjkowska(128)	Poland	2005	56.0%
Kucuk (43)	Turkey	2018	17.8%
Buabbas (98)	Kuwait	2021	10.0%
Akbulut (129)	Turkey	2018	20.8%
Acharya JP(127)	India	2013	47.4%
Alkhateeb(130)	KSA	2016	32.0%
Our study	Morocco	2023	38.0%

Studies have also linked mobile phone use and attention deficit disorder with hyperactivity (ADHD). In a Chinese study, 6 factors causing ADHD were detected. One of the most important factors is the mobile phone addiction (131). In a study carried out by Zheng F et al. on Chinese adolescents, a significant relationship was found between the duration of mobile phone use and ADHD (132).

4.2. Anger:

In our study,45.1%of parents reported that their children became angrier after digital devices use, almost the same results were found in a study conducted among college students in India, were they found that 50.8% of students got angry due to the use of smartphones for a prolonged duration.(127)

A similar study among 120 parents of Kuwaiti children aged 6-18 yearsshowed24.2% of parents noticed that their children became irritated(98) (Table IX).

Table IX: Anger reported by authors.

Authors	Country	Year	Anger
Buabbas (98)	Kuwait	2021	24.2%
Feten(133)	Lebanon	2022	34.0%
Cha(134)	South Korea	2018	31.1%
Acharya (135)	India	2013	50.8%
Our study	Morocco	2023	45.1%

A lot of studies have also shown that higher levels of smartphone use were associated with greater anger and lower levels of life satisfaction. However, it is important to note, that the relationship between digital devices use and anger is complex and likely to be influenced by the type of content that children consume.

Diverse studies warn about the high occurrence of aggression among children and the consumption of violent content. A study showed that by the age of 18, the average adolescent will have seen an estimated200 000 acts of violence on television alone.(136)also Both music videos and rap music have become increasingly violent.(137)(138)A recent analysis of video games revealed that more than half of all games contain violence, including 90% rated as appropriate for children aged 10 years and older.(139)

The impact of media violence on real-life aggressive behavior is stronger than many commonly accepted public health risks and nearly as strong as the link between smoking and lung cancer(figure 19) (140)

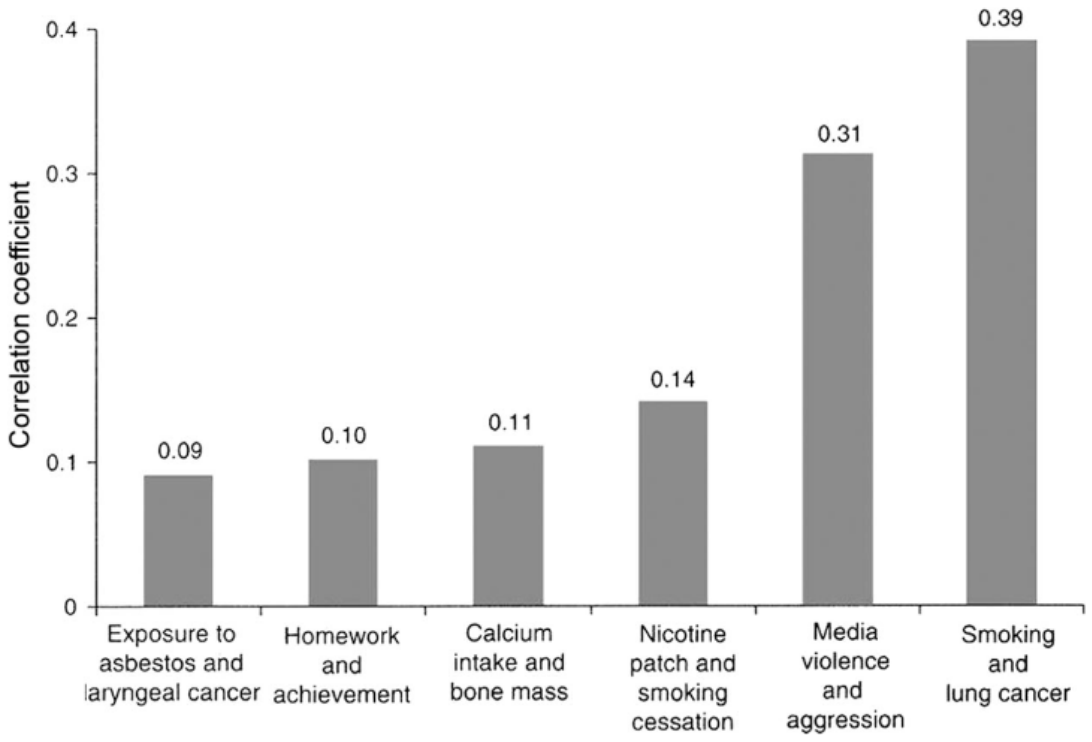


Figure 33: The influence of media violence and actual aggression on children is almost equivalent to the effect of smoking on lung cancer the

Additionally, according to Park et al., children with smart phone or game addiction are deprived of the ability to sympathize with other children and become aggressive which makes it difficult for them to make friends.(42)

4.3. loneliness:

In our study, 16.5%of the parents reported an association between their children's use of digital devices and a sense of loneliness. It is imperative to note that children's fascination with smartphones may decrease opportunities for their interactions with peers and in physical activities. This too may lead to a lack of social skills. More screen time, less movement, and

fewer interactions with others can lead to loneliness, depression and sedentary lifestyle. This association could be because children need to play and socialize in real life not just online, to feel connected to others. (141)

A similar study conducted in Kuwait showed comparable results among parents of children aged 6-18 years old (98).However, Korean children between the ages of 6 and 12 years old displayed a significant level of loneliness (69). (Table X)

Table X: Loneliness reported by authors.

Authors	Country	Year	loneliness
Baek (142)	South Korea	2014	63.15%
Buabbas (98)	Kuwait	2021	10.00%
Masthi(68)	India	2017	11.40%
Jiang (143)	China	2018	5.3%
Iqbal (144)	Indonisia	2016	11.7%
Gökçearslan(145)	Turkey	2021	19.8%
Our study	Morocco	2023	16.50%

Studies of children and adolescents with internet addiction have also shown that internet addicts are more risk-averse, shy and anxious, and have difficulty forming interpersonal relationships, so they feel safer online and prefer to interact in virtual spaces.(146)

Loneliness and digital technology use can be interrelated in a complex way, it can be a consequence but also a cause of digital devices use.

In one hand, some studies suggest that increased smartphone use may lead to feelings of loneliness and social isolation (98,69,146). This can occur if children spend excessive amount of time on their devices instead of interacting with others face-to-face.

On the other hand, it is also possible that children and adolescents who are already experiencing loneliness and social isolation may turn to their smartphones as a way to cope.

Smartphones can provide a sense of comfort and distraction from negative emotions, and can also be used to connect with others online. Bian et al. proved that the higher one scored in loneliness and shyness, the higher the likelihood one would be addicted to smartphone. When they analyzed the cause of smart phone addiction of Chinese college students. Also a longitudinal study with 288 participants 13–40 years of age examined causal relations between problematic use of smartphones, loneliness, face-to-face-interaction, and the need for social assurance (147).

Authors concluded that loneliness increases problematic use of smartphones, which in turn reduces face-to-face interactions and thus does not gratify increased needs for social assurance, and consequently, this process eventually leads to increased loneliness.

Moreover, clinicians from different countries (France(148), Japan(149), Romania(150),USA(151), Tunisia(152) and Qatar(153)) have independently witnessed a phenomenon not described previously in younger children. They found that children who have been heavily exposed to screen media (more than four hours a day, sometimes significantly more) from a very young age (usually from their first year of life) suffered from what they called "virtual autism". A term coined by a Romanian clinical psychologist Marius Zamfir.(150)

Virtual autism seems to have, in the beginning, a potentially very different trajectory from classical autism. But being clinically indistinguishable from « atypical autism », psychologists believe that it is possible that after some time it can stabilize in an Autistic Spectrum Disorders(ASD) presentation with some degree of mental retardation and/or language delay.(154)

Autistic children and adolescents are known to be at risk for problematic use of screen media, due to their tendency towards restricted interests and repetitive behaviors. (155) They also tend to use screen media in less social ways than peers in other disability groups. (156)A study by the Autism Center for Children with Autism in Romania shows that 90% of children aged 2-3 years who are diagnosed with autism are the trigger factor of over watching television programs or other forms of reality virtual.(150)

The child in front of the screen does not have the usual language experience, the dialogic stimulation of thought and reflection that parents or the human environment generally offers. The visual and auditory stimuli perceived in front of the small screen succeed with such rapidity that they exceed the brain's ability to control them. The invariable effect will be the inhibition of some important mental processes. Children get used to watching television or monitors no longer wanting to understand what's happening in the world around them, they are just happy with the sensations. (157)

However, according to psychologists, the “Virtual Autism” can disappear or dramatically decline within months after parents accept to remove Electronic Screen Media and replace them with daily dyadic playful interaction. Because after an initial phase of up to two weeks of a withdrawal-like state with irritability, clinical changes start to occur. The most impressive and usually the first to appear are in the facial expressions: those children whose faces were blank and inexpressive animated, displaying more social facial expressions. They suddenly seem to pay attention to family members around them and this is usually a very rewarding experience for the parents. Those children often keep some degree of language delay and hyperactivity but after a few months they no longer display the core symptoms of autism.(154)

4.4. Neck pain:

In our study10.2% of the parent reported that their children’s use of digital technologies had caused them Neck pain. Buabbas et al. reported that 27% of their study participants had neck pain(98). In a study conducted by Alkhateeb et al. 26.5% were having neck and back pain(130). (Table XI)

Table XI: Neck pain according to the literature.

Study	Country	Year	Neck pain
Shan (158)	China	2013	40.8%
Buabbas (98)	Kuwait	2021	27.0%
Hakala (159)	Filand	2006	26.0%
Alkhateeb(130)	KSA	2016	27.2%
Our study	Morocco	2023	23.1%

During the last few years, several studies are showing that the "text neck syndrome" might be considered as an emerging 21st-century syndrome. This clinical condition refers to the onset of cervical spinal degeneration that results from the repeated stress of frequent forward head flexion while we look down at the screens of mobile devices and while we "text" for long periods of time(160)(161). "Text neck syndrome" is largely reported in adult patients. However, very recent data show that new technologies are inducing a shift in the prevalence of this relevant issue from adulthood to all of the pediatric ages(162).

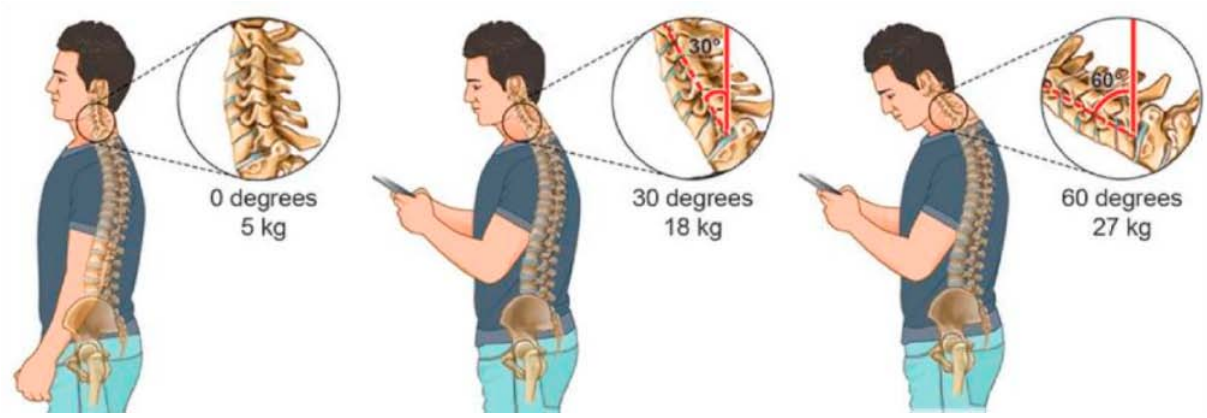


Figure 34: A chart depicting the stress and weight put on the neck and spine as a result of hunching over a smartphone, the neck flexion angle is the angle between the global vertical and the vector pointing from C7 to the occipito-cervical joint. A fullgrown head weighs 5 kg in the neutral position. As the head bends forward, the weight seen by the neck increases up to 18 kg at 30° and 27 kg at 60°(160)

4.5. Lower back pain:

In our study, 17.10% of children suffered from lower back pain. These data are practically comparable to those found in the literature (Table XII).

Table XII: Lower back pain according to the literature.

study	Country	Year	Lower back pain
Shan (158)	China	2013	33.1%
Alexander (163)	Scotland	2003	25.3%
Hakala (159)	Filand	2006	12.0%
Alkhateeb (130)	KSA	2016	26.5%
Our study	Morroco	2023	17.1%

Most studies on the effects of screen time in children indicate that the odds of musculoskeletal effects increase after 2–3 hours. (159)

The lower back pain is mainly associated with postural problems secondary to improper placement of computer screens, unsuitable table or chair height, or incorrect distance between the eye and screen resulting in unnecessary stretching or forward bending often resulting in a muscular sprain(164,165).

Straker et al. highlighted the importance of ergonomic workstation in the prevention of neuro-musculo-skeletal disorders (166), and recommend the following:

- Chair heights should be set such that the child's feet can lay flat on the floor or on a stool underneath the feet to allow for support.
- Chairs should not have arm rests unless they fit the child perfectly, as should back rests.
- Desks should be set at the child's elbow height or slightly lower.
- There should be enough depth on the desk to allow for forearm support; this is specifically effective in preventing musculoskeletal strain.
- Displays should be set in front of the child.

- There is no official recommendation for the angle of screen inclination. For computers, it is recommended to place the top of the display or monitor at the child's eye level, and then allow them to move the screen down into a comfortable viewing position as needed.
- Official recommendations regarding a screen's distance from a child do not exist. the computer screen should be placed at arm's length, and then moved as necessary.
- External devices such as keyboards should also be placed in front of the child, with the mouse close to the keyboard and appropriately sized.
- Workstation lighting should be equal throughout the visual field, so glare and reflections that inhibit screen viewing or cause visual discomfort are inhibited.

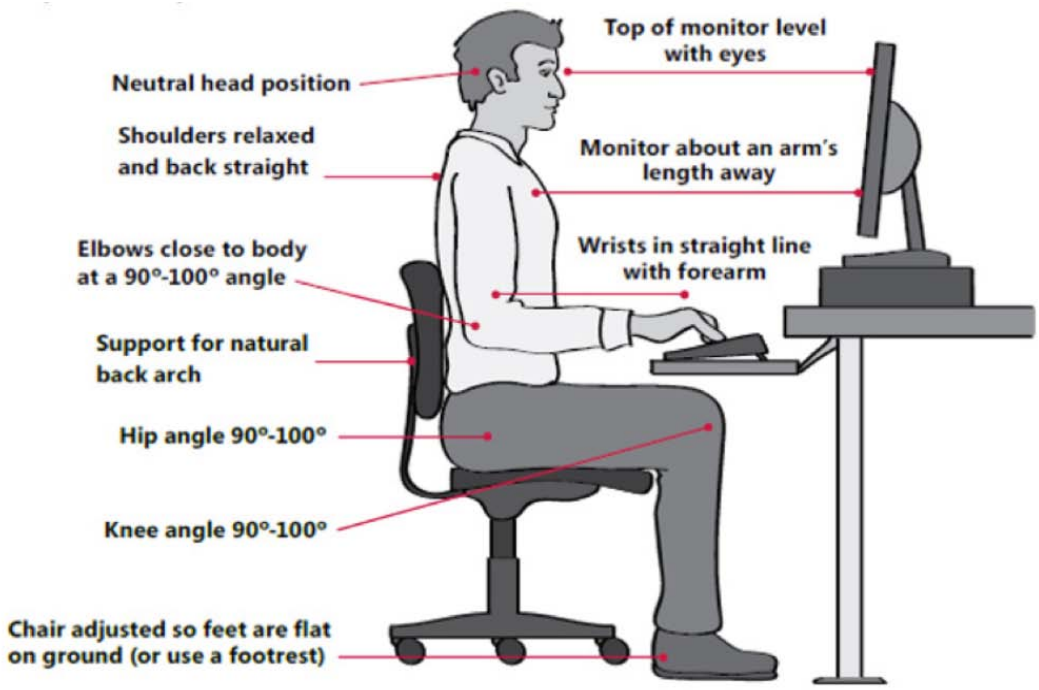


Figure 35: Standard ergonomic practice during laptop usage. (167)

4.6. Headache and migraine:

Our study revealed that 3.90%of parents noticed headache and migraine due to the use of digital devices by their children. As compared to other studies, our children had a lower incidence of headache. (Table XIII)

A Polish study showed that Out of 82 subjects who complained of headache, only 8 (6.8%) related this symptom to mobile phone use(128).In addition, Alosaimi et al. have confirmed a significant relationship between the frequency of headache and the use of a mobile phone.(54)

Table XIII: Headache and migraine among digital technology users according to authors.

Authors	Country	Year	Headache and migraine
Mohan (168)	India	2021	22.0%
Alosaimi (54)	KSA	2016	21.6%
Khalaj (169)	Iran	2015	40.2%
Akbulut (129)	Turkey	2018	22.3%
Kucuk (43)	Turkey	2020	23.8%
Falkenberg (170)	Norway	2020	12%
Szyjkowska (128)	Poland	2005	6.80%
Our study	Moroccco	2023	3.90%

In a study carried out in Denmark, when compared to those having no exposure, the incidence of migraine was found to be 1.30 and that of symptoms related with headache was found to be 1.32 among the individuals being exposed to mobile phone in prenatal and postnatal period (171). Another study has demonstrated that headache, concentration problems, sleep disorders, and sense of heat in the ear were found to be dose-dependent (172).

4.7. Sleep disorders:

Our results revealed that 14.20% of Tiznitian parents reported sleep disorders among their children, 12.20% of which had insomnia(i.e., difficulty in initiating sleep in 30minutes), and only 2.00% felt excess daytime sleepiness. This result was in agreement with many other studies (table XIV)

Table XIV: Comparison of studies in sleep disorders among digital technologies users.

Study	Country	Year	Sleep disorders
Alkhateeb (130)	KSA	2020	28.90%
Cartanyà (173)	Spain	2021	23.60%
Buabbas (98)	Kuwait	2021	03.30%
Chiu (174)	China	2015	04.90%
Kucuk (43)	Turkey	2020	10.88%
Our study	Morocco	2023	14.20%

Several studies have demonstrated that individuals who spend too much time online tend to lose sleep(173,175,176,177). Hale et al. reviewed 67 studies published from 1999 to early 2014, they found that screen time is adversely associated with sleep outcomes (primarily shortened duration and delayed timing) in 90% of studies. Some of the results varied by type of screen exposure, age of participant, gender, and day of the week. While the evidence regarding the association between screen time and sleep is consistent(176).

In a study that aims to investigate the relationship between sleep length, sleep quality and mobile phone use among Moroccan adolescents, Moustakbal et al. found that 46% of adolescents reported using phones at night before going to sleep. Most of those late-night mobile phone users had poor sleep quality and a significant reduction in sleep length, with 45 minutes less sleep than their counterparts not using mobile phones before sleep(178).

George et al.(179)suggested three possible pathways explaining sleep disorders due to digital devices use:

- Time spent on media and technology is displacing sleep time.
- Emotional arousal or online interactions make it more difficult for adolescents to fall and stay asleep.
- Emission of blue light or electromagnetic radiation from mobile phones can suppress melatonin production and disturbed sleep rhythms.

4.8. Eye complaints

19.10% of Tiznitian parents reported that their children are experiencing a variety of eye problems, such as their eyes hurting, eyestrain, and needing to wear glasses due to prolonged internet usage. Same as this study, studies found the significant relation between smartphone overuse and vision problems (Table XV).

Table XV: Eye complaints among digital technologies in the literature.

Study	Country	Year	Eye complaints
Mohan (76)	India	2021	49.76%
Buabbas (98)	Kuwait	2021	40.00%
Alkhateeb (130)	Saudi Arabia	2020	24.70%
Mokhtarinia (88)	Iran	2022	39.70%
Acharya (135)	India	2013	36.50%
Kucuk (43)	Turkey	2020	16.37%
Our study	Morocco	2023	19.10%

Digital eye strain (DES) or computer vision syndrome (CVS) is an entity defined by both visual and ocular symptoms arising due to the prolonged use of digital devices.DES is present in at least 50% of regular users of digital media. It is characterized by dry eyes, itching, foreign body sensation, visual fatigue, watering, blurring of vision, and headache. Non-ocular symptoms associated with eye strain include stiff neck, general fatigue, headache, and backache(180).A study conducted by Falkenberg et al. showed that eye strain increased with screen time and shorter viewing distance. This suggests that even healthy children with good vision may develop vision symptoms(170).

Although the ocular complications of digital device use have been extensively studied in adolescents and adults, only a few studies have addressed DES in children (181,182).While the COVID-19 pandemic has led to significant increase of children use of digital devices, as many schools have shifted to online learning and many families are practicing social distancing to limit

the spread of the virus, also the restrictions on outdoor activities has led to an increase time spent by children to play videogames. As a result, School closure protects children from COVID, but affects their eyesight, according to Mohan et al. there is high prevalence of DES among children in the present scenario of COVID19, even myopia progression has been linked to the digital eye strain in children. And this would remain unique to the pediatric population only (76).Despite earlier thinking, screen time is not a direct cause of the increased prevalence or progression of myopia; this prevalence has instead been linked with children spending fewer hours outdoors, and may potentially be due to decreased exposure to outdoor light. (183,184)

Additionally, playing videogames for long hours with maximum concentration and without any breaks can cause a newly described condition in children known as videogames vision syndrome (185).

Computer Vision Syndrome is still under-diagnosed. Awareness should be raised among parents, teachers, eye care- and health care personnel, of the importance of good visual ergonomics and screen time to promote health in youth. Canadian ophthalmologists recently emphasized on the following recommendations for a safe use of electronic screens(186):

- Recommended amount of screen-time for children:
    - 0–2 years: None, with the possible exception of live video-chatting (e.g., Skype, Facetime) with parental support, due to its potential for social development, though this needs further investigation.
    - 2–5 years: No more than 1 hour per day. Programming should be age-appropriate, educational, high-quality, and coviewed, and should be discussed with the child to provide context and help them apply what they are seeing to their 3-dimensional environment.
    - 5–18 years: Ideally no more than 2 hours per day of recreational screen time. Individual screen time plans for children between the ages of 5–18 years should be considered based on their development and needs.

- Breaks no later than after 60 minutes of use (after 30 minutes is encouraged). Breaks should include whole-body physical activity. The ideal length of break has not been identified for either children or adults.
- Workstation ergonomics: Displays should be set in front of the child. There is no official recommendation for the angle of screen inclination. For computers, it is recommended to place the top of the display or monitor at the child's eye level, and then allow them to move the screen down into a comfortable viewing position as needed. Official recommendations regarding a screen's distance from a child do not exist; the computer screen should be placed at arm's length, and then moved as necessary. Workstation lighting should be equal throughout the visual field, to avoid the glare and reflections that inhibit screen viewing or cause visual discomfort.
- The use of screens should be avoided one hour before bedtime. Screens in the bedroom are not recommended.
- Outdoor activity over screen time should be encouraged.
- Either the Children complain of electronic screen-associated discomfort or not, regular eye exams, which assess a child's visual ability to cope with their visual demands and offer treatments for deficiencies are recommended.

4.9. Skin itches:

Table XVI: Skin itches among digital technologies users according to the literature.

Authors	Country	Year	Skin itches
Szyjkowska (128)	Poland	2005	11.0%
Acharya (135)	India	2013	32.2%
Akbulut(129)	Turkey	2018	0.70%
Ofdetal (187)	Sweden	2000	3.20%
Our study	Morocco	2023	2.00%

Allergic contact dermatitis (ACD), a T-cell mediated hypersensitivity reaction, is often observed following skin exposure to metal items that release nickel in high concentrations. It is important to note that nickel allergy affects up to 17% of women and 3% of men in the general population. In addition, nickel sensitization is common in children, with a prevalence estimate ranging from 17% to 33%. The lesions appear, most of the time, during prolonged use (30 minutes in a row or 1 hour spread over the day).(188)

Reports of Allergic contact dermatitis (ACD) from cell phones have been reported since 2000, when Pazzaglia et al. reported two cases of nickel allergy caused by the use of a cell phone. In 2000, in Italy, 35 more cases were published, for a total of 37 cases. (189)

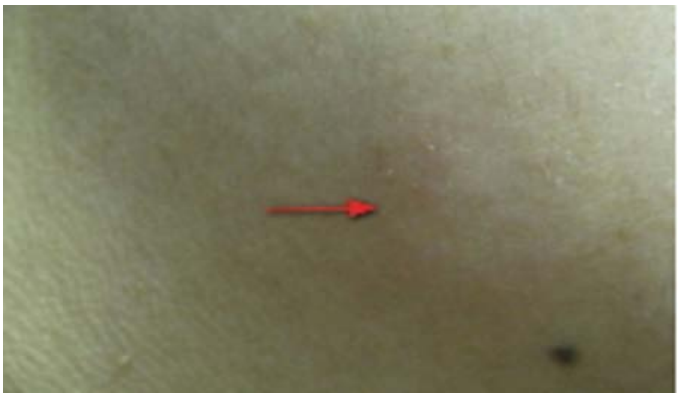


Figure 36: Close-up of patch of dermatitis above patient's right jaw line.(188)

Figure 37: Patient's metallic cell phone menu botton lines up directly with patch of dermatitis above patient's right jaw line. (188)

A Danish clinical study conducted in patients with dermatitis evaluated consecutively for nickel allergy between 2007 and 2009 also revealed that one third of the cell phones of nickel allergic patients released nickel. (190)

In a systematic review carried out by Keykhosravi A et al., it was reported that increase in skin temperature, oversensitivity to temperature, facial dermatitis, and sense of burning (on face, skin, behind and around the ear) may develop because of the use of mobile phone and tablets.(191)

5. Parents 'Concern of the Detrimental Impacts of digital technology:

In this study, 83.3% of parents surveyed were concern about detrimental impacts of digital devices. The group that demonstrated the highest level of concern were mothers aged between 30-49 years old, who had received education, and lived in urban areas. This aligns with a Canadian study that revealed that 80% of parents were concerned about the negative effects of digital technology (on their child's physical activity, ability to focus, behavior, social skills, creativity, and learning) and parents with post-secondary education were more concerned than those parents who had a high school education or less(93). Buabbas et al. stated that almost all parents (98.3%) expressed worries about the negative effects of digital devices' overuse especially addiction, however, the parents' levels of concern were not associated with the interviewer's age, gender, education level, or region(98). In Turkey, following the smoking and the friend selection, the use of mobile phone is the third most frequent problem that the parents have with young people(43).Madden et al. also reported that 69% of parents were worried about their adolescents' online activities and how their children are managing their reputations online(192).However, in a study conducted in four European countries (England, Greece, Malta and Luxemburg),parents did not believe that their children were at risk with using technologies(77).Moreover, Takeuchi et al. studied how parents nowadays feel about raising children in a digital age. They revealed that 65% of parents of children ages 3 through 10, did agree that although they are aware of negative impact of digital technologies' use from a very

young age, they considered their role is to help their children to learn how to use technologies in a responsible way(193).

In our study, the most common concerns among parents were about their child physical health (26.2%); their child mental health (12.3%); their child performing poorly in school (15.4%); their child 's ability to concentrate (10%); their child becoming addict to digital devices (8.5%);their child being exposed to inappropriate content (6.9%); their child's social skills (4.6%).

Numerous studies confirmed that the concerns expressed by these parents are well-founded.

5.1. Physical well being:

The most common worry of parents was about their child' physical health (26.2%), additionally, 30.2% of parents surveyed believed that their child's health had deteriorated since they started using a digital device, and 42.3% considered their children to be more vulnerable to sickness than other children who didn't use these devices.

Evidence from a variety of cross-sectional, longitudinal and empirical studies, linked prolonged digital technologies use to serious health damage. The evidence is both wide-ranging and compelling. The possible health risks identified include not only brain tumors but also damage to genes, the blood brain barrier and melatonin production as well as other biological effects thought to have a role in cancer development. Although radiation-emitting out of mobile phones are non-ionizing and hence appear to cause no harm to human, with the advent of 4G and 5G communication technology, the operating frequency has reached to the microwave range. Mobile phones kept in proximity may cause localized dielectric heating due to the interaction of living tissue with electromagnetic waves. Long-term exposure to these radiations may cause some dangerous and irreversible changes in the biological system of human beings which could cause irreparable loss to the brain functioning in the long run. The largest body of evidence concerns brain tumors. Almost every study of prolonged mobile phone use (roughly half-an-hour a day for 10 years) has found an increased risk of brain tumors. Several large-scale

studies have found a doubling of the risk after only 10 years' use. This evidence contributed to the classification of mobile phone radiation as "possibly carcinogenic to humans" by the World Health Organization's International Agency for Research on Cancer (IARC)(194).This is especially so for children. Not only do their thinner skulls, greater tissue conductivity and smaller heads increase their radiation absorption when on a phone call, but their cumulative lifetime exposure to the radiation will also be much greater(195).

Various studies have reported electromagnetic radiations to cause DNA damage. Single and double-stranded DNA might break in brain cells and increase the chances of apoptosis. Human blood leukocytes and lymphocytes when exposed to electromagnetic radiation may induce long-term chromosomal damage-causing gene mutation(196)(197)(198). This may also trigger the release of harmful free radicals which may lead to loss of immunity, blood-brain barrier damage, changes in metabolism, impaired brain function, risk of cardiovascular disease, decreased bone density, cause type 2 diabetes, hormonal imbalance, mental stress, loss of blood sugar control, autoimmune, inflammatory disorders and genetic degenerative disease (199)(200).

5.2. School performance:

While technology has undoubtedly provided significant support for student learning, particularly during the COVID-19 pandemic, excessive smartphone use may have a negative impact on academic achievement.

The results obtained in different studies suggest that children who spend an excessive amount of time on screens tend to perform poorly academically. A local study in Morocco, found that university students with good academic performance are less likely to be attached to their smartphone(78). In contrast, a different research revealed that 39.5% of students believed that their academic performance suffered because they spent more time using their phones. The correlation between phone use and academic performance was found to be statistically significant(201).Among a sample of 480 university students in the United States, those who dedicated more time to using technology, spent less time studying, and this was found to have a

highly negative correlation with their GPAs(202).Ironically, fifteen years ago, it was believed that the emergence of communication technologies would contribute to a growing disparity between learning rich and learning-poor (203). However, recently, there was optimism that mobile technology could actually help bridge the gap in learning opportunities by facilitating access to educational resources(204).

Research has shown that technological distractions are negatively related to academic performance(205). In a study by Junco et al., it was found that 93% of students engaged in active chatting while doing schoolwork (206). The appeal of numerous smartphone apps catering to every aspect of their lives fuels distractions from learning, and this allure is intensified by the apps' ease of use and the students' need for them. Additionally, the lack of interest and motivation in doing homework further exacerbate these distractions (207). For instance, Facebook use has been identified as a key factor contributing to students multitasking while studying (208), while instant messaging has been linked to failing to complete schoolwork (206).

Studies have also found a correlation between smartphone multitasking and decreased academic performance. For instance, in a study of 263 students in the United States between the ages of 11 and 25, those who used Facebook and texted while studying had lower GPAs compared to those who did not engage in such multitasking (209). According to Montag et al. when the student is focusing on a specific task, such as schoolwork, using a smartphone to check social media or notifications can interrupt their flow state previously experienced during the task, making the task less enjoyable and more difficult to complete(210). smartphones can divert attention from studying by presenting a different and potentially more psychologically satisfying method of spending one's time, unlike studying for exams, which does not provide immediate satisfaction(211).

Moreover, several studies suggest that higher brain exposure to the electromagnetic radiofrequency field effect (RF-EMF)is related to lower non-verbal intelligence and has a negative effect on the cognitive functions and memory performance. However, the effects of the long term use of this technology on our brain are not exactly known yet(212,213,214).

5.3. Mental well being:

Numerous studies have extensively investigated the relationship between digital technologies usage and mental health from a psychological and behavioral point of view. Findings indicate that high quantity of digital devices use was associated with a wide range of mental health outcomes, in both children and adults.

An observational study showed that spending more than a few hours per week using electronic media correlated negatively with self-reported happiness, life satisfaction and self-esteem, whereas time spent on non-screen activities (in-person social interactions, sports, religious services, working at a paid job), correlated positively with psychological well-being, among adolescents(215).

In addition, social media can affect adolescents' self-view and interpersonal relationships through social comparison and negative interactions, including cyberbullying. Moreover, social media content often involves normalization and even promotion of self-harm and suicidality among youth(216).

Although population-based studies suggest a link between social media use and mental distress among youth, the impact of these technologies may vary among individuals, and some may be less susceptible to harm, as indicated by an emerging literature of experimental studies. Girls and young women tend to spend more time on social media than boys do, have more exposure to cyberbullying and show tendency to experience more mental health effects(215) which is consistent with recent epidemiologic trends indicating that depressive symptoms, self-harm and suicidality have increased among young females in particular(217,218)

5.4. Addiction:

There is a growing scientific evidence base to suggest excessive internet use may lead to symptoms traditionally associated with substance-related addictions (219). Griffith et al. has operationally defined addictive behavior as any behavior that features what he believes are the six core components of addiction (salience, mood modification, tolerance, withdrawal symptoms,

conflict, and relapse). He also argues that any behavior (e.g., social networking) that fulfils these six criteria can be operationally defined as an addiction(220). For instance, some individuals, their use of social networking sites may become the single most important activity that they engage in, leading to a preoccupation with digital devices use (salience). The activities on these devices are then being used in order to induce mood alterations, pleasurable feelings or a numbing effect (mood modification). Increased amounts of time and energy are required to be put into engaging with digital devices activities in order to achieve the same feelings and state of mind that occurred in the initial phases of usage (tolerance). When digital devices use is discontinued, addicted individuals will experience negative psychological and sometimes physiological symptoms (withdrawal), often leading to a reinstatement of their digital devices use (relapse).

Local studies showed that over of the half of Moroccan youth suffer from addiction. In contrast, Sfendla et al. found that 55.8% of adolescents were excessive smartphone users(221). Another Moroccan study revealed that 57% of university students were social media addicts(222).

According to Lee et al. adolescents are more susceptible to smartphone addiction than adults(223), which can be attributed to the former's use of various contents for the purpose of interaction with peers and entertainment with their smartphones (34) and their neurobiological vulnerability as discussed in the dual processing theory(224).

5.5. Inappropriate content

Our study revealed that 6.9% of parents are worried about the content that their children consume. Similarly, a study conducted in the United States revealed that about a quarter of parents (23%) say that inappropriate content in the media is one of their top concerns as a parent. However, most parents don't think their own children are exposed to a lot of inappropriate content in the media they use. (225)

Livingstone et al. now typically organize the wide range of risks encountered online into three categories: content, contact and conduct risks. (226)

Content risks: Where a child is exposed to unwelcome and inappropriate content. This can include sexual, pornographic and violent images; some forms of advertising; racist, discriminatory or hate-speech material; and websites advocating unhealthy or dangerous behaviors, such as self-harm, suicide and anorexia.

Contact risks: Where a child participates in risky communication, such as with an adult seeking inappropriate contact or soliciting a child for sexual purposes, or with individuals attempting to radicalize a child or persuade him or her to take part in unhealthy or dangerous behaviors. Conduct risks: Where a child behaves in a way that contributes to risky content or contact. This may include children writing or creating hateful materials about other children, inciting racism or posting or distributing sexual images, including material they have produced themselves.(226)

5.6. Social skills:

Nowadays, groups of children and adolescents seen interacting with their phones rather than engaging with one another, it is described as spending time "alone together", and missing out on important socialization experiences, this trend raises worries among parents. In our study, 4.6% of parents fear that time spent by their children on devices is interfering with their ability to develop effective social and relationship skills.

Effectively, a Moroccan study reported that 1 in 3 parents believe that their child is less sociable since they have a smartphone. Indeed, the risks of overexposure to screens and the Internet are not only linked to the bad experiences that a child can have online, but also to the risks to their development and sociability. While 31% of Moroccan parents notice a drop in this sociability, they are 9 out of 10 to indicate that they have already been in conflict with their child because of a subject related to digital technology. They are also 9 out of 10 to feel totally overwhelmed by their children in all things digital (106). Another study conducted among second-grade students in a private elementary school in Indonesia showed that the degree of smartphone use had a direct positive effect on social skills (227). Moreover, some studies have shown that higher than average reported Internet use by adolescents is associated with lower

quality parental relationships, including parental attachment and knowledge (228). Thus, technology use among adolescents may take away from time spent with parents, but it does not necessarily weaken the parent–child relationship. Existing evidence suggests that if the quality of the parent–child relationship is strong offline, then new technologies may confer benefits.

Young people who replace in-person exchanges with time spent online appear to intensify their social impairments. Whereas, those who use online exchanges to supplement existing friendships report improvements in the quality and closeness of their existing relationships. (179)

In addition, time spent online may be beneficial for skill building and enhanced wellbeing among those with existing vulnerabilities. (229,230).

For example, shy college students report that they Instant Message to increase interpersonal contacts, improve fluency of in person conversations, and decrease loneliness (229).

Children use digital technology, regardless their parents' level of concern about their negative impacts. It seems that we are immersed in a digital era where it is impossible to prevent children from using these devices. Therefore, proper parental education and action are needed, wherein they can learn and use a variety of strategies to reduce the detrimental effects of digital devices without depriving them of their use.

V. Study limits

The limitations of this study are as follows. First, the subjects of this study were confined to children between the age of 3-15 years old in an area of Tiznit Province. There can be differences in children's digital technologies usage according to regions and age. Therefore, it will be necessary to consider the regional differences among study subjects and to extend the age range of the subjects in future studies. Second, Parent-reported duration of mobile device use in young children has low accuracy, and use of objective measures is needed in future research. Third, it only included parents, excluding their children from the study. Fourth, some of the questions asked the parents to recall their children's health-related symptoms as a result of digital technology's usage, which could be subject to recall bias.

Moreover, these health-related symptoms should not be attributed to digital technology use alone, as confounding factors were not accounted for because of the nature of the study. Fifth, due to the lack of research on similar populations in the region, most of the results of this study can only be compared with the findings of similar studies with populations from different cultures and environments.

VI. Study strengths

Despite these limitations, this study is significant in that it is believed to be the first nationwide survey of digital technologies usage among parents of children, because previous local studies focused on adolescents or mixed samples, whereas studies on young children (aged 3-15 years) are hardly found both domestically and abroad. This is due to a higher prevalence of use and ownership of smartphones in adolescents. Yet in the past years, smartphone usage rates have also considerably increased among preschool children.

In addition, several researches have mainly focused on the effects of excessive digital media use or overuse on the health of children. More research should be conducted on general populations of children, rather than focusing exclusively on excessive technology users. This qualitative study describes technology's impact on physical and mental health from parents' perspectives.

RECOMMENDATIONS

The use of digital technologies has become an integral part of modern life, and it is understandable that parents may be concerned about the potential negative effects of excessive smartphone use on their children's well-being. However, there are several steps parents can take to mitigate these concerns:

- Set limits: Establishing reasonable limits on the amount of time your child can spend using their smartphone is an effective way to minimize the negative effects of excessive smartphone use. Parents can set daily or weekly limits on screen time and encourage their children to engage in other activities such as sports, reading, or spending time with friends.

The Australian Department of Health (2012) published guidelines for children about the recommended time to pass on mobile devices or electronic media (229):

  - Children <2 years: recommended no time watching TV or using other electronic media.
  - Children 2-5 years: no more than 1 h/day sitting and watching television and other.
  - Infants, toddlers, and preschoolers should not be sedentary, restrained or kept inactive for more than 1 h at a time, with the exception of sleeping.

- Monitor usage: Parents should regularly monitor their children's smartphone usage to ensure they are using it in a safe and healthy way. Monitoring can include checking their messages, social media accounts, and browser history.
- Encourage offline activities: Encourage your child to participate in offline activities, such as playing outdoors, reading books, or engaging in arts and crafts. These activities can help to reduce their reliance on smartphones and provide a healthy balance between online and offline activities.

- Educate about online safety: Children should be educated about the potential dangers of using smartphones and the internet, such as cyberbullying, online predators, and exposure to inappropriate content. Parents can discuss safe online behavior and set rules for what is and is not acceptable to share online.
- Lead by example: Children often learn by example, so it's important for parents to model healthy smartphone use themselves. Parents should limit their own screen time and engage in offline activities with their children.
- Pediatricians and health care professionals also should promote healthy digital media use, by educating parents and taking a media history and ask questions related to media use at every well-child visit.

CONCLUSION

The widespread adoption of digital technologies has transformed various aspects of our lives, including how children interact, learn, and communicate.

The findings of the present study indicate that a significant majority (94.1%) of children use digital devices, and 50.2% of them own one. Moreover, the purchases of these devices has risen after the onset of the COVID-19 pandemic.

The study revealed that 30.2% of parents in Tiznit, observed a decline in their children's health after one year of the use of these digital devices. With anger, loss of concentration and sleep disorders being the most prevalent.

Most parents interviewed (83%) expressed concerns about the adverse effects of digital technologies, particularly on their children's physical, mental health, and school performance

Overall, the findings highlight that children are immersed in a digital era where smartphone use will continue to rise and have the potential to lead to psychological and physiological challenges for the pediatric population. It becomes evident that preventing children from using these devices is an unattainable goal. Instead, controlled, safe, and balanced Internet usage should be the goal

Therefore, proper parental education and action are needed, wherein they can learn and use a variety of strategies to reduce the detrimental effects of digital devices without depriving them of their use.

The results of this study serve as a clear call to action for parents, educators, pediatricians and policymakers in supporting the digital well-being of children.

ABSTRACT

Abstract

Introduction:

With the increasing availability and accessibility of smartphones, tablets, and other digital devices, children are becoming more immersed in the digital world from an early age. This has raised questions about potential health effects. When exploring the reasons behind and consequences of this public health concern, it is essential to take into account parents' awareness and attitudes toward this societal phenomenon, as they play a significant role.

Patients and methods:

We conducted a cross-sectional observational study, using an anonymous questionnaire to collect data from 156 parents of children aged 3-15 years from different regions of Tiznit.

Results:

The vast majority (94.1%) of children used digital devices and 50.2% owned one, with smartphones being the most commonly owned device. Boys aged between 10 and 15, living in urban areas and attending private schools, were found to be the biggest users of digital technology. More than half (52%) of device purchases took place after the onset of the COVID-19 pandemic.

Use for less than an hour was the most common (41.4%).

In terms of parental intervention, most parents (54%) set predefined screen time limits for their children, and the majority of them (73.1%) monitored their children's activity on these devices.

Half of the children preferred to spend their free time using electronic media as their preferred leisure activity (50,6%).

The study revealed that specific health problems were observed in children using digital devices: anger (45.1%), loss of concentration (38.0%), insomnia (12.2%), eye disorders (9.1%) and

back pain (7.1%). A significant proportion of parents (30.2%) observed a deterioration in their children's health after a year of using digital devices, and 83% of participants were concerned about these adverse effects of digital technologies, particularly on their children's physical, mental health and academic performance.

Conclusion:

Parents, Pediatricians, and health care professionals should be aware of the potential risks related to inappropriate use of digital technology. They should monitor, possible associated adverse effects. They must carry out, as well, the necessary interventions to prevent and/or lower the detrimental impact of smartphone overuse on children and adolescents' health, oriented to sustain adequate physical and psychological development as well as social relationships.

Résumé

Introduction :

Avec la disponibilité et l'accessibilité croissante des smartphones, tablettes et autres appareils numériques, les enfants sont de plus en plus immergés dans le monde numérique dès leur plus jeune âge. Cette situation a soulevé des questions quant aux effets potentiels sur la santé. Lorsque l'on étudie les raisons et les conséquences de ce problème de santé publique, il est essentiel de tenir compte de la sensibilisation et des attitudes des parents à l'égard de ce phénomène de société, car ils jouent un rôle important.

Patients et méthodes :

Nous avons mené une étude observationnelle transversale, en utilisant un questionnaire anonyme pour recueillir des données auprès de 156 parents d'enfants âgés de 3 à 15 ans de différentes régions de Tiznit.

Résultats :

La grande majorité (94,1 %) des enfants utilisait des appareils numériques et 50,2 % d'entre eux en possèdent un, les smartphones étant l'appareil le plus couramment possédé. Il a été observé que les garçons âgés de 10 à 15 ans, vivant dans des zones urbaines et fréquentant des écoles privées, étaient les plus grands utilisateurs de la technologie numérique. Plus de la moitié (52 %) des achats d'appareils ont eu lieu après le début de la pandémie de COVID-19.

L'utilisation de moins d'une heure était la plus répandue (41.4%).

En ce qui concerne l'intervention des parents, la plupart d'entre eux (54 %) ont fixé des limites prédéfinies de temps d'écran pour leurs enfants et la majorité des parents (73,1%) surveillaient l'activité de leurs enfants sur ces appareils.

La moitié des enfants préféraient passer leur temps libre en utilisant les médias électroniques comme activité de loisir préférée (50,6%).

L'étude a révélé que des problèmes de santé spécifiques ont été observés chez les enfants utilisant des appareils numériques : la nervosité (45,1 %) et la perte de concentration (38,0 %), l'insomnie (12,2 %), les troubles oculaires (9,1 %) et les douleurs lombaires (7,1 %). Une proportion significative de parents (30,2%) %) ont observé une dégradation de la santé de leurs enfants après un an d'utilisation d'appareils numériques et 83 % des participants ont été préoccupés par ces effets néfastes des technologies numériques, en particulier sur la santé physique, mentale de leurs enfants et sur les résultats scolaires.

Conclusion :

Les parents, les pédiatres et les professionnels de la santé doivent être conscients des risques potentiels liés à une utilisation inappropriée de la technologie numérique. Ils doivent surveiller les éventuels effets indésirables associés et effectuer également les interventions nécessaires pour prévenir et/ou réduire l'impact néfaste de la surutilisation des smartphones sur la santé des enfants et des adolescents afin de maintenir un développement physique et psychologique adéquat ainsi que des bonnes relations sociales.

ملخص

مقدمة:

مع زيادة توفر الهواتف الذكية والأجهزة اللوحية وغيرها من الأجهزة الرقمية وسهولة الوصول إليها، أصبح الأطفال منغمسين في العالم الرقمي منذ سن مبكرة. وقد أثار هذا تساؤلات حول التأثيرات الصحية المحتملة لهذه الأجهزة. عند استكشاف الأسباب والنتائج المحتملة لهذه المشكلة الصحية العامة، من الضروري أخذ وعي الآباء واتجاهاتهم تجاه هذه الظاهرة المجتمعية في الاعتبار، حيث يلعبون دورًا هامًا.

المرضى والأساليب:

أجرينا دراسة مراقبة مقطعية باستخدام استبيان لجمع البيانات من 156 أب وأم لأطفال تتراوح أعمارهم بين 3 و15 سنة من مناطق مختلفة في تزنيت.

النتائج:

تشير نتائج الدراسة الحالية إلى أن غالبية كبيرة (94.1٪) من الأطفال يستخدمون الأجهزة الرقمية، ويمتلك 50.2٪ منهم جهازًا خاصا به، وتعتبر الهواتف الذكية هي الأجهزة الأكثر امتلاكًا. ولوحظ أن الأولاد الذين تتراوح أعمارهم بين 10 و 15 سنة، ويعيشون في المناطق الحضرية ويدرسون في مدارس خاصة، هم أكثر المستخدمين للتكنولوجيا الرقمية.
ولوحظ كذلك أن أكثر من نصف (52٪) عمليات شراء الأجهزة حدثت بعد بدء جائحة كوفيد-19

في حين أن أقل من ساعة من الاستخدام كانت الأكثر شيوعًا، تبين أن الأنشطة الرئيسية التي يقوم بها الأطفال باستخدام وسائط رقمية هي للترفيه بدلاً من الأغراض التعليمية.

فيما يتعلق بتدخل الآباء، أنشأ غالبية الآباء (54٪) حدود زمنية محددة لاستخدام الشاشة لأطفالهم وراقب 73.1٪ من الآباء استخدام أطفالهم للأجهزة.

كما لوحظ أن نصف الأطفال يفضل قضاء وقت فراغهم باستخدام وسائط إلكترونية كنشاطهم الترفيهي المفضل (50.6٪)

كشفت الدراسة عن وجود مشاكل صحية معينة بين الأطفال الذين يستخدمون الأجهزة الرقمية: الغضب (45.1٪)، فقدان التركيز (38.0٪)، الأرق (12.2 ٪)، شكاوى العين (9.1٪) وآلام أسفل الظهر (7.1٪). كما لاحظت نسبة كبيرة من الآباء (30.2٪) تدهورا في صحة أطفالهم بعد عام واحد من استخدام الأجهزة الرقمية.

وأشارت الدراسة إلى أن 83٪ من المشاركين أعربوا عن قلقهم إزاء التأثيرات السلبية للتكنولوجيا الرقمية، وخاصة على صحة أطفالهم الجسدية والعقلية، وكذلك على تحصيلهم الدراسي.

الاستنتاج:

يجب على الآباء وأطباء الأطفال وأخصائي الرعاية الصحية أن يكونوا على دراية بالمخاطر المحتملة المتعلقة بالاستخدام غير الملائم للتكنولوجيا الرقمية. يجب عليهم مراقبة الآثار الضارة المحتملة المرتبطة بها و تنفيذ التدخلات اللازمة لمنع و / أو تقليل التأثير الضار للإفراط في استخدام الهواتف الذكية على صحة الأطفال والمراهقين، بهدف الحفاظ على النمو البدني والنفسي المناسب وكذلك علاقات اجتماعية مناسبة.

ANNEX

استجواب للأباء حول استعمال الهواتف المحمولة من طرف أبنائهم

Enquête auprès des parents sur l'utilisation des téléphones portables par leurs enfants

Ce questionnaire est anonyme, s'inscrit dans le cadre de mon sujet de thèse pour l'obtention du doctorat en médecine au sein de la faculté de médecine et de pharmacie de Marrakech .intitulé **"enquête auprès des parents sur l'utilisation des téléphones portables par leurs enfants"**.
ce questionnaire est destiné **aux parents des enfants entre 3-12 ans.**
Je tiens à vous remercier d'avance de bien vouloir m'apporter votre aide en participant à cette étude.

*Obligatoire

1. 1)Vous êtes? الجنس : *

Une seule réponse possible.

- ◯ Homme ذكر
- ◯ Femme أنثى

2. 2) quelle est votre tranche d'age? (aux parents)
الفئة العمرية (للأباء)

Une seule réponse possible.

- ◯ entre 18 - 29 ans مابين
- ◯ entre 30 - 49 ans مابين
- ◯ plus de 50 اكثر من

3. **3) votre niveau intelectuel? (des parents)** *
(مستواكم الدراسي (للأباء

Plusieurs réponses possibles.

- [ ] primaire الشهادة الابتدائية
- [ ] collège الشهادة الاعدادية
- [ ] baccalauréat شهادة الباكالوريا
- [ ] études universitaires تعليم جامعي

4. **4)qu'il est l' âge de vos enfants** كم عمر أطفالك

Une seule réponse possible par ligne.

	من de 3-5	من de 5-7	من de 7-10	من de 10 - 15
1er enfant الطفل الاول	◯	◯	◯	◯
2ème enfant الطفل الثاني	◯	◯	◯	◯
3ème enfant الطفل الثالث	◯	◯	◯	◯
4ème enfant الطفل الرابع	◯	◯	◯	◯

5. **5) le sexe de votre enfant?**
جنس طفلكم

Une seule réponse possible par ligne.

	garçon ذكر	fille انثى
1er enfant الطفل الأول	◯	◯
2ème enfant الطفل الثاني	◯	◯
3ème enfant الطفل الثالث	◯	◯
4ème enfant الطفل الرابع	◯	◯

6. 6) le type d'établissement scolaire de votre enfant
مدرسة طفلك

Une seule réponse possible par ligne.

	école publique مدرسة عمومية	école privée مدرسة خصوصية
1er enfant الطفل الاول	◯	◯
2ème enfant الطفل الثاني	◯	◯
3ème enfant الطفل الثالث	◯	◯
4ème enfant الطفل الرابع	◯	◯

7. 7) la zone d'habitation *
مقر السكن

Une seule réponse possible.

- ◯ milieu urbain مجال حضري
- ◯ milieu rural مجال قروي

8. 8) Est-ce que votre enfant utilise un appareil de télécommunication (téléphone portable, tablette, PC...)

(هل يستعمل طفلك وسيلة للتواصل اللاسلكي (هاتف محمول, لوحة رقمية, حاسوب

Une seule réponse possible par ligne.

	oui نعم	non لا
1er enfant الطفل الاول	◯	◯
2ème enfant الطفل الثاني	◯	◯
3ème enfant الطفل الثالث	◯	◯
4ème enfant الطفل الرابع	◯	◯

9. 9)depuis quand votre enfant utilise il un appareil
منذ متى يستعمل طفلكم جهازا الكترونيا

Une seule réponse possible par ligne.

	moins d'un an أقل من سنة	plus d'un an أكثر من سنة
1er enfant الطفل الاول	◯	◯
2ème enfant الطفل الثاني	◯	◯
3ème enfant الطفل الثالث	◯	◯
4ème enfant الطفل الرابع	◯	◯

10. 10) Est-ce que votre enfant possède son propre appareil ?
هل يمتلك طفلك جهازا شخصيا خاصا به

Une seule réponse possible par ligne.

	oui نعم	non لا	il le partage avec son frère يتشاركه مع اخاه
1er enfant الطفل الاول	◯	◯	◯
2ème enfant الطفل الثاني	◯	◯	◯
3ème enfant الطفل الثالث	◯	◯	◯
4ème enfant الطفل الرابع	◯	◯	◯

11. 11) Si oui, lesquels ? (Cocher plusieurs cases si besoin)
(ان كانت الاجابة نعم اية اجهزة بمنلك ابن(ت)ك (يمكنك اختيار عدة خانات

Plusieurs réponses possibles.

	1er enfant الطفل الاول	2ème enfant الطفل الثاني	3ème enfant الطفل الثالث	4ème enfant الطفل الرابع
Smartphone avec connexion internet هاتف محمول ذكي متصل بالانترنيت	☐	☐	☐	☐
Téléphone mobile sans connexion internet هاتف محمول غير متصل بالانترنيت	☐	☐	☐	☐
ordinateur حاسوب محمول	☐	☐	☐	☐
tablette numérique لوحة رقمية	☐	☐	☐	☐

12. 12)est ce que L'achat de l'appareil de télécommunication pour votre enfant était avant ou apres covid19 ?
هل شراء الجهاز الالكتروني لطفلكم كان قبل او بعد جائحة كوفيد19

Une seule réponse possible par ligne.

	avant covid19 قبل كوفيد 19	aprés covid 19 بعد كوفيد19
1er enfant الطفل الاول	◯	◯
2ème enfant الطفل الثاني	◯	◯
3ème enfant الطفل الثاني	◯	◯
4ème enfant الطفل الرابع	◯	◯

13. **13) Est-ce que vous avez prédéfini un temps d'écran ?** *
هل حددتم وقتا محددا لاستعمال الاجهزة

Une seule réponse possible.

- ◯ oui نعم
- ◯ non لا

14. **14)Approximativement, combien de temps passe votre enfant sur son appareil par jour ?**
تقريبا, كم يقضي طفلك من الوقت امام الشاشة

Une seule réponse possible par ligne.

	(0 à 1 heure par jour) (0 الى ساعة واحدة في اليوم)	régulièrement (1 à 2 heures par jour) بشكل منتظم (ساعة واحدة الى ساعتين في اليوم)	très régulièrement (plus de 2 heures par jour) بشكل جد منتضم (اكثر من ساعتين في اليوم)	que les weekends خلال نهاية الاسبوع فقط
1er enfant الطفل الاول	◯	◯	◯	◯
2ème enfant الطفل الثاني	◯	◯	◯	◯
3ème enfant الطفل الثالث	◯	◯	◯	◯
4ème enfant الطفل الرابع	◯	◯	◯	◯

15. 15) Est-ce que vous surveillez ce que fait votre enfant sur son appareil? *
هل تراقب ما يقوم به طفلك على جهازه

Une seule réponse possible.

- oui نعم
- non لا

16. 16) Si oui par quel moyen
ان كانت اجابتك بنعم, ماهي الوسيلة المستعملة

_____

17. 17) Quelles sont les activités pour lesquelles votre enfant utilise plus son appareil
لاي نشاط/انشطة يستعمل طفلك جهازه الالكتروني

Plusieurs réponses possibles.

	1er enfant الطفل الأول	2ème enfant الطفل الثاني	3ème enfant الطفل الثالث	4ème enfant الطفل الرابع
pour ses études للدراسة	☐	☐	☐	☐
social media (facebook, whatsapp, instagram, tiktok) مواقع التواصل الاجتماعي	☐	☐	☐	☐
regarder des vidéos مشاهدة الفيديوهات	☐	☐	☐	☐
jeux vidéo ألعاب الكترونية	☐	☐	☐	☐
je ne sais pas لا أعرف	☐	☐	☐	☐

18. 18) Est-ce que votre enfant joue un autre jeu / fait d'autres activités que l'utilisation de son appareil
هل يلعب طفلك ألعاب أخرى/يقوم بنشاط اخر غير استعمال جهازه الالكتروني

Une seule réponse possible par ligne.

	oui نعم	non لا
1er enfant الطفل الأول	☐	☐
2ème enfant الطفل الثاني	☐	☐
3ème enfant الطفل الثاني	☐	☐
4ème enfant الطفل الرابع	☐	☐

19. 19) est ce que votre enfant trouve le même plaisir que lorsqu'il utilise son téléphone
هل يجد ابنك نفس المتعة في ممارسة نشاط اخر غير استعمال الهاتف

Une seule réponse possible par ligne.

	a beaucoup plus de plaisir en utilisant son téléphone يستمتع اكثر باستعماله الهاتف	non a beaucoup plus de plaisir en jouant un autre jeu يستمتع اكثر بممارسة نشاط اخر
1er enfant الطفل الأول	☐	☐
2ème enfant الطفل الثاني	☐	☐
3ème enfant الطفل الثالث	☐	☐
4ème enfant الطفل الرابع	☐	☐

20. 20) Est-ce que vous avez constaté un changement au niveau de
هل لاحظت اي تغير من ناحية

Plusieurs réponses possibles.

	1er enfant الطفل الأول	2ème enfant الطفل الثاني	3ème enfant الطفل الثالث	4ème enfant الطفل الرابع
concentration التركيز	☐	☐	☐	☐
névrosité العصبية	☐	☐	☐	☐
communication التواصل	☐	☐	☐	☐
Cervicalgies الآلام الرقبة	☐	☐	☐	☐
Mal de dos (lombalgie) الآلام أسفل الظهر	☐	☐	☐	☐
Somnolence diurne excessive نعاس مفرط أثناء النهار	☐	☐	☐	☐
Maux de tête الآلام الرأس	☐	☐	☐	☐
Migraine صداع نصفي	☐	☐	☐	☐
Démangeaisons cutanées حكة في الجلد	☐	☐	☐	☐
Insomnie (difficulté de trouver le sommeil en 30min) الأرق (صعوبة النوم خلال 30 دقيقة)	☐	☐	☐	☐

21. 21) Comment réagit votre enfant lorsque vous lui enlevez son appareil
كيف يتصرف طفلك عندما تسحب منه جهازه الالكتروني

Une seule réponse possible par ligne.

	il le cède tranquillement يعطيه لك بكل هدوء	il se fâche يغضب	il pleure يبكي
1er enfant الطفل الأول	☐	☐	☐
2ème enfant الطفل الثاني	☐	☐	☐
3ème enfant الطفل الثالث	☐	☐	☐
4ème enfant الطفل الرابع	☐	☐	☐

22. 22) Etes-vous inquiets pour l'influence de ces appareils sur la santé de votre enfant ? *
هل انت قلق حيال تأثير الأجهزة الذكية على صحة ابنك

Une seule réponse possible.

- ☐ oui نعم
- ☐ non لا

23. 24) si oui, pourquoi vous êtes inquiets?
ان كانت اجابتك بنعم لماذا أنت قلق

24. 25) Pensez-vous que la santé de votre enfant est moins bonne qu'avant l'utilisation du téléphone ?
هل تظن ان صحة طفلك تدهورت عما كانت عليه قبل استعماله للهاتف

Une seule réponse possible par ligne.

	oui نعم	non لا
1er enfant الطفل الأول	◯	◯
2ème enfant الطفل الثاني	◯	◯
3ème enfant الطفل الثالث	◯	◯
4ème enfant الطفل الرابع	◯	◯

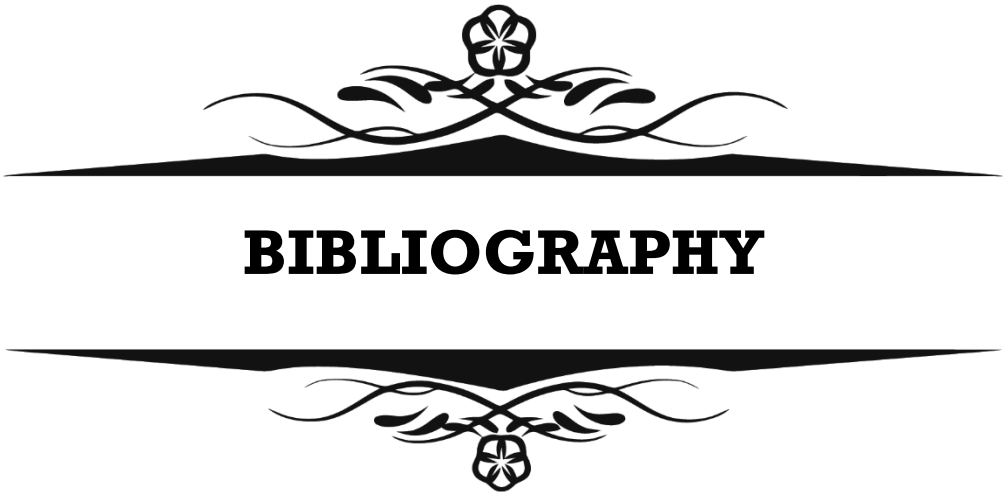
25. 26)Pensez-vous que votre enfant est plus vulnérable aux maladies que les autres enfants du même âge et qui n'utilise pas de téléphones *

هل تظن ان طفلك أكثر عرضة للإصابة بالأمراض من الأطفال الآخرين في نفس العمر و الذين لا يستعملون الهواتف

Une seule réponse possible.

◯ oui نعم
◯ non لا

26. 27) souhaitez vous ajouter des commentaires ou suggestion? هل تريد اضافة تعليقات او اقتراحات؟



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قسم الطبيب

أقْسِم بالله العَظِيم

أن أراقبَ الله في مِهْنَتِي.

وأن أصُونَ حياة الإنسان في كآفّةِ أطوَارهَا في كل الظروف والأحَوال باذلة وسْعِي في إنقاذها مِن الهَلاكِ والمرَضِ والألَم والقَلَق.

وأن أحفَظَ لِلنَاسِ كرَامَتهُم، وأسْتر عَوْرَتهُم، وأكتمَ سِرَّهُمْ.

وأن أكونَ عَلى الدوَام من وسائِل رحمة الله، باذلة رِعَايَتي الطبية للقريب والبعيد، للصالح والطالح، والصديق والعدو.

وأن أثابر على طلب العلم، وأسَخِّرَه لِنَفْعِ الإنْسَان لا لأذَاه.

وأن أُوَقّرَ مَن عَلَّمَني، وأُعَلّمَ مَن يَصْغرَني، وأكون أختاً لِكُلّ زَميل في المِهنَةِ الطِّبِّيَة مُتعَاونِين عَلى البرِّ والتقوى.

وأن تكون حياتي مِصْدَاق إيمَاني في سِرّي وَعَلانيَتي، نَقِيَّة مِمّا يُشينهَا تجَاهَ الله وَرَسُولِهِ وَالمؤمِنين.

والله على ما أقول شهيد

كليـــــــة الـطب
و الصيدلة - مراكش
FACULTÉ DE MÉDECINE
ET DE PHARMACIE - MARRAKECH
جامعة القاضي عياض
UNIVERSITÉ CADI AYYAD

سنة 2023 أطروحة رقم 182

استبيان للآباء التزنتين حول استعمال التكنولوجيا الرقمية من طرف أبنائهم

الأطروحة

قدمت ونوقشت علانية يوم 2023/06/15

من طرف

السيدة هاجر العدناني

المزدادة في 23 غشت 1997 بتزنيت

لنيل شهادة الدكتوراه في الطب

الكلمات الأساسية:

تكنولوجيا رقمية - أطفال - أعراض صحية - موقف الآباء

اللجنة

السيد	ع. بن علي أستاذ في الطب النفسي	الرئيس
السيد	م. بوالروس أستاذ في طب الأطفال	المشرف
السيدة	ن. لوهاب أستاذة في طب أمراض الدماغ والأعصاب	الحكام
السيد	ع. الهاشمي أستاذ في الإنعاش الطبي	