

## Systematic Review

# Addiction in Adolescents During COVID-19 Pandemic: A Systematic Review

 Melike Kevser Gul,<sup>1</sup>  Esra Demirci<sup>2</sup>

<sup>1</sup>Department of Child and Adolescent Psychiatry, Erzincan Binali Yıldırım University, Erzincan, Türkiye

<sup>2</sup>Department of Child and Adolescent Psychiatry, Erciyes University Faculty of Medicine, Kayseri, Türkiye

### Abstract

The COVID-19 pandemic has caused significant problems all over the world for over 1 year, the disease has spread in a short time, and all countries had to take preventions in this direction. As a result of these developments; people had to spend their time at home, physical activity, social life and social interaction have been severely restricted. Fear of illness, losing a close person, limitation of interaction with peers, changes in eating habits and sleep patterns, etc. affected children and adolescents as well as adults and uncertainty of the period have caused an increase in psychological and social problems in this age group. Especially the school closures, maintaining education with online distance education both have decreased the efficiency in education and caused children and adolescents to spend most of their time in the internet. Internet has not been used only for school and lessons, also using for entertainment have caused prolonged exposure to screens. As well as behavioral addictions, substance use in order to cope with difficulties has become a worthy subject to investigate in this period. It is predicted that the ongoing pandemic process will accelerate the studies about addictions in adolescents. In this review, we aimed to take attention to studies on addiction in adolescents during the COVID-19 pandemic.

**Keywords:** COVID-19, adolescents, addiction, internet, substance use

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The Coronavirus disease 2019 (COVID-19) first appeared in Wuhan city, Hubei province of China in December 2019.<sup>[1]</sup> Pandemic declared by the World Health Organization (WHO) on 11 March 2020 and globally, on 30 December 2020, there have been over 80.000 confirmed cases of COVID-19, including 1.775.776 deaths, reported to WHO.<sup>[2]</sup> Since the day the pandemic started, there have been important changes that people were not used to before. In order to prevent the spread of the pandemic, people have started to use face masks, social distance has become important, schools have been closed, and the social life of people, including work life, has restricted in a way. As a result of all these, the time

spent at home has increased considerably compared to before, and with the closure of schools, the transition to online education has significantly increased the time children and adolescents spend on the Internet. However, this usage is not limited with the education, it has seen that adolescents spend most of their time watching movies and documentaries, playing online games, and using social media. This situation has played a role in Internet addiction (IA) and Internet gaming disorder (IGD) development.

Depression, anxiety disorders, low self-esteem have been shown to be risk factors for addiction in previous studies.<sup>[3,4]</sup> At the same time, a type of addiction can be associated

**Address for correspondence:** Esra Demirci, MD. Erciyes Üniversitesi Tıp Fakültesi, Çocuk ve Ergen Psikiyatrisi Anabilim Dalı, Kayseri, Türkiye  
**Phone:** +90 352 207 66 66-20853 **E-mail:** esra\_z\_d\_r@hotmail.com

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with other addictions.<sup>[5]</sup> With the pandemic, the increasing depression, anxiety levels were found associated with COVID-19 news in adults<sup>[6]</sup> and also related with physical exercise and being without companion on work days in adolescents.<sup>[7]</sup> This situation may be a factor that increases substance use and behavioral addictions which used as coping mechanisms. On the contrary, it was stated that COVID-19 encouraged nearly a quarter of respondents to reduce their use of tobacco cigarette and electronic cigarette use and increase motivation to quit by more than a third.<sup>[8]</sup> However, adolescents' staying at home longer with their parents, decreased face-to-face communication with their peers are thought as factors which lead to changes in their substance use pattern.

In this report, it was aimed to review studies on addiction in adolescents during the COVID-19 pandemic. A limited number of studies conducted about the effect of the pandemic on substance use and behavioral addictions were included. Also when the literature was searched; it was noticed as a result of the pandemic the number of online studies have increased significantly in these days when it was difficult to reach people physically.

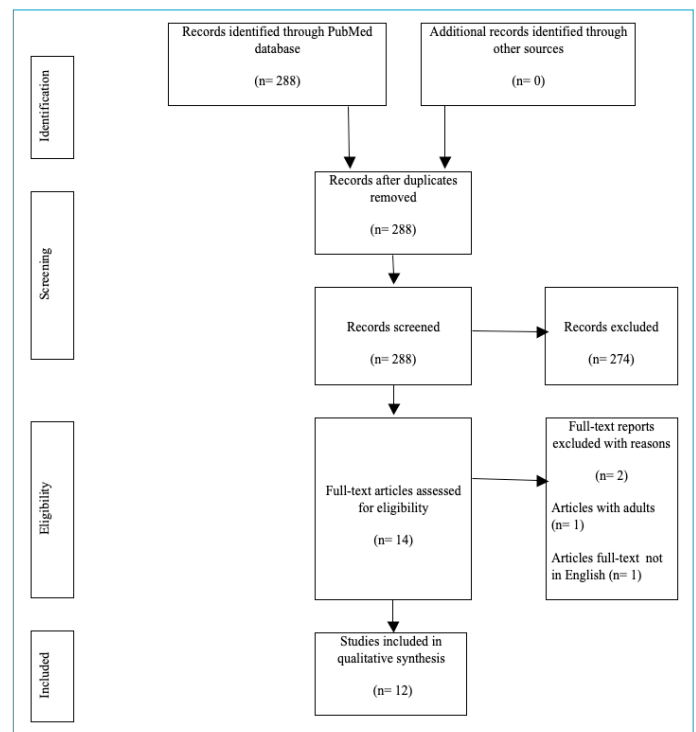
## Methods

In order to evaluate addiction studies in adolescents during the COVID-19 pandemic, articles published in the PubMed database between January and December 2020 were examined. The keywords used in the literature review were determined as follows: (covid-19 or coronavirus) and (addiction or substance use or internet or smartphone or alcohol or tobacco or opioid or cannabinoid) and (adolescent). The article selection method is shown in Figure 1 with the PRISMA flow diagram.

## Results

### Behavioral Addictions

In an online study that investigated the mental health of children and adolescents in China during the COVID-19 epidemic, anxiety, depression, IA, smartphone addiction (SA) and coping levels were examined; IA was detected in 6.03% of the participants, and the rate of SA was 10.30% in males and 13.06% in females. A significant relationship was found between the participants' increased depressive symptoms and their IA, SA levels and emotion- focused coping style, and it was emphasized that there was a relationship between increased depressive symptoms and average daily Internet use before the epidemic and problem focused coping style. Also, according to the Pearson correlation analysis, a positive correlation was found between anxiety levels and IA, SA and emotion-focused coping style.<sup>[9]</sup>



**Figure 1.** PRISMA flow diagram.

In another study from China, the rate of addicted and problematic Internet users during the COVID-19 period was found to be 2.68% and 33.37 % respectively, the average Internet Addiction Test (IAT) score was 78.96 for addicts, 49.38 for problematic users and 28.51 for normal users. The most used devices were smartphones and tablets and it was determined that the use of the electronic products for entertainment increased significantly after 00:00. At the same time, according to the binary logistic regression analysis, it was shown that male gender, age, mild to severe depression, mild to moderate anxiety, mild to severe stress were significantly associated with addictive Internet users and problematic Internet users. No relationship was demonstrated between severe anxiety and addicted or problematic Internet use.<sup>[10]</sup>

IA in high school students in Taiwan, during the COVID-19 period was found to be 24.4%, and it was stated that this rate was higher than previous studies. At the same time, high impulsivity, high virtual social support, low family functionality, and high alexithymia were independently predictive factors in forward logistic regression analyzes. Depression and neuroticism were found to be lower, actual social support and self-esteem were significantly higher in the group without IA group compared with IA group.<sup>[11]</sup>

In Iran, one of the countries where the pandemic spread rapidly, the role of depression, anxiety and stress in the relationship between IGD and quality of life and insomnia in

the COVID-19 period was examined. Internet Gaming Disorder Scale Short Form score was 19.07 ( $\pm 7.31$ ) and average time spent playing Internet during weekend (minutes/day) was 68.12 ( $\pm 39.83$ ). Quality of life has been negatively correlated with IGD and according to Pearson's correlation analysis, a significant relationship was found between IGD and insomnia, and between IGD and other mediators (depression, anxiety, stress).<sup>[12]</sup>

In a research which investigate the effect of lockdown following COVID-19 on IGD in college students, the frequency of IGD was found to be 14.84% higher than previous studies in the same region. About half of the participants stated increased gaming behavior during the lockdown period, and also reported it as helpful in coping with the COVID-19 period and associated stress factors.<sup>[13]</sup>

The use of social media and technology by parents and their children at the onset of the pandemic and its relationship with anxiety had investigated. 82.3 percent of children increased their technology use to connect with others. A positive correlation was found with parental anxiety level and social media use. Greater child anxiety was found to be associated with greater parental anxiety, which increased the use of technology and social media in children. The increase in technology use was not detected in children aged 0-5 as much as in older groups.<sup>[14]</sup>

University students between the ages of 18-22 were invited a research, which data was obtained thanks to the application installed on a smartphone, it was observed that as the amount of news related to COVID-19 increased, the amount of sedentary behavior and phone usage increased, the number of places visited and the number of phone unlocks decreased. Initially, the amount of phone unlocking was found to be surprisingly inversely proportional to COVID-19 news, but it was thought that this may be due to prolonged screen time.<sup>[15]</sup>

When schools were closed in Malaysia; according to the report of a study in which 15 adolescents were included, adolescents spent hours on the Internet in their bedrooms, used the Internet mostly for watching movies and documentaries, social media, and they exposed to pornography sites with unlimited Internet usage.<sup>[16]</sup>

### Substance Use

No significant change was found in the percentage of adolescents consuming alcohol in the post-pandemic period compared to the pre-pandemic in high school students. On the contrary, a significant increase in the amount of alcohol consumed per day was found and this increase was only for females. A significant decrease was found in both binge drinkers and vapers. There was a decrease in the number of

girls using cannabis and an increase in the amount of cannabis consumed per day compared to before and after the pandemic. The largest percentage (49.3%) of substance-using adolescents engaged with substance use alone since the COVID-19 pandemic, 23.6% and 31.6%, face-to-face with friends and through technology respectively.<sup>[17]</sup>

The use of electronic cigarettes in adolescents and young adults during the COVID-19 was investigated, it was found that quitting e-cigarettes in the group under 21 years of age was 36.5%, reducing the amount by half 18.4%, increasing the amount of nicotine in e cigarettes 16.6%, and increasing the amount of cannabis 8.4%. Underage youth could face obstacles in accessing electronic cigarettes due to restrictions, but there was no significant difference between teenagers and young adults in terms of quitting electronic cigarettes. Nicotine addiction and using electronic cigarettes more than 10 times a day found to be difficult factors in quitting or reducing electronic cigarettes in underage youth.<sup>[18]</sup>

In a study investigating mental health, substance use and well-being in adolescents and young adults in clinical and community samples in Canada, substance use was found to be 23.2% in the clinical sample and 3% in the community sample. Although substance use decreased in general due to changes in social factors such as physical distance; a group of youth reported that they mostly used substances for coping.<sup>[19]</sup>

Adolescents and young adults who admitted to the emergency department with alcohol abuse during the 3-week quarantine and then reopening period were examined. Although there was a decrease in the total number of emergency service admissions during the reopening period compared to the same period of the previous year, the number of patients presenting with alcohol abuse increased and there was no increase due to psychomotor agitation and other mental health problems. It was thought that alcohol abuse was a part of social interaction among peer groups and this increase could be an uncontrolled emotional response to quarantine ending.<sup>[20]</sup>

### Discussion

In this review, the effect of the COVID-19 pandemic on addiction in adolescents was examined, eight of the studies were related to behavioral addictions such as Internet and smartphone usage, and four were associated with substance use (Table 1). It was observed that most of the studies were cross-sectional online survey due to physical distance. Depending on this situation, the sample group was larger. Detailed information about the sample group was not available in a report.

**Table 1.** The addiction studies in adolescents during COVID-19 pandemic

Study	Country	Mean age ± SD Male/Female	Method	Results
(9)	China	N/A 1812 /1801	cross-sectional online questionnaire survey("Questionnaire Star")	1) Significantly association between depressive symptoms and IA, SA levels and emotion-focused coping style 2) Positive correlation between anxiety levels and IA, SA and emotion-focused coping style
(10)	China	12.34±4.67 1057/993	cross-sectional study and electronically invited participants continuity through the WeChat-based 'SurveyStar' online platform	mild to severe depression, mild to moderate anxiety, mild to severe stress were significantly associated with AIU and PIU
(11)	Taiwan	14.66±0.86 542/504	cross-sectional design	1) High impulsivity, high virtual social support, low family functionality, and high alexithymia was independently predictive factors for IA 2) Depression and neuroticism were found to be lower, actual social support and self-esteem were significantly higher in the group without IA group compared with IA group
(12)	Iran	15.5±2.75 853/659	a web-based self-report survey	Significant relationship between IGD and insomnia, and between IGD and other mediators (depression, anxiety, stress)
(13)	India	19.6±1.9 52/76	face-to-face interviews	The frequency of IGD was found to be 14.84% higher than previous studies in the same region
(14)	U.S.A.	7.69±5.64 N/A	brief online survey	1) Positive correlation between parental anxiety level and social media use 2) More child anxiety associated with more parental anxiety, which increased the use of technology and social media in children
(15)	U.S.A.	N/A 70/147	smartphone mobile sensing through the StudentLife app	The amount of sedentary behavior and phone usage increased, the number of places visited and the amount of phone unlocks decreased
(16)	Malaysia	N/A 15 adolescent	online communication platform	Adolescents spent hours on the Internet in, their bedrooms, used the Internet mostly for watching movies and documentaries, social media and they exposed to pornography sites with unlimited Internet usage
(17)	Canada	16.68±0.78 231/805	online survey	1) A significant increase in the amount of alcohol consumed per day only for females 2) A significant decrease in both binge drinkers and vapers 3) A decrease in the number of girls using cannabis and an increase in the amount of cannabis consumed per day compared to before and after the pandemic
(18)	U.S.A	19.17±2.3 723/1397	cross-sectional, anonymous online survey	1) Quitting 36.5%, reducing 18.4%, increasing the amount of nicotine in e cigarettes 16.6%, and increasing the amount of cannabis 8.4%. 2) Nicotine addiction and using electronic cigarettes more than 10 times a day have been found to be difficult factors in quitting or reducing electronic cigarettes in underage youth
(19)	Canada	20.6 ± 2.4 204/389	an online survey in REDCap software	Substance use decreased in general due to changes in social factors such as physical distance
(20)	Italy	Median age: 17.0 17/8	retrospective	The number of patients presenting with alcohol abuse increased

IA: Internet addiction; SA: smartphone addiction; AIU: addictive Internet users; PIU: problematic Internet users; IGD: Internet gaming disorder.

The results of the studies have assessed and the findings are important in terms of showing the relationship between the level of depression, anxiety and the level of IA. According to the results of 2 studies reported from China; one study found a significant association between IA, SA and depression, anxiety levels.<sup>[9]</sup> Interestingly in this study, the rate of IA was found to be lower than other studies conducted in the same region.<sup>[21,22]</sup> Another study found a significant correlation between IA and depression, mild to moderate anxiety, stress levels.<sup>[10]</sup> In this study, the rate of IA was lower and the rate of problematic Internet use was higher than the previous studies.<sup>[23,24]</sup> Another research found low self-esteem, high depression and neuroticism levels in the group with IA.<sup>[25]</sup> It has been shown in previous studies that people with low self-esteem were at high risk for IA.<sup>[25,26]</sup> In this study, compared to another study conducted in the same region before the pandemic,<sup>[27]</sup> the prevalence of IA was found to be higher. In the study in which children and their parents were assessed together, a relationship was found between the anxiety levels of both children and their parents and social media usage of them.<sup>[14]</sup>

As in previous studies,<sup>[28,29]</sup> it is not surprising that there are similar findings in the pandemic process between depression, anxiety levels and IA, IGD. Also it has been seen that there is an increase in the prevalence of IGD compared to the period before the pandemic. Insomnia, depression, anxiety and stress levels were investigated in the patients with IGD, and it was shown that IGD was associated with all these factors.<sup>[12]</sup> During the lockdown period, the prevalence of IGD among college students increased compared to previous studies, and they stated that they saw playing games as a coping mechanism.<sup>[13]</sup> The decrease of perceived social support and restriction of physical activity during COVID-19 lockdown, which play an important role in coping with stress, may lead individuals to use the Internet as a coping mechanism. The study involving 15 adolescents highlighted the importance of increasing Internet use and increasing exposure to pornography.<sup>[16]</sup> The fact that Internet usage is out of parental control may contribute to this situation.

When it was searched the developments about substance use; study results were different. While there was no significant difference in the prevalence of alcohol use before and after the pandemic the cannabis use increased significantly. The girls increased the amount of daily alcohol use and the percentage of cannabis using adolescents decreased for girls only.<sup>[17]</sup> In the study investigating the use of electronic cigarettes during the pandemic period, there was an increase in the rate of quitting and reducing electronic cigarettes during this period.<sup>[18]</sup> The fact that adolescents stay at home longer, weakened peer relationships, and per-

haps the knowledge that COVID-19 causes more problems in smokers may have contributed to this situation. It was stated that substance use decreased and this may be due to physical restriction in a study about substance use in clinical and community sample in Canada.<sup>[19]</sup> The increase in the number of adolescents who came to the emergency department with alcohol use after the opening period in Italy compared to the previous year<sup>[20]</sup> can also be attributed to this argument and may be due to the demand for socialization after quarantine.

As a result, the ongoing pandemic process will continue to cause social and mental problems in adolescents. In this context, the governments and health authorities should develop strategies for monitoring and prevention to minimize addiction-related problems.

### Disclosures

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