

The Digital Era's Effect on Neurodivergent Children and Adolescents: Correlating Smartphone Problematic use and ADHD in a Saudi Clinical Sample

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ABSTRACT

Smartphones have become indispensable for most people's lives worldwide. They are beneficial in communication, education, treatment, and entertainment. Unfortunately, smartphone addiction has proved to be associated with various physical, mental, and psychiatric disorders. This study aimed to assess the prevalence of smartphone addiction and the associated attention deficit hyperactivity and other psychiatric disorders. A cross-sectional study was conducted at King Saud University Medical City, Saudi Arabia, from July 2023 to August 2024. The data was gathered through a self-administered questionnaire through Google Forms, completed by caregivers of children aged 6-12 with ADHD, and face-to-face interviews. The validated Problematic Use of Mobile Phones (PUMP) scale was used. The Vanderbilt scale was used to evaluate the degree of the patient's ADHD. Chi-square, Non-parametric Spearman's rho correlation, and linear regression tests were applied to statistically analyze the relationship between the PUMP scale, the sociodemographic, and Vanderbilt variables. There was a statistically significant difference ($p < 0.05$) and correlation between smartphone use duration over the years, hours of smartphone use per day, with the ADHD patient's educational level, duration of parent marriage, refusal to follow instructions, avoidance of mentally demanding activities, difficulty playing quietly, waiting for their turns, interrupting the talk of others, refusal to obey adult requests or laws, being sensitive and easy to harass by others, and have previously broken into someone else's home, workplace or car. Control of children's use of smartphones is crucial, especially for those suffering from ADHD.

Keywords: ADHD; Children; Smartphones; King Saud University; Saudi Arabia, Vanderbilt scale

INTRODUCTION

Smartphones provide a wide range of mobile apps for information, communication, education, and entertainment, and they are becoming more and more necessary in daily life¹. Globally, smartphone users have been rising quickly, with the highest increase occurring in Asia and Europe². Smartphone addiction describes people who become so preoccupied with their smartphones that they overlook other aspects of their lives³. While several mobile applications promise to prevent and treat chronic diseases⁴⁻⁶, their excessive use has clear negative impacts on both physical and mental health. Symptoms of neck pain⁷ or incidents involving pedestrians and drivers while the user is driving are examples of negative physical impacts^{8,9}. Recent studies on mental health have shown that increased smartphone use may be connected to sleep issues and depression¹⁰. Addiction to smartphones is linked to co-occurring psychiatric disorders like obsessive-compulsive disorder (OCD), attention deficit hyperactivity disorder (ADHD), depression, and anxiety. Excessive smartphone use has been linked to social networking addiction, shyness, low self-esteem, impulsivity, cognitive impairment, and difficulty with cognitive emotion control. Medical issues also include decreased physical activity, unhealthful eating

patterns, pain and headaches, impaired cognitive function, and changes in the grey matter volume of the brain¹¹. Teenagers who use their smartphones excessively may suffer severe consequences, especially since adolescence is a delicate time when numerous physical, psychological, and social changes take place. Age-related declines in cell phone use have been observed, with those between the ages of 14 and 20 using their phones the most frequently^{12,13}. Attention-deficit hyperactivity disorder is an important growing psychiatric health problem of children and adolescents all over the world. Hyperactive, impulsive, and inattentive behaviors are two behavioral components of ADHD¹⁴. According to research, 40% of people with ADHD are smartphone addicts, making them more prone to addiction since they have trouble paying attention and displaying inhibition¹⁵. Keeping the layout in mind, this study aims to assess the prevalence of smartphone addiction among children in the Child and Adolescent Psychiatry OPD / King Saud University Medical City and its relation to ADHD and other psychiatric disorders.

MATERIAL AND METHODS

Study Design: Cross-sectional study.

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Study Setting: This study will be conducted at King Saud University Medical City, Saudi Arabia, following a cross-sectional study design. The data collection tool comprised a self-administered questionnaire and a face-to-face interview. The validated Problematic Use of Mobile Phones (PUMP) scale will be used.

Study Duration: 1 year

Target Population: children from 6-12 years

Sample Size with Sample Size Calculation/Sampling Technique:

$$x = Z(c/100)^2 r(100-r)$$

$$n = N x / ((N-1)E^2 + x)$$

$$E = \text{Sqrt}[(N - n)x / n(N-1)]$$

** where the sample size n and margin of error E , N is the study population size, r is the fraction of responses you are interested in, and $Z(c/100)$ is the critical value for the confidence level c .

The desired sample size will be an average of 60 patients with ADHD fulfilling the research criteria.

Subject Recruitment Procedures: self-administered questionnaire through Google form + face-to-face interview

Study Subject Selection:

Inclusion Criteria: Children (6-12 years) with ADHD attending the Psychiatry OPD at King Saud University Medical City.

Exclusion Criteria: Those who refuse to fill out the study questionnaire. Patients with Psychiatric disorders with age > 12 years.

Study Procedures: cross-sectional study for patients attending the child and adolescent psychiatry OPD at King Saud University Medical City through a self-administered questionnaire and face-to-face interview.

Data Collection Method/Data Source: Self-administered, online questionnaire and a face-to-face interview with caregivers of ADHD children attending the Psychiatry OPD, King Saud University Hospital, Saudi Arabia.

Questionnaires/data Sheets from other authors

The questionnaire will be collected from Dr. Hatem Alshahwan, author of the following article: "Arabic validation of problematic use of mobile phone scale among university students in Saudi Arabia. Journal of Nature and Science of Medicine"¹⁶.

Ethical approval was obtained from the Research and Ethics Committee of King Saud University with the reference number "24/0997/IRB".

The consent form was signed by the children's caregiver at the Psychiatry Outpatient Department of King Saud University Medical City.

Statistical Analysis: Data analysis was done by using the Statistical Package for Social Sciences (SPSS) version 26. The chi-square test was used to assess the statistical difference between sociodemographic characteristics of ADHD patients and PUMP, and also between the

Vanderbilt scale for ADHD and PUMP. Non-parametric Spearman's rho correlation was done to assess the Correlation coefficient (>0.7 = strong correlation, $0.3 - 0.7$ = Moderate correlation, <0.3 = weak correlation). The linear regression test was done to verify and quantify the correlations. P -value <0.05 was considered statistically significant.

RESULTS

Sociodemographic characteristics of patients with ADHD revealed that the most prevalent age group among participants was from 9 to < 12 years (37.9%). Most patients were males (72.4%) at the primary stage of education (46.6%), whose main hobbies were educational games (43.1%). The type of school was not a crucial risk factor for ADHD. University education and family income of more than 10000 SR were the most prominent among parents (79.3% and 72.4%, respectively). Consanguinity marriage was not recorded among most parents of children with ADHD (86.2%) (Table 1).

A study on personal and family histories of ADHD and other psychological disorders revealed that 46.6% of participants reported no family history of ADHD, while 48.3% answered "I don't know." Most participants (58.6%) indicated no family history of other psychiatric or developmental disorders. Of the patients, 67.2% were professionally diagnosed with 43.1% diagnosed by age 6. Additionally, 56.9% reported other psychological or developmental disorders, primarily anxiety (20.7%), speech disorders (17.2%), and impulse control disorders (17.2%). Treatment-wise, 60.3% received medications for ADHD, predominantly "Concerta," and 70.7% used non-pharmacological interventions, mainly "Behavioral therapy." Among the patients, 60.3% had taken an IQ test, with 37.9% scoring 70 or above. In terms of sleep habits, 51.7% reported restless sleep without a specific schedule, while the average sleep duration was 6-8 hours for 51.7% of participants (Table 2).

Table 3 reveals that the 58 children with ADHD exhibit high rates of core symptoms, including inattention, hyperactivity-impulsivity, oppositional behavior, and emotional challenges, along with significant functional impairments. Inattention was particularly notable, with many children frequently ignoring details, struggling to sustain attention, appearing unresponsive, having organizational difficulties, forgetting daily tasks, and losing necessary items. Hyperactivity and impulsiveness were also common, as many children were described as constantly moving, unable to play quietly, interrupting others, talking excessively, rushing to answer questions, and struggling to wait their turn.

Oppositional and conduct-related behaviors were commonly reported, including arguing with adults, refusing rules, losing one's temper, annoying others, aggression, and property destruction, though severe antisocial behaviors were less frequent. Many children also experienced emotional symptoms such as nervousness, sadness, feelings of inferiority, guilt, loneliness, shyness, and fear of making mistakes. These issues impacted school performance, especially in mathematics and writing, often resulting in average to difficult outcomes. Overall, the findings highlight the significant and complex effects of ADHD on behavior, emotional well-being, and daily functioning in the studied sample (Table 3).

Using smartphones for > 3 hours per day was associated with ADHD in approximately 55.2%. 41.4% of ADHD patients have to use smartphones for <2 hours per day. Sometimes, deprivation from smartphones makes patients with ADHD nervous and irritable in 46.6% of cases. Most ADHD patients (48.3%) were reported to prefer using a smartphone more than playing with peers (Table 4).

There were statistically significant differences ($p < 0.05$) and a correlation between smartphone use duration over the years, hours of smartphone use per day, and the ADHD patient's educational level, and the duration of their parents' marriage. Patient age, age group of the female parents, and patient reception of physiotherapy showed

statistically significant differences ($p < 0.05$) and correlations with smartphone use duration over the years. Receiving speech therapy showed a statistically significant difference ($p < 0.05$) and a moderate inverse correlation (-0.397) with hours of smartphone use per day (Tables 5, 6, 7).

Table 1. Sociodemographic frequency distribution for patients with ADHD (n= 58)

Variable	Options	Number of responses	Percentages
Age	< 6 years	10	17.2%
	From 6 to < 9 years	10	17.2%
	From 9 to < 12 years	22	37.9%
	12 years or more	16	27.6%
Sex	Male	42	72.4%
	Female	16	27.6%
Educational level	Not enrolled in any educational stage	14	24.1%
	Kindergarten stage	3	5.2%
	Primary stage	27	46.6%
	Intermediate stage	14	24.1%
School	Private	25	43.1%
	Governmental	25	43.1%
	Daycare centres	3	5.2%
	Comprehensive rehabilitation centers	5	8.6%
What kind of hobbies does the patient practice?	Exercise	11	19%
	Drawing or music	13	22.4%
	Electronic games	25	43.1%
	Others	9	15.5%
What is the educational level of the parents?	Uneducated	2	3.4%
	Intermediate education	2	3.4%
	Secondary education	3	5.2%
	University education	46	79.3
	Postgraduate studies	5	8.6
What is the average family income?	< 5000 SR	2	3.4
	≥ 5000 but < 10000 SR	14	24.1
	≥ 10000 SR	42	72.4
Which age group do the male parents of the patients belong to?	< 30 years	2	3.4
	≥ 30 and up to 60 years	52	89.7
	> 60 years	4	6.9
Which age group do the female parents of the patients belong to?	< 30 years	2	3.4
	≥ 30 and up to 60 years	56	96.6
	> 60 years	0	0
How long has it been since the beginning of marriage until now?	< 10 years	13	22.4
	≥ 10 and up to 25 years	35	60.3
	> 25 years	10	17.2
Are the patient's parents first-degree relatives?	Yes	8	13.8
	No	50	86.2
How many children are in the patient's family?	1	0	0
	2	16	27.6
	3	19	32.8
	4	10	17.2
	5	3	5.2
	> 5	10	17.2
What is the patient's order of birth?	1	20	34.5
	2	19	32.8
	3	9	15.5
	4	3	5.2
	5	3	5.2
	> 5	4	6.9

Table 2. Personal and family history of ADHD and other psychological disorders frequency distribution (Total number: 58)

Variable	Options	Responses	Percentages
Is there a family history of ADHD?	No	27	46.6
	Yes	3	5.2
	Don't know	28	48.3
Is there a family history of any psychiatric or developmental disorders?	No	34	58.6
	Yes	7	12.1
	Don't know	17	29.3
Has your child been diagnosed by a professional with ADHD?	No	19	32.8
	Yes	39	67.2
If the answer to the previous question is (yes), how old was the son/daughter when he/she was first diagnosed with ADHD? (N= 39)	≤ 6 years	25	43.1
	> 6 - 9 years	11	19
	> 9 – 12 years	3	5.2
Does the patient with ADHD suffer from any other disorders, whether psychological or developmental?	No	25	43.1
	Yes	33	56.9
If the answer to the previous question is (yes), please specify the type of disorder: (N=33)	Autism Spectrum Disorder	8	13.8
	Language Disorders	6	10.3
	Stuttering	4	6.9
	Speech Disorders	10	17.2
	Learning Disabilities	6	10.3
	Disorders of Motor Regulation and Tics	5	8.6
	Pervasive Developmental Delay	1	1.7
	Anxiety disorders	12	20.7
	Depression	3	5.2
	Oppositional Defiant Disorder	1	1.7
	Conduct Disorder	4	6.9
	Impulse Control Disorder	10	17.2
Has the patient been prescribed any medications or drugs for ADHD?	No	23	39.7
	Yes	35	60.3
If the answer to the previous question is (yes), please specify the number of these medications, the duration of use, and the doses. (N= 35)	0.25 عر جل ممدختسا مت نيئتنس رمع نم لادربس يرلا ءاود	2	3.4
	13 عر ج 1	5	8.6
	نيلزور	3	5.2
	مبح هابتنالا تتشتت جالع ىلا ريغت مت نيئتوراتيسلا هعاس 12 اهتدم حابصل مدحو	5	8.6
	اتريسنوكت	13	22.4
	مويلا يف مبح تتشتت بوبح	2	3.4
	نيلاتيير	1	1.7
	نيماع نم رشكا ذنم اتريسنوكتو لادربس ير	1	1.7
	لادربسا	1	1.7
	مويلا ب مدحو مبح تاوونس 4 نم دحاو ءاود	1	1.7
	نيدولكو اتريسنوكت	1	1.7
Have non-pharmacological interventions been used with the patient with ADHD?	No	17	29.3
	Yes	41	70.7
If the answer to the previous question is (yes), please specify the non-pharmacological interventions with the patient with ADHD (N= 41)	Behavioural therapy	37	63.8
	Occupational/functional therapy	22	37.9
	Physiotherapy	7	12.1
	Speech therapy	18	31
	Family therapy	5	8.6
	Parenting training	1	1.7
	Play therapy	6	10.3
Has an IQ test been done for the patient with ADHD?	No	23	39.7
	Yes	35	60.3
If the answer to the previous question is (yes), what is the intelligence level recorded for the patient with ADHD? (N=35)	< 20	2	3.4
	20-34	1	1.7
	35-49	5	8.6
	50-69	5	8.6
	≤ 70	22	37.9

What are the patient's sleeping habits?	Sleep early	26	44.8
	He stays up until the early hours of dawn	2	3.4
	Sleeps restlessly and there is no specific time to sleep	30	51.7
What are the average hours a patient sleeps per day?	Less than 6 hours	1	1.7
	6 to 8 hours	30	51.7
	> 8 to 10 hours	24	41.4
	More than 10 hours	3	5.2

Table 3. Vanderbilt scale to assess children with ADHD frequency distribution (Total number: 58)

		Options				Responses (Percentage)			
Was this assessment conducted at a time when the child:		Taking medication doses				26 (44.8)			
		Do not take medication doses				18 (31)			
		Not sure				14 (24.2)			
Symptoms:						Never	Sometimes	Often	All the time
1	Ignores details and makes negligent mistakes, such as homework					14 (24.1)	19 (32.8)	20 (34.5)	5 (8.6)
2	He finds it difficult to constantly focus on what he needs to accomplish (especially homework in class and at home)					14 (24.1)	17 (29.3)	17 (29.3)	10 (17.2)
3	He seems not to listen when he is directly addressed					10 (17.2)	32 (55.2)	13 (22.4)	3 (5.2)
4	Does not follow instructions and fails to complete activities (not due to refusal or lack of understanding)					22 (37.9)	25 (43.1)	7 (12.1)	4 (6.9)
5	It's difficult for them to organize tasks and activities, such as tidying up their room, scheduling classes, plays, and sleeping					13 (22.4)	21 (36.2)	12 (20.7)	12 (20.7)
6	Avoids, dislikes, or does not want to start mentally demanding activities such as homeschooling work					14 (24.1)	18 (31.0)	14 (24.1)	12 (20.7)
7	Loses tools and objects necessary to accomplish tasks or activities (such as games, assignments, pens, or books)					16 (27.6)	14 (24.1)	22 (37.9)	6 (10.3)
8	Easily distracted by noise or other stimuli					13 (22.4)	15 (25.9)	19 (32.8)	11 (19.0)
9	Forgets his daily activities, such as changing his clothes before bed, brushing his teeth, and tidying up his bag					14 (24.1)	16 (27.6)	17 (29.3)	11 (19.0)
10	Expresses boredom with his hands or feet or moves a lot on the chair					13 (22.4)	16 (27.6)	19 (32.8)	10 (17.2)
11	Leaves where he is expected to stay (such as during food or drink)					21 (36.2)	19 (32.8)	10 (17.2)	8 (13.8)
12	Runs or climbs a lot at inappropriate times when he should stay seated					28 (48.3)	15 (25.9)	6 (10.3)	9 (15.5)
13	Faces difficulty when asked to play quietly or participate in games quietly					17 (29.3)	15 (25.9)	18 (31.0)	8 (13.8)
14	Always moving as if it is powered by a motor					30 (51.7)	12 (20.7)	6 (10.3)	10 (17.2)
15	He talks a lot					18 (31.0)	20 (34.5)	10 (17.2)	10 (17.2)
16	Hurries to answer before completing the question posed to him					14 (24.1)	17 (29.3)	18 (31.0)	9 (15.5)
17	It's hard for him to wait for his turn, little patience					10 (17.2)	13 (22.4)	18 (31.0)	17 (29.3)
18	Interrupts the talk of others or breaks into their activities					11 (19.0)	16 (27.6)	15 (25.9)	16 (27.6)
19	Argue adults					20 (34.5)	14 (24.1)	4 (6.9)	20 (34.5)
20	Loses his temper, (becomes nervous about things that do not require it)					16 (27.6)	16 (27.6)	11 (19.0)	15 (25.9)
21	Refuses to obey adult requests or laws					17 (29.3)	18 (31.0)	12 (20.7)	11 (19.0)
22	Deliberately annoys others					34 (58.6)	9 (15.5)	13 (22.4)	2 (3.4)
23	Blames others for his mistakes or bad behaviours					23 (39.7)	16 (27.6)	12 (20.7)	7 (12.1)
24	Sensitive and easy to harass by others					9 (15.5)	18 (31.0)	11 (19.0)	20 (34.5)
25	Nervous and upset					18 (31.0)	17 (29.3)	3 (5.2)	20 (34.5)
26	Spiteful and has a desire for revenge					37 (63.8)	3 (5.2)	9 (15.5)	9 (15.5)
27	tyrannical in his dealings and threatens or intimidates others					36 (62.1)	10 (17.2)	8 (13.8)	4 (6.9)
28	Starts with physical brawls					34 (58.6)	7 (12.1)	9 (15.5)	8 (13.8)
29	Lies to survive problems or avoid any convictions (e.g., defraud others)					23 (39.7)	19 (32.8)	3 (5.2)	13 (22.4)
30	Absent from school without the permission of parents and the school					48 (82.8)	6 (10.3)	3 (5.2)	1 (1.7)
31	Physically violent with others					29 (50.0)	17 (29.3)	8 (13.8)	4 (6.9)
32	He has already stolen valuable (expensive) things					54 (93.1)	3 (5.2)	0 (0.0)	1 (1.7)
33	Deliberately destroys the property of others					44 (75.9)	11 (19.0)	3 (5.2)	0 (0.0)
34	Previously used a weapon that could cause serious harm (stick, knife, brick, pistol)					47 (81.0)	9 (15.5)	2 (3.4)	0 (0.0)
35	Cruel to animals					56 (96.6)	2 (3.4)	0 (0.0)	0 (0.0)
36	He has previously deliberately started a fire for the purpose of harm.					57 (98.3)	1 (1.7)	0 (0.0)	0 (0.0)
37	Has previously broken into someone else's home, workplace or car					50 (86.2)	8 (13.8)	0 (0.0)	0 (0.0)

38	He had previously stayed out of the house at night without permission	55 (94.8)	0 (0.0)	3 (5.2)	0 (0.0)	
39	He had previously run away from home at night	56 (96.6)	0 (0.0)	2 (3.4)	0 (0.0)	
40	Has ever forced someone to have sexual activity with him	58 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	
41	He gets scared worry and worry	25 (43.1)	11 (19.0)	14 (24.1)	8 (13.8)	
42	Afraid to try new things for fear of making mistakes	32 (55.2)	19 (32.8)	6 (10.3)	1 (1.7)	
43	Feels that it is not (or inferior) to others	28 (48.3)	13 (22.4)	8 (13.8)	9 (15.5)	
44	He blames himself for problems and feels guilty	32 (55.2)	16 (27.6)	7 (12.1)	3 (5.2)	
45	He feels lonely, unwanted, or unloved, and claims that "no one loves him."	24 (41.4)	17 (29.3)	9 (15.5)	8 (13.8)	
46	Feels sad, unhappy or frustrated	32 (55.2)	15 (25.9)	5 (8.6)	6 (10.3)	
47	Shy and easy to embarrass	23 (39.7)	26 (44.8)	8 (13.8)	1 (1.7)	
Performance:		Excellent	Very good	Medium	Having some difficulty	He has severe difficulty
1	Overall school performance	5 (8.6)	27 (46.6)	14 (24.1)	9 (15.5)	3 (5.2)
2	Reading	21 (36.2)	14 (24.1)	10 (17.2)	10 (17.2)	3 (5.2)
3	Writing	17 (29.3)	16 (27.6)	13 (22.4)	9 (15.5)	3 (5.2)
4	Math	6 (10.3)	24 (41.4)	12 (20.7)	13 (22.4)	3 (5.2)
5	His relationship with his parents	15 (25.9)	19 (32.8)	12 (20.7)	9 (15.5)	3 (5.2)
6	His relationship with his siblings	12 (20.7)	16 (27.6)	14 (24.1)	10 (17.2)	6 (10.3)
7	His relationship with his peers	9 (15.5)	23 (39.7)	17 (29.3)	6 (10.3)	3 (5.2)
8	Share structured activities (e.g., teams)	13 (22.4)	14 (24.1)	17 (29.3)	11 (19.0)	(5.2)

Table 4. The relationship between smartphone use and ADHD frequency distribution

Variable	Options	Responses	Percentages
How long does a smartphone be used by a person with ADHD?	< 1 year	6	10.3%
	1-3 years	20	34.5%
	> 3 years	32	55.2%
How many hours does a patient use a smartphone per day?	< 2 hours	24	41.4%
	2 - < 4 hours	9	15.5%
	4- < 6 hours	17	29.3%
	≥ 6 hours	8	13.8%
	No	9	15.5%
Does preventing a person with ADHD from using a smartphone make them nervous and irritable?	Yes	22	37.9%
	Sometimes	27	46.6%
	No	15	25.9%
Does the patient prefer to use a smartphone to play with peers?	Yes	28	48.3%
	Sometimes	15	25.9%

By Spearman's rho correlation test, there were considerable correlations between smartphone use over the years and hours of smartphone use per day with the age, educational level, family income, age group of parents, duration of the marriage, family history of ADHD, diagnosis of ADHD by a professional, and non-pharmacological interventions with ADHD patients like physiotherapy. Prevention of smartphone use recorded correlations with a family history of ADHD, suffering from Pervasive Developmental Delay and impulse control disorder, and receiving functional therapy. Preferring smartphone use over playing with peers recorded correlations with age, educational level, hobbies of patients, suffering from Language and Impulse Control Disorders, and receiving functional therapy (Table 6).

Using linear regression tests, there were significant correlations between smartphone use over the years and hours of smartphone use per day with educational level, age group of the female parents, duration of marriage,

number of children in the patient's family, order of birth, and suffering from depression. Prevention of smartphone use has correlations with educational level, School, patient's hobbies, educational level of the parents, the average family income, consanguinity marriage, number of children in the patient's family, order of birth, family history of ADHD, diagnosis by a professional, suffering from speech, motor regulation and tics disorders. Preferring smartphones over playing with peers has correlations with consanguinity marriage, the number of children in the patient's family and suffering from learning disabilities (Table 7).

A significant correlation exists between the duration of smartphone use and various behaviors in ADHD patients. Longer smartphone use is linked to refusal to follow instructions, avoidance of mentally demanding tasks, difficulty waiting for turns, interrupting others, and past incidents of breaking into homes or cars. Increased smartphone usage also correlates with arguments with adults, temper loss, annoying

Table 5. Results of the Sociodemographic characteristics Chi-square test (significant values only)

	Chi-square p-value			
	S. Ph use duration	S. Ph use hours	S. Ph prevention	S. Ph use or play
Age	0.014	0.003		
Gender				0.020
Educational level	0.034	< 0.001		0.001
School				< 0.001
What kind of hobbies does the patient practice?		0.014		< 0.001
What is the educational level of the parents?	0.004			0.009
What is the average family income?	< 0.001			0.004
Which age group do the male parents of the patients belong to?	< 0.001	0.007		
Which age group do the female parents of the patients belong to?	< 0.001			
How long has it been since the beginning of the marriage until now?	0.035	0.014		0.039
Are the patient's parents first-degree relatives?		0.030		
How many children are in the patient's family?	0.032	< 0.001	0.026	
What is the patient's order of birth?	0.007	0.002	0.025	0.003
Is there a family history of ADHD?	0.006	0.009		0.041
Is there a family history of any psychiatric or developmental disorders?	0.001			0.012
Has your child been diagnosed by a professional with ADHD?	0.022	0.011		
If the answer to the previous question is (yes), how old was the son/daughter when he/she was first diagnosed with ADHD?	0.006	< 0.001		0.002
The child is suffering from autism spectrum disorder		0.039		0.024
The child is suffering from Language Disorders		0.024		0.003
The child is suffering from Stuttering				
The child is suffering from Speech Disorders		< 0.001	0.028	0.013
The child is suffering from Learning Disabilities				
The child is suffering from Disorders of Motor Regulation and Tics		0.012		
The child is suffering from Pervasive Developmental Delay				
The child is suffering from anxiety disorders				
The child is suffering from Depression		< 0.001		
The child is suffering from Oppositional Defiant Disorder				
The child is suffering from Conduct Disorder	0.017			
The child is suffering from Impulse Control Disorder				
Has the patient been prescribed any medications or drugs for ADHD?	0.033			
If the answer to the previous question is (yes), please specify the number of these medications, the duration of use, and the doses.				
Have non-pharmacological interventions been used with the patient with ADHD?				
The patient received Behavioural therapy			0.047	
The patient received Occupational/functional therapy	0.001	0.001	0.018	
The patient received Physiotherapy	0.010	0.010		
The patient received Speech therapy		0.041		0.016
The patient received Family therapy				
The patient received Parenting training				
The patient received Play therapy		0.024		
Has an IQ test been done for the patient with ADHD?				
If the answer to the previous question is (yes), what is the intelligence level recorded for the patient with ADHD?	0.011			
What are the patient's sleeping habits?				
What are the average hours a patient sleeps per day?			0.041	

Significance: $P < 0.05$

Table 6. Results of the Sociodemographic Characteristics “Non-parametric Spearman's rho correlation test” (significant values only):

	r-value (correlation coefficient)			
	p-value			
	S. Ph use duration	S. Ph use hours	S. Ph use prevention	S. Ph use or play
Age	0.388 0.003	0.426 0.001		-0.304 0.020
Gender				-0.322 0.014
Educational level	0.386 0.003	0.574 < 0.001		-0.436 0.001
School				
What kind of hobbies does the patient practice?				0.607 < 0.001
What is the educational level of the parents?				
What is the average family income?	0.263 0.046			
Which age group do the male parents of the patients belong to?	0.375 0.004	0.369 0.004		
Which age group do the female parents of the patients belong to?	0.330 0.011			
How long has it been since the beginning of the marriage until now?	0.281 0.033	0.363 0.005		
Are the patient's parents first-degree relatives?				
How many children are in the patient's family?				
What is the patient's order of birth?				
Is there a family history of ADHD?	0.326 0.013	0.447 < 0.001	0.268 0.042	
Is there a family history of any psychiatric or developmental disorders?				
Has your child been diagnosed by a professional with ADHD?	-0.289 0.028	-0.391 0.002		
If the answer to the previous question is (yes), how old was the son/daughter when he/she was first diagnosed with ADHD?				
The child is suffering from autism spectrum disorder				
The child is suffering from Language Disorders		-0.336 0.010		0.348 0.008
The child is suffering from Stuttering				
The child is suffering from Speech Disorders				
The child is suffering from Learning Disabilities				
The child is suffering from Disorders of Motor Regulation and Tics				
The child is suffering from Pervasive Developmental Delay			-0.304 0.020	
The child is suffering from anxiety disorders				
The child is suffering from Depression				
The child is suffering from Oppositional Defiant Disorder		0.368 0.004		
The child is suffering from Conduct Disorder				
The child is suffering from Impulse Control Disorder			0.275 0.037	0.284 0.031
Has the patient been prescribed any medications or drugs for ADHD?				
If the answer to the previous question is (yes), please specify the number of these medications, the duration of use, and the doses.	0.308 0.019	0.273 0.038		
Have non-pharmacological interventions been used with the patient with ADHD?	0.328 0.012			
The patient received Behavioural therapy				
The patient received Occupational/functional therapy			0.315 0.06	0.299 0.022
The patient received Physiotherapy	-0.497 < 0.001	-0.357 0.006		

The patient received Speech therapy	-0.397 0.002
The patient received Family therapy	-0.356 0.006
The patient received Parenting training	-0.265 0.044
The patient received Play therapy	
Has an IQ test been done for the patient with ADHD?	
If the answer to the previous question is (yes), what is the intelligence level recorded for the patient with ADHD?	
What are the patient's sleeping habits?	
What are the average hours a patient sleeps per day?	
Correlation coefficient: >0.7 = strong correlation, 0.3 – 0.7 = Moderate correlation, <0.3 = weak correlation	

Table 7. Results of the sociodemographic characteristics linear regression test (The dependent variables are the duration of smartphone use by ADHD patients. The ADHD patients' smartphone use hours per day. The ADHD patient's reaction to preventing him from smartphone use. The ADHD patient's preference to use a smartphone than play with peers. (significant values only)

	β-value (regression coefficient)			
	p-value			
	S. Ph use duration	S. Ph use hours	S. Ph use prevention	S. Ph use or play
Age	0.278 0.045			
Gender				
Educational level	0.596 0.001	0.945 0.002	-0.769 < 0.001	
School			0.205 0.035	
What kind of hobbies does the patient practice?			-0.231 0.030	
What is the educational level of the parents?	-0.634 < 0.001		-0.573 0.001	
What is the average family income?			1.462 < 0.001	
Which age group do the male parents of the patients belong to?				
Which age group do the female parents of the patients belong to?	5.070 < 0.001	3.829 0.006		
How long has it been since the beginning of marriage until now?	0.870 < 0.001	1.239 0.003		
Are the patient's parents first-degree relatives?	1.349 < 0.001		-0.935 0.010	1.006 0.031
How many children are in the patient's family?	-0.584 < 0.001	-0.722 0.005	0.798 < 0.001	-0.429 0.043
What is the patient's order of birth?	0.271 0.008	0.379 0.035	-0.417 0.001	
Is there a family history of ADHD?			0.525 < 0.001	
Is there a family history of any psychiatric or developmental disorders?				
Has your child been diagnosed by a professional with ADHD?			-1.274 0.001	
If the answer to the previous question is (yes), how old was the son/daughter when he/she was first diagnosed with ADHD?	-0.724 < 0.001		1.212 < 0.001	-0.828 0.003
The child is suffering from autism spectrum disorder				
The child is suffering from Language Disorders	1.213 0.044			
The child is suffering from Stuttering	1.103 0.003			
The child is suffering from Speech Disorders			-1.406 0.004	

The child is suffering from Learning Disabilities			-0.984 0.028
The child is suffering from Disorders of Motor Regulation and Tics			-2.050 0.004
The child is suffering from Pervasive Developmental Delay			
The child is suffering from anxiety disorders			
The child is suffering from Depression	1.963 0.034	4.789 0.002	
The child is suffering from Oppositional Defiant Disorder			
The child is suffering from Conduct Disorder			
The child is suffering from Impulse Control Disorder			
Has the patient been prescribed any medications or drugs for ADHD?			
If the answer to the previous question is (yes), please specify the number of these medications, the duration of use, and the doses.			
Have non-pharmacological interventions been used with the patient with ADHD?			
The patient received Behavioural therapy		-0.812 0.021	
The patient received Occupational/functional therapy	-0.804 < 0.001		
The patient received Physiotherapy	1.436 0.002		
The patient received Speech therapy		-0.775 0.020	
The patient received Family therapy	-1.234 0.005		
The patient received Parenting training	2.176 0.004		
The patient received Play therapy	-1.575 < 0.001		
Has an IQ test been done for the patient with ADHD?			
If the answer to the previous question is (yes), what is the intelligence level recorded for the patient with ADHD?		0.353 0.044	
What are the patient's sleeping habits?			
What are the average hours a patient sleeps per day?			

Table 8. Results of the Vanderbilt scale Chi-square test (significant values only):

Symptoms	Chi-square p-value			
	S. Ph use duration	S. Ph use hours	S. Ph use prevention	S. Ph use or play
1 Ignores details and makes negligence mistakes, such as homework			< 0.001	0.020
2 He finds it difficult to constantly focus on what he needs to accomplish (especially homework in class and at home)				
3 He seems not to listen when he is directly addressed		< 0.001	< 0.001	
4 Does not follow instructions and fails to complete activities (not due to refusal or lack of understanding)	< 0.001	< 0.001	0.026	0.044
5 It's difficult for them to organize tasks and activities, such as tidying up their room, scheduling classes, plays, and sleeping	0.040	0.001	0.018	0.013
6 Avoids, dislikes, or does not want to start mentally demanding activities such as homeschool work	0.008	0.001		
7 Loses tools and objects necessary to accomplish tasks or activities (such as games, assignments, pens, or books)		0.002	0.002	0.004
8 Easily distracted by noise or other stimuli	0.032	< 0.001		
9 Forgets his daily activities, such as changing his clothes before bed, brushing his teeth, and tidying up his bag	< 0.001	0.037	0.034	0.037
10 Expresses boredom with his hands or feet or moves a lot on the chair		0.004	0.017	0.003
11 Leaves where he is expected to stay (such as during food or drink)		0.005	0.046	
12 Runs or climbs a lot at inappropriate times when he should stay seated	0.021	0.029	0.027	
13 Faces difficulty when asked to play quietly or participate in games quietly	0.021	0.017		

14	Always moving as if it is powered by a motor	< 0.001	0.001	0.002	0.015
15	He talks a lot				
16	Hurries to answer before completing the question posed to him	0.010	0.015	0.040	
17	It's hard for him to wait for his turn, little patience	0.018	< 0.001		
18	Interrupts the talk of others or breaks into their activities	0.035	0.016		
19	Argue adults	0.005		< 0.001	
20	Loses his temper, (becomes nervous about things that do not require it)	< 0.001		0.001	
21	Refuses to obey adult requests or laws	< 0.001	< 0.001	< 0.001	0.012
22	Deliberately annoys others	0.008		< 0.001	
23	Blames others for his mistakes or bad behaviors		0.006	0.001	
24	Sensitive and easy to harass by others	0.001	0.008	0.005	0.009
25	Nervous and upset			< 0.001	
26	Spiteful and has a desire for revenge		0.036	0.002	0.024
27	Tyrannical in his dealings and threatens or intimidates others	< 0.001	0.008	0.007	0.043
28	Starts with physical brawls	0.018	< 0.001	0.016	
29	Lies to survive problems or avoid any convictions (e.g. defraud others)		< 0.001		
30	Absent from school without the permission of parents and school	0.010	< 0.001	0.014	
31	Physically violent with others	< 0.001	0.001		0.017
32	He has already stolen valuable (expensive) things		0.042		0.039
33	Deliberately destroys the property of others	< 0.001			
34	Previously used a weapon that could cause serious harm (stick, knife, brick, pistol)		0.017		0.009
35	Cruel with animals	< 0.001			
36	He has previously deliberately started a fire for the purpose of harm.				
37	Has previously broken into someone else's home, workplace or car	< 0.001	0.004		
38	He had previously stayed out of the house at night without permission	< 0.001		0.011	
39	He had previously run away from home at night	< 0.001			
40	Has ever forced someone to have sexual activity with him				
41	He gets scared worry and worry		< 0.001		
42	Afraid to try new things for fear of making mistakes			0.022	
43	Feels that it is not (or inferior) to others	0.045	0.001		0.031
44	He blames himself for problems and feels guilty		< 0.001		
45	He feels lonely, unwanted or unloved, and claims that "no one loves him."	< 0.001	< 0.001	0.004	0.037
46	Feels sad, unhappy or frustrated	< 0.001	< 0.001	0.027	0.014
47	Shy and easy to embarrass	0.032	0.010	< 0.001	0.039
Performance					
1	Overall school performance				
2	Reading				
3	Writing				
4	Math				
5	His relationship with his parents				
6	His relationship with his siblings				
7	His relationship with his peers				
8	Share structured activities (e.g. teams)				

Table 9. Results of the Vanderbilt scale Non-parametric Spearman's rho correlation test (significant values only):

Symptoms	r-value p-value		S. Ph use prevention	S. Ph use or play
	S. Ph use duration	S. Ph use hours		
1 Ignores details and makes negligence mistakes, such as homework			-0.370** 0.004	
2 He finds it difficult to constantly focus on what he needs to accomplish (especially homework in class and at home)				
3 He seems not to listen when he is directly addressed		-0.345** 0.008	-0.344** 0.008	
4 Does not follow instructions and fails to complete activities (not due to refusal or lack of understanding)	-0.383** 0.003	-0.502** < 0.001	-0.302* 0.021	
5 It's difficult for them to organize tasks and activities, such as tidying up their room, scheduling classes, plays, and sleeping			-0.377** 0.004	

6	Avoids, dislikes, or does not want to start mentally demanding activities such as homeschool work	-0.278* 0.035	-0.313* 0.017	-0.282* 0.032
7	Loses tools and objects necessary to accomplish tasks or activities (such as games, assignments, pens, or books)			-0.322* 0.014
8	Easily distracted by noise or other stimuli			
9	Forgets his daily activities, such as changing his clothes before bed, brushing his teeth and tidying up his bag			-0.309* 0.018
10	Expresses boredom with his hands or feet or moves a lot on the chair			
11	Leaves where he is expected to stay (such as during food or drink)			
12	Runs or climbs a lot at inappropriate times when he should stay seated		-0.324* 0.013	.0386** 0.003
13	Faces difficulty when asked to play quietly or participate in games quietly	-0.278* 0.034	-0.390** 0.002	0.355** 0.006
14	Always moving as if it is powered by a motor	-0.301* 0.022	-0.541** < 0.001	0.375** 0.004
15	He talks a lot			
16	Hurries to answer before completing the question posed to him			-0.386** 0.003
17	It's hard for him to wait for his turn, little patience	-0.343** 0.008	-0.500** < 0.001	-0.280* 0.033
18	Interrupts the talk of others or breaks into their activities	-0.441** 0.001	-0.349** 0.007	-0.264* 0.045
19	Argue adults	-0.415** 0.001		-0.288* 0.029
20	Loses his temper, (becomes nervous about things that do not require it)	-0.329* 0.012		
21	Refuses to obey adult requests or laws	-0.435** 0.001	-0.316* 0.016	
22	Deliberately annoys others	-0.344** 0.008		
23	Blames others for his mistakes or bad behaviors	-0.310* 0.018		
24	Sensitive and easy to harass by others	-0.480** < 0.001	-0.274* 0.037	
25	Nervous and upset	-0.268* 0.042		
26	Spiteful and has a desire for revenge			
27	Tyrannical in his dealings and threatens or intimidates others			-0.272* 0.039
28	Starts with physical brawls	-0.419** 0.001		
29	Lies to survive problems or avoid any convictions (e.g. defraud others)			-0.272* 0.039
30	Absent from school without the permission of parents and school			
31	Physically violent with others			
32	He has already stolen valuable (expensive) things			-0.279* 0.034
33	Deliberately destroys the property of others	-0.523** < 0.001	-0.420** 0.001	
34	Previously used a weapon that could cause serious harm (stick, knife, brick, pistol)			
35	Cruel with animals	-0.330* 0.011		
36	He has previously deliberately started a fire for the purpose of harm.			
37	Has previously broken into someone else's home, workplace or car	-0.568** < 0.001	-0.429** 0.001	
38	He had previously stayed out of the house at night without permission	-0.408** 0.001		-0.325* 0.013
39	He had previously run away from home at night	-0.330* 0.011		

40	Has ever forced someone to have sexual activity with him		
41	He gets scared worry and worry		
42	Afraid to try new things for fear of making mistakes		
43	Feels that it is not (or inferior) to others		
44	He blames himself for problems and feels guilty	0.463** < 0.001	
45	He feels lonely, unwanted or unloved, and claims that "no one loves him."		-0.297* 0.024
46	Feels sad, unhappy, or frustrated		
47	Shy and easy to embarrass	0.287* 0.029	
Performance			
1	Overall school performance	0.313* 0.017	0.290* 0.027
2	Reading		
3	Writing	0.338** 0.009	
4	Math		0.319* 0.015
5	His relationship with his parents		
6	His relationship with his siblings		
7	His relationship with his peers		
8	Share structured activities (e.g. teams)		

*. Correlation is significant at the 0.05 level (2-tailed).

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

others, cruelty to animals, staying out late without permission, and running away from home. Additionally, it is associated with not listening when addressed, excessive physical activity at inappropriate times, self-blaming, and shyness. Preventing smartphone use correlates with ignoring details, making careless mistakes, not listening, struggling to organize tasks, losing necessary items, and rushing answers. Preference for smartphones over peer play is linked to domineering behavior, intimidation, theft of valuable items, and feelings of loneliness or being unloved (Table 8 and Table 9).

DISCUSSION

ADHD is a common neurobehavioral disorder affecting 3.4-5% of children globally¹⁷. In the Arab world, prevalence ranges from 1.3% to 16%¹⁸. The Saudi National School-Based Screening Program found a 2.81% prevalence of ADHD among first and fourth graders in the 2018-2019 academic year¹⁹. A recent study in the US demonstrated that 8% of its sample received an ADHD diagnosis between first and fifth grade, which is lower than the prevalence we found in the study (46.6%)²⁰ a difference that can be understood in the context of a larger sample size. The same study found similar results to ours, indicating that the predominant gender was male. In terms of family income, another study conducted in the U.S. discovered that 30.7% of its population came from low-income families. This contrasts with our findings, where the majority (72%) of families reported an income above average²¹, this can be understood in the context of the study site and the reflective family's level of education in the sample which was mainly university educated.

Genetics plays a significant role in ADHD; however, the specific impact of consanguinity on ADHD subtypes remains unclear. In the Arabian Gulf Nations, where consanguineous marriages are common, there is a possibility that such marriages could contribute to the prevalence of ADHD in the region. Nevertheless, existing research has not confirmed this idea. In fact, our study's findings indicate that 86.2% of our sample comprised non-consanguineous individuals²².

Comparing this study result with regional Arab results, male predominance was a consistent finding in a review of studies conducted in Arab, with a male-to-female ratio ranging from 1.61:1 to 5:2²³. A study conducted at the same site found comparable results of gender differences, and male predominant result 67.39%²⁴ and the study's age range was like ours^{22,25-27} compared to^{22,25-29}. Although the income reported in the study was similar to ours, the researchers noted that children with ADHD who also had an endocrine disease had a lower income. Additionally, a local study measuring the prevalence of ADHD in the western region of Saudi Arabia found that 50% of their sample earned more than eight thousand, which is comparable to our findings²⁴.

ADHD is a familial disorder, with a 6-8 times higher risk among first-degree relatives of individuals with ADHD. 30-35% of full siblings of individuals with ADHD also meet the diagnostic criteria for the disorder¹⁸. The current study revealed that most participants had no family history of the disorder. This finding contrasts with another local study, which reported that 66.66% of parents of children with ADHD indicated higher levels of ADHD symptoms, compared to only 41.4% in our study. Additionally, when examining comorbidities associated with ADHD, our study found a prevalence rate of 56.9%. This indicates that children with ADHD often experience a high rate of comorbid conditions²⁴. Anxiety disorder continues to be the most prevalent psychiatric comorbidity with ADHD, as 20% in our study had comorbid anxiety and 43% in another local study³⁰. The difference in rates can be explained by factors such as sample size, the location of sample collection, and the various tools used for measurement. Impulse control disorders are among the common psychiatric comorbidities, with occurrence rates reaching up to 56% in some studies. However, in our sample, the rate was lower at 17.2%. This discrepancy can be attributed to the fact that most participants in our study were receiving intervention at the time of data collection, with 70% currently undergoing treatment. Numerous studies have shown a positive correlation between treated ADHD and improved outcomes, particularly in relation to comorbid conditions²⁵.

ADHD medication is a well-established treatment for reducing the symptoms of ADHD, such as impulsivity, inattention, and hyperactivity. It is considered the most effective single treatment for managing these symptoms^{26,27}. In our study, we found that 60.3% of participants reported having received psychostimulant medication, particularly Concerta (methylphenidate ER). This rate is comparable to the National Survey of Children's Health (NSCH), which indicates that 69% of their sample received pharmacological intervention²⁹.

High-quality behavioral interventions can improve outcomes for some children with ADHD, but access to these interventions may be limited in the US²⁸. Sixty-three percent of the sample size was receiving behavioral therapy, which aligns with the recent CDC report indicating that 39-62% of children are receiving behavioral intervention³¹. ADHD diagnoses are usually based on symptoms observed during the daytime; however, many individuals with ADHD also experience sleep disturbances. The connection between ADHD and sleep is complex, as sleep issues can be both a cause and a consequence of ADHD symptoms³². Research indicates that 25-55% of individuals with ADHD experience moderate to severe sleep problems. A recent Australian study found that over 60% of children with ADHD have sleep difficulties, and nearly a quarter of them use sleep medication. According to the Consensus Statement of the American Academy of Sleep Medicine regarding the recommended amount of sleep for healthy children, children aged 6 to 12 years should regularly sleep between 9 to 12 hours in a 24-hour period to promote optimal health. In our sample, a majority, 51.7%, reported sleeping only about 6 to 8 hours daily³³.

In the present study, it was found that using smartphones for more than three hours a day is associated with ADHD in approximately 55.2% of cases. Notably, 41.4% of patients with ADHD use smartphones for less than two hours per day. Deprivation from smartphones often makes ADHD patients feel nervous and irritable, as reported in 46.6% of cases. Additionally, nearly half of the ADHD patients (48.3%) indicated a preference for using smartphones over playing with peers. Even when considering sleep and activity patterns as potential influences, recent data indicate that excessive screen time, including smartphone use, is linked to higher ADHD symptom scores among children and adolescents. Daily screen use of four hours or more is associated with an increased risk of attention-related issues compared to lower screen exposure³⁴.

Studies examining screen time and behavioral outcomes in Saudi children suggest a possible correlation between increased device engagement and symptoms of ADHD. This implies that prolonged use of devices may be associated with more severe concentration issues. These studies emphasize the need to consider both the amount of smartphone use and its psychological effects, such as irritability and social isolation, when interpreting the relationship between smartphone use and ADHD. Additionally, they support your observations regarding smartphone preferences and distress during periods of deprivation in individuals with ADHD³⁵.

The observed statistically significant associations between longer smartphone use and factors like educational level and the duration of parents' marriage align with emerging evidence that digital media habits vary across different demographic groups and can intersect with developmental and contextual factors. For example, research using Mendelian randomization has shown that the length of mobile phone use can mediate the relationship between ADHD and educational outcomes. This indicates that prolonged engagement with digital devices may influence academic trajectories and could interact with individual characteristics, such as educational attainment³⁶. Cross-sectional studies have consistently shown a correlation between

patterns of smartphone use and attention-related scores, as well as age. This suggests that demographic factors, such as age and developmental stage, are linked to the types and numbers of devices used among populations exhibiting symptoms of ADHD³⁷. Research indicates that increased smartphone usage is associated with poorer performance in various aspects of life, including academic and cognitive tasks. Therefore, the observation that receiving speech therapy is negatively correlated with the number of hours spent on smartphones may reflect broader behavioral trends. In this case, structured therapeutic activities, such as speech interventions, may compete with the time dedicated to screen use³⁸. Although there is limited research specifically focused on physiotherapy and smartphone use among individuals with ADHD, evidence from related fields suggests that younger people who have higher exposure to screens often display distinct usage patterns and associated psychosocial outcomes. This supports the idea that demographic factors and therapeutic involvement may significantly influence the digital media habits of this group³⁹.

The significant correlations found between the duration of smartphone use, the number of hours spent on devices, and a variety of ADHD-related behaviors and externalizing symptoms align with emerging research. This research suggests that problematic digital media use often co-occurs with more severe behavioral dysregulation in individuals with ADHD. Recent studies indicate that problematic media use is more prevalent among children and teenagers with ADHD, and that increased daily screen time is associated with more externalizing issues and behavioral challenges. These findings suggest that prolonged use of digital devices may be linked to the impulsive and attention-related difficulties commonly seen in individuals with ADHD⁴⁰. Research indicates that problematic smartphone usage is more prevalent among adolescents who exhibit more severe symptoms of oppositional defiant disorder, including traits such as argumentativeness, defiance, and irritability. These behaviors are often connected to the emotional and behavioral dysregulation seen in individuals with ADHD⁴¹. The connections observed between the number of hours spent using screens and problems such as interrupting others, ignoring rules, and difficulty waiting for turns are further supported by long-term studies. These studies indicate that increased screen time is associated with higher levels of impulsivity and worsened ADHD symptoms⁴². The consistent findings across various studies indicate that higher smartphone engagement among individuals with ADHD often coincides with a wider range of behavioral challenges and externalizing traits. These factors may impact both social functioning and psychological well-being, although the causal relationships are complex and likely bidirectional⁴⁰.

Limitations and Generalizability

This study has several limitations. First, its cross-sectional design limits the ability to establish a causal relationship between problematic smartphone use and ADHD symptoms. Second, the study was conducted at a single tertiary care center, King Saud University Medical City, Riyadh, Saudi Arabia, which may limit the generalizability of the findings to the broader Saudi population or non-clinical settings. Additionally, the relatively small sample size may affect the external validity of the results. The reliance on caregiver-reported questionnaires may also introduce recall and reporting bias. Further multicenter longitudinal studies with larger samples are recommended to confirm these findings.

CONCLUSION

Problematic smartphone use appears to be significantly associated with several behavioral and psychiatric manifestations among children and adolescents diagnosed with ADHD. These

findings highlight the importance of monitoring smartphone use and promoting healthy digital habits in neurodivergent pediatric populations. Further large-scale multicenter studies are recommended to better establish causality and improve the generalizability of the findings.

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