

# Evaluation of Depression, Anxiety, and Sleep Quality in Children Diagnosed With COVID-19

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**Abstract:** COVID-19 has affected individuals of all age groups, both physically and mentally. We aimed to determine anxiety and depression in children diagnosed with COVID-19. Fifty children aged 8 to 18 years diagnosed with COVID-19 were included in the study. The children were evaluated the revised Child Anxiety and Depression Scale, STAI form TX-I (state anxiety inventory), and STAI form TX-II (trait anxiety inventory). Child Sleep Habits Questionnaire was applied for one of the parents according to three different periods. The periods were established as before the pandemic, during the illness-quarantine process, and after the quarantine. We observed the highest scores for depression-anxiety and the poorest sleep quality during the quarantine period. The scores for depression-anxiety were lower, and sleep quality scores were higher in the pre-pandemic period compared with after the quarantine period. Measures should be taken to protect mental health for children with COVID-19.

**Key Words:** Anxiety, COVID-19, child, depression, sleep quality

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Coronavirus invasive disease 2019 (COVID-19) has been an unprecedented pandemic with enormous effects throughout 2020 and is still ongoing (World Health Organization, 2021a). The virus's spread from person to person in the presymptomatic and asymptomatic periods was considered the main reason for this rapid spread (Furukawa et al., 2020). In the newly updated data of the World Health Organization's (WHO's) Web site, dated July 16, 2021, it was reported that there were more than 185 million infected people and more than 4 million deaths worldwide (World Health Organization, 2021b). Although approximately a quarter of the world population was infected during the coronavirus invasive disease 2019 (COVID-19) pandemic, all humanity was exposed to the virus's psychosocial effects. As COVID-19 started in China for the first time in December 2019 and has affected humanity globally, countries had to take precautions to reduce the virus's contamination (Zhu et al., 2020). In many countries, restrictions were imposed on crowded areas such as restaurants, movie theaters, public vehicles, and shopping malls where people-to-people transition would be at high risk; home quarantine and curfews were imposed in certain conditions. The social restrictions and the growing fear of coronavirus caused anxiety and depression in individuals (Nwachukwu et al., 2020; Wang et al., 2020). Although the disease has a milder course in childhood and was ex-

pected to affect children less than those affected adults, some researchers demonstrated depression and anxiety in children in the pandemic era (Chen et al., 2020; Ghosh et al., 2020; Ludvigsson, 2020; Marques de Miranda et al., 2020).

In the literature review, we have not encountered a similar study that evaluated the psychiatric aspects of children diagnosed with COVID-19. Thus, we aimed to determine anxiety, depression, and sleep quality in children diagnosed with COVID-19.

## METHODS

### Study Population and Design

This cross-sectional study was conducted between April 2020 and July 2020 in our tertiary care hospital, in pediatric COVID-19 inpatient and outpatient clinics. Pediatric patients aged between 8 and 18 years who were diagnosed with COVID-19 detected by polymerase chain reaction (PCR) were consecutively invited to participate in the study. Patients with a chronic disease, nonnative Turkish speakers, and patients whose parents refused to participate in the study were excluded. During the study, 80 pediatric patients who were diagnosed with COVID-19 were detected. However, 20 patients' phone numbers were unavailable. Four participants were nonnative Turkish speakers, five patients' parents refused to participate in the study, and one patient has hearing loss. Eventually, 50 children and their parents (mother or father) were included in the study.

All the participant parents completed the Child Sleep Habits Questionnaire (CSHQ). The children completed the Revised Child Anxiety and Depression Scale (RCADS) and STAI form TX-I/II (state-trait anxiety inventory). Participants were evaluated in three different periods: before the COVID-19 pandemic, during the quarantine period, and after the quarantine. The surveys were conducted via a phone interview. Some of the patients were reached during their quarantine period, whereas the others reached during the postquarantine period. The patients who were phoned first during their quarantine period were rephoned when they were in their postquarantine period. However, the patients who were phoned first during their postquarantine period answered the tests for three different periods in one phone call. The postquarantine period was determined as 14 days after the end of the quarantine period. Consequently, survey results were obtained for “pre-pandemic period (P0),” “quarantine period (P1),” and “post-disease period (P2)” (Fig. 1). To maintain the patients' attention, a draft, which included the survey's answers and the definition of the periods, was prepared by the researchers and was sent to the patients through social media platforms. This draft provided the children with a visual guide rather than focusing only on voice. The patients were also offered the opportunity to break for an hour when they lost their attention.

### Assessment Measures

The RCADS has been modified from the Spence Children's Anxiety Scale and created by Chorpita et al. to measure child self-report of DSM childhood anxiety disorders and depression (Chorpita et al., 2000). It consists of 47 items and is scored as 0 (never), 1 (sometimes), 2 (often), and 3 (always). Higher scores indicate higher anxiety and

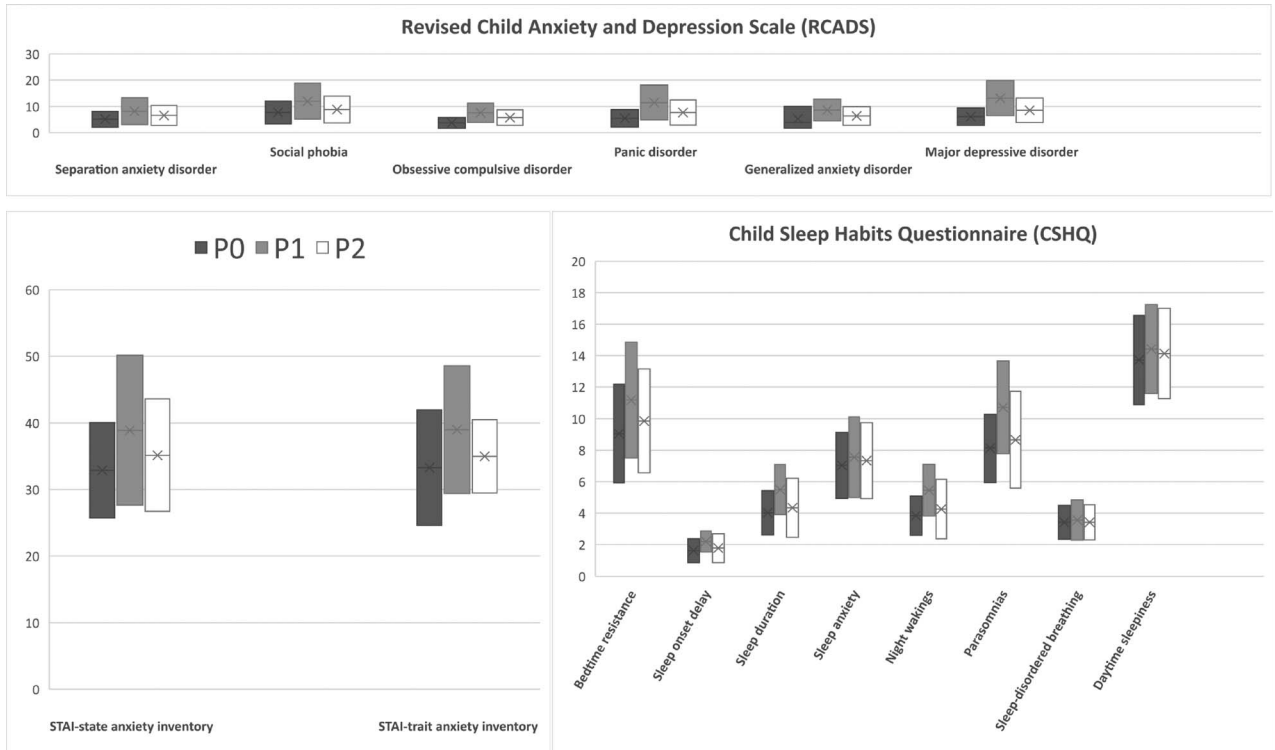
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Abbreviations: P0: Pre-pandemic period, P1: Quarantine period, P2: Post-disease period

FIGURE 1. Summary of the survey results of the children diagnosed with COVID-19.

depression levels. RCADS was adapted to the Turkish language by Görmez et al. with a Cronbach alpha of 0.920 (Görmez et al., 2017).

The STAI form TX-I/II (state-trait anxiety inventory) was created by Spielberger et al. and adapted into Turkish by Öner and Le Compte with a Cronbach alpha of 0.940 (Öner and Le Compte, 1985; Spielberger et al., 1970). In the state anxiety scale, the answer choices are (1) not at all, (2) somewhat, (3) moderately so, and (4) very much so; in the Trait Anxiety Scale, it is (1) almost never, (2) sometimes, (3) often, and (4) almost always.

The CSHQ was developed by Owens et al. and adapted to Turkish by Fiş et al. with a Cronbach alpha of 0.78. It consists of 33 items (Fiş et al., 2010; Owens et al., 2020). There are eight subscales listed as bedtime resistance, sleep onset delay, sleep duration, sleep anxiety, night wakings, parasomnias, sleep-disordered breathing, and daytime sleepiness. Having above 41 points is accepted as having clinically significant sleep problems.

**Statistical Analysis**

Statistical Package for the Social Sciences 22.0 (IBM Inc., Armonk, NY) was used for analysis. The Shapiro-Wilk test was used to evaluate whether the data were normally distributed. Nonparametric methods were used in the analysis because the data did not show normal distribution. Descriptive analyzes were used to summarize sociodemographic and clinical variables. Friedman test to compare triple variables between cases (pre-epidemic/epidemic period/post) and bivariate comparisons were made using the Wilcoxon test. Bivariate relationships between nominal variables were evaluated using the chi-square test. Statistical significance was accepted as  $p < 0.05$ .

**RESULTS**

The mean age of the children was  $13.78 \pm 2.9$  years, and the parents' average age was  $42.38 \pm 4.52$  years. The majority of the children (68%,  $n = 34$ ) were female, and the male participants were 32% ( $n = 16$ ).

Cases were compared in terms of the RCADS scores for the P0, P1, and P2 periods. All the RCADS's subscores were significantly

higher in the P1 than the P0. Also, all the RCADS's subscores were significantly lower in the P2 than the P1 but higher than the P0 (Table 1). Furthermore, the STAI state and trait anxiety scores were the highest in the P1 and the lowest in the P0 with statistical significance (Table 2). In the CSHQ, all subscores were the highest in the P1 and lowest in the P0 except the sleep-disordered breathing parameter. The sleep-disordered breathing parameter was higher in the P1 than in the P0; however, the relationships between P0–P2 and P1–P2 were not statistically significant. The comparison of the CSHQ scores in the three different periods was given in Figure 1 and Table 3.

**DISCUSSION**

The results showed higher anxiety, depression and sleep habits scores during the quarantine period compared with the prepandemic period. Moreover, after the quarantine period, it was observed that the depression and anxiety scores were improved compared with the quarantine period but remained significantly higher than the prepandemic period. Clinically significant sleep disturbance survey results were poorest in the quarantine period.

In the RCADS, STAI scores, the poorest anxiety and depression scores were obtained in children during the quarantine period. In children whose quarantine has ended, depressive symptoms improved compared with the quarantine period; however, the emotional states did not revert as the prepandemic. Because the pandemic continues, face-to-face school education was interrupted; children experienced social withdrawal and fewer activities with peers. Although the disease symptoms are milder in childhood, exposure to COVID-19 news via communication systems such as media/social media may negatively affect children during the illness and exacerbate fears of death. In an adult study conducted in China, exposure to the coronavirus news on social media has been questioned via an online survey; the general anxiety test (GAD-7) has been performed; a positive correlation was found between exposure to COVID-19 news via social media and anxiety rates (Gao et al., 2020).

**TABLE 1.** Comparison of the Depression and Anxiety Levels of the Patients Diagnosed With COVID-19 in Prepandemic, Quarantine, and Postdisease Periods

RCADS	P0 (Prepandemic)	P1 (Quarantine)	P2 (Postdisease)	<i>p</i> <sup>a</sup>	<i>p</i> (P0–P1) <sup>b</sup>	<i>p</i> (P0–P2) <sup>b</sup>	<i>p</i> (P1–P2) <sup>b</sup>
Separation anxiety disorder	5.12 ± 3.05	8.20 ± 5.13	6.56 ± 3.82	<0.001	<0.001	<0.001	<0.001
Social phobia	7.71 ± 4.37	11.98 ± 6.82	8.83 ± 5.13	<0.001	<0.001	0.008	<0.001
Obsessive compulsive disorder	3.72 ± 2.07	7.58 ± 3.70	5.76 ± 2.98	<0.001	<0.001	<0.001	<0.001
Panic disorder	5.47 ± 3.34	11.49 ± 6.62	7.69 ± 4.81	<0.001	<0.001	<0.001	<0.001
Generalized anxiety disorder	3.92 ± 2.23	8.65 ± 4.15	6.36 ± 3.55	<0.001	<0.001	<0.001	<0.001
Major depressive disorder	6.10 ± 3.33	13.14 ± 6.66	8.53 ± 4.68	<0.001	<0.001	<0.001	<0.001

<sup>a</sup>As triple variables, it was evaluated with the Friedman test.

<sup>b</sup>Evaluated by the Wilcoxon test.

Furthermore, a stigmatizing habit might have been developed for individuals who have “tested positive” due to increasing fear of the “coronavirus” among the public. As observed in COVID-19 outpatient clinics, many school authorities laid down a negative PCR criterion before going back to school. There are studies on stigmatization in literature, especially in HIV-positive individuals and patients diagnosed with tuberculosis (Bayraktar and Khorshid, 2017; Sahoo et al., 2020). In our study, we thought that social stigma could negatively affect the children's mental health diagnosed with COVID-19. Similarly, in a study conducted in Italy, the fear of social stigma has been linked to negative effects on hedonic and eudaimonic well-being in individuals diagnosed with COVID-19 (Paleari et al., 2021).

In the literature review, we did not encounter a similar study conducted with children who were diagnosed with COVID-19 (Lei et al., 2020). In a study conducted by Lei et al., in China with 1593 adult patients, the rates of anxiety and depression in individuals diagnosed with COVID-19 and those who were not were compared, and statistically higher anxiety and depression rates were found in infected patients. In the study of Gunaydin and Baykal, children aged 12 to 18 years diagnosed with asthma were questioned with the STAI-state and trait anxiety inventory in the era of the COVID-19 pandemic (Gunaydin and Baykal, 2020). Children with low asthma control scores (ACS) and uncontrolled asthma had significantly higher STAI-state anxiety inventory scores than the others. There was no relationship between the STAI-trait anxiety inventory and ACS and asthma control.

Sleep habits were also affected among the three periods in our study. In the quarantine period, all of the subscores of the CSHQ were poorest except sleep-disordered breathing score. In the study of Liu et al., comparing the children in the COVID-19 pandemic era with the children from the prepandemic era in terms of the CSHQ, interestingly, the bedtime resistance and night waking were significantly reduced in the pandemic era (Liu et al., 2021). They attributed this finding to parents' home office working style and their increased care toward their children. Nevertheless, our population includes the children and their family members diagnosed with COVID-19 who were mandatorily confined to the residences and most likely experiencing diseases symptoms. So, there was a worsening concerning sleep habits, in contrast to the study by Liu et al.

There are several limitations to our research. First of all, one important limitation of this study is the absence of comparison of the

mental effect of the exposed group with unexposed group. Because of social isolation, the unexposed group may probably suffer the same or similar mental impact as the exposed ones. Also, we could not carry out the surveys face to face. When we conducted the surveys, from April to July, COVID-19–diagnosed cases increased dramatically, and people were afraid of referring to a public health agency and the hospitals. Patients were also in their quarantine process, and outdoor activities were restricted. For the reasons above, we applied all the questionnaires via a phone interview. Although we established some precautions to prevent it, such as preparing a draft and offering a break, we thought that the phone interview technique might negatively affect the participants to maintain their attention and give accurate responses. In addition, the prepandemic period surveys were applied in quarantine or postdisease periods as the study was planned after the outbreak. The current pandemic situation might have affected the patients' assessment of the past. For the last, the study was done for a single center in the city where people with low sociocultural and socioeconomic status live. This population is somewhat vulnerable, and they would be agitated if asked about their sociodemographic characteristics, especially in a lengthy phone interview. Therefore, we could not determine the sociodemographic and other factors contributing to the children's depression and anxiety, such as dynamics in household, economic status, or losing a relative due to COVID-19. However, our research is unique and has reliable and valuable insights regarding the COVID-19 psychiatric effects in children.

In light of our findings, all children affected by the pandemic process, especially children diagnosed with COVID-19, should be supported psychologically. In a guide created by the Chinese National Health Commission, it was recommended to improve children's communication, informing children about COVID-19 and the pandemic via comic books and videos, planning regular activity programs, and provide referrals to psychiatric in case of occurring depression and anxiety symptoms (Liu et al., 2020). Although COVID-19 is called an “adult disease” due to its more dramatic consequences in adults, it is a challenging situation in children as well due to the interruption of face-to-face education, social restrictions, social stigma, and also because of feeling ill, witnessing the disease processes of the family members and having exposure to the pessimistic media/social media news. In the hospital setting, when managing infected pediatric patients, health care professionals

**TABLE 2.** Comparison of the STAI-State and Trait Anxiety Inventory of the Patients Diagnosed With COVID-19 in Prepandemic, Quarantine, and Postdisease Periods

	P0 (Prepandemic)	P1 (Quarantine)	P2 (Postdisease)	<i>p</i> <sup>a</sup>	<i>p</i> (P0–P1) <sup>b</sup>	<i>p</i> (P0–P2) <sup>b</sup>	<i>p</i> (P1–P2) <sup>b</sup>
STAI-state anxiety inventory	32.88 ± 7.16	38.90 ± 11.24	35.14 ± 8.43	<0.001	<0.001	<0.001	0.008
STAI-trait anxiety inventory	33.28 ± 8.68	38.98 ± 9.58	34.98 ± 5.52	<0.001	<0.001	<0.001	<0.001

<sup>a</sup>As triple variables, it was evaluated with the Friedman test.

<sup>b</sup>Evaluated by the Wilcoxon test.

**TABLE 3.** Comparison of the Sleep Habits of the Patients Diagnosed With COVID-19 in Prepandemic, Quarantine, and Postdisease Periods

CSHQ	P0 (Prepandemic)	P1 (Quarantine)	P2 (Postdisease)	<i>p</i> <sup>a</sup>	<i>p</i> (P0–P1) <sup>b</sup>	<i>p</i> (P0–P2) <sup>b</sup>	<i>p</i> (P1–P2) <sup>b</sup>
Bedtime resistance	9.05 ± 3.12	11.18 ± 3.67	9.86 ± 3.29	<0.001	<0.001	<0.001	<0.001
Sleep onset delay	1.62 ± 0.75	2.20 ± 0.67	1.78 ± 0.91	<0.001	<0.001	0.005	<0.001
Sleep duration	4.02 ± 1.41	5.50 ± 1.59	4.34 ± 1.88	<0.001	<0.001	0.008	<0.001
Sleep anxiety	7.04 ± 2.10	7.56 ± 2.56	7.34 ± 2.42	<0.001	<0.001	0.006	0.009
Night wakings	3.84 ± 1.25	5.46 ± 1.64	4.26 ± 1.89	<0.001	<0.001	0.006	<0.001
Parasomnias	8.16 ± 2.22	10.72 ± 2.94	8.66 ± 3.07	<0.001	<0.001	0.005	<0.001
Sleep-disordered breathing	3.42 ± 1.07	3.56 ± 1.28	3.42 ± 1.12	0.030	0.008	0.998	0.102
Daytime sleepiness	13.73 ± 2.82	14.42 ± 2.83	14.13 ± 2.87	<0.001	<0.001	0.011	0.026

<sup>a</sup>As triple variables, it was evaluated with the Friedman test.

<sup>b</sup>Evaluated by the Wilcoxon test.

should focus on organic complaints and psychological well-being. Clinicians should inform patients of possible depressiveness and anxiety symptoms and guide them in case occurring.

**CONCLUSIONS**

The highest anxiety, depression and sleep habit scores were detected in children diagnosed with COVID-19 during their quarantine period compared with the prepandemic and postquarantine periods. The postquarantine test results were also higher than the prepandemic period. The psychological effects of the COVID-19 pandemic on children who are diagnosed with COVID-19 should not be underestimated.

**DISCLOSURE**

The authors declare no conflict of interest.

Ethics committee approval was obtained for noninterventional clinical research on September 6, 2020 and with the 2020/7-21 protocol number. Before applying the tests, the patients and their parents were informed about the study's purpose, and oral consent was obtained from participants.

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