Anxiety-Depression and Sleep Quality in Students Receiving Online Education at Home During the Covid-19 Pandemic

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Abstract

Aim: In this study, we aimed to analyzed symptoms of anxiety and depression, excessive daytime sleepiness, and sleep habits in students during the Covid-19 pandemic.

Methods: Two hundred children who received online education at home during the COVID-19 pandemic were included in this study. The students were divided into three groups as primary school, middle school, and high school. The students completed questionnaire forms including the Epworth Sleepiness Scale (ESS), Child Sleep Habits Questionnaire (CSHQ), and Childhood Anxiety and Depression Scale (CADS)

Results: The rates of CADS and ESS did not differ according to the groups (p>0.05). The rates of anxiety disorder and daytime sleepiness according to CADS and ESS were mostly in the high school group. According to the CSHQ score, sleep quality disorder was observed with a higher rate in primary school students (p<0.005) The median ESS was found to be lower in those who had adenoidectomy compared to those who did not (p=0.011). The Median CSHQ and ESS scores were higher in the secondary school class with allergies than in those without allergies (p = 0.040). Secondary school students who are exposed to cigarette smoke at home Median CADS and CSHQ scores were higher than those who did not (p = 0.022)

Conclusions: If the children have adenotonsillar disease, performing surgery without delay by following COVID-19 precautions may contribute to increase sleep quality. We must be careful exposure to cigarettes and allergies during the Covid-19 pandemic.

Keywords: *Anxiety, Covıd-19, sleep quality*

1. Introduction

A series of unexplained cases of pneumonia were reported in Wuhan, China in December 2019[1]. The World Health Organization stated that it was caused by the virus named SARS-COV-2 and announced it as a pandemic with the spread of the virus all over the world. Very different epidemic prevention and control strategies developed in different countries. It has been observed that staying in quarantine at home for a long time, being away from the outside world, and developing extreme fear of being infected has caused both physical and mental distress in the general public.

During the coronavirus epidemic, symptoms such as fear of loneliness, panic, anxiety and depression were observed[2]. Significant anger control disorders, sleep disorders, and suicides have been reported[3].

Children are less likely to become infected with COVID-19 and have a lower mortality rate than adults. Therefore, fewer studies have been conducted on the clinical features of COVID-19 in children and its effects on children's mental and emotional health[4]. However, some studies have shown that because the emotional development of children and adolescents is not complete compared with adults, they may experience more stress during the pandemic period and may be more psychologically affected[5]. In children and adolescents, the closure of schools and transition to online education, the obligation to stay in quarantine at home, and lifestyle changes have caused negative changes in mental and emotional health[6]. Anxiety-depression symptoms were observed in children during the pandemic period and sleep problems increased[7]. Various questionnaires such as the Childhood Anxiety and Depression Scale (CADS) are used to evaluate the symptoms of anxiety and depression in childhood, to identify patients at risk, and to provide early diagnosis and treatment[7]. CADS does not diagnose anxiety but can provide information

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about anxiety levels.

Sleep problems are quite common in childhood. The most important symptoms that bring families of children with sleep problems to us as ear, nose, and throat (ENT) physicians include sleeping with mouth open, snoring, and stopping breathing during sleep. Obstructive sleep apnea (OSAS) in childhood is one of the most important and serious sleep problems, and it is seen in 2% of children aged 2-8 years[8]. The most important and most common risk factor for OSAS in children is adenotonsillar hypertrophy[8,9]. In addition, chronic diseases, allergic symptoms, and cigarette exposure increase the risk of OSAS[8]. Due to the decrease in sleep quality in children with sleep problems, excessive daytime sleepiness, learning difficulties, decrease in school success, and various mental problems can be seen. The Epworth Sleepiness Scale (ESS) can be used to evaluate daytime sleepiness in children, and the Child Sleep Habits Questionnaire (CSHQ) can be used to evaluate sleep quality[10,11].

After the 2020 spring semester, schools in Türkiye, as in many countries with the progress of the pandemic, moved to online teaching. In this study, we analyzed symptoms of anxiety and depression, excessive daytime sleepiness, and sleep habits in students who received online education at home during the COVID-19 pandemic. We examined factors that affected these and their relationship with each other. The aim of this study was to test the hypothesis that there might be negative changes in the mental health and sleep habits of students who received online education at home during the 2019 coronavirus epidemic and to compare these changes between age groups.

2. Materials and methods

Two hundred children who received online education at home during the COVID-19 pandemic were included in this study. The students were divided into three groups as primary school, middle school, and high school. The students completed questionnaire forms including the ESS, CSHQ, and CADS with the support of families for young children when necessary. The demographic data of the students, age, sex, class, allergic diseases, adenoidectomy history, tonsillectomy history, smoking exposure, and chronic diseases were questioned. Written consent was obtained voluntarily from the families and children. Children who could not complete the questionnaire completely and those whose information was incomplete were excluded from the study. The daytime sleepiness of the students was evaluated using the ESS by their families. It was developed by Johns in 1991 and adapted to Turkish and its validity and reliability tests were performed by Ağargün et al[12]. The modified ESS for children in the pediatric population was used[13]. It evaluates the state of falling asleep or sleeping in eight different daily life situations. Each item in the scale is graded as never = 0, rarely = 1, frequent = 2, and always = 3. Excessive daytime sleepiness is indicated if the total score for each condition on the scale is above 10[14]. The CSHQ was developed by Owens et al. in 2000. It is used to investigate children's sleep habits and sleep-related problems[15]. Its validity and reliability tests in Turkish have been performed[16]. The questionnaire includes questions about the child's sleeping habits and possible sleep difficulties. The scale is completed retrospectively by the parents, who are asked to evaluate the sleeping habits of the child over the previous week. It is accepted that children with a score of 42 and above have significant sleep problems[15]. Anxiety and depression symptoms were evaluated using CADS, which was developed by Birmaher et al.[17]. Its validity and reliability tests in Turkish have been performed[18]. There are 47 questions describing how children feel about themselves. Each question in the scale is graded as never = 0, rarely = 1, frequent = 2, and always = 3. A score of 25 and above indicates a significant anxiety disorder. High scores from the scale indicate more severe anxiety. This study has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans. This study was approved by the Ethics Committee of Medical Ethics Decision date: 13.01.2021, Number: 1258.

2.1. Statistical analyses

Statistical analyses were performed using the SPSS 21 program. Normality analyses of continuous variables were performed using the Shapiro-Wilk test. Variables were analyzed using non-parametric methods because they did not conform to normal distribution. The Mann-Whitney U test was used for comparing two independent groups, and the Kruskal-Wallis test was used for more than two groups. Spearman's correlation coefficients were calculated to determine the linear relationships between continuous variables. The Chi-square test was used in the analysis of categorical variables. The statistical significance level was taken as 0.05.

Table 1

Sex distribution of students by groups

	Male		Female		Total	
	n	%	n	%	n	%
Primary school	23	26.7	20	17.5	43	2.5
Middle school	51	5.3	55	48.2	106	53.0
High school	12	1.0	39	34.2	51	25.5
Total	86	100.0	114	100.0	200	100.0

Table 2
Results of the groups according to their CADS, CSHQ, and ESS scores

		Primary school		Middle school		High school		Total		
		n	%	n	%	n	%	n	%	p
CADS	No	14	32.6	30	28.3	9	17.6	53	26.5	0.219
	Yes	29	67.4	76	71.7	42	82.4	147	73.5	
CSHQ	No	0	0.0	1	0.9	4	7.8	5	2.5	0.017
	Yes	43	100.0	105	9.1	47	92.2	195	97.5	
ESS	No	39	90.7	99	93,4	44	86.3	182	91.0	0.343
	Yes	4	9.3	7	6.6	7	13.7	18	9.0	

p: Chi-square test, CADS: Childhood Anxiety and Depression Scale, CSHQ: Children's Sleep Habits Questionnaire, ESS: Epworth Sleepiness Scale

3. Results

Of the 200 students who participated in the study, 43 were primary school students, 106 were at middle school, and 51 were high school students. There was a total of 114 female and 86 male students (Table 1). Nearly three-quarters (73.5%) of the students had anxiety disorder, 97.5% had sleep disturbances, and 9% had excessive daytime sleepiness. The rates of CADS and ESS did not differ according to the groups (p>0.05). The rates of anxiety disorder and daytime sleepiness according to CADS and ESS were mostly in the high school group. According to the CSHQ score, sleep quality disorder was observed with a higher rate in primary school students (p<0.005) (Table 2). When evaluated in general (total), CADS scores differed according to the education group (p<0.001).

According to this, the CADS scores of high school students were found to be higher than for primary and secondary school students, and those who went to secondary school has higher CADS scores than primary school students (p<0.05). Although the CADS scores of students attending primary school did not differ according to sex, the CADS scores of female students attending secondary and high school were higher than for boys. The difference was significant p<0.05). CADS scores differed between girls according to the education group (p<0.001). The CADS scores of female high school students were higher than those at primary and secondary schools, and girls who went to secondary school were found to have higher CADS scores than primary school students (p<0.05) (Table 3).

CSHQ scores were highest in primary school and lowest in high school. CSHQ scores of high school students were found to be lower than middle school and primary school students (p=0.001). The CSHQ scores of female high school students were found to be higher than for boys (p<0.05). CSHQ scores differed among males according to the education group and the highest values were in the primary school group (p=0.001) (Table 3).

ESS scores of primary school students did not differ according to sex, but the daytime sleepiness scores of female middle and high schools students were found to be higher than for boys (p<0.05) (Table 3).

No significant relationship was found between CADS, CSHQ, and ESS among male high school students (p>0.05). A positive moderate linear relationship was found between CADS and CSHQ among female high school students (p<0.05).

A positive moderate linear relationship was found between CADS and CSHQ in high school students (p<0.05) (Table 4).

A total of 23% students had a history of allergy, 16.5% had adenoidectomy, 10% had tonsillectomy, 6.5% had chronic disease, and 25% had smoking exposure. Allergy history, adenoidectomy, and chronic disease rates did not differ according to the groups (p>0.05). The rate of having tonsillectomy varied according to the groups (p=0.038). The rate of having tonsillectomy in middle school students was higher than in high school students (p<0.05). The rate of smoking at home varied according to the groups (p=0.022). The rate of smoking in the homes of primary school students was lower than that of middle school and high school students (p<0.05). The group with the highest smoking exposure was the high school group (Table 5).

The median ESS was found to be lower in those who had adenoidectomy compared to those who did not (p=0.011) in middle school students. The median CSHQ and ESS scores were higher in middle school student with allergies than in those without allergies (p=0.040) Who are exposed to cigarette smoke at home median CAHS and CSHQ scores were higher than those who did not in middle school students. (p = 0.022). CADS, sleep habits, and daytime sleepiness did not differ in patients with tonsillectomy and the presence of chronic diseases, both in total and according to education groups (p>0.05) (Table 6).

4. Discussion

In our study, sleep habits, excessive daytime sleepiness, and anxiety-depression symptoms were investigated in students who received online education at home during the pandemic period. Sleeping habits were evaluated using the CSHQ, excessive daytime sleepiness with the ESS, and anxiety and depression symptoms using CADS. The students were divided into primary school, middle school, and high school according to their education level, and they were grouped according to their sex.

Table 3

CADS, CSHQ and ESS results of the groups by sex

	Male			Female			Total			
	Mean±SD	Median [IQR]	Min-Max	Mean±SD	Median [IQR]	Min-Max	Mean±SD	Median [IQR]	Min-Max	p1
CADS										
Primary school	35.74±19.64	38 [18-49]	0-92	29.8±13.31	29 [17.5-40.5]	9-55	32.98±17.06	33 [18-46]	0-92	0.227
Middle school	34.96±19.13	34 [21-44]	2-103	47.53±27.39	43 [24-67][a]	7-116	41.48±24.5	35 [23-59][a]	2-116	0.038
High school	27.83±13.33	23.5 [21.5-33.5]	9-62	60.23±22,92	52 [48-78][ab]	22-117	52.61±25.12	51 [31-72][ab]	9-117	<0.001
p2		0.340			<0.001			<0.001		
CSHQ										
Primary school	50.7±5.76	50 [48-51]	41-66	51.1±6.32	50 [47-55,25]	41-67	50.88±5.96	50 [47-53]	41-67	0.854
Middle school	48.51±4.54	48 [45-51]	41-62	50.51±5.99	49 [47-53]	38-66	49.55±5.41	49 [46-52]	38-66	0.081
High school	43.83±5.13	44 [41-45.75][ab]	33-54	49.69±7.66	50 [44-54]	37-73	48.31±7.53	46 [44-54]	33-73	0.010
p2		0.001			0.609			0.061		
ESS										
Primary school	5.39±3.58	7 [2-7]	0-12	4.1±4.25	2.5 [1.25-6.75]	0-17	4.79±3.91	4 [2-7]	0-17	0.188
Middle school	4.06±3.1	4 [2-6]	0-14	5.58±3.74	5 [3-7]	0-17	4.85±3.52	4 [3-6]	0-17	0.028
High school	3.17±1.9	3.5 [2-4.75]	0-6	5.,77±3.79	6 [3-9]	0-13	5.16±3.6	4 [2-9]	0-13	0.036
p2		0.155			0.087			0.720		

p1: Mann Whitney U test, p2: Kruskal-Wallis test, CADS: Childhood Anxiety and Depression Scale, CSHQ: Children's Sleep Habits Questionnaire, ESS: Epworth Sleepiness Scale

Table 4

CADS, CSHQ, and ESS effects on each other by groups and sex

Groups			Male		Female		Total	
			CSHQ	ESS	CSHQ	ESS	CSHQ	ESS
Primary school	CADS	r	0.268	0013	0.174	0156	0.203	0.149
		p	0.216	0.954	0.463	0.512	0.193	0.339
	CSHQ	r		0.397		0.725		0.564
		p		0.061		<0.001		<0.001
Middle school	CADS	r	0.444	0.046	0.365	0.285	0.396	0.218
		p	0.001	0.747	0.006	0.035	<0.001	0.025
	CSHQ	r		0.308		0.360		0.348
		p		0.028		0.007		<0.001
High school	CADS	r	0.179	-0.068	0.529	0.027	0.592	0.185
		P	0.579	0.834	0.001	0.871	<0.001	0.194
	CSHQ	r		0.471		0.002		0.166
		p		0.122		0.988		0.245

p: Spearman Correlation, CADS: Childhood Anxiety and Depression Scale, CSHQ: Children's Sleep Habits Questionnaire, ESS: Epworth Sleepiness Scale

Table 5

Allergy history, adenoid and tonsil surgery, chronic diseases, and cigarette exposure of the groups

		Primary school		Middle school		High school		Total		
		n	%	n	%	n	%	n	%	p
Allergy	No	33	76.7	83	78.3	38	74.5	154	77.0	0.869
	Yes	10	23.3	23	21.7	13	25.5	46	23.0	
Adenoidectomy	No	36	83.7	84	79.2	47	92.2	167	83.5	0.124
	Yes	7	16.3	22	20.8	4	7.8	33	16.5	
Tonsillectomy	No	41	95.3	90	84.9	49	96.1	180	90.0	0.038
	Yes	2	4.7	16	15.1	2	3.9	20	10.0	
Chronic diseases	No	40	93.0	99	93.4	48	94.1	187	93.5	0.975
	Yes	3	7.0	7	6.6	3	5.9	13	6.5	
Smoking exposure	No	39	90.7	75	70.8	35	68.6	149	74.5	0.022
	Yes	4	9.3	31	29.2	16	31.4	51	25.5	

Table 6
Factors affecting CADS, CSHQ, and ESS

	ESS			CSHQ			CADS		
	No	Yes	p	No	Yes	p	No	Yes	p
Adenoidectomy	5 (3-7)	3 (2-5)	0.042						
Middle school adenoidectomy	5 (3-6.75)	3 (1.75-4)	0.011						
Middle school allergy	4 (2-7)	5 (2.75-8.25)	0.048	48 (45-51)	50 (47-55)	0.040			
Middle school smoking exposure				48 (45-51)	51 (48-54)	0.010	34 (21-47)	51 (30-66)	0.022

CADS: Childhood Anxiety and Depression Scale, CSHQ: Children's Sleep Habits Questionnaire, ESS: Epworth Sleepiness Scale

The students smoking exposure, adenotonsillectomy, and allergy history were questioned.

The coronavirus (COVID-19) pandemic has adversely affected the mental health of all people, children, adolescents, and adults alike[19]. During the COVID-19 pandemic, children are deprived of social interaction and friendship because they are in quarantine at home and therefore their sensitivity to psychiatric disorders increases. The closure of schools and playgrounds, the fear of being infected by their parents, and the restriction of outdoor activities caused panic attacks and anxiety disorders in children[20]. In a web-based survey study conducted in India during pandemic period, it was revealed that 73.15% of children showed signs of increased anger and 51.25% of them[7]. Many studies have reported that anxiety and depression levels had increased in children and adolescents compared with the pre-pandemic period[2,21]. In a study conducted with university students during the COVID-19 pandemic in Italy, depressive symptoms were 27.8%, and anxiety symptoms were 34.3%[22]. In our study, we saw anxiety-depression symptoms with a high rate of 73.5%. The reason for this may be the different study population, quarantine conditions, survey cut-off values, and varying sociocultural differences between countries. Although questionnaires used such as CADS do not diagnose anxiety, they can provide information about anxiety levels in childhood.

The sex difference in anxiety and depression is also evident in many studies [23,24]. In our study, similar to LI Duan's study, adolescents' anxiety levels were found to be significantly higher than in children, and girls' anxiety levels were significantly higher than in boys ($p<0.001$)[1]. Having a family member or friend infected with coronavirus, residing in an urban area, the mother's occupation being related to the epidemic, and telephone and internet addiction increased levels of anxiety and depression[3]. Anxiety in city centers is higher than in rural areas; stricter implementation of quarantine in the city may be related to the fact that there are fewer open areas such as parks and gardens and the apartments are more common, and smoking exposure and allergic symptoms are more common. Our study was conducted with children living in the city, and smoking exposure increased anxiety levels, especially in the middle school group.

Children need healthy sleep to fully complete their physical, psychological, and spiritual development 25. Quality sleep means that the individual feels fit and ready for a new day after waking up. Decreased sleep quality causes daytime sleepiness in children and adolescents[25]. Excessive daytime sleepiness is an important public health problem and significantly reduces the quality of life[26]. It has been reported that children and adolescents with high daytime sleepiness have behavioral problems during the day and show lower academic success[27]. The reason for increased daytime sleepiness is poor sleep quality[28].

To evaluate the sleeping habits of children, the sleeping habits of pediatric subpopulations in Cape Verde and Mozambique were evaluated using the Portuguese version of the Child Sleep Habits Questionnaire[11]. There may be differences between studies in the prevalence of sleep disorders and the factors affecting them because children's sleep habits are highly influenced by socio-economic, psychosocial, cultural, and environmental factors.

In a survey study conducted on university students and administrative staff during the COVID-19 pandemic in Italy, it was observed that sleep was delayed, sleep quality decreased, insomnia symptoms, anxiety in-creased, and depression symptoms increased in both groups compared with the pre-pan-demic period[22]. During the COVID-19 pan-demic, it has been reported in many studies that the time spent outside and physical activity decreased, sedentary movements such as screen time increased, diet and sleep habits changed[29,30]. In our study, we found that high school girls had poorer sleep quality than high school boys and they had more excessive daytime sleepiness. The reason for this may be that, as seen in our study, the anxiety level of high school girls is higher than that of boys. It may also be because boys are more fond of games involving physical activities and girls adopt a more sedentary lifestyle.

Sleep disorders are quite common in children. One of the most common is simple snoring, but the most severe and most serious is obstructive sleep apnea syndrome (OSAS)[31]. In OSAS, upper airway obstruction, and consequently apnea attacks, hypoxia, hypercapnia, blood gas changes, and systemic complications may occur[32]. Behavioral problems, hyperactivity, and learning difficulties can be seen in

affected children. In Italy, simple snoring in children was reported as 4.9% and OSAS as 1.8%[33,34]. The most important risk factor for OSAS was adenotonsillar hypertrophy, obesity, and less frequently allergy and smoking exposure[34,35]. There are very few questionnaires that can be used to evaluate children suspected of having OSAS, but the ESS is one of them. Otorhinolaryngology physicians are vital in the evaluation of children with OSAS and adenotonsillectomy should be performed in these children when necessary[36]. It is observed that sleep apnea attacks disappear and sleep quality increases after surgery[37]. In our study, the daytime sleepiness of children who had nasal surgery was found to be significantly lower than those who did not have surgery. In our study, allergy and cigarette exposure negatively affected sleep quality and increased excessive daytime sleepiness. In children with sleep disorders, the history of allergies should be questioned, and if necessary, they should be referred to allergy polyclinics. Smoking exposure should be investigated and protective measures should be taken.

Limitation: This study has some limitations. First, data collection was performed by dis-tributing questionnaires to children and adolescents. Results may vary according to the understanding of the participants, especially for children who need their parents' assistance. This situation may have restricted the reaction of children and prevented them from expressing themselves properly. Second, our sample was from a specific area in the city center and there was a limited number of participants. For this reason, to improve further study designs and the scientific structure of their results, it is necessary to increase the sample size and catchment areas, to conduct face-to-face surveys, and to use qualitative interview methods.

5. Conclusions

The COVID-19 pandemic has caused anxiety symptoms, especially in high school girls and poor sleep quality in primary school-age boys. Although it cannot be said definitively that there may be adenoid vegetation in children in the presence of excessive daytime sleepiness, it can be a guide for us. Children should be examined and investigated in this respect. Cigarette exposure and allergies negatively affect sleep quality and cause excessive daytime sleepiness.

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Statement of ethics

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki and was approved by Adana City Training and Research Hospital Medical Ethics Committee with the decision no. 1258 dated 13.01.2021.

Conflict of interest statement

The authors declare that they have no financial conflict of interest with regard to the content of this report.

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Author contributions

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