*Arh. farm. 2024; 74: 569 – 581* *Review article/Pregledni rad*

# How the COVID-19 pandemic has affected mental health and internet addiction in adolescents: a comprehensive review

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Received: 15 May 2024; Revised in revised forme: 2 July 2024; Accepted: 2 July 2024

## Abstract

The COVID-19 pandemic began in China in December 2019, from where it spread throughout the world and caused a serious threat to both physical and mental health. People were afraid due to COVID-19 cases rapidly increasing all over the world and the quick changes in how people lived. Previous studies have clearly linked the pandemic with signs of depression, stress, anxiety, and suicide thoughts, as well as with excessive internet use. This paper provides a comprehensive review of the available scientific findings regarding the impact of the COVID-19 pandemic on mental health and internet addiction in adolescents. Having insight into the scientific literature on COVID-19, mental health, and internet addiction, we have concluded that during the COVID-19 pandemic time spent on the internet increased due to reduced social activities, which consequently led to internet addiction and thus to psychological distress, increased loneliness, and depression in adolescents. Early intervention is essential to reduce internet addiction and preserve the mental health of adolescents, especially in conditions of increased social stress due to the COVID-19 pandemic.

**Key words:** mental health, internet addiction, COVID-19, adolescents

https://doi.org/10.5937/arhfarm74-51029

## Introduction

A new coronavirus known as 2019-nCoV triggered a pneumonia outbreak around the end of December 2019, which extended from Wuhan, in the province of Hubei, to the entire nation of China. This outbreak drew significant international attention and posed serious concerns for public health. A greater comprehension of the pandemic's epidemiology resulted in the implementation of several approaches, encompassing both pharmaceutical and non-pharmacological ones, to reduce the global spread of the SARS-CoV-2 virus. Restrictions on population movement and full or partial lockdowns were enacted in numerous nations to reduce the spread of disease and protect health systems from being overwhelmed (1, 2).

On March 15, 2020, the Serbian government proclaimed a state of emergency, nine days after the first COVID-19 case was formally reported. This led to the implementation of some of Europe's strictest measures to combat the pandemic, including curfews that are enforced by the police every day and night for 12 hours, strict prohibitions on movement (particularly for those over 65), and border closures. All kindergartens, schools, colleges, and cultural organizations were closed, and kids spent days, weeks, or months indoors watching TV to learn. Sports and training were also put on hold. Social media played a significant role in spreading news and bringing people together when they were at home watching TV, or using laptops and tablets (2).

The whole world's population was in shock and anguish as a result of the COVID-19 pandemic, and 200 industrialized and underdeveloped nations reported confirmed cases. Because of the rapidly changing lifestyles and the rapidly rising number of COVID-19 cases worldwide, people were terrified. Previous studies have unmistakably connected the pandemic to symptoms of stress, despair, anxiety, and suicidal thoughts in addition to excessive internet use. During the lockdown, communication with others could only be carried out via the internet. Numerous studies undertaken during the quarantine have indicated a rise in mental health issues since the onset of this worldwide pandemic (3).

This paper provides a comprehensive review of the available scientific findings regarding the impact of the COVID-19 pandemic on mental health and internet addiction in adolescents.

## Methodology

We conducted a thorough search of the literature for English-language papers for this comprehensive narrative review using the Medline database and the PubMed interface. Using the Boolean operators "AND" or "OR," the keywords and MeSH phrases "internet addiction," "mental health," "adolescents," and "COVID-19" helped to identify the studies and reports required for the investigation of the relationship between internet addiction and COVID-19. The selection of these four keywords was solely based on the preliminary literature search. Furthermore, an extensive additional literature search was conducted utilizing the identical electronic database and more focused search terms to ensure the review's accuracy. To achieve this aim, the following phrases and their combinations were commonly used: "mental health" OR "psychological distress" AND "internet addiction" OR

"depression," "distress," "loneliness," "coronavirus disease 2019," AND "internet addiction." Observational research, cross-sectional studies, systematic reviews, and meta-analyses that were published between 2020 and 2022 were all included. We reviewed the available findings on the effects of the COVID-19 pandemic that can be linked to internet addiction, such as internet abuse, distress, depression, anxiety, social isolation, and loneliness.

## Results and discussion

The key studies that evaluated internet addiction and adolescent mental health during the COVID-19 pandemic included in this comprehensive review are summarized in Table I.

**Table I** Characteristics of the most significant studies examining internet addiction and mental health in adolescents during the COVID-19 pandemic

**Tabela I** Karakteristike najznačajnijih studija koje su ispitivale zavisnost od interneta i mentalno zdravlje adolescenata tokom pandemije COVID-19

| Authors | Year | Country | Objective | Research methodology | Participants and sample size | Relevant measures of mental health | Relevant measures of internet addiction |
|---|---|---|---|---|---|---|---|
| Kumar et al. | 2022 | India | Examining the impact of internet addiction during COVID-19 on anxiety and sleep quality among college students | Web-based cross-sectional study | Students (n = 475) | Generalised Anxiety Disorder score; The Pittsburgh Sleep Quality Index | Patterns of internet use; Young's Internet Addiction Test |
| Lebni et al. | 2020 | Iran | Investigating internet addiction and its effects on the mental health of university students | Descriptive-analytical study | Students (n = 447) | Goldberg General Health Questionnaire 28 | Young's Internet Addiction Test |
| Onukwuli et al. | 2022 | Nigeria | Examining the prevalence and associated factors of internet addiction among adolescents during the pandemic | Cross-sectional study | Adolescents (n = 851) | Structured self–administered questionnaire | Young's Internet Addiction Test (IAT) |
| Lin | 2020 | Taiwan | Determining the prevalence of internet addiction and identifying psychosocial risk factors | Cross-sectional survey | High school students (n = 1060) | Depression Anxiety Stress Scale (DASS) | The Chen Internet Addiction Scale (CIAS) |
| Sarıalioğlu et al. | 2021 | Turkey | Determining the relationship between the levels of loneliness adolescents feel during the pandemic, and their respective levels of internet addiction | Descriptive-correlational study | Adolescents (n = 482) | UCLA loneliness scale-short form (ULS-SF) | Internet addiction scale for adolescents (IASA) |
| Hamami et al. | 2021 | Indonesia | Investigating the relationship between stress and internet addiction in college students | Survey-based correlational quantitative study | College students (n = 81) | Perceived Stress Scale-10 modified for COVID-19 | Internet Addiction Test |

**Table I (continued)**
**Tabela I (nastavak)**

| Authors | Year | Country | Objective | Research methodology | Participants and sample size | Relevant measures of mental health | Relevant measures of internet addiction |
|---|---|---|---|---|---|---|---|
| Dong et al. | 2020 | China | Assessing Internet use characteristics and objectively examining the potential psychological factors associated with internet addiction (IA) during the COVID-19 epidemic | Cross-sectional self-reported study | Children and adolescents (n = 2050) | Young's Internet Addiction Test (IAT); Questions regarding demographic information and internet use characteristics | Depression, Anxiety, and Stress Scale (DASS-21) |

## COVID-19 pandemic and mental health

The COVID-19 pandemic has posed a serious threat to mental health. According to the World Health Organization, mental health is a condition of wellbeing in which a person may fulfill their potential, cope with daily stress, do their job effectively, and contribute to society. As successful functioning within one's own family, positive interactions with others, and expressing life happiness are the attributes of a person who is mentally healthy, it follows that mental health is more than merely the absence of mental illness. Sadness, illness, rage, and unhappiness are all part of a fully lived existence for a human being; emotionally healthy individuals often feel these types of emotions. Still, mental health is usually perceived as experiencing solely positive affects, with satisfaction and control over one's surroundings being its defining characteristics (4).

The idea of mental health refers to how we feel, think, and behave in different life circumstances (5). Since depression, anxiety, and stress are considered to be fundamentally negative indices of mental health and some of the main health problems, research into their existence, causes, and treatments has garnered interest. Depression symptoms include dysphoria, a sense of self- and life-devaluation, pessimism, social exhaustion, and anhedonia. Three characteristics of anxiety include the feeling of helplessness, elevated physiological arousal, and self-perceived anxiety. The organism experiences negative stress when one or more dangerous events occur. This condition is marked by elevated alertness and intensely pessimistic thinking. People who are more likely to experience anxiety also often show signs of depression, and vice versa. Stress is also associated with anxiety and depression (6).

People have encountered a number of situations because of the COVID-19 pandemic that not only altered their own lives but also the lives of those they love. Some people had never experienced things like losing close friends, closing their houses, or being in a generally uncertain environment until that point. The persistent stress of the pandemic most likely caused serious damage to their mental health. Stress is the result of

both physiological and psychological reactions to external stressors, many of which are out of a person's control (4).

In reaction to the COVID-19 epidemic, there was a global quarantine response that has been linked to social isolation, loneliness, and anxiety. Combining lockdown and physical isolation with the panic and fear of illness, especially in vulnerable people, can lead to a number of negative consequences, such as social isolation, income loss, loneliness, and inactivity. It can also limit access to basic services, increase the risk of eating disorders, alcohol abuse, drug use, and online gambling, and drastically lower family and social support (7). The COVID-19 pandemic was accompanied by a significant prevalence of mental health issues, which were strongly correlated with frequent social media use, according to a Chinese study (8).

The COVID-19 pandemic may have had a particularly serious negative effect on the mental health of vulnerable groups, such as children and adolescents. When children are at home and away from school, friends, and colleagues, they may have a lot of questions about the outbreak and turn to their parents or other adult caregivers for answers. Different parents and children react differently to stress. Children may encounter social isolation, anxiety, distress, and abuse, all of which can have either immediate or long-term consequences for their mental health. Typical alterations in children's conduct include: prolonged crying and irritable behavior; an increase in melancholy, despair, or anxiety; problems paying attention and focusing; changes to their former interests or avoidance of them; headaches and body pain that come on suddenly, along with alterations in eating patterns. Parents must maintain composure, handle the issue sensibly, and do their best to address all of the child's inquiries in order to counteract bad behavior. It is advisable for parents to spend some time discussing the COVID-19 pandemic with their children and providing them with positive data and facts. In addition to encouraging adolescents to partake in healthy activities like indoor sports and mental and physical activity, parents may assist in assuring them that they are safe at home. In order to assist their children in keeping up with their academics, parents might also create a routine at home. It is important for parents to show less tension and anxiety at home since children pick up on and experience negative energy from their parents. Engaging children and their parents in healthful activities together helps ease tension and anxiety and improve the situation on the whole (9).

The COVID-19 pandemic is associated with incredibly significant levels of stress, which in many cases may cross the threshold of clinical importance, according to studies assessing stress, anxiety, and depression during quarantine brought on by the spread of SARS-CoV-2. These studies have revealed the presence of severe psychological distress and psychopathological factors (10).

**COVID-19 pandemic and internet addiction**

Internet addiction (IA) is characterized by compulsive behaviors associated with any online activity that interfere with normal daily activities and cause interpersonal stress (11). The American Psychiatric Association defines IA as a disorder associated

with mood disturbances over a two-month period. It offers seven diagnostic criteria (at least three criteria over two months), including decreased social interaction and work, appreciation of the benefits of internet use, mobility issues, longer than anticipated online sessions, a recurring inclination toward impulse control behavior, tolerance, and the amount of time spent on internet-related activities (11). Compared to the DSM-5's description of Internet Gaming Disorder, the World Health Organization's proposed diagnosis of Gaming Disorder in the beta draft of the (11th edition) International Classification of Diseases (which includes sub-varieties of online and offline gaming disorders) seems far more rational and well-considered (12). Despite inconsistent results, internet addiction is a significant public health concern, particularly for adolescents. Numerous studies have connected internet addiction to negative consequences such as social anxiety, depression, and stress (11).

Internet gaming disorder has a significant public health importance, and more research may eventually show that it has merits as a separate condition. Internet gaming disorder is also widely referred to as internet usage disorder, internet addiction, or gaming addiction. Epidemiological studies should be conducted, similar to those conducted for gambling disorders, in order to ascertain the prevalence, clinical course, potential hereditary effect, and potential biological determinants based on the data from, for instance, brain imaging (12).

Excessive use of the internet can lead to internet addiction. Previous studies have suggested that dysfunctional families, the adolescent's personality type (aggression, neuroticism, degree of impulsivity, degree of self-control), and parental control over the adolescent's free time are all potential causes of excessive internet use among young people. Additionally, it has been demonstrated that the consequences of excessive internet use on the central nervous system are strikingly similar to those of substance addiction, with the brain's response being reflected in an increase in dopamine secretion. Despite the fact that internet-addicted individuals have difficulty suppressing their excessive online behaviors in real life, little is known about the pathophysiological and cognitive mechanisms responsible for Internet addiction (13).

According to Shek et al. (14), "problematic internet use" is another term for internet addiction, which is the incapacity of a person to control their internet use. It has become recognized as a serious health concern worldwide. Research indicates that one in eight Americans uses the internet problematically (15). Internet addiction was reported by 2.4% of Chinese individuals (16), 10.4% of Taiwanese people (17), 1.5% and 8.2% of Americans and Europeans (13), and 3.2% of UK citizens (18). The rates in the event of a pandemic were 14.4% in Indonesia (19), 88.1% in Nigeria (20), and 24.4% in Taiwan (21). The Philippines had the greatest rate of internet addiction, and this behavior is prevalent there, according to a different study that analyzed data from six Asian countries (22). Several risk variables are associated with internet addiction during the pandemic, such as boredom, loneliness, sadness, fear about COVID-19, hyperactivity, and anxiety (23). In addition, it is the underlying cause of poor sleep quality and insomnia (24). Numerous studies show that internet addiction decreases one's social self-

efficacy, self-esteem, and self-confidence (25). Internet addiction causes people to destroy their families and can result in a number of psychological and social issues (26). People without jobs who are addicted to the internet may not be as interested in learning new skills (27). Problematic internet use also hinders academic progress. As a result, the unemployment rate can increase (28).

Excessive and inappropriate internet use has already been linked to internet addiction. The most common and vulnerable internet users are adolescents and young adults (29). They are the ones that use it extensively. Internet addiction (IA) is a severe public health concern, especially for teenagers, despite the fact that outcomes are usually inconsistent. Anxiety, stress, and sadness have all been linked to IA in numerous studies (30). According to research, nine European countries have a prevalence rate of problematic internet use ranging from 14% to 55% (31). Internet addiction did, however, increase during the COVID-19 pandemic.

### The influence of the COVID-19 pandemic on mental health and internet addiction in adolescents

Throughout their lives, a lot of people experience mental health problems, which affect their decision-making, stress management, and social interactions. A component of the explanation for people's psychological and social outcomes is the persisting COVID-19 infection and consequent social isolation, lockdowns, and house confinement. Individuals' sleep patterns have been disturbed, unpleasant emotions have been generated in society, and their mental health has also been impacted (32). Since everyone was forced to stay indoors throughout the epidemic, the internet has also expanded enormously in popularity. For many, it was the only means of getting amusement, enrolling in online classes, and keeping in contact with family members who lived far away (32). In a 2017 meta-analytic study, Tokunaga found the average correlation between internet usage and loneliness and depression in existing studies and investigated the specific order in which these effects might differ. In all the studies, cumulative correlations showed that depression and loneliness were independent factors associated with internet usage (33).

The COVID-19 pandemic has had an impact on a number of aspects of life, including the rise in internet usage, particularly on social networking sites. More frequent users of the internet face the risk of becoming internet addicted. Research from across the world has shown that people are more likely to become addicted to the internet when they are under a lot of stress related to the COVID-19 outbreak (34).

Lockdowns are situations of isolation that can cause psychological distress and be unpleasant for all parties involved. There were various degrees of movement restrictions in place during the lockdown to stop the COVID-19 virus from spreading. Digital device usage has surged in response to stay-at-home quarantines and physical distance orders. Recreational activities were restricted, and in-person interactions decreased as a result of online learning. As a result of these measures, which made them spend the majority of their time at home, adolescents used the internet for longer periods of time – not only for

academic objectives, but also for gaming and other social activities, with the aim of achieving pleasure (35).

Studies conducted in India (36) and Nepal (37) found a strong positive association between anxiety and internet addiction. Lebni et al. (38) demonstrated the link between depression and internet addiction and how excessive internet use can contribute to social isolation and depression by reducing a person's sense of family, community, and online connection. Therefore, depression can occur as a result of internet addiction (38). Numerous studies have shown that the fear of COVID-19 and the extended period of quarantine could make people succumb to anxiety symptoms. Amateur internet activities like gaming, viewing television shows, online shopping, and online conversation are frequently used as coping mechanisms for anxiety and sadness. However, excessive usage can lead to the development of unhealthy coping strategies, which in turn can increase anxiety and exacerbate internet addiction (38).

Research has demonstrated an established connection between internet addiction and mental health problems such as stress, anxiety, and depression.

Individuals with depression had a higher risk of developing an internet addiction (39). The chaotic life during the COVID-19 pandemic contributed to this, since people's levels of depression increased as news of the innumerable deaths caused by COVID-19 spread. An important mental health problem is anxiety. Studies have shown a clear link between internet addiction and anxiety. Participants may become more anxious after hearing about COVID-19's indestructible status, since internet addiction leads to more online time (40). Because of the traumatic lockdown brought on by the COVID-19 epidemic, stress, another factor that negatively affects mental health, has been positively correlated with internet addiction (34).

Indeed, the psychosocial consequences of the pandemic were identified as an increase in self-harm and suicidal behaviors, eating disorders, internet and video game addiction, sleeping difficulties, and panic and anxiety disorders (41).

This comprehensive review summarizes the relevant findings, as all studies included in our paper used only standardized, widely applied instruments, which represent the gold standard for assessing internet addiction, such as Young's Internet Addiction Test (IAT). This instrument used to assess internet addiction is a one-dimensional (one-factor structure) questionnaire that uses a five-point Likert scale. It consists of 20 items and has been shown to have good validity and reliability (42). It is important to note that, although the instruments used in the research have been methodologically validated around the world, caution should be exercised when drawing conclusions, as these are self-report questionnaires, and therefore the studies may be affected by the possibility of recall bias and self-reporting bias.

The internet has profoundly influenced human behavior, and although this has led to both beneficial and harmful effects, its excessive usage can lead to internet addiction. Studies have proven that anxiety, depression, and poor mental health are among the consequences of excessive internet use.

## Conclusion

Having insight into the scientific literature on COVID-19, mental health, and internet addiction, we have concluded that during the COVID-19 pandemic time spent on the internet increased due to reduced social activities, which consequently led to internet addiction and thus to psychological distress, increased loneliness, and depression in adolescents. Internet addiction is a significant issue that has a detrimental effect on mental health. Early intervention is essential to reduce internet addiction and preserve the mental health of adolescents, especially in conditions of increased social stress due to the COVID-19 pandemic.


## Acknowledgements

This research received no external funding.


## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Author contributions

Ana Pjevač: conceptualization, writing – original draft, writing – review & editing; Teodora Safiye: conceptualization, writing – original draft, writing – review & editing; Emir Biševac: methodology, writing – review & editing; Elvis Mahmutović: methodology, writing – review & editing; Mirjana Jovanović: conceptualization, writing – original draft, writing – review & editing.

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# Pregled saznanja o uticaju pandemije bolesti COVID-19 na mentalno zdravlje i zavisnost od interneta među adolescentima

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## Kratak sadržaj

Pandemija bolesti COVID-19 je počela u Kini u decembru 2019. godine, odakle se proširila po celom svetu i izazvala ozbiljnu pretnju kako fizičkom tako i mentalnom zdravlju. Ljudi su bili uplašeni zbog slučajeva COVID-19 koji su se ubrzano povećavali u celom svetu i brzih promena u svakodnevnom načinu života. Prethodne studije su jasno povezale pandemiju COVID-19 sa simptomima depresije, stresa i anksioznosti, kao i sa preteranom upotrebom interneta. Ovaj rad pruža sveobuhvatan pregled dostupnih naučnih saznanja o uticaju pandemije COVID-19 na mentalno zdravlje i zavisnost od interneta kod adolescenata. Uvidom u naučnu literaturu o COVID-19, mentalnom zdravlju i zavisnosti od interneta, zaključili smo da se tokom pandemije COVID-19 povećalo vreme provedeno na internetu zbog smanjenih društvenih aktivnosti, što je posledično dovelo do zavisnosti od interneta, kao i do psihološkog distresa, povećane usamljenosti i depresije kod adolescenata. Rane intervencije su neophodne kako bi se smanjila zavisnost od interneta i očuvalo mentalno zdravlje adolescenata, posebno u uslovima povećanog društvenog stresa zbog pandemije COVID-19.

**Ključne reči:** mentalno zdravlje, internet, zavisnost, COVID-19, adolescenti