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Review

Psychiatric Disorders and Symptoms in Children and Adolescents During the COVID-19 Pandemic: A Review

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Abstract

The COVID-19 pandemic, which has entered our lives unexpectedly and rapidly and has been continuing for more than 1 year, seriously affects mental health as well as physical health. Still, restrictions have been continued in many countries due to the occurrence of new mutations, the lack of adequate vaccination, and the high number of cases and deaths. Although the disease progresses with milder symptoms in children and adolescents, their physical activity has been restricted during the pandemic to prevent the spread of disease, especially with the closure of schools. Children and adolescents continues to develop in physically, cognitive and emotionally, thus the effects of the pandemic can be devastating. Because of the effects of pandemic and fear of COVİD-19, depression, anxiety and PTSD have been observed more, on the other hand, screen time has increased with the closure of schools and increase of time spent at home, maybe it will be a predictive factor for behavioral addictions. At the same time, some behavioral problems have been observed and increased in children and adolescents especially with neurodevelopmental disorders. Children with special needs have become more sensitive to the effects of the pandemic due to disruption of special education processes. The pandemic, which is not yet clear when it will end, will continue to affect mental health of both children, adolescents and adults in the coming years not only now.

Keywords: COVID-19, children, adolescents, psychopathology, depression, anxiety, sleep

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The Coronavirus disease 2019 (COVID-19) first appeared in Wuhan city, Hubei province of China in December 2019.[1] This disease was first reported as pneumonia of unknown etiology,[2] then spread rapidly all over the world and on 11 March 2020 the World Health Organization (WHO) characterized COVID-19 as a pandemic.[3] Globally, on 30 January 2021, there have been 101.561.219 confirmed cases of COVID-19, including 2.196.944 deaths, reported to WHO.[4] Vaccination studies are ongoing in order to terminate this disease, there is still no effective drug treatment and the number of cases and deaths is increasing day by day.

The restrictions to prevent the spread of the COVID-19 pandemic have changed the way of life today. The use of mask-disinfectant has become routine, borders between countries have been closed, quarantine has been applied in many countries, cafe-restaurants, which are great means of socializing, have been closed. The time children and adolescents spend at home has increased with the closure of schools and the introduction of distance education all over the world. At the same time, problems about mental health

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in this group have been inevitable because of some reasons; the decrease in physical activity time, the weakening of peer relationships and the decrease in time spent with friends, the increase in conflicts with parents, online education difficulties. Although the disease progresses with milder symptoms in children,[5] the effects of the virus on the developing brain are still unknown today, and it is thought that the neurodevelopmental and psychiatric effects of this situation will be elucidated in the following years.

The COVID-19 pandemic is not the first outbreak faced by humanity and will not be the last. In previous studies, it was shown that people had an increase in the frequency of psychiatric symptoms during the epidemics. Posttraumatic stress disorder (PTSD), anxiety, and depression symptoms was reported 10% to 18% in survivors of severe acute respiratory syndrome (SARS) which is the first outbreak of 21st century.[6] Again in this period, a higher stress level was observed in SARS survivors compared to the controls and this situation persisted after 1 year.[7] In a study, it was found that Ebola virus disease survivors had extreme somatization, depression, anxiety, obsession-compulsion, hostility, phobic anxiety, paranoid ideation, bad sleep and appetite.[8]

Since the first days of the outbreak, it has been observed that there have been a lot of researches about mental health and it is thought that the number of studies will increase considering the continuation of the pandemic. In this review, it was aimed to collect the studies about psychiatric disorders and symptoms in children and adolescents during the COVID-19 pandemic.

Method

In order to evaluate studies about psychiatric disorders and symptoms in children and adolescents during the COVID-19 pandemic, articles published in the PubMed database between January 2020 and 14 January 2021 were examined. The keywords used in the literature review were determined as follows: (covid-19 or coronavirus) and (psychopathology or adhd or asd or ocd or depression or anxiety or sleep) and (children or adolescents). In addition to studies with children and adolescents, studies conducted in the general population with sufficient data on adolescents were also included. The article selection method is shown in Figure 1 with the PRISMA flow diagram.

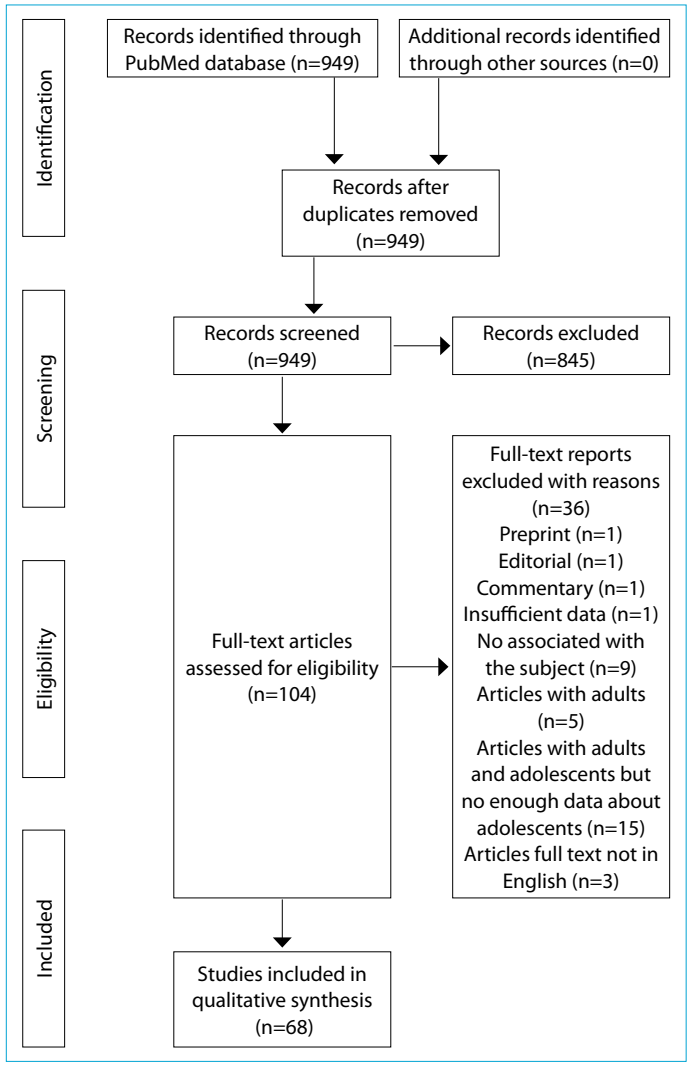

Figure 1. PRISMA flow diagram.

Results

Depression and Anxiety

It has seen that there are many studies on depression and anxiety levels and predictive factors both these disease in children and adolescents during the pandemic. Although most of these studies were cross-sectional, there were also longitudinal studies evaluating pre- and post-pandemic period and studies evaluating the mental health of both children and parents. When considered on a country basis, it is striking that most of the researches were conducted in China where the disease first appeared. The detailed characteristics of the studies are given in Table 1.

When studies evaluated, examining depression, anxiety and sleep problems together; the rate of depression, anxiety and insomnia in Chinese adolescents during the pandemic was 48.20%, 36.70% and 37.80%, respectively. Also, female gender, by the effects of the pandemic, the fear of COVID-19, were found to be associated with these symptoms. It was also found that high physical activity was associated with lower levels of depression, anxiety and insomnia symptoms.[9] In one study, participants reported depressive, anxiety and insomnia symptoms respectively 45.7%, 34.4%, 34.9% and also COVID-19 related fear was found to be associated with

higher depression, anxiety and insomnia symptoms. Physical activity time was associated with lower depression and insomnia symptoms, inactivity like sitting time was associated with higher depression, anxiety, and insomnia symptoms. [10] In a study evaluating adolescents, adults and healthcare professionals, adolescents reported moderate-severe depressive symptoms (55%), anxiety (48%), suicidal thoughts and behavior (38%), PTSD (45%) and sleep problems (69%) more than adults. Loneliness, time spent on social media and exposure to COVID-19 news were found to be predictors of depressive symptoms, suicidal ideation and behavior in adolescents.[11]

Depression, anxiety, and stress levels were examined together in four studies; depresssion, anxiety and stress rate was 22%, 26.9%, 26.4% respectively, and PTSD rate was 21.70 in high school students in China. Resilience and positive coping in high school students were found to be protective in terms of depression, anxiety and stres, positive coping was also found to be protective in dealing with trauma-related distress.[12] At the time of school closure, the three most common symptoms were depression (19.7%), anxiety (24.9%) and stress (15.2%). Participants were generally satisfied with life during school closures. Elderly classes were positively correlated with psychopathological symptoms and negatively associated with life satisfaction, while perceived benefit from home quarantine and parent-child discussions on COVID-19 were negatively correlated with psychopathological symptoms and positively correlated with life satisfaction. Among the participants who perceived no benefit from home quarantine, those who argued with their parents about COVID-19 experienced less depression, anxiety, and stress.[13] In a study from Iran, quality of life was negatively correlated with Internet gaming disorder (IGD) and positive correlation was found between IGD, insomnia, depression, anxiety and stress with small to large effects.[14] The prevalence of depression, anxiety, and stress was found to be 17.66%, 15.54%, and 7.07%, respectively. Mild to severe depression, mild to moderate anxiety, mild to severe stress were significantly associated with addictive Internet users and problematic Internet users.[15]

During COVID-19, 11.78% of adolescents reported depression, 18.92% anxiety and 6.56% both depression and anxiety. Females and elder adolescents in sample found to be more depressed. Adolescents without companion on workdays were more likely to become depressed and anxious during COVID-19. Not surprisingly, physical exercise was associated with both depression and anxiety, and showed some protective effects for adolescent mental health.[16] The prevalence of depressive symptoms was 43.7% and anxiety symptoms was 37.4% during COVID-19 outbreak in Chinese adolescents. Multivariate logistic regression analysis revealed that female gender was a higher risk factor for depressive and anxiety symptoms. In terms of grades, senior high school students were under risk for depressive and anxiety symptoms; the higher the grade, the higher the prevalence of depressive and anxiety symptoms. [17] 22.6% and 18.9% of students reported depressive and anxiety symptoms respectively in Hubei province in home confinement. Depression scale scores were lower in the group who were not or less anxious about being infected with COVID-19 compared to the intensely worried group.[18] Depression and anxiety symptoms were found 44.5% and 38% respectively in Chinese adolescents. Female gender, COVID-19 exposure and low social support were associated with higher symptoms of depression and anxiety.[19] In a study conducted with adolescent athletes, moderate to severe anxiety was found to be higher in females 43.7%, 28.2% respectively. Depressive symptoms were found the highest in team sport individuals and the lowest in individual sport participants.[20]

When looking at studies that only about anxiety; in the study examining anxiety in older adolescents during the COVID-19 pandemic, the Self-Rating Anxiety Scale (SAS) overall mean score was 42.2±4.7, more than half of the SAS individual items achieved a high anxiety score, and as a result, the SAS total score reached an unusually high anxiety score. The highest symptom of anxiety was difficulty in breathing. Somatic symptoms were appeared less severe and anxiety total scale scores appeared significantly higher in females than males.[21] The factors affecting anxiety in adolescents during home quarantine were investigated, state and trait anxiety scores were found 43.17±5.86 and 51.53±5.19. A positive correlation was found between loneliness and the state and trait anxiety scores.[22] In the first 6 weeks of closure, adults and adolescents were evaluated together, the higher outcome anxiety in female gender suggested that there was a gender difference in anxiety due to pandemic In the adolescent sample, females and elder adolescents tended to worry about the consequences of the pandemic.[23] The prevalence of anxiety was determined to be 19% in adolescents during COVID-19 outbreak and adequate sleep time, moderate physical activity, participating distance learning were found to be associated with less anxiety in adolescents. Also adolescents who were concerned about the COVID-19 outbreak were shown to be less anxious.[24] COVID-19-related anxiety was investigated by telephone interviews in children and adolescents with severe obesity, anxiety related to COVID-19 was reported 32% of children. Most of the children with reported anxiety were afraid to be at increased risk for COVID-19 infection. [25] The prevalence of anxiety during the pandemic was % 19.4 in children. Social distancing without parents, number

of people living in house and education level of parents were found to be associated with higher Children's Anxiety Questionnaire scores.[26]

The relationship between cyberchondria and emotion regulation through the Internet and anxiety in parents and children during COVID19 was investigated. It was found that girls reported higher anxiety ($\overline{X}$=49.68) than boys ($\overline{X}$=41.99). It was shown that the more adolescents' emotion regulation over the Internet, the higher they experience anxiety. Accordingly, higher parental distress was associated with lower adolescent anxiety, while increased parental compulsion and anxiety was associated with increased adolescent anxiety.[27] The prevalence of depression was found to be 39.5% in a study conducted with female adolescents during the outbreak period. Female adolescents, ages between 15-18, not participating in distance education, not worrying about COVID-19, have less than 6 hours sleep time and less than 30 minutes physical activity were found to be risky for the development of depression.[28] After the 8 weeks peer education intervention programme in adolescents, SAS scores of the intervention group were better than the control group. Also, the Self-rating Depression Scale scores of both groups decreased, but the effect was more important in the intervention group than control group. Finally, after 2 months of intervention the total Pittsburgh sleep quality index scores of both groups decreased, but the effect was more important in the intervention group than in the control group.[29] Total PTSD score was found to be positively correlated with Generalized Anxiety Scale (GAD) scores, perceived threat and stigma in children and adolescents. Also it was found that, intrusion was negatively correlated with avoidance and positively correlated with GAD and perceived threat.[30]

7 studies compared the period before and after the pandemic. In a longitudinal study involving adolescents and young adults, the participants showed increased symptoms of generalized and social anxiety. The percentage of participants with clinically elevated generalized anxiety, social anxiety, panic/somatic symptoms and depression during COVID-19 was 40.4%, 29.5%, 18.2% 10.4%, respectively. In addition, increased panic/somatic and depressive symptoms were detected in females. Increased COVID-19 concern was found to be associated with increased depressive symptoms. Also greater COVID-19 confinement concern was associated with increased generalized anxiety and decreased social anxiety symptoms.[31] In senior high school students, the depression rate (Patient Health Questionnaire-9 score ≥11) increased from 48.5% to 63.8% and the anxiety rate (GAD-7 score ≥11) increased from 23.8% to 49.5% during the lockdown compared to before confinement.[32] One study found that participants experienced an increase in internalization symptoms from 3 months before the pandemic to 2 most recent weeks during the pandemic. If executive control network, which supports the cognitive processes that help manage difficulties and regulate emotions successfully in stressful situations, coherence was low in early maturing youth, internalization symptoms were higher.[33] The depression rate in children was found to be increased with moderate to large effect (Revised Child Anxiety and Depression Scale (RCADS) depression scores were on average 0.74 higher), when compared before and during lockdown period, no significant change was found in RCADS anxiety subscale and Strengths and Difficulties Questionnaire (SDQ) emotional problems subscale.[34] When it was compared 12 months before pandemic and 2 months into the pandemic, an increase in depression and anxious symptoms was found in adolescents, and it was prominent in females. Also there was a decrease in life satisfaction especially in girls.[35] A small significant increase in depression, anxiety symptoms and loneliness was found in a study comparing before and after the pandemic. Perceived social and emotional changes which related to the friendship and family dynamics were found to be associated with increased depressive and anxiety symptoms and loneliness compared to pre-pandemic.[36] In the study conducted before and after the closing of schools into the pandemic, it was determined that the Children's Depression Inventory-Short Form (CDI-s) scores decreased when the schools were closed (3.90) compared to before (4.19). School closure was found to be associated with increased screen time.[37]

Four studies evaluated children and their parents together. The problems identified by the caregiver for their children were mostly related to misbehavior (35%), anxiety/stress (24%), social isolation (23%), depression (20%), and academics (17%) and these symptoms were positively correlated with the number of children at home. Depression, anxiety-stress-related problems were mostly reported in elder adolescents.[38] It was shown that internalization symptoms increased in both parents and children in the period compared to the onset of the pandemic (elevated depression percentage 24.2%, anxiety 26.4% for children) and factors such as demographic characteristics and fear of COVID-19 contagion were risk factors for internalization symptoms in both groups.[39] For children, 1.84% experienced moderate anxiety, 2.22% experienced depression and 3.16% met the diagnostic criteria for PTSD, intense media exposure was found as a risk factor for anxiety and PTSD in children, and it was reported that children and their parents did not have severe psychological complaints in the region where the disease was not intense.[40] Greater child anxiety was found to be associated with greater parental anxiety, which increased

the use of technology and social media in children.[41]

Adolescents' use of social media as a coping method in the lockdown period was evaluated, it was found that anxious adolescents use social media more to actively deal with the crisis and to communicate with others. Anxiety and loneliness were found negatively associated with happiness. Although the humorous coping method was positively related to happiness, it was shown that it was not affected by loneliness and anxiety.[42]

During the COVID-19 pandemic, a relationship was found between psychiatric disorders and various risk factors such as the area of residence, stay away from parents, crowded family life, the economic status of the family, and the number of siblings. The depression, anxiety, and sleeping disorder scores were higher for a child whose family lived in the urban areas (63.3%). The child had higher mental health disturbance scores who had higher corona positive relative/neighbor. The higher the number of parents who need to go to the workplace (25%), the smoking habit (35.7%) and the chance of losing their job (28.6%), the higher the child's depression, anxiety and sleep disorder scores. The score was also higher for the child who frequently quarreled with each other, the child watching cartoons and playing the game using a smartphone or other electronic device for 2-4 hours a day, and the child whose parents did not take any action to keep them busy.[43] When the effect of being an only child in the pandemic was examined, 35.2% of only children and 38.8% of non-only children reported depression symptoms, while 20.5% and 24.7%, respectively reported anxiety symptoms. Depression and anxiety symptoms were more common in non-only children compared to those with only child. Exposure to COVID-19 was identified as a risk factor for depression and anxiety in those who are not the only children. While resilience and parent-child relationship were protective in both groups for depression and anxiety, emotional abuse was found to be a risk factor.[44] Being exposed to excessive maltreatment during childhood was found to be associated with more posttraumatic stres symptoms (PTSS) and anxiety during the pandemic. Also the fear of exposure to COVID-19 was significantly associated with PTSS and anxiety.[45] Anxiety symptoms were found to be higher in children living in Wuhan compared to other regions of China.[46]

Sleep Problems

Depression and anxiety appear to be associated with sleep problems during the COVID-19 outbreak. Also there are studies that examine sleep problems and screen exposure together. The closure of schools and the increase in the time spent at home may have caused both an increase in the amount of sleep and a prolonged exposure to the screen.

During the COVID-19 pandemic, 34.2% of the parents reported that their children's tendency to sleep increased, and 69.3% reported that Internet use increased.[47] The study found that during the COVID-19 pandemic, screen exposure and sleep time increased. Screen time was 2.0±1.6 h/day before confinement and 4.9±2.3 h/day during confinement. These measuurement was 9.1±1.2 h/day and 9.3±1.6 h/day for sleep time.[48] In the early stages of the pandemic, physical activity and sleep quality were found to be reduced. Screen time was 3.05±1.92 h/day and sleep time was 11.01±1.86 and they were both increased when compared before the pandemic.[49] When lifestyle changes compared before and after the confinement, the prevalence of children with screen exposure time for more than 2 hours a day increased from 66% to 87.7%, and it was found that the amount of sleep increased both weekdays and weekends.[50] A study conducted in 3 European countries found increased screen time, decreased physical activity and increased sleep time. >40% of children were irritable, and ~1/3 argues with the family more than before confinement. Level of anxiety, mood, sleep, nutrition, behavior and cognitive changes were found to be higher in boys compared with girls.[51]

Compared to 2018 during pandemic, it was observed preschool children had later sleeping and waking times, there was an increase in the amount of sleep, and nap durations was shorter.[52] In adolescents, the amount of sleep increased by 58 minutes and naps decreased at the end of the period of stay at home compared to the pre-quarantine period.[53] When the time schools were open and the pandemic was compared in adolescents, prolonged sleep duration, increased sleep quality, decreased daytime sleepiness were found.[54] There was significantly decrease of regular napping in adolescents; the number of naps was 421 in pre-lockdown, and two months of stay at home it was reported as 28.[55]

The prevalence of insomnia symptoms during the COVID-19 pandemic was 23.2%. Binomial logistic regression analysis revealed that female gender and urban residency were larger risk factors for insomnia symptoms. Depression or anxiety were risk factors for insomnia symptoms; however, both subjective and objective social support were protective factor against insomnia symptoms. Additionally, anxiety and depression symptoms were mediators of social support and insomnia symptoms.[56] In the study investigating vulnerability and resilience after school closure, children on average slept for 10.76 h, exercised for around 1 h, and used electronic devices for 2.31 h per day. The SDQ scores were higher in children with special education needs and health problems, and children whose parents with mental disorder or divorced. Sleep delay, insufficient sleep,

excessive use of electronic devices were found to be associated with high parental stress and psychosocial problems in the preschool children. The delay in bed time and the duration of using electronic devices for gaming were found to be positively associated with SDQ and Perceived Stress Scale scores in all age groups.[57]

Neurodevelopmental Disorders and Behavioral Problems

Behavioral problems have increased in children with neurodevelopmental disorders such as Autism spectrum disorder (ASD) and Attention deficit hyperactivity disorder (ADHD) during the pandemic period due to reasons for example; the closure of schools, restriction of outdoor activities, and disruption of the special education process.

There are 3 studies examining children and adolescents with ASD during this period. Children with ASD became more aggressive (55%), their tics increased or new tics appeared (26%), their communication skills worsened (29%) and had a change in sleep and appetite (44% and 33% respectively) according to their parents. Increased stereotypies, aggression, hypersensitivity, behavioral problems, sleep and nutritional changes in autistic patients were evaluated as COVID-19 related PTSD-like symptoms. Sleep time was decreased compared to the before of the pandemic.[58] During pandemic, patients with ASD had more intense (35.5%) and more frequent (41.5%) behavioral problems. Individuals with ASD with pre-existing behavioral problems were 1.67 times more likely to exhibit more frequent behavioral problems than those without previous behavioral problems.[59] In a report with nine adolescents with ASD, when it was compared before and during the pandemic, screen time increased on weekdays (3.69 vs 6.25) and weekends (5.94 vs. 7.39), and no change was detected in sleep duration.[60]

It was determined that problems related to sleep, screen exposure, and adaptation to distance education increased in children and adolescents with ADHD. Average of children's ADHD behaviors worsened significantly during the COVID-19 outbreak compared to their normal state and overall mood and study time of children, mood states of parents were found to be predictive for ADHD behavior in children.[61] Adolescents with ADHD had less routine and more distant learning difficulties than those without. In this group, having less routine, negative affect, and concentration difficulties due to COVID-19 were found to be associated with difficulties in the distance education process.[62] When the group with ADHD was compared with the pre-pandemic period, exercise, time spent out and pleasure from activities decreased, television, social media use, gaming, depressive mood and loneliness increased.[63] ADHD patients with high to moderate severity showed significant improvement rates in many emotional mood and behavioral dimensions, although they maintained greater stability in their severity before and during lockout. Patients with previously low intensity of these behaviors worsened significantly in almost all dimensions with exception of anxiety and, only among adolescents, of sadness during lockout.[64] Sleep problems were found to be the full mediating factor in the relationship between Children's Impact of Event Scale (CRIES-8) scores and the severity of ADHD symptoms and between Children's Chronotype Questionnaire scores and severity of ADHD symptoms in children during COVID-19 confinement. A mild positive correlation was found between CRIES-8 and Children's Sleep Habit Questionnaire scores.[65]

A study found 14.2% of the total research subject at risk on total difficulties problems; 38.1% of adolescent was at risk on peer-relationship problems, 28.3% at risk on pro-social behavior problems, 15% at risk on conduct behavior and 10.6% at risk on emotional problems during school closure. The associations between having health or mental health information during the COVID-19 pandemic and conduct behavior; subjective perception of anxiety linked to COVID-19 and pro-social behavior problems; parental support during the pandemic and total difficulties and pro-social problems; friend support during pandemic and conduct behavior; friend support during pandemic and pro-social behavior problems were found statistically significant in a study.[66] Behavioral and psychological interaction of parents and children during the COVID-19 period was examined in children, increased conduct problems, emotional symptoms, hyperactivity/inattenion issues were detected independently of the mother's working status. According to the multiple regression analyze, children's inhibitory self control was found to be associated with both their own and their parents' sleep quality.[67] The prevalence of total difficulty was 8.2%, and conduct problems, peer problems, hyperactivity-inattention, emotional problems, prosocial problems were 7.0%, 6.6%, 6.3%, 4.7%, 10.3%, respectively in school-aged children during quarantine. Also children with physical activity had less attention deficit hyperactivity problems compared to those who did not exercise.[68] The findings from study in India revealed that 73.15% and 51.25% of the children, respectively, showed increased irritation and anger symptoms; 18.7% of the parents mentioned depression and 17.6% anxiety symptoms about their children during lockdown.[69] According to the SDQ scale, it was shown that the scores of conduct, peer, prosocial and total problems increased during the lockdown period. It was found that worsening of adolescents mental

health was associated with unhealthy activities, deteriorating relationships and dysfunctional parental attitudes.[70] In a study investigating the effect of online homeschooling on children, parents and teachers, parental-rated SDQ results showed that 17.6% of students were suspected of having emotional or behavioral problems, and lower grade students were considered more vulnerable than higher grade students. As noted in the SAS results, only 9.6% of the parents and 17.2% of the teachers reported a high level of anxiety for children.[71]

In children with neurodevelopmental disorders, parents reported that 81.6% of children viewing more television and digital media, 43.6% of them had reduced sleep quality, and 18.8% of the parents stated that a higher dose of medication was needed.[72]

Obsessive-Compulsive Disorder (OCD)

There are 4 studies with OCD during the pandemic period. While 3 studies reported worsening of symptoms in children and adolescents with OCD, one study did not report a significant worsening of OCD symptoms. More than half of the children and adolescents reported an increase in symptom severity according to both Children's Yale-Brown Obsessive Compulsive Scale (CY-BOCS) and Clinical Global Impression–Severity Scale, and 22 subjects had at least a 30% increase in total CY-BOCS scores during the pandemic period. The most common symptoms of OCD, both before and during the pandemic, were contamination obsessions and cleaning/washing compulsions. During the pandemic, there was a significant increase in the frequency of contamination obsessions and cleaning/washing compulsions.[73]

In the study in which OCD patients were divided into two groups as clinical and survey, in both groups, but most pronounced in the survey group, participants experienced worsening of OCD, anxiety, and depressive symptoms. The exacerbation of OCD was associated with worsening anxiety, depressive symptoms, and the extent of avoidance behavior. For both groups, OCD aggressive symptoms predicted a significant worsening. The poor basic insight tended to predict that the symptom was getting worse. The worsening was most pronounced in children whose symptoms started at an early age and had a family history of ADHD.[74]

Fear of COVID-19 exerts a strong influence on adolescents with OCD. Experimental avoidance, depression, and anxiety had positive and significant predictive coefficients. Fear of COVID-19 positively predicted emotional reactivity, and emotional reactivity was highly correlated with experimental avoidance, depression and anxiety.[75] In the study conducted during the first wave of pandemic in Israel, no significant worsening was found in the symptoms of children and adolescents with OCD.[76]

Discussion

In this review, the studies about prevalence of psychiatric diseases and symptoms in children and adolescents during the COVID-19 pandemic, the impact of the outbreak on these diseases, risk factors and protective factors were evaluated. 38 of studies were about depression and anxiety, 11 studies were related to sleep problems, 15 of them were about neurodevelopmental disorders and behavioral problems, and finally the number of studies associated with OCD was 4. The scales were mostly filled by the individuals themselves or their parents, and sometimes teachers' observations were taken. Although the majority of the studies were cross-sectional online survey studies, there were also longitudinal studies that evaluate before and after the pandemic.

Considering the most researched diseases depression and anxiety; studies found the prevalence for depression varying from 2.22% to 63.8%.[9-13,17,31,32,40] For anxiety, this rate was reported as 7.50% to 49.5%.[15,17-19,32] It is possible that this difference was caused by the fact that the regions of studies were different, they were conducted in different periods of the pandemic, and the assessment instruments were variable. According to datas of longitudinal studies, the increased rates of depression and anxiety during the pandemic period are important in terms of the negative impact of the epidemic on mental health. It was stated that depression and anxiety rates were reported more frequent in females than males,[9,16,17,19] like previous researches,[77-79] and older adolescents.[16,23,38] Increased duration of physical activity was protective against the development of depression and anxiety.[9,10,16,24,28] Fear of COVID-19 also appears to be one of the risk factors for the development of depression and anxiety. Factors such as frequent exposure to the coronavirus news, obtaining information from unreliable sources, having a relative who had the disease or died due to COVID-19, and the uncertainty of the period can increase the fear about the disease. Positive coping, resilience, parent-child relationship and social support seemed to be protective factors against depression and anxiety[12,19,44] while living urban areas, emotional abuse and being non-only children were risk factors.[43,44]

It was shown in many studies that the amount of sleep and screen time increased during the pandemic. There could be more than one reason for this situation. With the closure of schools and transition to distance education, some changes have occurred in the routines of children and adolescents. Along with later sleep and wake up times, the

sleep duration also increased, and some studies reported that the amount of daytime naps decreased.[52,53] With the online education, the duration of Internet use of children has been increased and the time spent at home has contributed to increase of screen time. Increased screen time and intensive Internet use are not only associated with psychiatric disorders such as, depression and anxiety but also important for developing physical problems like increased risk of obesity[80] and posture disorders.[81]

It has been observed that there was an increase in behavioral problems with pandemic in children and adolescents with neurodevelopmental disorders. Sleep quality of children was impaired, the screen time increased, and some families needed higher drug doses.[72] Disruption of the special education process and changes in routines can be shown as the reason for this in ASD patients, while factors such as increased time spent at home and restriction of physical activity have increased these problems in ADHD patients who are prone to behavioral problems, anger and irritability. Also in the normal population, parents reported more behavioral and emotional problems in their children.

OCD is another topic worth exploring during this period. Knowing that COVID-19 is a rapidly transmitted viral disease when hygiene rules are not observed, seems to have caused an increase in avoidance and compulsions in OCD patients during the pandemic.

Conclusion

The ongoing COVID-19 pandemic is causing serious mental health problems in growing children and adolescents. Closure of schools in most countries, continuation of restrictions, and unpredictability of how long the process will continue increase these problems. Considering that the physical, mental and economic effects of the pandemic will seriously affect people's life not only now but also in the coming years. Taking the most appropriate precautions considering all these effects to improve mental health such as taking protective preventions, making new regulations for education and training, organizing psychosocial intervention support programs, ensuring controlled activity, providing correct information to reduce anxiety as well as correcting false-known facts about the pandemic will be important in terms of children and adolescents' cognitive, emotional and social development.

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References

1. Archived: WHO Timeline - COVID-19 [Internet]. [cited 2020 Dec 30]. Available from: https://www.who.int/news/item/27-04-2020-who-timeline---covid-19
2. WHO | Pneumonia of unknown cause – China. WHO. 2020.
3. WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020 [Internet]. [cited 2021 Feb 4]. Available from: https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020
4. WHO Coronavirus Disease (COVID-19) Dashboard | WHO Coronavirus Disease (COVID-19) Dashboard [Internet]. [cited 2021 Jan 31]. Available from: https://covid19.who.int/
5. Tezer H, Bedir Demirdağ T. Novel coronavirus disease (Covid-19) in children. Turk J Med Sci 2020;50(SI-1):592-603. [CrossRef]
6. Wu KK, Chan SK, Ma TM. Posttraumatic stress, anxiety, and depression in survivors of severe acute respiratory syndrome (SARS). J Trauma Stress 2005;18:39–42. [CrossRef]
7. Lee AM, Wong JGWS, McAlonan GM, Cheung V, Cheung C, Sham PC, et al. Stress and psychological distress among SARS survivors 1 year after the outbreak. Can J Psychiatry 2007;52:233–240. [CrossRef]
8. Ji D, Ji YJ, Duan XZ, Li WG, Sun ZQ, Song XA, et al. Prevalence of psychological symptoms among Ebola survivors and healthcare workers during the 2014-2015 Ebola outbreak in Sierra Leone: A cross-sectional study. Oncotarget 2017;8:12784–12791. [CrossRef]
9. Chi X, Liang K, Chen S-T, Huang Q, Huang L, Yu Q, et al. Mental health problems among Chinese adolescents during the COVID-19: The importance of nutrition and physical activity. Int J Clin Heal Psychol 2020 Dec 24:100218. [CrossRef]
10. Lu C, Chi X, Liang K, Chen S-T, Huang L, Guo T, et al. Moving More and Sitting Less as Healthy Lifestyle Behaviors are Protective Factors for Insomnia, Depression, and Anxiety Among Adolescents During the COVID-19 Pandemic. Psychol Res Behav Manag 2020;13:1223–1233. [CrossRef]
11. Murata S, Rezeppa T, Thoma B, Marengo L, Krancevich K, Chiyka E, et al. The psychiatric sequelae of the COVID-19 pandemic in adolescents, adults, and health care workers. Depress Anxiety 2020. [CrossRef]
12. Zhang C, Ye M, Fu Y, Yang M, Luo F, Yuan J, et al. The Psychological Impact of the COVID-19 Pandemic on Teenagers in China. J Adolesc Heal 2020;67:747–755. [CrossRef]
13. Tang S, Xiang M, Cheung T, Xiang YT. Mental health and its correlates among children and adolescents during COVID-19 school closure: The importance of parent-child discussion. J

Affect Disord 2021;279:353–360. [CrossRef]
14. Fazeli S, Mohammadi Zeidi I, Lin CY, Namdar P, Griffiths MD, Ahorsu DK, et al. Depression, anxiety, and stress mediate the associations between internet gaming disorder, insomnia, and quality of life during the COVID-19 outbreak. Addict Behav Report 2020 Dec 1;12. [CrossRef]
15. Dong H, Yang F, Lu X, Hao W. Internet Addiction and Related Psychological Factors Among Children and Adolescents in China During the Coronavirus Disease 2019 (COVID-19) Epidemic. Front Psychiatry 2020;11:00751. [CrossRef]
16. Chen F, Zheng D, Liu J, Gong Y, Guan Z, Lou D. Depression and anxiety among adolescents during COVID-19: A cross-sectional study. Brain Behav Immun 2020;88:36–38. [CrossRef]
17. Zhou SJ, Zhang LG, Wang LL, Guo ZC, Wang JQ, Chen JC, et al. Prevalence and socio-demographic correlates of psychological health problems in Chinese adolescents during the outbreak of COVID-19. Eur Child Adolesc Psychiatry 2020;29:749–758. [CrossRef]
18. Xie X, Xue Q, Zhou Y, Zhu K, Liu Q, Zhang J, et al. Mental health status among children in home confinement during the coronavirus disease 2019 outbreak in Hubei Province, China. JAMA Pediatr 2020:e201619. [CrossRef]
19. Qi M, Zhou SJ, Guo ZC, Zhang LG, Min HJ, Li XM, et al. The Effect of Social Support on Mental Health in Chinese Adolescents During the Outbreak of COVID-19. J Adolesc Heal 2020;67:514–518. [CrossRef]
20. McGuine TA, Biese KM, Petrovska L, Hetzel SJ, Reardon C, Kliethermes S, et al. Mental Health, Physical Activity, and Quality of Life of US Adolescent Athletes During COVID-19–Related School Closures and Sport Cancellations: A Study of 13 000 Athletes. J Athl Train 2020 Dec 8. [CrossRef]
21. Smirni P, Lavanco G, Smirni D. Anxiety in Older Adolescents at the Time of COVID-19. J Clin Med 2020;9:3064. [CrossRef]
22. Kılınçel Ş, Kılınçel O, Muratdağı G, Aydın A, Usta MB. Factors affecting the anxiety levels of adolescents in home-quarantine during COVID-19 pandemic in Turkey. Asia-Pac Psychiatry 2020 Aug 11:e12406. [CrossRef]
23. McElroy E, Patalay P, Moltrecht B, Shevlin M, Shum A, Creswell C, et al. Demographic and health factors associated with pandemic anxiety in the context of COVID-19. Br J Health Psychol 2020;25:934–944. [CrossRef]
24. Qi H, Liu R, Chen X, Yuan XF, Li YQ, Huang HH, et al. Prevalence of anxiety and associated factors for Chinese adolescents during the COVID-19 outbreak. Psychiatry Clin Neurosci 2020;74:555-557. [CrossRef]
25. Abawi O, Welling MS, Eynde E, Rossum EFC, Halberstadt J, Akker ELT, et al. COVID-19 related anxiety in children and adolescents with severe obesity: A mixed-methods study . Clin Obes 2020;10:e12412. [CrossRef]
26. de Avila MAG, Filho PTH, da Silva Jacob FL, Alcantara LRS, Berghammer M, Nolbris MJ, et al. Children's anxiety and factors related to the covid-19 pandemic: An exploratory study using the children's anxiety questionnaire and the numerical rating scale. Int J Environ Res Public Health 2020;17:1–13. [CrossRef]
27. Akgül G, Atalan Ergin D. Adolescents' and parents' anxiety during COVID-19: is there a role of cyberchondriasis and emotion regulation through the internet? Curr Psychol 2021;1-10.
28. Zhou J, Yuan X, Qi H, Liu R, Li Y, Huang H, et al. Prevalence of depression and its correlative factors among female adolescents in China during the coronavirus disease 2019 outbreak. Global Health 2020;16:69. [CrossRef]
29. Ding X, Yao J. PEER EDUCATION INTERVENTION ON ADOLESCENTS' ANXIETY, DEPRESSION, AND SLEEP DISORDER DURING THE COVID-19 PANDEMIC. Psychiatr Danub 2020;32:527–535.
30. Li Y, Duan W, Chen Z. Latent profiles of the comorbidity of the symptoms for posttraumatic stress disorder and generalized anxiety disorder among children and adolescents who are susceptible to COVID-19. Child Youth Serv Rev 2020;116:105235.
31. Hawes MT, Szenczy AK, Klein DN, Hajcak G, Nelson BD. Increases in Depression and Anxiety Symptoms in Adolescents and Young Adults during the COVID-19 Pandemic. Psychol Med 2021;1–25. [CrossRef]
32. Giannopoulou I, Efstathiou V, Triantafyllou G, Korkoliakou P, Douzenis A. Adding stress to the stressed: Senior high school students' mental health amidst the COVID-19 nationwide lockdown in Greece. Psychiatry Res 2021;295:113560. [CrossRef]
33. Chahal R, Kirshenbaum JS, Miller JG, Ho TC, Gotlib IH. Higher Executive Control Network Coherence Buffers Against Puberty-Related Increases in Internalizing Symptoms During the COVID-19 Pandemic. Biol Psychiatry Cogn Neurosci Neuroimaging 2020;6:79-88. [CrossRef]
34. Bignardi G, Dalmaijer ES, Anwyl-Irvine AL, Smith TA, Siugzdaite R, Uh S, et al. Longitudinal increases in childhood depression symptoms during the COVID-19 lockdown. Arch Dis Child 2020 Dec 9;archdischild-2020-320372. [CrossRef]
35. Magson NR, Freeman JYA, Rapee RM, Richardson CE, Oar EL, Fardouly J. Risk and Protective Factors for Prospective Changes in Adolescent Mental Health during the COVID-19 Pandemic. J Youth Adolesc 2021;50:44-57. [CrossRef]
36. Rogers AA, Ha T, Ockey S. Adolescents' Perceived Socio-Emotional Impact of COVID-19 and Implications for Mental Health: Results From a U.S.-Based Mixed-Methods Study. J Adolesc Heal 2021;68:43–52. [CrossRef]
37. Xiang M, Yamamoto S, Mizoue T. Depressive symptoms in students during school closure due to COVID-19 in Shanghai. Psychiatry Clin Neurosci 2020;74:664-666. [CrossRef]
38. Fitzpatrick O, Carson A, Weisz JR. Using Mixed Methods to Identify the Primary Mental Health Problems and Needs of Children, Adolescents, and Their Caregivers during the Coronavirus (COVID-19) Pandemic. Child Psychiatry Hum Dev 2020:1–12. [CrossRef]
39. Crescentini C, Feruglio S, Matiz A, Paschetto A, Vidal E, Cogo

P, et al. Stuck Outside and Inside: An Exploratory Study on the Effects of the COVID-19 Outbreak on Italian Parents and Children's Internalizing Symptoms. Front Psychol 2020;11:586074.
40. Yue J, Zang X, Le Y, An Y. Anxiety, depression and PTSD among children and their parent during 2019 novel coronavirus disease (COVID-19) outbreak in China. Curr Psychol 2020;1-8. [CrossRef]
41. Drouin M, McDaniel BT, Pater J, Toscos T. How Parents and Their Children Used Social Media and Technology at the Beginning of the COVID-19 Pandemic and Associations with Anxiety. Cyberpsychology, Behav Soc Netw 2020;23:727–736.
42. Cauberghe V, Van Wesenbeeck I, De Jans S, Hudders L, Ponnet K. How Adolescents Use Social Media to Cope with Feelings of Loneliness and Anxiety During COVID-19 Lockdown. Cyberpsychology Behav Soc Netw 2020 Oct 20. [CrossRef]
43. Yeasmin S, Banik R, Hossain S, Hossain MN, Mahumud R, Salma N, et al. Impact of COVID-19 pandemic on the mental health of children in Bangladesh: A cross-sectional study. Child Youth Serv Rev 2020;117:105277. [CrossRef]
44. Cao Y, Huang L, Si T, Wang NQ, QU M, Zhang XY. The Role of Only-child Status in the Psychological Impact of COVID-19 on Mental Health of Chinese Adolescents. J Affect Disord 2020;282:316-321. [CrossRef]
45. Guo J, Fu M, Liu D, Zhang B, Wang X, van IJzendoorn MH. Is the psychological impact of exposure to COVID-19 stronger in adolescents with pre-pandemic maltreatment experiences? A survey of rural Chinese adolescents. Child Abus Negl 2020;110:104667. [CrossRef]
46. Chen S, Cheng Z, Wu J. Risk factors for adolescents' mental health during the COVID-19 pandemic: A comparison between Wuhan and other urban areas in China. Global Health 2020;16:96. [CrossRef]
47. Adıbelli D, Sümen A. The effect of the coronavirus (COVID-19) pandemic on health-related quality of life in children. Child Youth Serv Rev 2020;119:105595. [CrossRef]
48. López-Bueno R, López-Sánchez GF, Casajús JA, Calatayud J, Gil-Salmerón A, Grabovac I, et al. Health-Related Behaviors Among School-Aged Children and Adolescents During the Spanish Covid-19 Confinement. Front Pediatr 2020;8:573. [CrossRef]
49. Aguilar-Farias N, Toledo-Vargas M, Miranda-Marquez S, Cortinez-O'ryan A, Cristi-Montero C, Rodriguez-Rodriguez F, et al. Sociodemographic predictors of changes in physical activity, screen time, and sleep among toddlers and preschoolers in chile during the covid-19 pandemic. Int J Environ Res Public Health 2021;18:1–13. [CrossRef]
50. Medrano M, Cadenas-Sanchez C, Oses M, Arenaza L, Amasene M, Labayen I. Changes in lifestyle behaviours during the COVID-19 confinement in Spanish children: A longitudinal analysis from the MUGI project. Pediatr Obes 2020;e12731. [CrossRef]
51. Francisco R, Pedro M, Delvecchio E, Espada JP, Morales A, Mazzeschi C, et al. Psychological Symptoms and Behavioral Changes in Children and Adolescents During the Early Phase of COVID-19 Quarantine in Three European Countries. Front Psychiatry 2020;11:570164. [CrossRef]
52. Liu Z, Tang H, Jin Q, Wang G, Yang Z, Chen H, et al. Sleep of preschoolers during the coronavirus disease 2019 (COVID-19) outbreak. J Sleep Res 2021;30:e13142. [CrossRef]
53. Roitblat Y, Burger J, Leit A, Nehuliaieva L, Umarova GS, Kaliberdenko V, et al. Stay-at-home circumstances do not produce sleep disorders: An international survey during the COVID-19 pandemic. J Psychosom Res 2020;139:110282. [CrossRef]
54. Gruber R, Saha S, Somerville G, Boursier J, Wise MS. The impact of COVID-19 related school shutdown on sleep in adolescents: a natural experiment. Sleep Med 2020;76:33–35. [CrossRef]
55. Rome O, Sinai L, Sevitt R, Meroody A, Nadolne M, Shilco P, et al. Owls and larks do not exist: COVID-19 quarantine sleep habits. Sleep Med 2020 Sep 15.
56. Zhou SJ, Wang LL, Yang R, Yang XJ, Zhang LG, Guo ZC, et al. Sleep problems among Chinese adolescents and young adults during the coronavirus-2019 pandemic. Sleep Med 2020;74:39–47. [CrossRef]
57. Tso WWY, Wong RS, Tung KTS, Rao N, Fu KW, Yam JCS, et al. Vulnerability and resilience in children during the COVID-19 pandemic. Eur Child Adolesc Psychiatry 2020:1–16. [CrossRef]
58. Mutluer T, Doenyas C, Aslan Genc H. Behavioral Implications of the Covid-19 Process for Autism Spectrum Disorder, and Individuals' Comprehension of and Reactions to the Pandemic Conditions. Front Psychiatry 2020;11:561882. [CrossRef]
59. Colizzi M, Sironi E, Antonini F, Ciceri ML, Bovo C, Zoccante L. Psychosocial and behavioral impact of COVID-19 in autism spectrum disorder: An online parent survey. Brain Sci 2020;10:341. [CrossRef]
60. Garcia JM, Lawrence S, Brazendale K, Leahy N, Fukuda D. Brief report: The impact of the COVID-19 pandemic on health behaviors in adolescents with Autism Spectrum Disorder. Disabil Health J 2020;101021. [CrossRef]
61. Zhang J, Shuai L, Yu H, Wang Z, Qiu M, Lu L, et al. Acute stress, behavioural symptoms and mood states among school-age children with attention-deficit/hyperactive disorder during the COVID-19 outbreak. Asian J Psychiatr 2020;51:102077.
62. Becker SP, Breaux R, Cusick CN, Dvorsky MR, Marsh NP, Sciberras E, et al. Remote Learning During COVID-19: Examining School Practices, Service Continuation, and Difficulties for Adolescents With and Without Attention-Deficit/Hyperactivity Disorder. J Adolesc Heal 2020;67:769–777. [CrossRef]
63. Sciberras E, Patel P, Stokes MA, Coghill D, Middeldorp CM, Bellgrove MA, et al. Physical Health, Media Use, and Mental Health in Children and Adolescents With ADHD During the COVID-19 Pandemic in Australia. J Atten Disord 2020 Dec 17;1087054720978549. [CrossRef]
64. Melegari MG, Giallonardo M, Sacco R, Marcucci L, Orecchio S, Bruni O. Identifying the impact of the confinement of Covid-19 on emotional-mood and behavioural dimensions in

children and adolescents with Attention Deficit Hyperactivity Disorder (ADHD). Psychiatry Res 2020;296:113692. [CrossRef]
65. Çetin FH, Uçar HN, Türkoğlu S, Kahraman EM, Kuz M, Güleç A. Chronotypes and trauma reactions in children with ADHD in home confinement of COVID-19: full mediation effect of sleep problems. Chronobiol Int 2020;37:1214–1222. [CrossRef]
66. Wiguna T, Anindyajati G, Kaligis F, Ismail RI, Minayati K, Hanafi E, et al. Brief Research Report on Adolescent Mental Well-Being and School Closures During the COVID-19 Pandemic in Indonesia. Front Psychiatry 2020;11:598756. [CrossRef]
67. Di Giorgio E, Di Riso D, Mioni G, Cellini N. The interplay between mothers' and children behavioral and psychological factors during COVID-19: an Italian study. Eur Child Adolesc Psychiatry 2020;1-12. [CrossRef]
68. Liu Q, Zhou Y, Xie X, Xue Q, Zhu K, Wan Z, et al. The prevalence of behavioral problems among school-aged children in home quarantine during the COVID-19 pandemic in china. J Affect Disord 2021;279:412-416. [CrossRef]
69. Sama BK, Kaur P, Thind PS, Verma MK, Kaur M, Singh DD. Implications of COVID-19-induced nationwide lockdown on children's behaviour in Punjab, India. Child Care Health Dev 2021;47:128–135. [CrossRef]
70. Ezpeleta L, Navarro JB, de la Osa N, Trepat E, Penelo E. Life conditions during COVID-19 lockdown and mental health in Spanish adolescents. Int J Environ Res Public Health 2020;17:1–13.
71. Zhao Y, Guo Y, Xiao Y, Zhu R, Sun W, Huang W, et al. The effects of online homeschooling on children, parents, and teachers of grades 1-9 during the COVID-19 pandemic. Med Sci Monit 2020;26:e925591-1–e925591-10. [CrossRef]
72. Masi A, Mendoza Diaz A, Tully L, Azim SI, Woolfenden S, Efron D, et al. Impact of the COVID-19 pandemic on the well-being of children with neurodevelopmental disabilities and their parents. J Paediatr Child Health 2021 Jan 10. [CrossRef]
73. Tanir Y, Karayagmurlu A, Kaya İ, Kaynar TB, Türkmen G, Dambasan BN, et al. Exacerbation of obsessive compulsive disorder symptoms in children and adolescents during COVID-19 pandemic. Psychiatry Res 2020;293:113363. [CrossRef]
74. Nissen JB, Højgaard DRMA, Thomsen PH. The immediate effect of COVID-19 pandemic on children and adolescents with obsessive compulsive disorder. BMC Psychiatry 2020;20:511.
75. Seçer İ, Ulaş S. An Investigation of the Effect of COVID-19 on OCD in Youth in the Context of Emotional Reactivity, Experiential Avoidance, Depression and Anxiety. Int J Ment Health Addict 2020:1–14. [CrossRef]
76. Schwartz-Lifshitz M, Basel D, Lang C, Hertz-Palmor N, Dekel I, Zohar J, et al. Obsessive compulsive symptoms severity among children and adolescents during COVID-19 first wave in Israel. J Obsessive Compuls Relat Disord 2021;28:100610.
77. Merikangas KR, He JP, Burstein M, Swanson SA, Avenevoli S, Cui L, et al. Lifetime prevalence of mental disorders in U.S. adolescents: Results from the national comorbidity survey replication-adolescent supplement (NCS-A). J Am Acad Child Adolesc Psychiatry 2010;49:980–989. [CrossRef]
78. Hankin BL, Abramson LY, Moffitt TE, Silva PA, McGee R, Angell KE. Development of depression from preadolescence to young adulthood: Emerging gender differences in a 10-year longitudinal study. J Abnorm Psychol 1998;107:128–140. [CrossRef]
79. Ohannessian CMC, Milan S, Vannucci A. Gender Differences in Anxiety Trajectories from Middle to Late Adolescence. J Youth Adolesc 2017;46:826–839. [CrossRef]
80. Tsitsika AK, Andrie EK, Psaltopoulou T, Tzavara CK, Sergentanis TN, Ntanasis-Stathopoulos I, et al. Association between problematic internet use, socio-demographic variables and obesity among European adolescents. Eur J Public Health 2016;26:617–622. [CrossRef]
81. Kee I-K, Byun J-S, Jung J-K, Choi J-K. The presence of altered craniocervical posture and mobility in smartphone-addicted teenagers with temporomandibular disorders. J Phys Ther Sci 2016;28:339–346. [CrossRef]

Table 1. The characteristics of the studies about psychiatric disorders in children and adolescents during COVID-19 pandemic

Study	Country	Participants Mean age±SD M/F	Study Design	Measures
(9)	China	15.26±0.46 1007/787	Cross-sectional	FCV-19S YSIS PHQ-9 GAD-7 IPAQ-SF
(10)	China	15.26±0.46 556/409	Cross-sectional	FCV-19S YSIS PHQ-9 GAD-7 IPAQ-SF
(11)	United States	15.8±1.4 117/ 466	Cross-sectional	PHQ-9 GAD-7 PC-PTSD-5 SITBI ICG-RC
(12)	China	15.56±1.89 528/497	Cross-sectional	BRS CSQ IES DASS-21
(13)	China	11.86 ± 2.32 2216/2126	Cross-sectional	DASS-21
(14)	Iran	15.51±2.75 853/659	Cross-sectional	IGDS9-SF ISI DASS-21 PedsQL
(15)	China	12.34±4.67 1057/993	Cross-sectional	IAT DASS-21
(16)	China	531/505	Cross-sectional	DSRS-C SCARED
(17)	China	median age: 16 3753/4326	Cross-sectional	PHQ-9 GAD-7
(18)	China	1012/772	Cross-sectional	CDI-S SCARED
(19)	China	median age: 16 3343/3859	Cross-sectional	PHQ-9 GAD-7 SSRS
(20)	United States	16.3±1.2 6117/6885	Cross-sectional	PHQ-9 GAD-7 PedsQL
(21)	Italy	17.9±1.2 64/84	Cross-sectional	SAS EAQ
(22)	Turkey	16.83±1.66 227/518	Cross-sectional	STAI-S UCLA loneliness scale
(23)	United Kingdom	13.42±6.25 349/349	Cross-sectional	PAS K6
(24)	China	9744 participants	Cross-sectional	GAD-7

Table 1. CONT.

Study	Country	Participants Mean age±SD M/F	Study Design	Measures
(25)	Netherlands	median age: 10.5 36/39	Cross-sectional	PedsQL
(26)	Brazil	8.84±2.05 132/157	Cross-sectional	CAQ NRS
(27)	Turkey	14.63±2.04 62/93	Cross-sectional	STAI Emotion Regulation Subscale of Dysfunctional Internet Usage Questionnaire
(28)	China	median age: 15 4805 female	Cross-sectional Randomized Controlled Trial	CES-D SAS
(29)	China	Intervention group: 15.2±2.1 40/30 Control group: 15.3±2.4 39/32		SDS PSQI
(30)	China	12.80±1.64 489/683	Cross-sectional	CRIES-8 GAD-2 CCSS
(31)	United States	17.49±1.42 156/295	Longitudinal	CDI SCARED
(32)	Greece	138/304	Longitudinal	GAD-7 PHQ-9
(33)	United States	16.54±1.30 (COVID-19) 11.29±0.92 (before the pandemic) 36/49	Longitudinal	Youth Self-Report CRISIS Cumulative ELS Severity
(34)	United Kingdom	School group: 8.7± 0.63 (baseline) 10.5 0.74 (lockdown) Lab group: 22/32 8.5±0.66 (baseline) 9.4±0.78 (lockdown) 58/56	Longitudinal	SDQ Emotional Problems subscale RCADS short form
(35)	Australia	14.4±0.5 122/126	Longitudinal	SMFQ-C SLSS Generalized Anxiety subscale Newly developed measurement for COVID-19 related distress
(36)	United States	15.24±1.69 407 participants 50% female Generalized Anxiety subscale	Longitudinal	CDI-S
(37)	China	3042 (first survey) 2427 (second survey)	Longitudinal	CDI-S

Table 1. CONT.

Study	Country	Participants Mean age±SD M/F	Study Design	Measures
(38)	United States	8.21±4.94 133 participants	Cross-sectional	BFS GAD-7 PHQ-8 TPA
(39)	Italy	10.07±2.52 372/349	Cross-sectional	IES-R HADS CBCL/ 6-18
(40)	China	10.56±1.79 734/626	Cross-sectional	SAS CES-DC SDS PCL-5
(41)	United States	7.69±5.64	Cross-sectional	PHQ-4
(42)	Belgium	15.51±1.59 2165 participants 66.6% girls	Cross-sectional	GAD-7 RULS-6 Brief-Coping Scale
(43)	Bangladesh	N/A	Cross-sectional	RCADS GAD-6 SCAS-P CBCL
(44)	China	14.33±1.101 5598/5582	Cross-sectional	PHQ-9 GAD-7 CTQ CD-RISC
(45)	China	6196 participants	Cross-sectional	PCL-5 SAS
(46)	China	3713/4059	Cross-sectional	S-EMBU PHQ-9 GAD-7
(47)	Turkey	597 participants	Cross-sectional	KINDL
(48)	Spain	9.6±3.9 437/423	Longitudinal	four questions included in the survey in relation to four HRBs (i.e., physicalactivity, screen exposure, sleep time, and fruit and vegetable consumption
(49)	Chile	3.1±1.38 1597/1560	Cross-sectional	Sleep quality was assessed with a Likert scale
(50)	Spain	Before pandemic 12.1±2.4 291 participants 47.8% girls, During pandemic: 12.0±2.6 113 participants	Longitudinal	YAP

Table 1. CONT.

Study	Country	Participants Mean age±SD M/F	Study Design	Measures
		48.7% girls		
(51)	Italy	9.15±4.27		
	Spain	781/699	Cross-sectional	Newly developed
	Portugal			questionnaire
(52)	China	220/216 (2018 sample)	Longitudinal	CSHQ
		791/828 (COVID-19 sample)		
(53)	United States	1740/1338	Prospective	the newly designed
	United Kingdom			sleep-wake patterns
	Australia			questionnaire
	Canada			
	Israel			
	Germany			
	France			
	Ukraine			
	Russia			
	India			
	Uzbekistan			
(54)	Canada	13.5±1.9	Qualitative	One-on-one semi-structured
		13/32		phone interviews
(55)	United States	373/454	Prospective	sleep-wake patterns
	Israel			questionnaire
(56)	China	17.41±2.70	Cross-sectional	PSQI
		5009/6826		PHQ-9
				GAD-7
				SSRS
(57)	China	6.50 ±2.84	Cross-sectional	CPCIS
		14970/14140		SDQ
				PSS
				PedsQL
(58)	Turkey	13.96±6.1	Cross-sectional	ABC
		72/15		PSQI
				BAI
(59)	Italy	13±8.1	Cross-sectional	survey consisted of
		527 participants		40 questions
(60)	United States	16.87±1.36	Observational study	survey that contained
		8/3		items measuring health
				behaviors adapted from the
				National Survey of Children's
				Health
(61)	China	9.43±2.39	Cross-sectional	CSDC
		194/47		SNAP-IV parent form
(62)	United States	132/10	Cross-sectional	HACS
				ARQ
				CASPE
(63)	Australia	11±3.09	Longitudinal	CRISIS
		213 participants		
		76.4% males		

Table 1. CONT.

Study	Country	Participants Mean age±SD M/F	Study Design	Measures
(64)	Italy	11.52±3.17 847/145	Cross-sectional	CBCL
(65)	Turkey	10.09±2.23 53/23	Cross-sectional	CCQ CSHQ CRIES-8 T-DSM-IV-S
(66)	Indonesia	14.07±2.18 60/53	Cross-sectional	SDQ
(67)	Italy	4.10±0.92 128/117	Cross-sectional	PSQI SDSC BRIEF-P SDQ-P DERS
(68)	China	9.81±1.44 707/557	Cross-sectional SDQ	SAS
(69)	India	179/131	Cross-sectional	newly developed questionnaire
(70)	Spain	13.9 ± 0.28 109/117	Longitudinal	SDQ
(71)	China	11.0±1.7 380/358	Cross-sectional	SAS SDQ
(72)	Australia	9.7±3.8 202/100	Cross-sectional questionnaire	Newly developed
(73)	Turkey	13.62±2.72 34/27	Cross-sectional	CGI-S CY-BOCS
(74)	Denmark	Clinical group 14.89±2.66 24/41 Survey group 14.14±2.79 12/25	Cross-sectional	Newly developed questionnaire
(75)	Turkey	16.40±2.14 598 participants 61.10% female	Cross-sectional	OCI-CV ERS RCADS FCV-19S MEAQ
(76)	Israel	14.2±3.0 19/10	Follow-up	OCI-CV CGI-S CGI-I

ABC: Aberrant Behavior Checklist; ARQ: Adolescent Routines Questionnaire; BAI: Beck Anxiety Inventory, BFS: Behavior and Feelings Survey, BRIEF-P: Behavior Rating Inventory of Executive Functions—preschool version, BRS: Brief Resilience Scale, CAQ; scores 4–12: Children's Anxiety Questionnaire, CASPE: COVID-19 Adolescent Symptom and Psychological Experience Questionnaire, CBCL/ 6-18: Child Behavior Checklist, CCQ: Children's Chronotype Questionnaire, CCSS: Chinese Courtesy Stigma Scale, CDI: Children's depression inventory, CDI-S: Children's Depression Inventory-Short Form, CD-RISC: Connor-Davidson Resilience Scale, CES-D: Center for Epidemiological Studies Depression Scale, CES-DC: Center for Epidemiologic Studies Depression Scale for Children, CGI-I: Clinical Global Impression-Improvement Scale, CGI-S: Clinical Global Impression–Severity Scale, CPCIS: Chinese Parent–Child Interaction Scale, CRIES-8: Children's Impact of Event Scale, CRISIS: CoRonavIruS Health Impact Survey, CSDC: Child Stress Disorders Checklist, CSHQ: Children's Sleep Habit Questionnaire, CSQ: Coping Style Questionnaire, CTQ: Childhood Trauma Questionnaire, CY-BOCS: Children's Yale-Brown Obsessive Compulsive Scale, DASS-21: Depression Anxiety Stress Scale, DERS: Difficulties in Emotion Regulation, DSRS-C: Depression Self-Rating Scale for Children,

Table 1. CONT.

EAQ: Emotion Awareness Questionnaire, ELS: Early Life Stress, ERS: Emotional Reactivity Scale, F: Female, FCV-19S : Fear of COVID-19 Scale, GAD-7: Generalized Anxiety Disorder scale, HACS: Home Adjustment to COVID-19 Scale, HADS: Hospital Anxiety and Depression Scale, HRB: Health-Related Behaviors, IAT: Internet Addiction Test, ICG-RC: Complicated Grief-Revised for Children IES: Impact of Event Scale, IES-R: Impact of Event Scale-Revised, IGDS9-SF: Internet Gaming Disorder Scale-Short Form, IPAQ-SF: International Physical Activity Questionnaire Short Form, ISI: Insomnia Severity Index, K6: Kessler Psychological Distress Scale, KINDL: Generic health-related quality of life questionnaire for children (Kid-KINDL) for ages of 7–13, M: Male, MEAQ: Multidimensional Experiential Avoidance Questionnaire, NRS; scores 0–10: Numerical Rating Scale, OCI-CV: Obsessive-Compulsive Inventory-child version, PAS: Pandemic Anxiety Scale, PC-PTSD-5: Primary Care PTSD Screen for DSM-5, PCL-5: PTSD Checklist for DSM-5, PedsQL: Pediatric Quality of Life Inventory 4.0, PHQ-9: Patient Health Questionnaire, PSQI : Pittsburgh sleep quality index, PSS: Parental Stress Scale RCADS: Revised Child Anxiety and Depression Scale, RULS-6: 6-item Revised UCLA Loneliness Scale, SAS: Self-Rating Anxiety Scale, SCAS-P: Spence Child Anxiety Scale for Parents, SCARED: Screen for Child Anxiety Related Disorders, S-EMBU: Short Egna Minnen Beträffande Uppfostran, SD: Standard Deviation, SDQ: Strengths and Difficulties Questionnaire, SDQ-P: Strengths and Difficulties Questionnaire—Parent version, SDS: Self-rating depression scale, SDSC: Sleep Disturbance Scale for Children, SITBI: Self-Injurious Thoughts and Behavior Interview, SLSS: Student's Life Satisfaction Scale, SMFQ-C: Short Mood and Feelings Questionnaire—Child Version, SNAP-IV: Swanson, Nolan, and Pelham scale, Social Support Rate Scale, STAI-S: State Anxiety Inventory, T-DSM-IV-S: The Turgay DSM-IV Disruptive Behavior Disorders Rating Scale, TPA: Top Problems Assessment, YAP: The Youth Activity Profile" questionnaire, YSIS: Youth Self-Rating Insomnia Scales.