





Psychiatric and general health effects of COVID-19 pandemic on children with chronic lung disease and parents' coping styles

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Abstract

Background: We aim to assess the anxiety and depressive symptoms related to the COVID-19 pandemic in children with chronic lung disease and their parents and also to evaluate parents' coping strategies.

Methods: Parents of children aged 4–18 years, with chronic lung disease (study group $n = 113$) and healthy control ($n = 108$) were enrolled in the study. General Health Questionnaire-12, specific COVID-19 related anxiety questions, The Coping Orientation to Problems Experienced inventory, coronavirus-related psychiatric symptom scale in children–parental form were used to analyze the psychiatric effects of COVID-19. Parents were also asked about how online education affected their family life and children. All data were compared between children/parents in the study and control groups. Risk factors related with anxiety scores of children were also analyzed.

Results: Talking about the pandemic, concern about coronavirus transmission, taking precaution to prevent coronavirus transmission, making pressure to protect from COVID-19 were significantly higher in parents within the study group ($p < .05$). Parents in the study group used more problem-focused coping than parents in the control group ($p = .003$). Anxiety symptoms score was higher in children of the study group ($p = .007$). Parents in the study group found online education more useful than parents in the control group.

Conclusion: Children with chronic lung diseases and their parents have more anxiety due to COVID-19 pandemic and these parents use more mature coping strategies to manage the stress of the pandemic. Longitudinal and larger studies should be done in all aspects of online education in children with chronic lung diseases.

KEYWORDS

anxiety, COPE, COVID-19, cystic fibrosis, interstitial lung disease, primary ciliary dyskinesia

1 | INTRODUCTION

Coronaviruses are enveloped single-stranded RNA viruses that mainly cause common cold.¹ However, like severe acute respiratory syndrome coronavirus (SARS-CoV)^{2,3} and Middle East respiratory syndrome coronavirus (MERS-CoV),⁴ the World Health Organization (WHO) announced in January 2020 a new coronavirus (COVID-19) that mainly affected the lower respiratory tract of patients and was named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).⁵ As with SARS-CoV and MERS-CoV, SARS-CoV-2 mainly spreads through close contact with infected people via respiratory droplets.⁶ COVID-19 mostly causes fever, dry cough, and tiredness, the symptoms range from mild to severe, and in some cases result in death.⁷ Fatalities were primarily seen in middle-aged and older patients with chronic diseases such as malignancy, immunodeficiency, cirrhosis, hypertension, lung disease, coronary heart disease, and diabetes.⁸ Among children, symptomatic cases were usually seen in those with comorbidities such as chronic lung disease, immunodeficiency, and heart diseases.⁹

The most common chronic, progressive lung diseases with genetic inheritance are cystic fibrosis (CF), primary ciliary dyskinesia (PCD), and interstitial lung disease (ILD) in childhood. CF is one of the most common genetic diseases among Caucasians caused by a defect of the CF transmembrane conductance regulator gene. CF affects multiple systems, predominantly with pulmonary involvement. Chronic airway inflammation and mucus plugging cause structural lung destruction.¹⁰ PCD is a genetically heterogeneous disorder characterized by ciliary dysfunction that causes impaired mucociliary activity, which results in upper and lower respiratory tract infections. PCD morbidity is dependent on pulmonary damage with chronic suppurative airway infections, lung function degradation, and bronchiectasis, which begin during childhood.¹¹ ILD is a rare heterogeneous group of diffuse parenchymal lung disease. Children with ILD consist of a wide spectrum of developmental, genetic, inflammatory, infectious, and reactive disorders. These diseases are related with high morbidity and mortality, and there is no proven treatment.¹²

The epidemic brought the risk of death and caused fear, anxiety, and behavioral and psychiatric disorders in most of the population worldwide.^{13,14} As in other pandemics, all adults and children will experience some degree of health anxiety and fear during the COVID-19 pandemic.^{15,16} There are no detailed studies on the psychological effect of COVID-19 on children with chronic lung disease. Owing to the fact that COVID-19 mainly causes lung damage, the first aim of this study was to assess the anxiety and depressive symptoms related to the COVID-19 pandemic in children with chronic lung disease and in their parents. The second aim was to evaluate the coping strategies used by parents in this pandemic environment.

2 | METHODS

2.1 | Study design—population and procedure

This is a case-control, cross-sectional study. Parents of patients aged 4–18 years, 200 with CF, 60 with PCD, and 25 with ILD who

had been followed at our pulmonology center were invited to the study, 113 (39.6%) of whom agreed to participate in the study are evaluated. We recruited a control group consisting of 108 parents of healthy children aged 4–18 years who were contacted through close associations (e.g., neighbors, children's classmates, friends) of the parents of children with chronic lung diseases via email/social media applications on their phones. The questionnaire was sent out to the parents as a web-based survey in April 2020, at which time COVID-19 started to peak in Turkey. Parents answered the self-report questionnaires for themselves and also for their children based on their external observations. The questionnaire was planned to take approximately 15 min and data collection was completed within 15 days.

In the questionnaire, all parents were also asked about whether their children had a known chronic disease. According to the answer, children who had any chronic diseases such as diabetes mellitus, asthma, congenital heart diseases, immune deficiency, celiac disease, and so forth, were excluded from the study.

Children with chronic lung diseases and their parents were defined as the study group. Healthy children and their parents were considered as the control group. All data were compared between the study group and the control group.

Parents' monthly income was categorized as low (<3,000 TL), low to moderate (3,001–6,000 TL), normal (6,001–9,000 TL), and high (>9,000 TL).

CF was diagnosed through clinical findings, two positive sweat tests, and/or genetic analysis. The diagnosis of PCD was based on clinical and radiologic findings, evaluations of ciliary beat frequency, and pattern using high-speed video-microscopy, and genetic analysis and/or electron microscopy. ILD was diagnosed through a combination of clinical and imaging features and lung biopsy and/or genetic analysis. Four of the ILD patients were diagnosed with hypersensitivity pneumonia, four with pulmonary hemosiderosis, and one with follicular bronchiolitis.

Ethics approval was obtained on March 31, 2020, from the local institutional review board according to guidelines of the Helsinki Declaration of Human Rights (GO20/351). All participants provided informed consent and the confidentiality of the questionnaire information was assured.

2.2 | Measures

A sociodemographic and coronavirus-related data form was used to gather information including the participants' age, sex, education, employment status, family monthly income, coronavirus diagnosis in their family or associates, history of parents' psychological disorders, contact history with a COVID-19 patient, family structure, age of the child for whom the questionnaire was answered, history of the child's chronic lung diseases or other chronic diseases, and disease-specific information was requested.

The General Health Questionnaire-12 (GHQ-12) was used to measure the mental health of the parents.¹⁷ The GHQ-12 is a

self-assessment scale consisting of 12 items with response options of “no (1), not more than usual (2), more than usual (3), and much more than usual (4).” The total score ranges between 0 and 36, with higher scores indicating higher degrees of disturbance of the general mental health status. Scoring 15 or higher could be considered as increased risk of anxiety or depression.¹⁸ The Turkish validity and reliability study was performed in 1996 by Kılıç.¹⁹

The Coping Orientation to Problems Experienced inventory (COPE) is one of the most commonly used scales for evaluating coping strategies.²⁰ Responses are assessed in 15 subscales of COPE: active coping, planning, suppression of competing activities, restraint coping, use of instrumental support, use of emotional support, positive reinterpretation and growth, acceptance, denial, use of religion, behavioral disengagement, and mental disengagement. COPE can also be evaluated as three major coping aspects: problem-focused coping, emotional focused coping, and dysfunctional coping. The Turkish validity and reliability study was performed in 2005 by Agargun et al.²¹ Response options range from 1 (never do this) to 4 (I do this very often), and higher scores indicate more frequent use of that kind of coping strategy.

The coronavirus-related psychiatric symptom scale in children–parental form (CoV-PSY-CP) measures COVID-19-related depressive and anxiety symptoms in children and adolescents (age 4–18 years) according to parents' observations.²² CoV-PSY-CP consists of 35 questions and two subscales: anxiety and depression. The response options range from 0 (never) to 3 (completely). The scale's validity and reliability study was performed in 2020 by Tural Hesapcioglu et al.²²

The assessment of the parents' COVID-19-related anxiety was assessed using specific questions such as the following.

- How much did the coronavirus outbreak affect your psychology in general?
- How often do you talk about coronavirus at home?
- How concerned are you about coronavirus transmission to you and your loved ones?
- How much precaution do you take to prevent coronavirus transmission?
- How much pressure do you put on your family to protect them from coronavirus?

The response options of these questions were none, a little to moderate, and very much.

Parents were also asked “How did online education affect your family life and children” with response options such as good, good-bad, and bad, and then asked to specify how.

2.3 | Statistical analyses

Statistical analyses were performed using the IBM SPSS for Windows Version 23.0 software. Numerical variables are

expressed as mean \pm SD or median [25th–75th percentile] as appropriate. Categorical variables are summarized as numbers and percentages. The normality of distribution of continuous variables was tested using the Shapiro–Wilk test. The Levene test was used to show the homogeneity of variances. Differences between two independent groups according to continuous variables were determined using the independent samples *t* test or Mann–Whitney *U* test as appropriate. The Kruskal–Wallis test was used to compare more than two independent groups. Categorical variables were compared using the χ^2 test. Multiple stepwise linear regression analysis was performed to explain the anxiety scores of the children. *p* values of less than .05 were considered statistically significant.

3 | RESULTS

In this study, we evaluated 113 parents and their children in the study group and 108 parents and their children in the control group. Children with chronic lung disease were diagnosed as having CF ($n = 92$, 81.4%), PCD ($n = 12$, 10.6%), and ILD ($n = 9$, 8.0%). There were no significant differences in terms of demographic characteristics between the two groups of children (Table 1).

The psychiatric effects of COVID-19 on children involved in the study were assessed using the CoV-PSY-CP scale through their parents. CoV-PSY-CP total scores were higher in the study group, but there were no statistical differences between the groups ($p = .074$). Anxiety symptom scores were higher in the study group ($p = .007$) and depressive symptoms scores were not different between the groups ($p = .374$). There were no statistical differences in total scores of CoV-PSY-CP, and anxiety and depression symptom scores of CoV-PSY-CP between the age categories were as preschool (4–6 years), middle school (7–11 years), and adolescents (12–18 years) among the groups (Table 2).

TABLE 1 Characteristics of children

Demographic characteristics	Study group	Control group	<i>p</i>
Age	10.8 (± 4.4)	10.5 (± 3.7)	.595
Preschool (4–5) <i>n</i> %	21 (18.5%)	8 (7.4%)	
Middle childhood (6–11) <i>n</i> %	40 (35.4%)	60 (55.5%)	
Adolescent (12–13) <i>n</i> %	52 (46.1%)	40 (37.1%)	
Sex			.948
Male	57 (50.4%)	54 (50.0%)	
Female	56 (49.6%)	54 (50.0%)	
Disease			
CF	92 (81.4%)		
PCD	12 (10.6%)		
ILD	9 (8.0%)		

Abbreviations: CF, cystic fibrosis; ILD, interstitial lung disease; PCD, primary ciliary dyskinesia.

TABLE 2 The coronavirus-related psychiatric symptom scale in children–parental form subscale and total scores according to the age groups

	Study group	Control group	Z	p
Preschoolers (4–5 years)	n = 21 (18.5%)	n = 8 (7.4%)		
Anxiety symptom score	19.5 (±6.1)	17.0 (±5.6)	-1.066	.306
Depression symptom score	33.4 (±11.3)	33.0 (±8.1)	-0.426	.693
Total score	53.0 (±16.7)	50.0 (±13.3)	-0.042	.983
Middle childhood (6–11 years)	n = 40 (35.4%)	n = 60 (55.5%)		
Anxiety symptom score	21.2 (±7.8)	18.9 (±6.1)	-1.266	.206
Depression symptom score	33.8 (±12.3)	31.8 (±9.3)	-0.544	.587
Total score	54.9 (±19.3)	50.7 (±14.5)	-0.917	.359
Adolescent (12–13 years)	n = 52 (46.1%)	n = 40 (37.1%)		
Anxiety symptom score	24.3 (±8.3)	21.0 (±7.1)	-1.644	.100
Depression symptom score	36.9 (±14.5)	33.5 (±11.6)	-0.877	.380
Total score	61.2 (±21.6)	54.5 (±17.4)	-1.416	.157
All age groups	n = 113 (100.0%)	n = 108 (100.0%)		
Anxiety symptom score	22.3 (±8.0)	19.5 (±6.5)	-2.702	.007
Depression symptom score	35.2 (±13.2)	32.6 (±10.0)	-0.888	.374
Total score	57.5 (±20.2)	52.1 (±15.5)	-1.784	.07

Note: Bold values imply a statistically significant result at the 5% significance level.

The demographic characteristics of the parents are given in Table 3. There were no significant differences in terms of demographic characteristics, except the gender of the parents, between the two groups of parents.

The COVID-19-related anxiety and general psychological effects of the parents were assessed using GHQ-12 and special questions about COVID-19 anxiety. There was no significant difference between the groups in terms of the mean of total scores of the GHQ-12. Also, there were no differences between the number of parents having GHQ-12 scores lower than 15 and higher than 15 in the two groups. According to the COVID-19-specific anxiety questions, talking about the pandemic, concern about coronavirus transmission, taking precautions to prevent coronavirus transmission, and pressuring people to protect against COVID-19 was significantly higher in the study group (see details in Table 4).

According to the question about the effect of online education on the family and children, there were significant differences in answers between the groups ($p = .044$). Parents in the study group answered the question as “good” more than the control group. In the study group who answered as “good” mostly qualified the question by saying “My child became less sick and was not missing her education.” When all parents’ answers were analyzed in detail, the most common reasons for answering as “good” and “bad” were explained as “It was good because I can spend more time with my child,” “It was bad because I thought that my child would not get enough education,” respectively.

The parents’ coping styles were assessed using COPE, the details are shown in Table 5. Planning, suppression of competing activity, and acceptance coping were used more in the study group than in the control group. Humor and mental disengagement coping strategies were used more by the control group than the

study group. When COPE was assessed as the three major subscales, problem-focused coping, emotional-focused coping, and dysfunctional coping, the study group used more problem-focused coping style than the control group ($p = .003$). There were no significant differences according to the use of emotional-focused coping and dysfunctional coping between the groups ($p = .361$, $p = .432$, respectively).

CoV-PSY-CP scale results showed statistical differences according to the parents’ GHQ-12 scores being less than 15 or higher than 15. Details are shown in Table 6 for both children with chronic lung diseases and healthy children.

Multiple stepwise linear regression analysis was performed to explain the anxiety scores of the children. The total r^2 of this model was .21 ($p < .001$). The regression model to predict the children’s anxiety included four of the seven potential factors: (1) Children’ age, (2) having chronic lung diseases, (3) if parents’ GHQ was >15 , (4) parent’s dysfunctional coping strategies, (5) parent’s general psychologic status, (6) talking more about coronavirus by parents, (7) parents making much pressure on the family to protect against the coronavirus. The results (Table 7) indicate that children’s age, parents GHQ score, parent’s coronavirus-related anxiety (talking more about COVID-19 and increased protection pressure on the family) significantly led to an increase in anxiety scores of CoV-PSY-CP.

4 | DISCUSSION

The COVID-19 pandemic has gripped the world since early 2020. In our study, the children with chronic lung diseases and their parents were found to have more anxiety about COVID-19 and the parents

TABLE 3 Demographic characteristics of the parents

	Study group n (%)	Control group n (%)	p
Age (years) ^a	40.3 (±6.9)	39.4 (±5.8)	.330
<30	5 (4.4%)	6 (5.6%)	
31–40	49 (43.4%)	55 (50.9%)	
41–50	50 (44.2%)	44 (40.7%)	
>50	9 (8.0%)	3 (2.8%)	
Sex			.001
Male	39 (34.5%)	15 (13.9%)	
Female	74 (65.5%)	93 (86.1%)	
Educational level			.308
Primary-middle school	30 (26.5%)	24 (22.2%)	
High school	42 (37.2%)	40 (37.0%)	
College-University	39 (34.5%)	37 (34.3%)	
Master-Doctorate	2 (1.8%)	7 (6.5%)	
Monthly income			.234
<3,000 TL	45 (39.8%)	45 (41.7%)	
3,001–6,000 TL	39 (34.5%)	26 (24.1%)	
6,001–9,000 TL	15 (13.3%)	15 (13.9%)	
>9,000 TL	14 (12.4%)	22 (20.4%)	
Family structure			.404
Nuclear family	98 (86.7%)	98 (90.7%)	
Extended family	6 (5.3%)	6 (5.6%)	
Single parent family	9 (8.0%)	4 (3.7%)	
Employment status			.455
Unemployed	60 (53.1%)	49 (45.4%)	
Employed	53 (46.9%)	59 (54.6%)	
Having psychiatric disorders in you or your partner			.361
No	102 (90.3%)	102 (94.4%)	
Yes	11 (9.7%)	6 (5.6%)	
Anyone in your family or around was diagnosed COVID-19			1.000
No	111 (98.2%)	106 (98.1%)	
Yes	2 (1.8%)	2 (1.9%)	

Note: Bold values imply a statistically significant result at the 5% significance level.

^amean (SD).

used more mature coping strategies such as problem-focused coping when compared with parents of healthy children to manage the psychiatric effects of the pandemic.

In all age groups, the mean anxiety symptom scores were higher in the study group, though the differences between the study and control groups were not found to be statistically significant which may be due to the small sizes of the age groups. When the mean anxiety symptom scores were compared over all age groups, the study group turned out to have a significantly higher mean score. This is possibly because of the larger sample sizes obtained when the age groups are combined.

TABLE 4 Parent anxiety evaluation for COVID-19 specific anxiety questions

	Study group n (%)	Control group n (%)	p
How much did the coronavirus outbreak affect your psychology in general?			.582
None	1 (0.9%)	3 (2.8%)	
A little to moderate	69 (61.1%)	73 (67.6%)	
Very much	43 (38.0%)	32 (29.6%)	
How often do you talk about coronavirus at home?			.041
None	11 (9.7%)	13 (12.0%)	
A little to moderate	93 (82.3%)	87 (80.6%)	
Too much	9 (9.0%)	8 (7.4%)	
How concerned are you about coronavirus transmission to you and your loved ones?			.002
None	1 (0.9%)	0 (0.0%)	
A little to moderate	23 (20.4%)	39 (36.1%)	
Too much	89 (78.7%)	69 (63.9%)	
How much pressure do you put on your family to protect them by coronavirus?			.046
None	6 (5.3%)	5 (4.6%)	
A little to moderate	39 (34.5%)	55 (50.9%)	
Too much	68 (60.2%)	48 (44.4%)	
How much precaution do you take to prevent coronavirus transmission?			.001
A little	0 (0.0%)	1 (0.9%)	
Moderate	1 (0.9%)	9 (8.3%)	
Too much	112 (99.1%)	98 (90.8%)	
How did online education affect your family life and your children? ^a			.044
Good	43 (43.0%)	29 (27.4%)	
Good and bad	17 (17.0%)	18 (17.0%)	
Bad	40 (40.5%)	59 (55.7%)	

Note: Bold values imply a statistically significant result at the 5% significance level.

^aThis question was answered only by parents whose children went to school.

Like other pandemics, COVID-19 also causes different degrees of psychiatric problems, especially fear and anxiety.^{13–16} Lunn et al.²³ showed that because COVID-19 had no proper treatment, it led to panic and anxiety in the population. A study on the general

TABLE 5 Comparison of coping strategies and GHQ scores of parents

	Study group	Control group	<i>p</i>
Coping strategies			
Active coping	13.6 (±2.1)	13.1 (±2.3)	.061
Restraint coping	9.5 (±2.2)	9.2 (±2.0)	.176
Planning	13.7 (±2.0)	13.1 (±2.3)	.046
Seeking social support—instrumental	12.3 (±2.4)	11.9 (±2.5)	.166
Seeking social support—emotional	11.4 (±2.4)	11.3 (±2.7)	.801
Suppression of competing activities	11.6 (±2.0)	10.5 (±2.0)	.001
Positive reinterpretation and growth	13.9 (±1.7)	13.5 (±2.0)	.293
Turning to religion	14.0 (±2.5)	13.5 (±2.8)	.086
Humor	6.8 (±2.4)	7.9 (±2.8)	.011
Acceptance	11.8 (±2.6)	11.0 (±2.5)	.024
Focus on and venting of emotions	11.4 (±2.2)	11.4 (±2.6)	.963
Denial	5.9 (±2.2)	6.0 (±1.9)	.479
Behavioral disengagement	5.3 (±2.2)	5.6 (±2.2)	.259
Mental disengagement	8.7 (±2.4)	9.3 (±2.1)	.046
Alcohol-drug disengagement	4.7 (±1.6)	4.4 (±1.3)	.238
GHQ-12			
Total (mean)	13.1 (±4.1)	12.6 (±3.7)	.510
GSA < 15	87 (77.0%)	88 (81.5%)	.512
GSA > 15	26 (23.0%)	20 (18.5%)	

Note: Bold values imply a statistically significant result at the 5% significance level.

Abbreviation: GSA, General Health Questionnaire-12.

population in China revealed that even during the initial phase of epidemic, one-third of the study population had moderate-to-severe anxiety.¹⁴ In our study, when comparing parents in the study and control groups, there were no significant differences in demographic

TABLE 6 CoV-PSY-CP scale results according to parents GHQ-12

	Parents		<i>p</i>
	GHQ < 15	GHQ > 15	
Children with chronic lung diseases			
Total	53.5 (±16.6)	70.6 (±25.2)	.001
Anxiety	20.9 (±6.1)	26.6 (±8.6)	.001
Depression	32.6(±10.3)	43.9 (±17.6)	.003
Healthy children			
Total	50.1 (±14.9)	60.7 (±15.5)	.004
Anxiety	18.5 (±6.1)	23.6 (±6.0)	.002
Depression	31.5(±10.0)	37.1 (±9.2)	.011

Note: Bold values imply a statistically significant result at the 5% significance level.

Abbreviations: CoV-PSY-CP, psychiatric symptom scale related to coronavirus in Children-Parent Questionnaire; GSA, General Health Questionnaire-12.

characteristics and total scores of GHQ-12, but according to specific questions related with COVID-19-based anxiety, parents in the study group were more anxious than parents in the control group. Anxiety is not exclusively experienced only under pandemic conditions among parents of children with chronic lung diseases, it also frequently seen in normal situations.²³⁻²⁸

Coping strategies include specific behavioral and psychological struggle to cope with unexpected stressful life events that help to manage and decrease the stress.¹⁷ These can change according to the situations and there are many coping methods. COPE can be divided into three subscales: problem-focused coping strategies include the use of instrumental social support, active coping, restraint coping, suppression of competing activities, and planning; emotional-focused coping strategies include positive reinterpretation and growth, turning to religion, humor, use of emotional social support, and acceptance; and dysfunctional coping strategies include mental disengagement, focus on and venting of emotions, denial, behavioral disengagement, and alcohol-drug disengagement.¹⁹ Lazarus and Folkman²⁹ specified problem-focused coping strategies as directed to solving or preventing problems and emotional-focused coping as used for coping with negative emotions, arising from problems. In our study, suppression of competing activities and planning, which are problem-focused coping methods, and acceptance were used significantly more by parents of the study group. Humor and mental disengagement were used significantly more by parents of the control group. There are many studies on coping strategies in parents of children with CF, most of which placed emphasis on coping strategies related with the chronicity of the disease.³⁰⁻³³ There are also a few studies on the coping skills of parents of children with PCD or ILD, which generally evaluated the burden and health-related quality of life of caregivers.^{34,35} In general, each parent's effort to cope should be supported so that they can help contribute to their child's health through coping methods; a study highlighted the importance of fostering constructive and positive coping in caregivers.³⁶

In agreement with our results, many studies have shown that patients with chronic lung disease have higher levels of anxiety compared with healthy controls.³⁷⁻³⁹ Senkalfa et al.⁴⁰ was reported that COVID-related anxiety was not significantly different between children with CF and healthy children. In our study, anxiety was more common in the study group but did not differ according to age categories. Children with chronic lung diseases already have disease anxiety; however, it can worsen during a pandemic because of increased parent anxiety, as expressed through increased frequency of talking about the coronavirus at home, putting more protection pressure due to COVID-19, and the psychological problems of parents. Anxiety and depression symptoms were more common in children with parents who had GHQ more than 15 in both groups.

Many countries have closed schools to slow the spread of the COVID-19 and reduce the burden on healthcare systems as did our country. The Turkish government started online education immediately after the schools closed. The parents in the study group found online education favorable because their children were less ill and did not lag behind in their education. The online education

TABLE 7 Linear regression model on CoV-PSY-CP anxiety score

Variables	B	β	Regression coefficient with 95.0% confidence interval		t	p
			Lower limit	Upper limit		
Children age	0.389	.215	0.173	0.606	3.458	<.001
Parent with GHQ > 15	4.589	.252	2.358	6.819	4.055	<.001
Increased talking about coronavirus by parents	2.801	.189	0.985	4.617	3.040	.003
Increased protection pressure by parents	2.095	.141	0.249	3.914	2.237	.026

Note: Bold values imply a statistically significant result at the 5% significance level.

Abbreviations: B, regression coefficient; β , standardized regression coefficient; CoV-PSY-CP, psychiatric symptom scale related to coronary virus in Children-Parent Questionnaire; GSA, General Health Questionnaire-12.

option should be evaluated within all aspects in children with chronic lung diseases as other chronic progressive diseases.

This study has some limitations. First, the study design was cross-sectional so we cannot interpret causality. Second, it was conducted in a single center, which limits wider generalization of the results. Third, data were collected through parent reports, which may impact the reporting of their children's psychological problems. Also, we could not evaluate the relationship between anxiety degree and disease severity in children with chronic lung disease due to the hidden identity of the participants. Fourth, due to the small number of children with ILD and PCD, we could not perform statistical analyses between subgroups of chronic lung diseases. Fifth, there was only the gender of the parents significantly differing between the groups of parents in terms of demographic characteristics and fathers of children with chronic lung diseases participated in the study more than those of the control group. This situation can also make a bias on the results. Finally, parents answered the questionnaires based on their external observations for children in all ages. Although this may lead to some bias, it also allows us to have a standardized set of answers.

Despite these limitations, there are some strengths of the study. Psychiatric effects of the COVID-19 pandemic on children with chronic lung disease are analyzed by a COVID-19 specific scale. The assessment of children's and their parent psychiatric symptoms at the same time could let us to evaluate the relation between parental and children's anxiety. This study can be a resource for future studies on the mental health of children with chronic lung in extreme natural traumatic events.

In conclusion, children with chronic lung diseases and their parents had more anxiety due to the COVID-19 pandemic. Parents of children with chronic lung disease use more problem-focused coping strategies to manage the stress of the pandemic. These results reflect the acute effects of COVID-19. For evaluation of the long-term effects of the pandemic on children with chronic lung diseases, further studies are needed. Given that COVID-19 causes lung damage in particular, children with chronic lung disease and their families should be supported in terms of anxiety and parent coping efforts to help manage the mental health of both parents and their children. Longitudinal and larger studies should be performed on all aspects of online education in children with chronic progressive diseases.

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

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