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Effects of the COVID-19 Pandemic on Anxiety and Depressive Symptoms in School-Age Children

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Abstract

Objective: The 2019 coronavirus disease epidemic that started in China has developed into a global health threat, and great efforts are being made to stop the spread of this pandemic worldwide. In the present study, we inquired into the association between the global epidemic and depression and anxiety in school-age children.

Methods: In this study, school-age children were assessed via an online survey in terms of depression and anxiety symptoms and several aspects relating to the COVID-19 pandemic. The depression level was assessed with The Child Depression Inventory. The anxiety levels were evaluated with the Childhood Anxiety Sensitivity Index and the State-Trait Anxiety Inventory for Children.

Results: A critical result of our study is the percentage of children and adolescents who acquired scores above 19 on the Child Depression Inventory. This cut-off point is considered significant, as it reflects a pathological level of depression. Of the sample population, 316 (41.79%) had Child Depression Inventory scores that exceeded this value. These data point to the fact that school-age children are affected approximately 15 times more severely than normal by the COVID-19 pandemic. The regression analysis showed significant effects of anxiety, age, and knowledge of COVID-19 on the Child Depression Inventory scores.

Conclusion: The present study demonstrated the effects of the COVID-19 pandemic on the depression and anxiety levels in school-age children. Our results predict that there is an urgent need for psychosocial support for school-age children. Moreover, there will be a considerable increase in the incidence of psychiatric disorders among school-age children if the psychological aspects of the pandemic are ignored.

Keywords: COVID-19, pandemic, childhood, adolescent, depression, anxiety

COVID-19 Pandemisinin Okul Çağı Çocuklarında Anksiyete ve Depresif Belirtiler Üzerindeki Etkileri

Öz

Amaç: Çin'de 2019 yılında başlayan koronavirus hastalığı salgını, küresel sağlığa yönelik bir tehdit haline geldi. Bu salgını tüm dünyada durdurmak için büyük çabalar mevcuttur. Bu çalışmada, okul çağındaki çocuklarda küresel salgın ile depresyon ve anksiyete arasındaki ilişkiyi araştırdık.

Yöntemler: Bu çalışmada, okul çağındaki çocukların depresyon ve anksiyete belirtileri ile COVID-19 pandemisinin çeşitli yönleri açısından ilişkileri çevrimiçi anket aracılığıyla değerlendirildi. Depresyon düzeyi Çocuk Depresyon Envanteri ile değerlendirildi. Kaygı düzeyleri Çocukluk Çağı Anksiyete Duyarlılık İndeksi ve Çocuklar İçin Durumluk-Sürekli Kaygı Envanteri ile değerlendirildi.

Bulgular: Çalışmamızın kritik bir sonucu, Çocuk Depresyon Envanteri'nde 19'un üzerinde puan alan çocuk ve ergenlerin yüzdesidir. Bu kesme noktasının dikkate alınması, patolojik bir depresyon düzeyini yansıttığı için önemlidir. Örneklemin 316'sının (% 41.79) CDI puanında depresyon eşiğini geçtiği bulunmuştur. Bu veriler, okul çağındaki çocukların COVID-19 pandemisinden normal orandan yaklaşık 15 kat daha fazla etkilendiğine işaret etmektedir. Regresyon analizi, anksiyete puanları, yaş ve COVID-19 bilgisinin Çocuk Depresyon Envanteri puanları üzerindeki önemli etkilerini göstermiştir.

Sonuç: Bu çalışma, COVID-19 salgınının okul çağındaki çocukların depresyon ve anksiyete düzeyleri üzerindeki etkilerini göstermiştir. Sonuçlarımız, okul çağındaki çocukların psikososyal desteğe acil bir ihtiyaç olduğunu öngörmektedir. Ayrıca, pandeminin psikolojik yönleri göz ardı edilirse okul çağındaki çocuklarda psikiyatrik bozuklukların görülme sıklığında önemli bir artış olacaktır.

Anahtar Kelimeler: COVID-19, pandemi, çocukluk, ergen, depresyon, anksiyete

The 2019 coronavirus disease (COVID-19) epidemic that started in China has developed into a threat against global health,[1] with the number of infected patients and associated deaths exceeding those stemming from severe acute respiratory syndrome within a few weeks of the outbreak.[2] Onset occurred in late December 2019 in patients who presented with pneumonia of cryptic etiology in Wuhan City, Hubei Province,[2,3] and the outbreak spread to all 34 regions of China by January 30, 2020. These developments

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prompted the World Health Organization (WHO) to declare the COVID-19 outbreak a public health emergency of international concern.[3] The organization eventually proclaimed the outbreak a global pandemic on March 11, 2020.[4]

COVID-19 is a beta coronavirus that spreads among humans through close physical interaction.[5] Research suggests that every case of COVID-19 will result in an average of 4 new infections.[6] The disease has no pathognomonic symptoms, but infected patients may present with chills, cough, coryza, sore throat, breathing difficulties, myalgia, nausea, vomiting, and diarrhea. Elderly men with medical comorbidities are considered at risk for mortality.[7] The provisional case fatality rate identified by the WHO is approximately 2%, but some researchers have estimated the value to range from 0.3% to 0.6%.[8]

The first case of COVID-19 in Turkey was detected on March 11, 2020, and the first death was reported on March 17, 2020. By March 26, 2020, the total number of COVID-19 cases increased to 3629, and the total number of deaths rose to 7.[9] After the first case was detected in Turkey, radical interventions were implemented by the government to prevent the spread of the disease. These preventive measures included canceling classes in schools and universities and switching to distance education, and closing cafes, shopping centers, children's play areas, and other public places where people may infect one another. The government, along with non-governmental organizations, advised citizens to stay home-a recommendation followed by many people, who isolated themselves and thus eliminated escalation into a "desperate plea."[10] The ongoing epidemic has caused extreme fear, underscoring the increasing need for psychiatric support.[11] The problem is that limited data have been derived regarding the psychological effects of outbreaks. A few studies in this respect were directed to the influenza outbreak, which caused anxiety among 10-30% of the general public about the potential for contracting an infection.[12] The current research and clinical routines focus on the treatment and prevention of COVID-19 given its mortality rate, and only 2 studies have investigated its psychological effects on the general population[13] and health workers.[14]

Meanwhile, current observations indicate a very low risk of coronavirus infection among children,[15] but this does not mean that this population will not be affected by any other aspects of the COVID-19 pandemic, which has driven the imposition of restrictions and bred fear. As with the deficiency described above, research on the psychological effects of the pandemic on children is lacking. To fill this void, we inquired into the association between the global epidemic and depression and anxiety in school-age children.

Material and Methods

Participants

We designed an anonymous survey intended to evaluate child depression and anxiety. A link to the online questionnaire (Survey Monkey) was initially sent to university students and medical staff, who were asked to pass on this information to other individuals. The link, which was sent to people's mobile phones, included a request for recipients to participate if they had children. They were also asked to assist and watch over their children as the survey was completed. The inclusion criteria were as follows: a willingness among parents and their children to participate in the survey, children aged 9-16 years old, and sufficient education to understand the study protocol and scales used in the survey. The exclusion criteria were incomplete surveys, a history of psychiatric disorders, or presence of a chronic disease such as diabetes mellitus, epilepsy, etc. The study was approved by the Research Ethics Committee of the Non-Invasive Clinic at Tekirdağ Namık Kemal University (Approval Number: 2020.76.03.26). A total of 858 respondents returned their questionnaires, but 102 were excluded because of missing data on their survey forms or because they had indicated psychiatric illness. This left us with a final sample of 756 children.

Preliminary data on the participants

The participants were asked to indicate their age, gender, grade or year level, and type of school attended. Three additional questions were also presented to them:

1. Please identify the level of knowledge that you have on the COVID-19 pandemic using the following scale (0: "I have no idea," 10: "My knowledge is perfect"):
   () 0 () 1 () 2 () 3 () 4 () 5 () 6 () 7 () 8 () 9 () 10
2. Do you think that the COVID-19 pandemic has affected your psychological health (0: "No," 10: "Absolutely")?
   () 0 () 1 () 2 () 3 () 4 () 5 () 6 () 7 () 8 () 9 () 10
3. Do you think that the social isolation due to the pandemic has affected your psychological well-being (0: "No," 10: "Absolutely")?
   () 0 () 1 () 2 () 3 () 4 () 5 () 6 () 7 () 8 () 9 () 10

Additional Instruments

Childhood anxiety sensitivity index (CASI)

The CASI is a self-report inventory consisting of 18 items scored on a 3-point Likert scale ranging from 1 ("not at all") to 3 ("very much"). Children are asked to score each item, which explains how the experience of

anxiety poses negative consequences. The scores that can be obtained on this index range from 18 to 54.[16] Its test–retest reliability values are 0.79 and 0.76 in clinical and non-clinical samples, respectively.[17]

Children's depression inventory (CDI)

The CDI is a 27-item self-assessment instrument used for depression screening in children aged 7-17 years. Each question comes with 3 response options, among which a child selects the answer that best reflects his or her ideas and feelings over the past 2 weeks. Each item receives a score from 0 to 2 points, for a highest possible total score of 54. A score of 19 or above is considered indicative of clinical depression.[18] The CASI has been demonstrated to be valid and reliable in the Turkish context.[19]

State-Trait Anxiety Inventory for Children (STAI-CH)

The STAI-CH, which was developed by Spielberger and his coworkers, is a self-report scale consisting of 2 sub-scales that measure state and trait anxiety (STAIS and STAIT, respectively, in this work),[20] for which scores from 20 to 60 can be derived. High scores indicate considerable levels of state or trait anxiety. The validity and reliability of the scale for Turkish children were examined by Özusta.[21]

Statistical analysis

The central tendencies and distributions of the variables were determined on the basis of descriptive statistics. In accordance with the cut-off points of the CDI, another variable was defined and used as a reference in forming 2 groups. The first consisted of participants with CDI scores of 19 or lower, whereas the second group comprised participants with CDI scores greater than 19. To compare mean values, the normality assumption of parametric tests was verified by applying the Shapiro–Wilk test to the CDI groups. When the assumption was satisfied, the independent-samples *t*-test was conducted twice to compare the groups. On the grounds of the normality assumption for correlation analyses, Pearson's coefficient of correlation was used, and stepwise multiple regression was carried out to determine the dependent variables that potentially affect independent variables. Such regression was also adopted to eliminate non-significant dependent variables. The following regression assumptions were validated: the dependent and independent variables have a linear relationship; the mean of residuals is 0; residuals are normally distributed, are homoscedastic, or display equal variance; and no multicollinearity or autocorrelation of residuals occur. *P*-values of 0.01 and 0.05 were regarded as significant. The statistical analyses were performed using R (Version 3.5.3) and the Statistical Package for the Social Sciences (Version 23.0).

Results

Descriptive data and comparisons of groups

The descriptive data are presented in Table 1. The homogeneity of variance was ascertained via Levene's test, which indicated that the assumption was satisfied. Of the sample population, 316 (41.79%) had CDI scores that exceeded 19. The comparison of the 2 groups (CDI scores equal to or lower than 19, CDI scores greater than 19) indicated statistically significant differences relating to gender, knowledge of COVID-19, experience of psychological effects, experience of the effects of social isolation, and STAIS scores. The group with CDI scores above 19 had greater knowledge of COVID-19 (7.700 ± 1.554), and the psychological welfare of this group was more strongly affected by the disease (5.840 ± 2.708). The group also experienced stronger social isolation effects on psychological health (5.510 ± 3.088) and registered higher STAIS scores (39.832 ± 5.892). The comparison results are listed in Table 2.

Correlation analysis

The correlation of the CASI, STAIS, STAIT, and CDI scores regarding knowledge of COVID-19, the disease's effects on psychological health, and the effects of social isolation on such well-being is depicted in Figure 1. Overall, the effects of social isolation and COVID-19 on psychological welfare, the effects of social isolation as determined via the CDI, the effects of COVID-19 on psychology as ascertained via the CASI alone, and the psychological ramifications of the disease as identified by a combination of the CDI, CASI-STAIT, and the STAIS-CDI were significantly correlated ($P < .05$). These correlations were positive, as reflected by values falling between 0.522 and 0.076. Knowledge of the disease as determined through the CDI, STAIS, and STAIS-STAIT also reflected significant correlations ($P < .05$), but these were of a negative direction.

In the group with CDI scores equal to or lower than 19 (Figure 1a), knowledge of COVID-19 as identified through the CASI, CDI, and STAIS; the psychological effects of social isolation and COVID-19; the psychological effects of social isolation as ascertained via the CDI; and the effects of COVID-19 on psychology as indicated by the CASI, CASI-CDI, CASI-STAIT, and the STAIT-CDI scores were significantly correlated ($P < .05$) in a positive direction ($P = .590$-$.096$). In the group with CDI scores greater than 19 (Figure 1b), the effects of social isolation and the effects

Table 1. Descriptive Statistics

***n* = 756**	***n* (%)**	$\bar{x}$	***s***	**Median**	**IQR**
Gender					
Male	386 (51.1)			1.00	1.0-2.0
Female	370 (48.9)				
Age		11.90	2.48	12.0	9.0-14.0
Education year		5.40	2.52	5.0	3.0-8.0
Knowledge of COVID-19		7.44	1.86	7.0	7.0-9.0
The effect of COVID-19 on psychology		5.47	2.88	6.0	3.0-8.0
The effect of social isolation		5.19	3.11	5.0	3.0-8.0
CASI		33.15	5.64	32.0	30.0-37.0
CDI		21.17	3.31	19.0	19.0-24.0
STAIS		33.43	4.35	33.0	29.0-37.00
STAIT		38.90	6.79	40.0	34.0-43.0

Abbreviations: IQR, interquartile range; CASI, Childhood Anxiety Sensitivity Index; CDI, Children's Depression Inventory; STAIS, State-Trait Anxiety Inventory (State), STAIT, State-Trait Anxiety Inventory (Trait).

Table 2. Comparison of CDI Groups (Cut-off Point of CDI) According to the Variables

		CDI Groups		
		Cut-off point ≤19 (*n* = 440)	**Cut-off point >19 (*n* = 316)**	***P***
Age	$\bar{x} \pm s$	11.80 ± 2.60	12.04 ± 2.28	.181[a]
Gender	n_{Male} (%)	44 (5.8)	396(52.4)	<.001**,[b]
	n_{Female} (%)	142 (18.8)	174 (23.0)	
Education year	$\bar{x} \pm s$	5.30 ± 2.64	5.53 ± 2.32	.209[a]
Knowledge of COVID-19	$\bar{x} \pm s$	7.07 ± 2.15	7.70 ± 1.55	<.001**,[a]
The effect of COVID-19 on psychology	$\bar{x} \pm s$	5.20 ± 2.96	5.84 ± 2.70	.002**,[a]
The effect of social isolation	$\bar{x} \pm s$	4.95 ± 3.10	5.51 ± 3.088	.015*,[a]
CASI	$\bar{x} \pm s$	32.90 ± 4.44	33.50 ± 6.97	.149[a]
STAIS	$\bar{x} \pm s$	38.23 ± 7.29	39.83 ± 5.89	.001**[a]
STAIT	$\bar{x} \pm s$	33.40 ± 4.29	33.47 ± 4.42	.816[a]

$P^* < .05$, $P^{**} < .01$; [a]Independent samples *t*-test, [b]Fisher's exact test.
Abbreviations: CASI, Childhood Anxiety Sensitivity Index; CDI, Children's Depression Inventory; STAIS, State-Trait Anxiety Inventory (State); STAIT, State-Trait Anxiety Inventory (Trait).

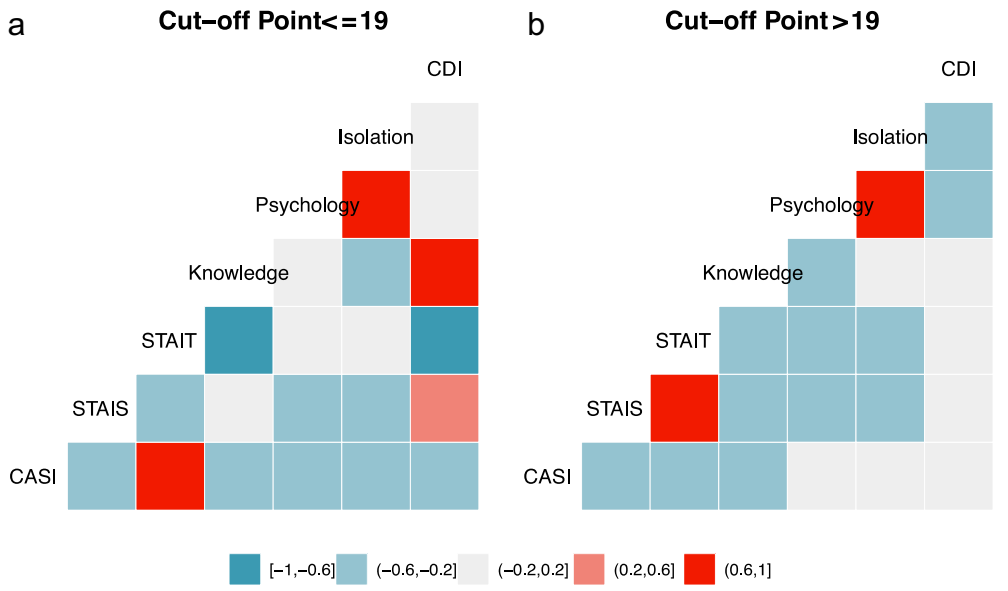

Figure 1. a, b. The correlation matrix map according to cut-off point of CDI.
Abbreviations: CASI, Childhood Anxiety Sensitivity Index; CDI, Children's Depression Inventory; STAIS, State-Trait Anxiety Inventory (State); STAIT, State-Trait Anxiety Inventory (Trait)

of COVID-19 on psychology and the effects of social isolation as determined using the STAIS exhibited a significant correlation ($P < .05$), and this association was also positive ($P = .407$-$.209$) (Figure 1).

Regression Analysis

The stepwise multiple regression analysis involved calculations based on the CDI scores in Table 3, which indicate that model 1 explained approximately 1.6% of the changes in the STAIS scores. These scores were significant at the 5% level in this model. Model 2 explained approximately 3.2% of the changes in STAIS scores and knowledge of COVID-19. These scores were also significant at the 5% level in model 2.

Age, STAIS scores, and knowledge of COVID-19 exerted a statistically significant effect on the CDI scores. Model 3 accounted for approximately 6.8% of the changes in the aforementioned variables. Model 5 was significant at the 5% level. The CASI scores, age, STAIS scores, and knowledge of COVID-19 had a statistically significant effect on the CDI scores. The regression models are presented in Table 3.

Discussion

Humanity is battling against the primary and most powerful threat of the 21st century that is the COVID-19 pandemic. People all over the world are focused on the global outbreak, and almost every country is affected by all the aspects of this occurrence. Correspondingly, substantial research has been devoted to the treatment and prevention of the disease and the mortality risk presented by the coronavirus infection. Turkey, as well as most nations around the world, have imposed severe restrictions to curtail the spread of the outbreak. These restrictions are mandatory if countries are to prevent further proliferation, but they have also brought forth a serious crisis in terms of impairment in the homeostasis of life.[22]

A critical result of our study is the percentage of children and adolescents who acquired scores above 19 on the CDI. Considering this cut-off point is important as it reflects a pathological level of depression.[18] Of the sample, 316 (41.79%) had CDI scores that exceeded 19. A meta-analysis of studies that investigated the prevalence of psychiatric disorders among children and adolescents uncovered that worldwide (27 countries), anxiety prevails at a rate of 6.5% (95% CI: 4.7-9.1), and depressive disorder has a prevalence rate of 2.6% (95% CI: 1.7-3.9).[23] Wang et al.[13] stated that 16.5% of respondents sampled from a general population suffering from the COVID-19 epidemic in China reported experiencing moderate to severe depressive symptoms. These data point to the fact that school-age children are affected approximately 15 times more severely than normal prevalence by the COVID-19 pandemic. Wang et al.[13] added that these children exhibit a depressive status that is almost twice as severe as the levels suffered by the normal population amid the global epidemic.

We compared the 2 participant groups in terms of anxiety levels, knowledge of the COVID-19 pandemic, and the effects of the pandemic and social isolation on psychological health. These variables were

Table 3. The Results of Multiple Regression (Stepwise)

Model		*B*	SE	*t*	*P*
1	Constant	18.74	.69	26.91	<.001**
	STAIS	.06	.01	3.53	<.001**
	R^2		.016		
	F		12.45		
	P		<.001**		
2	Constant	20.33	.82	24.71	<.001**
	STAIS	.06	.01	3.71	<.001**
	Knowledge of COVID-19	-227	.06	3.55	<.001**
	R^2		.032		
	F		12.62		
	P		<.001**		
3	Constant	18.54	.90	20.42	<.001**
	STAIS	.06	.01	3.61	<.001**
	Knowledge of COVID-19	.33	.06	4.90	<.001**
	Age	.22	.05	4.39	<.001**
	R^2		.05		
	F		15.07		
	P		<.001**		
4	Constant	17.96	.92	19.41	<.001**
	STAIS	.06	.01	3.50	<.001**
	Knowledge of COVID-19	.33	.06	4.92	<.001**
	Age	.22	.05	4.43	<.001**
	The effect of COVID-19 on psychology	.12	.04	2.95	.003**
	R^2		.06		
	F		13.60		
	P		<.001**		
5	Constant	16.50	1.18	13.98	<.001**
	STAIS	.05	.01	3.36	.001**
	Knowledge of COVID-19	.33	.06	5.02	<.001**
	Age	.24	.05	4.74	<.001**
	The effect of COVID-19 on psychology	.11	.04	2.80	.005**
	CASI	.04	.02	1.97	.049*
	R^2		.07		
	F		11.704		
	P		<.001**		

*$P < .05$, **$P < .01$.
Abbreviations: STAIS, State-Trait Anxiety Inventory (State).

significantly higher in the depressive group than in the non-depressive ones, as denoted by the CDI scores. In particular, the comparison revealed a stronger awareness of the seriousness of the COVID-19 pandemic as the most important result. These levels and effects are expected. Moreover, the regression analysis showed significant effects of the CASI scores, age, STAIS scores, and knowledge of COVID-19 on the CDI scores.

Depression and anxiety in children adversely affect their development[24,25] and quality of life,[26] as these

diminish their academic performance and social functioning.[27] Even at low thresholds, depression and anxiety symptoms are associated with an increased risk for the occurrence of psychiatric disorders in later life. Adverse events and experiences in childhood might develop into several mental health problems during adulthood.[28] Given that depressive symptoms were 15 times more severe among the school-age children in this work, urgent priority should be given to providing psychiatric support to this population. No one can predict the exact outcomes of the pandemic, therefore such assistance should be extended to school-age children as soon as possible. Otherwise, the COVID-19 global outbreak will be exacerbated by a considerable incidence of psychiatric disorders in these children. Previous data reported the prevalence of anxiety and depressive symptoms as 19 and 23%, respectively, for primary school children,[29] 37 and 44%, respectively, for high school children,[30] and clinically elevated depressive symptoms scores for more than 22% of children and adolescents during the COVID-19 lockdown.[31]

The present study has several limitations. First, this study is based on an online survey and we could not assess participants face to face. However, this limitation is related to the outbreak situation. Thus, we defined participants based on the score on the CDI instead of labeling them as "with and without depressive disorder." Second, self-reported scales for anxiety, depression, and stress may not diagnose school-age children. There is no specific scale for COVID-19. Therefore, we created simple questions to evaluate the knowledge and effects of psychological status of the COVID-19 pandemic; which can be regarded as subjective. Third, it was not possible to assess the mental status of the parents.

The present study demonstrates the effects of the COVID-19 pandemic on depression and anxiety levels among school-age children. Moreover, there will be a considerable increase in the incidence of psychiatric disorders among school-age children if the psychological aspects of the pandemic are ignored. It can be also concluded that the effects of the COVID-19 pandemic on the psychological status on children can also lead to mental problems in future. There should be several plans to protect children from possible psychiatric problems in the future. Our results predict that there is an urgent need for psychosocial support of school-age children.

Ethics Committee Approval: The study was approved by the Research Ethics Committee of the Non-Invasive Clinic at Tekirdağ Namık Kemal University (Approval Number: 2020.76.03.26).

Informed Consent: Written informed consent was obtained from the participants of this study.

Peer Review: Externally peer-reviewed.

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