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The impact of the COVID-19 pandemic on internet usage profiles in individuals: the mediating role of ADHD symptoms

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ABSTRACT

Aims: Attention deficit/hyperactivity disorder (ADHD) is a common neurodevelopmental disorder characterized by attention deficit, impulsivity, and hyperactivity. This disorder may have had an impact on individuals' internet usage profiles, particularly due to the pandemic measures. The aim of the study was to determine the prevalence of ADHD and to examine the factors affecting internet addiction in this disorder.

Methods: This clinical study was designed as a cross-sectional and descriptive study and was conducted on 250 participants living in the city center of Sakarya and selected by random sampling method. The sociodemographic data form, Addiction Profile Index internet (APIINT) form, Adult ADHD Self-Report Scale (ASRS), Epidemic Anxiety Assessment Scale (EAAS) were applied to the participants online via e-mail via Google forms.

Results: Of the participants, 14 (5.6%) stated that they were diagnosed with ADHD in childhood and 20 (8%) in adulthood. The number of patients who reported that they were diagnosed with any psychiatric disorder in adulthood (other than ADHD) was 50 (20%). With the APIINT scale score, the APIINT total score mean values were found to be significantly higher in the groups diagnosed with ADHD in childhood, diagnosed with ADHD in adulthood and suspected ADHD with ASRS compared to the group without ADHD diagnosis (p=0.001).

Conclusion: Internet use has intensified during the pandemic, and it has been observed that this situation may be related to the level of anxiety about the pandemic. Internet addiction was found to be higher in those with ADHD than in the non-ADHD group. The study is valuable in that it examines the changes in people's media and technology usage habits during the pandemic, but studies with larger samples, face-to-face interviews, and follow-up data are needed to better understand the subject.

Keywords: ADHD, internet addiction, COVID-19, media, technology

INTRODUCTION

Attention deficit/hyperactivity disorder (ADHD) is a common neurodevelopmental disorder characterized by a persistent pattern of inattention, hyperactivity, and impulsivity.[1] It affects approximately 5-10% of school-aged children and usually begins in childhood and continues into adulthood in approximately 60% of individuals.[2] The disorder can impair individuals' performance in social, educational, and work environments.[3] ADHD typically begins before age 7.[4] Genetics play an important role in ADHD, with studies pointing to multiple susceptibility genes across different populations.[5] It is considered one of the most common neurodevelopmental disorders of childhood.[2]

Internet addiction has attracted significant attention in recent years, with an increase in research focusing on its epidemiology, behavioral aspects, and impact on individuals' daily lives.[6] Although it is difficult to give a standard definition of internet addiction, it is generally characterized by symptoms such as inability to control desire for internet activities, extreme irritability when away from the internet, and weakening of relationships in the work environment, social relationships and family relationships.[7] There are studies showing a direct relationship between internet addiction and psychological problems.[8] Additionally, internet addiction has been linked to various factors such as temperament, urbanization, social anxiety, and parenting styles.[9-11]

The COVID-19 pandemic has led to a significant increase in anxiety symptoms, depression, addictions, and internet usage worldwide due to global stay-at-home mandates

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and quarantines.[12,13] This increase in online activities has particularly manifested itself in areas such as telehealth, distance education and e-commerce.[14,15] The shift to online platforms has become essential to maintaining productivity during the pandemic.[16] In terms of social interactions, the pandemic has also accelerated the digitalization of face-to-face communities, with religious gatherings, social events and community activities shifting to online platforms.[17]

Studies have found that internet addiction has increased during the COVID-19 pandemic. A positive relationship has been demonstrated between internet addiction and intolerance of uncertainty regarding COVID-19, depression, and perceived risk. This suggests that the uncertainty and risks brought by the pandemic may contribute to an increase in internet use and addiction.[18] It has been determined that the pandemic has led to an increase in internet-based addictive behaviors, including internet addiction, gaming disorder and social media addiction, and that the feeling of isolation and loneliness experienced during the pandemic may have led individuals to excessive internet use as a coping mechanism.[19]

Additionally, individuals with pre-existing conditions such as ADHD have been found to be more prone to internet addiction during the COVID-19 pandemic. Studies have shown that children with ADHD tend to overuse the internet during the pandemic, leading to worsening ADHD symptoms, emotional dysregulation, and angry outbursts.[20-23] The pandemic is also causing an increase in addictive internet and substance use behaviors, further complicating mental health issues.[24]

This study aimed to examine the prevalence of ADHD and the characteristics of internet use accompanying this disorder. It also evaluates the psychological media and technology usage habits of individuals during the COVID-19 pandemic and aims to reveal the specific difficulties experienced by individuals diagnosed with ADHD during this process. This aspect of the research can make significant contributions to the development of strategies for the management of ADHD and to better understand the needs of individuals in extraordinary situations such as pandemics.

METHODS

Ethical Approval

Ethics committee approval was obtained from Sakarya University Faculty of Medicine Non-interventional Ethics Committee (Date 29.05.2020, Decision No: 2020/309). The research was conducted in accordance with the 1964 Helsinki Declaration.

Research Design and Sample Selection

This clinical research was designed as a cross-sectional and descriptive study and was conducted between 20/06/2020 and 20/10/2020 on 250 volunteer participants living in the city center of Sakarya and selected by random sampling method. Individuals between the ages of 18-65, who are literate and able to understand the scales used and select the appropriate answer were included in the study.

Consent to Participate

Informed consent was obtained from all study participants

Study Procedure

The sociodemographic data form applied to the participants, BAPI internet (APIINT) Form, ASRS, EAAS surveys were compiled by the researchers in the form of consecutive questions using Google Forms. The prepared forms were sent to the participants online via e-mail and they were asked to answer them.

Data Collection Tools

Sociodemographic Data Form: It was created by the researchers to include questions such as the participants' gender, age, marital status, education level, place of residence, employment status, monthly income level, and whether a curfew was imposed due to COVID-19 in their place of residence.

APIINT Addiction Form: It was developed by Ögel[25] and his colleagues to determine the level of internet addiction in accordance with the concept of addiction and the literature. It is a self-report scale consisting of 18 items. The first item includes the frequency of internet use, which includes a six-item answer. Other questions are scored between 0 (never) and 4 (almost always). The Cronbach alpha value of the scale is .88. The sub-dimensions of the scale were determined as frequency of internet use, addiction diagnosis criteria, the effect of internet use on life, intense desire to use, and motivation to reduce internet use. The cut-off score of the scale is two.

Epidemic Anxiety Assessment Scale (EAAS): It was developed by Yazıcı et al.[26] to assess the level of anxiety related to epidemics. It is a Likert-type scale consisting of 15 items, with each question being scored between 0 (almost never) and 4 (almost always). The Cronbach's alpha value of the scale is .94.

Adult ADHD Self-Report Scale (ASRS): The Adult ADHD Self-Report Scale (ASRS) is a comprehensive scale developed by the Adult ADHD Working Group in collaboration with the World Health Organization (WHO) to assess symptoms of ADHD in adults.[27] This 18-item scale allows individuals to self-assess their ADHD symptoms according to DSM-IV criteria.[27] The ASRS serves as a valuable screening tool for ADHD and provides a dimensional self-assessment consistent with diagnostic criteria.[28] The Turkish validity and reliability was carried out by Doğan et al.[29]

Statistical Analysis

The study data were entered into the SPSS (statistical package for the social sciences) 22.00 program on a computer with Windows 10.0 package program installed and evaluated with this program. First, descriptive and frequency analyses were performed, then the groups were compared. Normality tests were performed using the Kolmogorov-Smirnov and Shapiro-Wilk tests. When comparing the groups diagnosed with ADHD and those not diagnosed with ADHD, the groups were evaluated with the Mann-Whitney U test because they did not show a normal distribution. The relationship between the APIINT, ASRS and EAAS scales was determined with Spearman correlation analysis. The significance level was determined as 0.05 for two sides.

RESULTS

Our study included 250 individuals between the ages of 18-65. Of the participants, 163 (65.2%) were female and 87 (34.8%) were male, with an average age of 33.5±11.5 years. The sociodemographic characteristics of the patients and their COVID-19 positivity status are presented in Table 1.

Table 1. Sociodemographic characteristics of participants

	n	%
Gender		
Woman	163	65.2
Man	87	34.8
Marital status		
Married	109	43.6
Single	132	52.8
Divorced	6	2.4
Living separately	3	1.2
Education level		
Primary school	5	2
Middle school	3	1.2
High school	33	13.2
University	163	65.2
Master's degree and above	46	18.4
Place of living		
Rural	15	6
Urban	235	94
Active working status		
Working regularly	141	56.4
Works irregularly	17	6.8
Doesn't work	92	36.8
Monthly income level		
0-2000 TL	75	30
2001-5000 TL	83	33.2
5001-10.000 TL	76	30.4
10.001 TL and above	16	6.4
Living area		
There is a curfew on weekends and similar occasions	218	87.2
No curfew	27	10.8
There is a curfew every day	**5**	**2**
COVID suspicion or positivity	15	6
Total	250	100

Of the participants, 14 (5.6%) stated that they were diagnosed with ADHD in childhood and 20 (8%) in adulthood. The number of patients who reported that they were diagnosed with any psychiatric disorder (other than ADHD) in adulthood was 50 (20%).

While the number of patients reporting that there was at least one family member diagnosed with ADHD was 32 (12.8%), the number of patients reporting that there was no family member diagnosed with ADHD was 218 (87.2%).

While the number of patients who reported receiving psychiatric treatment for any reason was 69 (27.6%), the number of patients who reported not receiving psychiatric treatment was 181 (72.4%).

The number of patients who used at least one of tobacco, alcohol or any psychoactive substance was 122 (48.8%); 87 people (50.9%) reported using tobacco, 80 people (48.5%) reported using alcohol and 1 person (0.6%) reported using substances (n=171).

The patients' levels of internet addiction, the severity of anxiety related to the pandemic, and ADHD symptoms were assessed using the APIINT, ASRS, and EAAS scales, and the results are presented in Table 2.

Table 2. Numerical data regarding APIINT, EAAS and ASRS scales

Scales	Lowest score (n=250)	Highest score (n=250)	Avg±SD (n=250)
APIINT	0.10	3.60	1.65±0.75
ASRS	0	22	8.09±4.51
EAAS	1	54	14.36±10.65

APIINT: Addiction Profile Index internet, EAAS: Epidemic Anxiety Assessment Scale, ASRS: Adult Self-Report Scale

The APIINT cut-off score was 2, and the number of patients with a score above 2 was 81 (32.4%).

The correlation levels between the APIINT, ASRS, and EAAS scales were examined. When all scales were compared in pairs through correlation analyses, a significant positive correlation was found between them (Table 3).

Table 3. Evaluation of the correlation relationship of APIINT, ASRS and EAAS scales

		ASRS total score	APIINT total score	EAAS total score
ASRS	r	1000	.474**	.261**
	p		.001	.001
	n	250	250	250
APIINT	r	.474**	1000	.400**
	p	.001		.001
	n	250	250	250
EAAS	r	.261**	.400**	1000
	p	.001	.001	
	n	250	250	250

**Correlation level 0.001, Spearman correlation analysis was applied, APIINT: Addiction Profile Index internet, ASRS: Adult Self-Report Scale, EAAS: Epidemic Anxiety Assessment Scale

According to ASRS scores, no individual with a high probability of ADHD (24 points and above) was identified in our study; the number of individuals considered to have probable ADHD (17-23 points) was determined to be 16 (6.4%). It was determined that 234 patients (93.6%) scored 16 points and below.

Evaluations Regarding Participants' Television, Telephone and Internet Usage Profiles

The participants' usage durations of television, phone, and internet were analyzed in hours and summarized in Table 4. It was found that a quarter of the participants used the internet for more than 6 hours, while approximately one-fifth used their phones for more than 6 hours. The reasons for patients' use of phones and the internet are summarized in Figure.

Table 4. Numerical data on television, telephone and internet usage times

	Television (n=250)		Telephone (n=250)		Internet (n=250)		
Duration (hour)	**n**	**%**	**n**	**%**	**Duration (hour)**	**n**	**%**
I never watch	69	27.6	-	-	I never use	1	0.4
1-2 hour	103	41.2	64	25.6	1-2 hour	55	22
3-4 hour	58	23.2	93	37.2	3-4 hour	83	33.2
5-6 hour	15	6	46	18.4	5-6 hour	48	19.2
6 hour and above	5	2	47	18.8	6 hour and above	63	25.2

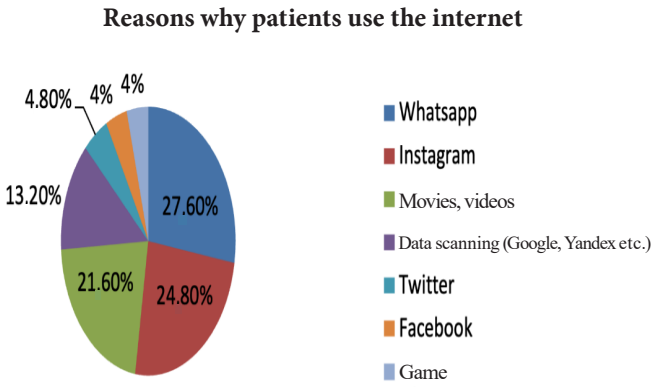

Figure. Numerical data on patients' reasons for internet use

In the sociodemographic data form, patients were asked questions about the duration of phone, tablet/PC and internet/social media use during the pandemic and options were presented. During the pandemic, it was determined that 68.4% of the participants experienced an increase in tablet usage, and 76.8% reported an increase in the time spent watching television. Data on patients' opinions on the subject are shown in Table 5.

Table 5. Evaluations regarding tablet/PC, phone and TV/radio usage time

	Tablet /PC		TV		TV/radio	
Question-1 (n=250)	**n**	**%**	**n**	**%**	**n**	**%**
Has there been an increase in your usage time during the pandemic?						
Yes	171	68.4	192	76.8	125	50
No	66	26.4	58	23.2	102	40.8
I don't use	13	5.2	-	-	23	9.2

PC: Personal computer, TV: Television

The mean APIINT total score values in the patient group diagnosed with ADHD in childhood were higher than in the group without the diagnosis (p: 0.001).

The mean APIINT total score values in the patient group diagnosed with ADHD in adulthood were higher than in the group without the diagnosis (p: 0.001).

The mean APIINT total score values in the group thought to have ADHD diagnosis with ASRS are higher than the group thought to not have ADHD (p: 0.001).

The analysis results of the relationship between the presence of ADHD diagnosis and APIINT total scores are presented in Table 6.

Table 6. Evaluation of the relationship between ADHD and APIINT total score

		n	u	z	p*
APIINT total score	**Childhood ADHD**				
	There is a diagnosis	14			
	No diagnosis	236	611.000	-3.960	0.001
	Total	250			
	Adult ADHD				
	There is a diagnosis	20			
	No diagnosis	230	1231.500	-3.445	0.001
	Total	250			
	ADHD detected by ASRS				
	Possibly ADHD	16			
	Not ADHD	234	663.000	-4.320	0.001
	Total	250			

*Mann-Whitney U test was used, ADHD: Attention deficit/hyperactivity disorder, APIINT: Addiction Profile Index internet, ASRS: Adult Self-Report Scale

DISCUSSION

This article presents the findings of a study conducted on 250 individuals between the ages of 18 and 65. Participants were assessed in terms of various sociodemographic characteristics, including gender, marital status, level of education, place of residence, active employment status, monthly income level, region of residence, curfew status during the COVID-19 pandemic, and psychological health status. The study also examined the participants' television, phone, and internet usage habits and how these habits changed during the pandemic. In particular, the focus was on the participants' psychological health status, including the proportion of individuals diagnosed with ADHD, psychiatric disorders, and tobacco, alcohol, and other psychoactive substance use.

The COVID-19 pandemic has caused a significant increase in internet usage globally. Studies have shown a significant increase in online activities during the pandemic, with internet services experiencing significant growth ranging from 40% to 100% compared to pre-pandemic levels.[30] This increase in internet usage has been observed across a range of age groups, suggesting that the pandemic has had a widespread impact on a variety of online behaviors.[31] Notably, in 2020, the first year of the pandemic, the number of internet users globally increased by 10.2%, marking the most significant growth in the last decade.[32] In our study, after the COVID-19 pandemic, 68.4% of the participants had an increase in tablet and computer usage, and 76.8% had an increase in phone usage. These results are consistent with previous literature and indicate a significant increase in internet usage during the COVID-19 period.

The relationship between COVID-19 and internet addiction has been investigated in terms of perceived risk and emotion regulation. Recent studies have shown a significant positive relationship between perceived risk of COVID-19 and internet addiction, and difficulties in emotion regulation further strengthen this link.[33] This suggests that fear and uncertainty surrounding the pandemic may drive individuals to seek solace or distraction through increased internet use, potentially leading to addictive behaviours. Childhood traumatic experiences, poor physical health, depression,

and anxiety have been identified as key risk factors in the progression of pandemic-induced addictive internet use, highlighting the complex interaction of psychological and environmental factors that trigger internet addiction during COVID-19.[34] In our study, a moderately significant correlation was found between the epidemic anxiety assessment scale and the internet addiction scale (APIINT). This situation, in line with the literature, shows that disease anxiety during the pandemic period may be related to screen addiction.

When studies examining the relationship between internet addiction and ADHD are examined, it has been shown that there is a strong relationship between ADHD and internet addiction in various age groups, including adolescents and adults. Chou and colleagues found that adolescents diagnosed with ADHD have a higher risk of developing internet addiction than those without ADHD.[35] This is further supported by the finding that adolescents with ADHD are more vulnerable to internet addiction symptoms, which may increase the risk of depression and anxiety among parents.[36] Additionally, Rupesh and colleagues observed that children with ADHD showed a higher tendency towards internet addiction compared to their non-ADHD peers.[37]

When we look at the studies examining the screen time of ADHD patients during the COVID-19 period, it was found that the total internet usage time in ADHD patients increased by 46% compared to the pre-COVID-19 period.[21] Another study has shown that the COVID-19 period leads to worsening ADHD symptoms, emotional dysregulation and angry outbursts.[20-23] In our study, participants were examined in 3 different categories in terms of ADHD (those diagnosed with ADHD in childhood, those diagnosed with ADHD in adulthood and those diagnosed with ASRS) and compared with the other group in terms of APIINT scores, and it was determined that the APIINT scores of the ADHD group were statistically significantly higher than the non-ADHD group. These results are consistent with previous literature. The fact that this comparison was made on 3 different categories allowed the differences between the subcategories to be evaluated.

Limitations

If we talk about the limitations of this study, first of all, the selection of participants and demographic diversity come to the fore. The sample size and socioeconomic diversity of 250 individuals included in the study may not reflect all the characteristics of the general population, which may limit the generalizability of the findings. In addition, relying on data reported by the participants themselves may lead to response biases and subjective assessments. Collecting data on psychological states and behaviors using the self-report method has some limitations due to the lack of objective measurement techniques. The accuracy of data on the diagnosis and treatment of ADHD and other psychiatric disorders may also be limited due to the lack of access to participants past medical records. Finally, the impact of dynamic factors such as the social and psychological effects of the COVID-19 pandemic on the study results may not have been fully controlled, which is a factor that should be taken into account when interpreting the findings of the study. Despite these limitations, the study presents important findings and provides valuable insights into psychological health, sociodemographic characteristics, and media use during the pandemic.

CONCLUSION

The frequency of ADHD in children and adults, its correlation with sociodemographic traits, and the necessity of psychiatric therapy were all investigated in this study. Increased internet use during the pandemic may be linked to anxiety levels, and people with ADHD are more likely to develop an internet addiction. In addition to developing support services, it is advised that people with ADHD be monitored for behavioral addictions like substance and internet addiction. The study offers crucial information for comprehending how media and technology usage patterns changed during the epidemic and how sociodemographic characteristics affected mental health.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of the Sakarya University Faculty of Medicine Non-interventional Ethics Committee (Date 29.05.2020, Decision No: 2020/309).

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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