



## The Effects of COVID-19 Pandemic on Mental Health in Children with Primary Immunodeficiency

COVID-19 Pandemisinin Primer İmmün Yetmezliği Olan Çocuklar Üzerindeki Mental Etkileri

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### ABSTRACT

**Objective:** The aim of our study is to investigate effects of the COVID-19 pandemic on mental health of children with primary immunodeficiency.

**Material and Method:** Parents of the participants were filled out the Revised Child Anxiety and Depression Scale - Parent Form (RCADS-P). Participants were divided into two groups: Group 1: patients with primary immunodeficiency; Group 2: control group. This study was carried out between June 2020 and December 2020.

**Results:** RCADS-P depression scores and RCADS-P total scores of patients in group 1 were statistically significantly higher than group 2 ( $p=0.022$ ,  $p=0.042$ , respectively). Positive correlations were found between the patients' age ( $r=0.419$ ,  $p=0.024$ ), education level ( $r=0.588$ ,  $p=0.013$ ) and RCADS-P depression scores. In addition, negative correlation was found between the number of siblings ( $r=-0.396$ ,  $p=0.038$ ) and RCADS-P OCD scores.

**Conclusions:** COVID-19 pandemic has more negative effect on mental health's of primary immunodeficient patients compared to public.

**Keywords:** Children, COVID-19, mental health, anxiety-depression, primary immunodeficiency

### ÖZ

**Amaç:** Çalışmamızın amacı, COVID-19 pandemisinin primer immün yetmezliği olan çocukların ruh sağlığı üzerindeki etkilerini araştırmaktır.

**Gereç ve Yöntem:** Katılımcıların ebeveynleri tarafından Revize Çocuk Anksiyete ve Depresyon Ölçeği - Ebeveyn Formu (RCADS-P) doldurulmuştur. Katılımcılar Primer immün yetmezliği olan hastalar ve kontrol grubu olmak üzere iki gruba ayrılarak değerlendirilmiştir. Bu çalışma Haziran 2020-Aralık 2020 tarihleri arasında yapılmıştır.

**Bulgular:** Çalışma grubundaki hastaların RCADS-P depresyon puanları ve RCADS-P toplam puanları kontrol grubuna göre istatistiksel olarak anlamlı derecede yüksekti (sırasıyla  $p=0,022$ ,  $p=0,042$ ). Hastaların yaşı ( $r=0,419$ ,  $p=0,024$ ), eğitim düzeyi ( $r=0,588$ ,  $p=0,013$ ) ve RCADS-P depresyon puanları arasında pozitif yönde ilişkiler bulundu. Ayrıca kardeş sayısı ( $r=-0,396$ ,  $p=0,038$ ) ile RCADS-P OKB puanları arasında negatif korelasyon saptanmıştır.

**Sonuç:** COVID-19 pandemisi, primer immün yetmezliği olan hastaların ruh sağlığı üzerinde olumsuz etkilere sahiptir.

**Anahtar Kelimeler:** Çocuklar, COVID-19, akıl sağlığı, anksiyete-depresyon, primer immün yetmezlik

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## INTRODUCTION

The new Coronavirus disease (COVID-19) has been affecting all over the world since beginning of 2020. The World Health Organization has announced the disease as a pandemic since March 2020. The disease mostly has a milder course and its prevalence has been reported as 2% in children (1,2). Children usually shows nonspecific signs of viral infection such as sore throat, cough, shortness of breath, nausea, vomiting, diarrhea, eating disorders in the disease (1,3). However, it may cause more negative effects in terms of mental health. Psychiatric disorders including anxiety, depression and post-traumatic stress disorder may more frequently observe in both children and adults in extraordinary events such as disasters and pandemics which affect a large part of the society (4–6). School closures, significant restrictions in social life, quarantine processes, unemployment of parents, and death of family members can cause psychological problems in children in such conditions (7–10). Hereby, it is important to protect and improve public health and be ready to such extraordinary events (11). For these reasons, it is obvious to determine which children suffer from the pandemic and what kind of mental health disorder is occurred (12). Particularly the child population, which is the vulnerable part of the society, should be better monitored in this regard.

Since COVID-19 is an infectious disease, more careful attention is required to protect immunodeficient children from the disease. This circumstance can make the children even more vulnerable in terms of mental health disorder. Depends on subtype of immunodeficiency, the children may have increased risk of severe COVID-19 infections. Thus, the process is likely increase their fear on recurrent hospitalization and death. It is also known that regardless of the pandemic, these children tend to show symptoms of anxiety and depression (13). Similar to children, the COVID-19 pandemic has been reported to increase symptoms of anxiety disorders and depression in adults with immune deficiency (14). There are not enough studies in the literature on the relation of COVID-19 pandemic and mental health in children with primary immunodeficiency. The aim of our study is to investigate effects of the COVID-19 pandemic on mental health of children with primary immunodeficiency.

## MATERIAL AND METHOD

### Participants

Fifty-four children and adolescents aged between 7-20 and their parents were included in this study. These were divided into two groups: Group 1: Patients on regular IVIG treatment for every 21 days who were followed in pediatric immunology outpatient unit of our hospital with a diagnosis of primary immunodeficiency and their patients; Group 2: Patients applied to the general

pediatrics outpatient clinics of same institution for routine follow-up. Patients with any chronic illness, using any drug, and needed hospitalization were not included into group 2.

This study was approved by the local ethics committee (Decision number:2020/2531). All procedures were conducted in accordance with the Declaration of Helsinki and local laws and regulations. Also, all participants and their parents gave their written informed consent.

### Procedures

Sociodemographic characteristics and their protection methods and awareness about the COVID-19 pandemic was applied to the parents of all the participants were noted. In this context, the change of hygiene levels of families, protective methods such as masks and disinfectants, behavior of stacking foods and ways to access news' sources (Radio/TV/Newspaper, Social Media/Web) about COVID-19 pandemic were questioned. Parents of all the participants were also filled out the Revised Child Anxiety and Depression Scale - Parent Form (RCADS-P) for determining the symptoms of anxiety, depression and obsessive-compulsive disorder (OCD) of the children and adolescents included in the study.

### Revised Child Anxiety and Depression Scale (RCADS)

This scale consists of two parts as the child and parent forms (RCADS-P) and both included 47 questions (15). It measures the symptoms of anxiety, depression and OCD in children and adolescents, and includes six subscales which measure social phobia (SoPh), generalized anxiety disorder (GAD), panic disorder (PD), separation anxiety disorder (SAD), depression and OCD. This scale is in four-point Likert type. The validity and reliability study of the scale for Turkish population was conducted by Gormez et al.(16).

### Statistical Analyses

The data were analyzed using SPSS 20.0 software (IBM Corporation, Armonk, NY, USA). The data were presented as mean (standard deviation (SD)) for numerical variables and percentages for categorical variables. The Shapiro-Wilk normality test was used to determine whether the variables have a normal distribution. Chi-square ( $\chi^2$ ) test was used to compare categorical variables and frequencies. Continuous variables were expressed by means (SD). Student's t-test was used to compare the variables with normal distribution between two groups. The Mann-Whitney U test was used to analyze non-normally distributed variables. Pearson or Spearman's correlation analyses were used for variables showing normal or non-normal distribution features, respectively, to determine the association between psychiatric variables and RCADS-P scores. All statistical analyses were performed within 95% confidence interval, and a p value of <0,05 was considered statistically significant.

## RESULTS

Twenty-nine children and adolescents admitted to the pediatric immunology outpatient unit and 25 children and adolescents admitted to the general pediatric outpatient unit were included in the study. These two groups were compared and no statistically significant difference in terms of age, gender, education level, number of siblings, socioeconomic level, parental age and education level was observed ( $p > 0,05$ ). Personal hygiene change of families related to the COVID-19 pandemic was statistically significantly higher in pediatric immunology patients ( $p=0,021$ ). There was no statistically significant difference between the two groups in terms of the usage of protective methods and ways to access news' sources about COVID-19 pandemic ( $p > 0,05$  for all). Sociodemographic characteristics of the participants and their protective methods and other variables regarding the COVID-19 pandemic are presented in **Table 1**.

RCADS-P depression scores and RCADS-P total scores of patients in group 1 were statistically significantly higher than group 2 ( $p=0,022$ ,  $p=0,042$ , respectively). No statistically significant difference was found between the two groups in terms of SoPh, GAD, PD, SAD, OCD and total anxiety scores in RCADS-P ( $p > 0,05$  for all) (**Table 2**).

Correlation analyses were used to determine the relationship between sociodemographic characteristics, protective method use for COVID-19 pandemic and psychiatric symptoms in patients with primary immunodeficiency. Positive correlations were found between the patients' age ( $r=0,419$ ,  $p=0,024$ ), patients' education level ( $r=0,588$ ,  $p=0,013$ ) and RCADS-P depression scores. In addition, negative correlation was found between the number of siblings ( $r=-0,396$ ,  $p=0,038$ ) and RCADS-P OCD scores (**Table 3**).

There were also positive correlations between and ways to access news' sources about COVID-19 pandemic and RCADS-P SoPh scores ( $r=0,460$ ,  $p=0,012$ ), RCADS-P PD scores ( $r=0,507$ ,  $p=0,005$ ), RCADS-P GAD scores ( $r=0,428$ ,  $p=0,021$ ), RCADS-P OCD scores ( $r=0,510$ ,  $p=0,005$ ), RCADS-P total anxiety scores ( $r=0,637$ ,  $p<0,001$ ), RCADS-P total scores (**Table 3**).

**Table 2. Comparison of psychiatric variables between study groups**

Variables	Group 1 (n:29)	Group 2 (n:25)	p
RCADS-P (Social Phobia)	7.03±4.87	6.68±4.91	0.792
RCADS-P (Panic Disorder)	3.55±3.40	2.00±1.97	0.066
RCADS-P (Separation Anxiety Disorder)	6.55±2.98	5.64±3.61	0.315
RCADS-P (Generalized Anxiety Disorder)	5.34±2.74	4.24±2.63	0.139
RCADS-P (Obsessive Compulsive Disorder)	4.21±3.39	3.00±2.29	0.222
RCADS-P (Total Anxiety)	22.48±9.86	18.56±9.16	0.138
RCADS-P (Depression)	6.72±4.99	3.80±2.79	0.022*
RCADS-P (Total)	33.41±15.83	25.36±11.96	0.042*

RCADS-P: Revised Child Anxiety and Depression Scale Parent Form, \* $p<0,05$

**Table 1. Sociodemographic and clinical characteristics of the participants**

Variables	Primary Immunodeficiency (Group 1) (n:29)	Control group (Group 2) (n:25)	p
Age (years)			0.717
Mean±SD	11.07±4.20	11.42±2.66	
Education Level (years)			0.578
Mean±SD	5.41±3.57	6.00±3.10	
Number of siblings			0.951
Mean±SD	2.50±1.40	2.52±0.91	
Mothers' age (years)			0.154
Mean±SD	37.45±6.02	39.92±6.53	
Fathers' age (years)			0.276
Mean±SD	39.34±6.48	41.24±6.09	
Mothers' Education Level, n (%)			0.764
Primary	15 (51.7)	12 (48)	
Middle	5 (17.3)	4 (16)	
High	7 (24.2)	5 (20)	
University	2 (6.8)	4 (16)	
Fathers' Education Level n (%)			0.676
Primary	15 (51.7)	10 (40)	
Middle	2 (6.9)	3 (12)	
High	6 (20.7)	6 (24)	
University	4 (13.7)	6 (24)	
Gender, n (%)			0.266
Boy	16 (55.1)	10 (40)	
Girl	13 (48.9)	15 (60)	
Family income n (%)			0.798
Low	8 (27.6)	5 (20)	
Middle	11 (37.9)	11 (44)	
High	10 (34.5)	9 (36)	
History of psychiatric disorders in family members, n (%)			0.262
Yes	6 (20.6)	2 (8)	
No	23 (79.4)	23 (92)	
Change of personal hygiene levels, n (%)			0.021*
None	4 (13.7)	0 (0.0)	
Some	3 (10.4)	3 (12)	
Moderate	5 (17.3)	13 (52)	
High	17 (58.6)	9 (36)	
Protective methods, n (%)			0.408
Face mask	2 (6.8)	0 (0.0)	
Disinfectant	1 (3.4)	1 (4)	
More than one method	26 (89.8)	24 (96)	
Stacking food, n (%)			0.336
Yes	4 (13.7)	6 (24)	
No	25 (86.3)	19 (76)	
Ways to access news' sources, n (%)			0.949
Radio/TV/Newspaper	13 (44.8)	12 (48)	
Social Media/Web	2 (6.9)	2 (8)	
More than one	14 (48.3)	11 (44)	

\* $p<0,05$

**Table 3. Correlation analysis between psychiatric variables and sociodemographic and clinical characteristics**

Variables	RCADS-P (Social Phobia)		RCADS-P (Panic Disorder)		RCADS-P (Separation Anxiety Disorder)		RCADS-P (Generalized Anxiety Disorder)		RCADS-P (Obsessive Compulsive Disorder)		RCADS-P (Total Anxiety)		RCADS-P (Depression)		RCADS-P (Total)	
	r	p	r	p	r	p	r	p	r	p	r	p	r	p	r	p
Age	.285	0.133	.034	0.862	-.162	0.400	.357	0.057	.026	0.895	.216	0.261	.419*	0.024	.329	0.081
Gender	.079	0.684	-.059	0.762	-.129	0.504	.310	0.102	.088	0.651	.075	0.700	.065	0.642	.075	0.700
Education Level	.257	0.320	.338	0.185	-.366	0.148	.408	0.104	.413	0.099	.248	0.338	.588*	0.013	.371	0.143
Number of Siblings	-.259	0.183	-.225	0.250	-.282	0.146	-.114	0.562	-.395	0.038	-.332	0.085	-.010	0.958	-.327	0.089
Mothers' Education Level	.264	0.202	-.032	0.880	.393	0.052	.126	0.548	.139	0.507	.315	0.125	.115	0.585	.189	0.366
Fathers' Education Level	.199	0.320	-.054	0.788	.181	0.366	-.147	0.466	.049	0.810	.100	0.619	-.277	0.162	-.014	0.946
Family Income	.212	0.269	.292	0.124	.188	0.328	.233	0.224	.183	0.342	.154	0.426	.144	0.457	.166	0.389
History of Psychiatric Disorders	.087	0.654	-.165	0.392	.276	0.147	-.216	0.260	-.308	0.104	.071	0.713	-.077	0.691	-.020	0.916
Change of Personal Hygiene Levels	-.072	0.710	-.145	0.453	-.026	0.892	-.068	0.725	-.211	0.157	-.077	0.693	-.151	0.274	-.187	0.332
Protective Methods	.079	0.683	.165	0.391	-.038	0.845	.102	0.599	-.171	0.374	.104	0.590	-.270	0.156	-.129	0.506
Stacking Food	-.306	0.107	.073	0.707	-.144	0.456	-.097	0.618	-.133	0.493	-.240	0.210	.127	0.512	-.114	0.557
Ways to access news' sources	.460*	0.012	.507**	0.005	.290	0.127	.428*	0.021	.510**	0.005	.637**	0.000	.279	0.143	.597**	0.001

RCADS-P: Revised Child Anxiety and Depression Scale Parent Form, \*p&lt;0.05, \*\*p&lt;0.01

## DISCUSSION

Results of our study revealed negative effects of the COVID-19 pandemic on people's physical and mental health especially in primary immunodeficient patients as a first study in the literature (12,17). These negativities may occur with the direct effect of the infection on the brain or indirectly caused by anxiety and panic. These effects are more common in individuals with poor social support, chronic medical problems and psychiatric disorders (17). Immunodeficiency patients and their families may also be more likely to experience the psychological negative effects of the pandemic.

Anxiety disorders and depression are the most common psychiatric disorders during pandemic periods (18,19). Psychiatric disorders such as anxiety disorder, depression, obsessive-compulsive disorder, post-traumatic stress disorder have also been reported during the COVID-19 pandemic (4,6,19,20). There is no study reporting the mental effects of the COVID-19 pandemic in children with primary immunodeficiency and their families. However, Kuburovic et al. reported that children with primary immunodeficiency had more symptoms of anxiety and depression than in healthy children (13). In our study, in line with previous studies, depression and RCADS-P total scores were found to be significantly higher in patients with primary immunodeficiency. It has been reported that the mental health of children is negatively affected by fear of infection, isolation and quarantine periods, being away from school, not being

able to contact their peers, and financial losses of their parents (8). Higher depression scores in patients with primary immunodeficiency in our study may be related to the fear of getting COVID-19 disease and isolation processes.

In the study of Bhatia et al. the frequency of depression symptoms in any period of childhood and adolescence was reported to be 15% (21). Depressive disorders were more common after puberty (22). We also found a positive correlation between the age of the children, the number of years of education and their depression scores in our study. This may result of a better perception to understand what is happening around them due to increase in their mental capacity with age. Environmental factors such as school-related problems, difficulties in relationships with peers, learning difficulties, decreased sleep quality, tendency to unhealthy diet, increased screen time may also be risk factors for increased frequency of depression during adolescence (23). It has been reported that children with long-term health problems have a higher risk for depression (24). Because primary immunodeficiencies are mostly chronic disease, older children with the disease and related processes for a longer time, show depressive symptoms more frequently.

Wang et al reported that people used the internet as the first source of access to information in the COVID-19 pandemic, with a frequency of 93% (25). Kelly reports that misinformation circulating in social media leads

to free floating anxiety(17). According to Roy et al., information about pandemic circulating in social media is spreading faster than the disease (18). In the review by Dubey et al., it was reported that the COVID-19 pandemic and related preventive measures lead to mental health problems such as anxiety, depression, paranoia and obsessive behaviors in children and this situation has an "infodemic" spread with social media platforms (26). In our study, a positive correlation was found between the number of and ways to access news' sources and anxiety and total scores, in accordance with the literature. Wang et al. reported that following up-to-date information about the pandemic reduces anxiety symptoms (25). However, as the media resources used for tracking pandemic news increase, the possibility of inappropriate use of the media may arise. It has been reported that news sources that are used without filtering media literacy can increase anxiety disorders (6). The finding of a positive correlation between the number of ways to access news' sources and anxiety scores in our study, may be related to the follow-up of the news sources in a way that does not comply with the media literacy rules.

In our study, a negative correlation was found between the number of siblings and obsessive-compulsive disorder scores in children with primary immunodeficiency. To the best of our knowledge, there is no study in the literature investigating the relationship between the number of siblings of children with primary immune deficiency and mental health problems. Children with primary immunodeficiency may need to spend less time together with their peers and participate less in socializing activities, in order to be protected from infectious diseases. Similar reasons can lead to spend more time together with family members and especially with siblings. Since a higher number of siblings will bring more opportunities for socialization, it may be associated with less mental problems such as obsessive-compulsive disorder. Randomized controlled studies including more patients and controls are required to confirm this result on this subject.

This study has several limitations. The first limitation is the limited number of the study sample. Secondly, a structured psychiatric diagnosis interview was not conducted with the participants to screen psychiatric symptoms. The last limitation is that psychiatric symptoms were screened with scales filled only by parents.

## CONCLUSION

COVID-19 pandemic has more negative effect on primary immunodeficient patients compared to public. Increased anxiety and depression scores in the patient group may decrease their life quality and lead to more limitation in their socializing activities which already present in

such patients. Negative effects of the pandemic can be eliminated by mental rehabilitation processes in the post-pandemic period.

**Abbreviations:** COVID-19: The novel Coronavirus disease, GAD: Generalized anxiety disorder, OCD: Obsessive compulsive disorder, PD: Panic disorder, SAD: Separation anxiety disorder, SoPH: Social phobia

## ETHICAL DECLARATIONS

**Ethics Committee Approval:** This study was approved by the ethics committee of Necmettin University (Decision number:2020/2531).

**Informed Consent:** All patients signed the free and informed consent form.

**Referee Evaluation Process:** Externally peer-reviewed.

**Conflict of Interest Statement:** The authors have no conflicts of interest to declare.

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