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Children with ADHD were affected in terms of mental health and quality of life during the COVID-19 pandemic

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ABSTRACT

Aim: COVID-19 pandemic has had negative effects on the lives of many children and adolescents with psychiatric disorders. This research aims to investigate the effects on the mental status and quality of life of children with ADHD during the COVID-19 pandemic.

Material and Method: This study was conducted at the child and adolescent psychiatric outpatient clinic of a university hospital, between April and May 2020. The research group consisted of 113 children and adolescents with ADHD, and the control group consisted of 45 children and adolescents. The depression and anxiety symptoms of the children were assessed using the Child Depression Inventory (CDI) and the Screen for Child Anxiety-Related Emotional Disorders (SCARED), respectively. Child-reported and parent-reported Pediatric Quality of Life Inventories (PedsQL) were used to evaluate the health-related quality of life of the children.

Result: Depressive symptoms and anxiety levels were found to be statistically higher in the ADHD group. According to PedsQL-P scale, psychosocial and scale total scores were statistically significantly lower. According to the regression analysis, the SCARED scores predicted negative physical, psychosocial, and total scores of the PEDsQL-C scale. The CDI scores, however, predicted negative physical, psychosocial, and total scores of the PEDsQL-P scale.

Conclusion: This study revealed that in the COVID-19 pandemic, children with ADHD are more affected in terms of depression, anxiety and quality of life than children without any psychiatric disease. The study findings suggest that further studies are needed to better understand the psychological conditions and difficulties that children with ADHD experience during the COVID-19 pandemic.

Keywords: Attention-deficit/hyperactivity disorder, children, COVID-19, depression, anxiety, life of quality

INTRODUCTION

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder characterized by problems with attention deficit, mobility, impulsiveness and executive functions, starting in childhood (1,2). Around the world, 5-12% of children are known to be affected by ADHD (3). Due to this high prevalence, ADHD is also defined as a public health problem (4,5).

The COVID-19 pandemic directly causes widespread anxiety, fear, and panic in all age groups and segments of society (6-9). Children and young people, and individuals with chronic physical and psychiatric illnesses are especially vulnerable in this regard (10). The inability of children and young people to attend school, being subjected to physical restrictions, and the negative effects of the quarantine process on both children and their parents leads to significant negative mental effects experienced by families. (8,11-14).

In a recent study, Fonseca et al. (15) found that patients with schizophrenia were at serious risk both physically and psychologically during this pandemic. Research conducted by Hao et al. (16) with patients who received treatment for psychiatric diagnoses revealed that the pandemic worsened their psychiatric symptoms.

It is known that carelessness, mobility, and executive dysfunction in individuals with ADHD are directly linked to individuals' quality of life and daily functionality (17,18). However, mood disorders, such as depression and anxiety, are known to have negative effects on irritability, emotional liability, and core symptoms of ADHD in individuals with ADHD (19,20). Moreover, daily functionality and quality of life have negative effects on the relationship between ADHD and mood symptoms (21). Therefore, the effects of physical and social restrictions on children's mental health during the COVID-19 pandemic and

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the management strategies for the resulting problems are of importance in a disease such as ADHD, where social communication and mobility are at the forefront (22). A study investigating the stress levels, behavioral symptoms, and mood levels of school-age children with ADHD during the pandemic has shown that negative mood levels are associated with ADHD symptoms and that parents' mood affects the child's ADHD symptoms (23). In a literature review, there was no other research investigating the psychological effects of the pandemic process on individuals with ADHD.

It is of great importance to respond to the psychological effects of the COVID-19 pandemic, in a timely manner, in every age group and every disease group (24). When planning these interventions, it is necessary to determine the effects of the pandemic in individuals receiving psychiatric treatment. This research aims to investigate the effects of the COVID-19 pandemic on the psychological state and quality of life of children with ADHD.

MATERIAL AND METHOD

The study was carried out with the permission of Necmettin Erbakan University Meram Faculty of Medicine Non-Pharmaceutical and Medical Device Researches Ethics Committee (Date: 08.05.2020, Decision No: 2020/2482). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Participants

The study group consisted of patients with ADHD in aged 7-17 years and their parents. A total of 113 children and adolescents with ADHD and 45 healthy controls were included in this study. The patients were diagnosed in the pediatric and adolescent psychiatric outpatient clinic of a university hospital, according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria and were followed up and treated for at least 6 months. Inclusion criteria for the study group were to be under follow-up and medication with the diagnosis of ADHD, and to be between the ages of 7-17. The exclusion criteria included the presence of major physical, endocrine or neurologic disorders, autism spectrum disorder, psychotic disorder, bipolar disorder, substance use disorder, severe head injury, intellectual disabilities and comorbid psychiatric disorders. The control group comprised healthy, volunteer children and adolescents aged 7-17 years and their parents. Children with normal cognitive and social development were included in the control group of the study. The same exclusion criteria were also applied to the control group. Those who previously received a psychiatric diagnosis and treatment were not included in the control group.

This study was conducted between May – June 2020. Children and adolescents followed up with the diagnosis of ADHD were re-evaluated between these dates. Written and oral consents were obtained from the participants and the parents after the researchers explained the purpose and course of the research.

Procedure

In order to determine the depression and anxiety levels of the participants who received ADHD treatment, who had no comorbid psychiatric disorders, and were diagnosed as having ADHD according to the Schedule for Affective Disorders and Schizophrenia for School-Aged Children, Present and Lifetime Version (K-SADS-PL) in our clinic, they were asked to complete the Children's Depression Inventory (CDI), and the Screen for Child Anxiety-Related Disorders (SCARED). Then, both children and adolescents and their parents were asked to complete the Pediatric Quality of Life Inventory.

Schedule for Affective Disorders and Schizophrenia for School-aged Children–Present and Lifetime Version

The K-SADS-PL is a semi-structured interview method that was developed by Kaufman et al. (25) to identify psychiatric disorders that children and adolescents experience in the past and present. The K-SADS-PL is implemented by interviewing the child and the parent face-to-face, and as a result, data are collected from various sources (parents, children, and schools), evaluated, and finalized. If there is a discrepancy in the data from different sources, the physician uses their clinical opinion to solve the problem. The validity and reliability study of the Turkish version of this interview form was conducted by Gökler et al. (26). The DSM-5 adaptation study of the K-SADS-PL for Turkey was performed by Ünal et al. (27).

Children's Depression Inventory (CDI)

This scale, developed by Kovacs, is used to measure the level of depression in children. It is a self-assessment scale and can be applied to children and adolescents aged 6-17 years (28). The scale consists of a total of 27 items. Each item contains three sentences in which the child evaluates their last two weeks and chooses the most appropriate statement. The answers given are scored between 0 and 2 points. The depression score is obtained by summing up these scores. The highest score possible on the scale is 54. An increased total score indicates an increased severity of depression. The cut-off score of the scale for a diagnosis of depression is 19 points. Its Turkish adaptation was conducted by Öy (29).

Screen for Child Anxiety Related Disorders (SCARED)

SCARED is used to measure anxiety levels in the children and adolescents. It was developed by Birmaher

(30). Each item in the 41-item scale is rated 0, 1 or 2 according to the severity of the symptoms. The higher the total score, the more severe the level of anxiety. The validity and reliability study for the Turkish population was conducted by Karaceylan(31).

Pediatric Quality of Life Inventory (PedsQL)

PedsQL is an overall quality of life scale that assesses the physical and psychosocial experiences of children in the 8-18 years' age group. There are two separate forms of the scale that assess 8-12-year-olds and 13-18-year-olds. Scoring is performed in three areas on the scale. The first is the scale total score, the second is the physical health total score, and the third is the psychosocial health total score, which assesses social and school functionality. On this scale of 23 items, each item is scored in the range of 0-100. The score taken is 100 if all the responses are 'never', 75 if all are 'rarely', 50 if all are 'sometimes', 25 if all are 'frequently', and 0 if all are marked as 'almost always'. The Turkish validity and reliability study of both parts was conducted by Memik et al (32,33).

Data Evaluation and Statistical Analysis

Statistical analysis of the data was performed using the Statistical Package for the Social Sciences (SPSS) version 23.0. Skewness and Kurtosis statistics were used to evaluate the normality of distribution of the data. Student's t-test was used to evaluate quantitative data. The Chi-square ($\chi 2$) test or Fisher's exact Chi-square test was used for intergroup comparisons of quantitative data. Pearson's and Spearman correlation tests were used to investigate the relationship between two measured values in the groups. $P<0.05$ was accepted as the level of statistical significance in all analyses. The effects of different variables on the occurrence of quality of life variables in the patients with ADHD in univariate analysis were analyzed, and the variables for which the unadjusted p-value was <0.10 in logistic regression analysis were identified as potential risk markers and included in the full model. We reduced the model by using backward conditional elimination multivariate logistic regression analyses and eliminated potential risk markers by using likelihood ratio tests.

RESULTS

The study included 113 children and adolescents with ADHD, and 45 children and adolescents in the control group. There was no significant difference between the patients and the control group in terms of age, sex, and maternal and paternal education levels. The demographic characteristics of the study population are presented in **Table 1**.

Table 1. Demographic and clinical characteristic of patients and healthy controls

	Patient (n=113)	Control (n=45)	t or x^2	p
Age (year)	11.89 (3.38)	12.27 (3.64)	-.611	0.54
Sex, male/ female	59/54	19/26	1.285	0.25
Education (year)				
Mother	10.44 (3.39)	9.61 (3.01)	1.222	0.22
Father	12.56 (2.69)	11.81 (2.32)	1.398	0.16

Depressive symptoms and anxiety levels were found to be statistically higher in the ADHD group (**Table 2**). There was no statistically significant difference between the groups in terms of total and sub-scale PedsQL-C scores (**Table 2**). According to the PedsQL-P scale, psychosocial and scale total scores were statistically significantly lower. However, there was no statistically significant difference in terms of physical levels. In addition, the quality of life and psychological variables of the children and adolescents in the ADHD group were also compared with each other. According to this, the depressive symptom level of adolescents (16.06±8.17) was statistically higher than that of children (11.75±6.96) (z= -2.99, p=0.003). In terms of the levels of anxiety and quality of life, there was no statistically significant difference between the children and adolescents in the ADHD group.

Table 2. Quality of life and levels of psychological variables in ADHD and Control group

	Patient (n=113)	Control (n=45)	t or z	p
CDI	13.73 (7.8)	8.18 (5.23)	-4.25[b]	<0.001
SCARED	31.79 (15.74)	25.48 (11.92)	2.72[a]	0.007
PedsQL-C				
Physical	81.94 (12.24)	81.38 (13.30)	-0.21[b]	0.82
Psychosocial	79.57 (9.72)	82.59 (9.45)	-1.77[a]	0.07
Total	80.39 (8.93)	82.17 (9.09)	-0.95[b]	0.34
PedsQL-P				
Physical	71.14 (19.13)	78.19 (14.26)	-1.83[b]	0.06
Psychosocial	61.95 (19.21)	82.81 (11.55)	-8.03[a]	0.016
Total	65.27 (16.43)	81.20 (10.76)	-5.94[a]	<0.001

PedsQL-C, Pediatric quality of life inventory child version; PedsQL-P, Pediatric quality oflife inventory parent version; CDI, Child depression inventory; SCARED, Screen for child anxiety-related emotional disorders. [a] Student'st-test. [b] Mann–Whitney test.

The correlation between PedsQL scores and psychological variables of children with ADHD was also evaluated. A negative correlation was found between the total and sub-scale scores of both PedsQL-C and PedsQL-P scales and the CDI and SCARED scores (**Table 3**).

Table 3. Correlation between PEDsQL and psychological variables in ADHD group

PedsQL-C	CDI		SCARED	
	r	p	r	p
Physical health	-.255**	0.006	-.266**	.004
Psychosocial	-.2630**	0.005	-.354**	<0.001
Total	-.369**	<0.001	-.394**	<0.001
PedsQL-P				
Physical health	-.356**	<0.001	-.246*	0.014
Psychosocial	-.482**	<0.001	-.290**	0.004
Total	-.479**	<0.001	-.302**	0.002

PedsQL-C, Pediatric quality of life inventory child version; PedsQL-P, Pediatric quality oflife inventory parent version; CDI, Child depression inventory; SCARED, Screen for child anxiety-related emotional disorders. *<0.05 **<0.01

The effects of the psychological variables on PEDsQL were evaluated using linear regression analysis. According to the analyses, the SCARED score predicted negative physical, psychosocial, and total scores of the PEDsQL-C scale (β= -0.236, p<0.001, β= -0.198, p=0.008, β= -0.211, p=0.002, respectively). The CDI score, however, predicted negative physical, psychosocial, and total scores of the PEDsQL-P scale (β= -0.672, p=0.033, β= -1.243, p<0.001, β=-1.023, p<0.001, respectively).

DISCUSSION

In this study, depressive symptoms and anxiety levels were higher in the ADHD group than in the control group. According to the parental form of the Quality of Life scale, psychosocial and total health scores were lower in the ADHD group than in the control group. However, the physical health score was low compared with the controls. Similarly, there were no differences between the groups in terms of total and sub-scale scores, according to the pediatric form of the Quality of Life scale. In addition, the distribution of psychiatric factors in the children was assessed to investigate whether they affected the quality of life outcomes. Regression models showed that the anxiety symptoms in the children affected the quality of life reported by the children. Moreover, it was found that depressive symptoms in children affected the quality of life reported by the parents.

The anxiety and fear caused by the pandemic is one of the important negative effects of this situation, in addition to the deadly effects of the COVID-19 pandemic (8). Although these effects have an impact on all segments of society, it is an undeniable fact that children and young people are more vulnerable in this regard (13,34). However, individuals experiencing physical or psychiatric problems, in particular, are more vulnerable in this regard (9). Current psychiatric symptoms may increase during this process and may become difficult to treat. Therefore, it is essential to apply timely and appropriate mental interventions. For appropriate interventions to be implemented, it is of importance to know the effects of the pandemic, especially in selected disease groups. However, data on these populations are highly limited. In diseases such as ADHD, which are known to be more affected by symptoms of anxiety and depression than the normal population, it is important to determine the level of exposure to the pandemic for appropriate interventions (school holiday and curfew). The study of Zhang et al. (23) the only study in the literature that we could find, found that children's negative mood was associated with ADHD symptoms, and the parents' mood also affected the symptoms of ADHD. However, this study did not make a comparison with healthy children, so it is not possible to determine how much the patients with ADHD were affected compared with the normal population. Moreover, the symptoms of anxiety were not fully determined and the quality of life and daily functioning of the children who had severe difficulties during the quarantine processes were not evaluated. Our research provides the first data in the literature in this context; both anxiety and depression symptoms were statistically significantly higher in children and adolescents with ADHD than in the healthy control group. These results show that children and adolescents with ADHD experience more symptoms of depression and anxiety compared with general society during the pandemic.

The COVID-19 pandemic has led to changes in children's daily routines in many countries, such as attending school and spending time with friends. Given the importance of adequate social functionality and healthy peer relationships for the optimal development of children, the COVID-19 pandemic can be stated as affecting children mentally and socially (35). Children with ADHD are reported to have lower quality of life and greater difficulties in their daily lives compared with their peers (36). In this study, parents of children with ADHD reported a worse quality of life in physical and total areas compared with the control group. This may indicate significant difficulty in staying at home in the ADHD group, where mobility and disorganization are prominent. The absence of differences in psychosocial quality of life in children with ADHD may be due to the fact that children are maintaining both academic and peer relationships through the Internet during the COVID-19 pandemic. This is because children with ADHD are reported to have greater difficulties in social skills and have excessive use of the Internet and technology (37). In contrast to their parents, children with ADHD reported no worsening in their quality of life in this study. This may suggest that, given the disorganization, distraction, and difficulty in planning and organization in children with attention-deficiency (17,18), they may have trouble fully interpreting the possible ongoing effects of the COVID-19 pandemic process on their lives. As far as we can assess,

no study in the literature has investigated the quality of life of children with ADHD during the pandemic. However, a recent study that evaluated children with immunodeficiency reported that quality of life was worse in children at risk of depression/anxiety (10).

The present study showed that increased anxiety and depression scores were associated with worsening in the quality of life in children with ADHD and their parents. Moreover, increased depression scores predict a related worsening in children's physical and psychosocial quality of life, according to their parents. Increased anxiety scores, however, were associated with worsening physical and psychosocial quality of life of children with ADHD, according to children's self-reports. Given this information, it can be suggested that the children's quality of life worsens, according to their own views, as their anxiety increases during the pandemic, whereas this process does not lead to a negative manifestation of the children's quality of life, according to their parents. In contrast, increased depressive symptoms in children may make the deterioration in children's quality of life more visible to parents. In line with our findings, a systematic review reported that psychiatric conditions such as anxiety and depression in children with ADHD worsened their quality of life (38).

As far as we know, this study is the first to investigate the quality of life of children with ADHD during the COVID-19 pandemic. Moreover, the study is of importance as being the first study in which the depression and anxiety levels in children are compared with a control group. The most important limitation of this study is that it does not reveal causality because it is a cross-sectional study. In addition, as a limitation, the effects of any psychiatric conditions of the parents on their children were not evaluated in the study.

CONCLUSION

Finally, the findings of this study have important implications. The study findings suggest that further studies are needed to better understand the psychological conditions and difficulties that children with ADHD experience during the COVID-19 pandemic. In addition, the problems in psychological conditions and quality of life seen in the ADHD group will contribute to the planning of preventive interventions for these children.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Necmettin Erbakan University Meram Faculty of Medicine Non-Pharmaceutical and Medical Device Researches Ethics Committee (Date: 08.05.2020, Decision No: 2020/2482).

Informed Consent: Written and oral consents were obtained from the participants and the parents after the researchers explained the purpose and course of the research.

Referee Evaluation Process: Externally peer-reviewed.

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