Original Article

Is coronavirus pandemic-related anxiety higher in children with chronic kidney disease than healthy children?

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Abstract   **Background**: Since the emergence and worldwide spread of the new coronavirus (COVID-19) pandemic, it has caused people to experience adverse psychological effects. This study aimed to assess anxiety levels during COVID-19 in children with chronic kidney disease (CKD), including nephrotic syndrome (NS) and kidney transplantation (Tx).

Methods: A case-controlled, cross-sectional study was conducted with children aged 10–18 years, who had a diagnosis of CKD or NS, or Tx, and followed in our center between April and July 2020. A healthy control group was recruited with age- and gender-matched children. A questionnaire with printed and online versions was designed in three parts: the first addressed demographic characteristics, the second addressed opinions about the pandemic, and the third was the Turkish version of the Revised Child Anxiety and Depression Scale – Child Version.

Results: A total of 88 children completed the questionnaire. The patient and control groups were similar in terms of gender, age, household members and history of psychiatric treatment. Both groups stated that coronavirus is a risky disease for children (63.6%), and that they were afraid of contagion (69.3%). Only half of them were receiving realistic and informative answers from family members. In the Revised Child Anxiety and Depression Scale – Child Version, 66% of them received a high score on at least one subscale. The social phobia scores of the control group were higher than those of the patient group, although the proportion of high scores was similar in both groups. The ratio of high-scored participants was higher in CKD patients for panic disorder, and was lower in the immunosuppressive agent group for social phobia.

Conclusion: The current COVID-19 pandemic is a disaster that children encounter for the first time in their lives. It does not exclusively cause anxiety among children with chronic kidney diseases but also affects healthy children.

Key words   anxiety, child, chronic kidney disease, COVID-19, immunosuppression.

The new coronavirus, named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was first isolated in Wuhan, China, and was confirmed as the cause of the novel coronavirus disease 2019 (COVID-19). Lower respiratory tract involvement symptoms range from mild to severe, such as tiredness, muscle pain, sore throat, fever, cough, wheezing, dyspnea, and tachypnea. It may result in severe pneumonia and acute respiratory distress syndrome. Gastrointestinal manifestations and multiple organ failure may accompany it, and the disease may even result in death.[1,2] Severe cases and deaths are rarely seen in children, especially in those with chronic diseases such as malignancy, immunodeficiency, chronic lung diseases, heart diseases.[3]

Since the World Health Organization (WHO) announced the dramatic outbreak in January 2020, COVID-19 has spread globally. The first case in Turkey was reported on March 11, 2020. Since then, various precautions and restrictions have been implemented as the number of cases increased. High contagion rates, uncertain prognosis, and lack of effective treatment caused fear and panic, not only in Turkey but in all around the world. The media have reinforced this fear with information about daily numbers of infections and dead, overcrowded hospitals, and insufficient intensive care units. Social media added to the difficulty in accessing accurate information. In brief, widespread panic, desperation, and hyperarousal developed.

Symptoms such as anxiety and sleep disturbances are being reported more frequently during the COVID-19 pandemic.[4]

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The incidence of post-traumatic stress disorder and depression is reported to be between 8% and 32% during COVID-19.[5,6] In China, a cross-sectional study evaluating the general population's psychological responses to COVID-19 indicated that one-third of participants had moderate to severe anxiety. Female gender, student status, specific physical symptoms, low self-reported health status, and chronic illness were associated with higher stress levels, anxiety, and depression.[7] Another extensive study in college students showed that 21.3% had mild anxiety, 2.7% had moderate anxiety, and 0.9% had severe anxiety anxiety.[8]

The COVID-19 pandemic and restrictions have severe emotional impacts on vulnerable groups. Knowing the risk factors for COVID-19 mortality may cause patients with chronic diseases to experience exaggerated fear of contagion and death. Children and adolescents are on emotional and social developmental stage, so they are vulnerable to the impacts of the danger of pandemic and social isolation due to quarantine.[9] In several studies during the COVID-19 pandemic, it has been demonstrated that the anxiety levels of children and adolescents have increased.[10–13] Some studies have been published on the psychological effects of COVID-19 in children with chronic diseases, especially in chronic lung diseases.[14,15] However, there are no detailed studies of the psychological effect of COVID-19 on children with chronic kidney disease. This study aimed to assess the anxiety levels and factors influencing them during the COVID-19 pandemic in children with chronic kidney disease, including nephrotic syndrome and kidney transplantation.

Methods

Study design

This was a case-controlled, cross-sectional study. The children were aged between 10 and 18 years, and had been diagnosed with chronic kidney disease (CKD) at the pediatric nephrology clinic of the Izmir Tepecik Training and Research Hospital, Turkey. They were invited to participate in the study between April and July 2020. We recruited a control group consisting of age and gender-matched healthy children admitted to the pediatric outpatient clinic. Exclusion criteria were defined as being under the age of 10, not speaking Turkish, and refusing to approve the informed consent form. Informed consent was obtained from the children and their parents. The patients' primary diseases were classified as nephrotic syndrome (NS), renal transplantation (Tx) and CKD.

We designed a questionnaire with three parts: demographic characteristics of participants, opinions about the pandemic, and the third part was the Turkish version of the Revised Child Anxiety and Depression Scale-Child Version (RCADS-CV). The data were collected via the questionnaire in both printed and online versions. The online version was generated by using Google Forms application (Alphabet Inc., Mountain View, CA, USA). The first two parts of the questionnaire consisted of 13-items. The third part, RCADS-CV, was a self-report questionnaire to assess the clinical symptoms of anxiety and depression based on DSM-IV criteria. The RCADS-CV has been shown to be a reliable and valid instrument in different cultures and languages as well as in Turkish.[16] It consists of 47 items with six subscales corresponding to generalized anxiety disorder (GAD), major depressive disorder (MDD), separation anxiety disorder (SAD), social phobia (SP), panic disorder (PD), and obsessive-compulsive disorder (OCD). It is a four-point Likert-type scale (0 = never, 1 = sometimes, 2 = often, and 3 = always). The fifth, ninth, 17th, 18th, 33rd, 45th, and 46th items represent SAD. The fourth, seventh, eighth, 12th, 20th, 30th, 32nd, 38th, and 43rd items are for SP. The 10th, 16th, 23rd, 31st, 42nd, 44th items are for OCD. The third, 14th, 24th, 26th, 28th, 34th, 36th, 39th, 41st items are for PD. The first, 13th, 22nd, 27th, 35th, and 37th items are for GAD. The second, sixth, 11th, 15th, 19th, 21st, 25th, 29th, 40th, and 47th items are for MDD. The total scores of GAD, SAD, PD, MDD, SP, and OCD provide optimal sensitivity and specificity above 7, 5, 6, 11, 9 and 7 points, respectively.[16]

Statistical analysis

The data were analyzed using the IBM SPSS Statistics 25.0 (IBM Corp., Armonk, NY, USA) statistical package. Descriptive statistics were listed as the number of cases (n), percentage (%), mean plus or minus standard deviation, and median with the lowest and highest values. The distribution of the numerical variables was evaluated with the Kolmogorov–Smirnov normality test and Q–Q graphics. The groups were compared using Student's *t*-test for variables with normal distribution and the Mann–Whitney *U*-test for variables that were not normally distributed. Categorical variables were compared using the χ^2 test. A value of $P < 0.05$ was considered significant. The Clinical Research Ethics Committee of University of Health Sciences, Izmir Tepecik Training and Research Hospital approved this study (Decision No: 2020/7-6).

Results

A total of 88 children completed the questionnaire. The female to male ratio was 0.63. The mean of the participants' ages was 15.3 ± 2.6 years. The demographic characteristics of the patient and control groups are summarized in Table 1. These two groups were similar in terms of gender, age, household members, and history of psychiatric treatment ($P > 0.05$).

The answers of the participants to the coronavirus-related questions are listed in Table 1. While 63.6% of the participants thought that coronavirus is a risky disease for children, this ratio increased to 70.5% in the patient group, although the difference was nonsignificant ($P = 268 > 0.05$). In total, 69.3% of the participants described their concern about coronavirus transmission to themselves or their loved ones as "very" to "extreme." The control group also exhibited more concern about this situation (72.8%), although it was statistically similar to the patient group ($P = 0.592$). Nearly 10% of the

Table 1 Demographic characteristics of the survey participants and their answers to COVID-19 specific questions

	All participants ($n = 88$) n (%)	Patient group ($n = 44$)	Control group ($n = 44$)	P
Gender				
Female, n (%)	34 (38.6%)	13 (29.5%)	21 (47.7%)	0.125
Male, n (%)	54 (61.4%)	31 (70.5%)	23 (52.3%)	
Age (years), mean ± SD	15.3 ± 2.6	15.7 ± 2.5	14.7 ± 2.5	0.084
Number of people live in the household, mean ± SD	4.3 ± 1.2	4.4 ± 1.3	4.2 ± 1.1	0.240
History of psychiatric treatment, n (%)	15 (17.1%)	5 (11.4%)	10 (22.7%)	0.257
"Is coronavirus a risky disease for children?"				
No, it is not.	32 (36.4%)	13 (29.5%)	19 (43.2%)	0.268
Yes, it is risky	56 (63.6%)	31 (70.5%)	25 (56.8%)	
"How concerned are you about coronavirus transmission to you and your loved ones?"				
Not at all	4 (4.5%)	2 (4.5%)	2 (4.5%)	0.592
Slightly	4 (4.5%)	1 (2.3%)	3 (6.8%)	
Moderately	19 (21.6%)	12 (27.3%)	7 (15.9%)	
Very	25 (28.4%)	13 (29.5%)	12 (27.3%)	
Extremely	36 (40.9%)	16 (36.4%)	20 (45.5%)	
"How often do you talk about coronavirus at home?"				
Never	3 (3.4%)	2 (4.5%)	1 (2.3%)	0.804
Rare	6 (6.8%)	4 (9.1%)	2 (4.5%)	
Sometimes	48 (54.5%)	22 (50%)	26 (59.1%)	
Frequently	20 (22.7%)	11 (25%)	9 (20.5%)	
Almost always	11 (12.5%)	5 (11.4%)	6 (13.6%)	
"How do your family members answer to your questions about coronavirus?"				
They forbidden the questions.	3 (3.4%)	2 (4.5%)	1 (2.3%)	0.719
No need to be concerned about it.	11 (12.5%)	5 (11.4%)	6 (13.6%)	
It's a horrible and deadly disease.	28 (31.8%)	16 (36.4%)	12 (27.3%)	
Realistic answers.	46 (52.3%)	21 (47.7%)	25 (56.8%)	

participants claimed that they rarely or never talked about coronavirus at home. Finally, we ask "How do your family members answer your questions about coronavirus?" and 52.3% of the participants thought they were receiving "realistic and informative answers." However, while 12.5% of the participants were receiving evasive answers such as "you do not need to worry about it"; 31.8% were scared by the family members and 3.4% were even banned to ask questions in 3.4% (Table 1). There was no relation between the answers to coronavirus-related questions and high scores.

The proportion of high-scoring participants from each sub-score was evaluated. While 34% of the participants ($n = 30$) did not receive a high score on any subscale, 2.3% of them ($n = 2$) had high scores from all six subscales. These two participants were in the patient group. A total of 28.4% participants had high scores for OCD, 25% for PD, 33% for GAD, 12.5% for MDD, 26.1% for SAD, and 38.6% for SP. The SP scores of female participants were higher than those of males ($P = 0.024 < 0.05$), and the other scores were similar in both genders. The ratio of high-scoring participants was similar between genders.

The comparisons of the RCADS-CV scores are shown in Table 2. The proportions of the high-scoring participants are in Table 3. Only the SP score of the patient group was lower than the score of the control group ($P = 0.038 < 0.05$); the other scores were similar (Table 2). However, the ratio of high-scoring patients did not show any significant difference between the patient and control groups (Table 3). Three

categories of primary kidney diseases – NS, Tx, and CKD – were compared with each other and with the control group separately. The RCADS-CV scores were similar (Table 2), and the proportion of people with high scores was similar on the subscales except for PD, which was higher for CKD than the control group ($P = 0.049 < 0.05$; Table 3). The patients receiving immunosuppressive agents were also compared with patients who did not, and with the control group. Only the scores and high-scoring ratios in the SP subscale were found to be higher in the control group than for the patients with an immunosuppressive agent (Tables 2 and 3).

Discussion

In this study, it was shown that most of the participants had worried about the coronavirus infection and considered it as a risky disease for children. The healthy children had the same concerns about the pandemic as the children with chronic kidney diseases. Almost half of the participants had claimed that the family members had given evasive answers to questions about coronavirus. The RCADS-CV scale, which is used for the evaluation of anxiety and depression in children, showed no difference between healthy children and children with chronic kidney disease, except in the case of the SP subscale. It was thought that the higher SP score in the control group was a coincidental finding.

Depression and anxiety are the most common mental disorders seen in children and adolescents, causing significant

Table 2 Comparison of the Revised Child Anxiety and Depression Scale – Child Version (RCADS-CV) scores

Subscales	Patient group (n = 44)	Control group (n = 44)	p
Total Scores			
SAD	3 (0–15)	4 (0–19)	ns
SP	7 (0–21)	9 (2–19)	0.038
OCD	5 (0–15)	5 (0–18)	ns
PD	4 (0–19)	3 (0–27)	ns
GAD	6 (1–14)	6 (1–13)	ns
MDD	6 (0–18)	6 (0–28)	ns

Subscales	CKD (n = 11)		NS (n = 14)		Tx (n = 19)		p^2
	score	p^1	score	p^1	score	p^1	
Patients with primary diseases							
SAD	2 (0–10)	ns	3 (0–14)	ns	3 (0–15)	ns	ns
SP	8 (0–15)	ns	6 (0–21)	ns	6 (0–18)	ns	ns
OCD	8 (0–12)	ns	6 (0–15)	ns	4 (0–13)	ns	ns
PD	6 (0–11)	ns	3 (0–19)	ns	5 (0–17)	ns	ns
GAD	8 (1–12)	ns	4 (1–14)	ns	5 (3–13)	ns	ns
MDD	6 (0–18)	ns	6 (0–18)	ns	5 (1–16)	ns	ns

Subscales	Receiving (n = 34)		Non-receiving (n = 10)		p^4
	score	p^3	score	p^3	
Immunosuppressive agent					
SAD	3 (0–15)	ns	2 (0–10)	ns	ns
SP	6 (0–21)	0.023	9 (0–15)	ns	ns
OCD	4 (0–15)	ns	8 (0–11)	ns	ns
PD	4 (0–19)	ns	5 (0–11)	ns	ns
GAD	5 (1–14)	ns	8 (1–12)	ns	ns
MDD	6 (0–18)	ns	6 (0–18)	ns	ns

p^1 is obtained by comparison of each primary disease category with the control group; p^2 is by comparison of these primary diseases with each other; p^3 is obtained by comparison of the immunsuppressive agent receiving and non-receiving categories with the control group; p^4 is obtained by comparison of these categories with each other.

CKD, chronic kidney disease; GAD, generalized anxiety disorder; MDD, major depressive disorder; NS, nephrotic syndrome; ns: nonsignificant; OCD, obsessive-compulsive disorder; PD, panic disorder; SAD, separation anxiety disorder; SP, social phobia; Tx, renal transplantation.

Table 3 Comparison of the proportions of the high-scored participants on the Revised Child Anxiety and Depression Scale – Child Version (RCADS-CV)

Subscales	All participants (n = 88)	Patient group (n = 44)	Control group (n = 44)	p
Ratio of high-scored participants				
SAD	23 (26.1%)	8 (18.2%)	15 (34.1%)	ns
SP	34 (38.6%)	13 (29.5%)	21 (47.7%)	ns
OCD	25 (28.4%)	14 (31.8%)	11 (25.0%)	ns
PD	22 (25%)	15 (34.1%)	7 (15.9%)	ns
GAD	29 (33%)	15 (34.1%)	14 (31.8%)	ns
MDD	11 (12.5%)	6 (13.6%)	5 (11.4%)	ns

Subscales	CKD (n = 11)		NS (n = 14)		Tx (n = 19)		p^2
	n (%)	p^1	n (%)	p^1	n (%)	p^1	
Patients with primary diseases							
SAD	2 (18.2%)	ns	4 (28.6%)	ns	2 (10.5%)	ns	ns
SP	5 (45.5%)	ns	3 (21.4%)	ns	5 (26.3%)	ns	ns
OCD	6 (54.5%)	ns	4 (28.6%)	ns	4 (21.1%)	ns	ns
PD	5 (45.5%)	0.049	4 (28.6%)	ns	6 (31.6%)	ns	ns
GAD	6 (54.5%)	ns	3 (21.4%)	ns	6 (31.6%)	ns	ns
MDD	2 (18.2%)	ns	3 (21.4%)	ns	1 (5.3%)	ns	ns

Subscales	Receiving (n = 34)		Non-receiving (n = 10)		p^4
	n (%)	p^3	n (%)	p^3	
Immunosuppressive agent					
SAD	6 (17.6%)	ns	2 (20%)	ns	ns
SP	8 (23.5%)	0.050	5 (50%)	ns	ns
OCD	9 (26.5%)	ns	5 (50%)	ns	ns
PD	11 (32.4%)	ns	4 (40%)	ns	ns
GAD	10 (29.4%)	ns	5 (50%)	ns	ns
MDD	4 (11.8%)	ns	2 (20%)	ns	ns

p^1 is obtained by comparison of the each primary disease category with control group, p^2 is by comparison of these primary diseases with each other. p^3 is obtained by comparison of the immunsuppressive agent receiving and non-receiving categories with control group, p^4 is by comparison of these categories to each other.

CKD, chronic kidney disease; GAD, generalized anxiety disorder; MDD, major depressive disorder; NS, nephrotic syndrome; ns, nonsignificant; OCD, obsessive-compulsive disorder; PD, panic disorder; SAD, separation anxiety disorder; SP, social phobia; Tx, renal transplantation.

functional impairment.[17,18] These life periods are developmentally sensitive times, so children and adolescents are very vulnerable to the impact of chronic stressors.[19,20] The mental health evaluation of children and young adults is a critical concern in disasters like pandemics. We hypothesized that children and adolescents with chronic kidney diseases might have thought that they were at higher risk when they become infected, leading to increased anxiety and depression in these patients.

Since the emergence of the new Coronavirus disease and its spread worldwide, knowledge about the disease has increased, and risk factors affecting disease progression and mortality have been described.[21,22] New treatment strategies and vaccines are being developed.[23,24] However, uncertain

prognoses, lack of appropriate treatment, and the emergence of mutated strains still cause fear and anxiety. This study was carried out between April and July 2020. As at April 1, 2020, the total number of cases reported in Turkey was 15 ,679 with 277 deaths; it rose to 230 thousand with 5,674 deaths at the end of July, despite the various measures and restrictions (Republic of Turkey Ministry of Health, 2020). No vaccine had been developed yet during that time period. So, this situation may have exaggerated people's anxiety.

The pandemic has caused rapid changes in the daily routines of children and young adults, with the closure of schools and attending classes remotely, and the restriction of extracurricular activities and social interaction. These changes may put already vulnerable groups at greater risk of mental problems.

Subsequently, these losses may worsen anxiety and depressive symptoms. Fear of contagion may exacerbate specific anxiety types, including specific phobias and obsessive-compulsive disorder. In this study, 66% of all participants had high scores on at least one of the subscales of RCADS- CV. It was shown that 28.4% of the participants had increased risk of OCD, 25% had increased risk of PD, 33% had increased risk of GAD, and 12.5% had increased risk of MDD. Those findings were similar to other findings in the literature. Liu et al.[6] had shown that at least one-third of young adults had elevated levels of depression (43.3%), anxiety (45.4%), and PTSD symptoms (31.8%). Xie et al.[25] evaluated 2,330 primary school students during home confinement due to COVID-19 in China and reported that 22.6% and 18.9% had symptoms of depression and anxiety, respectively. When we compared the patients with chronic kidney disease and healthy control groups, we found no difference in the RCADS-CV scales, except on the SP subscale, which was higher in the control group. However, the ratios of high scoring participants were also similar. The category of the primary chronic renal disease and use of immunosuppressive agents did not make any significant difference in terms of the scores and the ratio of high-scoring people.

Gender is an essential factor in analyzing general mental health states. In some studies, conducted in the pediatric population it has been shown that adolescent girls are more likely to present symptoms of anxiety and depression.[12,13] However, in our study, female and male participants had similar anxiety and depression scores, except for the SP scores, which were higher in females.

The infection of children and adolescents with COVID-19 usually presents with milder symptoms, fewer hospital admissions, and a lower fatality rate than adults. However, in our study, 63.6% of the participants had answered "Yes" to the question of "Is coronavirus a risky disease for children?" Among the children with chronic renal diseases, it increased to 70%, although the difference was insignificant comparing with the healthy control group.

The anxiety of children with chronic diseases may worsen during the pandemic because of increased parental anxiety, talking about the coronavirus often at home, increased pressure to ward off coronavirus, and the exaggerated psychological problems of parents. We asked the participants about the frequency of COVID-19-related conversations in their homes; 35.2% of the participants answered "frequently" and "almost always". The frequency of the conversations about the pandemic was similar in both healthy and patient groups. High-scores were also similar statistically. Therefore, in this study, we could not show any effect of frequently talking about the pandemic on anxiety, nor could we show any effect of having a child with chronic kidney disease, on the frequency of these conversations.

The COVID-19 pandemic has affected family interactions, which evidently influences child and adolescent mental health. Parents are required to help their children to manage their emotions, coping with stress, and interpreting their own experiences. However, for all of these, effective communication between two sides is essential. In this study, we tried to evaluate the communication between children and their family members about the pandemic with a question ("How do your family members answer your questions about coronavirus?"). Only 31.8% of the children were given realistic and informative answers to COVID-related questions, whereas 52.3% were scared by their family members. These responses were similar in children with or without chronic kidney disease. We also found no significant effect of these answers on the RCADS-CV scores. Nevertheless, effective communication may become challenging for the parents due to their own demoralizing losses, such as loss of work, death of loved ones, anxiety about contagion, and exacerbation of their own psychiatric illnesses. Evaluation of the parents' mental status is therefore also useful. Studies have shown that symptoms of anxiety and depression are more common in children with parents who appear high-risk on mental health scales.[26]

This study has some limitations. First, the study design is cross-sectional, so we cannot comment on causality. Second, it is conducted in a small group of participants in a single center, limiting the broader generalization of the results. Third, we could not evaluate the relationship between the levels of anxiety of the parents and those of the children. Finally, as the psychiatric status of the sample before the pandemic was not known, it was not possible to associate the findings only with the pandemic.

The current COVID-19 pandemic is a disaster that children encounter for the first time in their lives. Due to the unpredictability and uncertainty of the pandemic, it has caused high levels of anxiety in children and adolescents as well as in adults. This study shows that the COVID-19 pandemic may not exclusively cause anxiety among children with chronic kidney diseases but also healthy children. So, psychosocial support may need for both groups. For evaluation of the long-term effects of the pandemic on children, further studies are needed.

Disclosure

Author contributions

S.A.Ç. and B.K.D. designed the study. G.E., Ö.Ö.Ş. and C.B. collected the data. G.E. and G.Ö. performed the data analysis. G.E., G.Ö., and S.A.Ç. interpreted the results. G.E., Ö.Ö.Ş., and D.A. wrote the draft of manuscript. S.A.Ç. and G.Ö. revised the manuscript critically for important intellectual content. All authors read and approved the final manuscript.

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