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Original Article

Evaluation of the effects of COVID-19 pandemic on sleep habits and quality of life in children

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Abstract

Aim: Children are thought to be one of the groups most affected by the psychosocial impact of the pandemic. The aim of this study is to examine the effects of COVID-19 pandemic on sleep habits and quality of life in children.

Materials and Methods: 60 children between the ages of 8-13, who were not diagnosed with any psychiatric disorder with regard to pre-pandemic period according clinical assessment and "Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children- Present and Lifetime Version (KSADS-PL)" semi-structured interview tool, clinically normal intelligence level, did not have any medical illness that required treatment, had no history of adverse life events other than Covid pandemic, and had verbal consent and written informed consent of the family were included. Pre-pandemic and pandemic data were evaluated with Children's Sleep Habits Questionnaire (CSHQ)- Short Form, Pediatric Quality of Life Inventory (PesdQL) parent forms and Screen for Child Anxiety Related Disorders (SCARED), Children's Depression Inventory (CDI) self-report scales.

Results: "Bedtime resistance", "Delayed sleep onset", "Night awakenings", "Parasomnias", "Daytime sleepiness" scale scores increased statistically significantly during the pandemic period. A statistically significant decrease was also found in all PedsQL scale scores compared to the pre-pandemic period. All CSHQ subscales except "sleep duration" related to the pandemic period were found to be statistically correlated with PedsQL scale scores. Additionally, statistically significant increases were found in SCARED anxiety and CDI depression scores of children during the pandemic period compared to the pre-pandemic period. Furthermore, anxiety and depression scores were found to be correlated with both sleep problems and decrease in psychosocial quality of life domains except social anxiety.

Conclusion: The results of our study indicate that COVID-19 pandemic may affect sleep habits and quality of life of children. We suggest that interventions targeted to regulate sleep habits are important for well-being of children during and after the pandemic. In addition, the results of increased anxiety and depression levels and the correlations between anxiety, depression with sleep problems and worse quality of life indicates the importance of evaluating anxiety and depression among children during COVID-19 pandemic.

Keywords: Children; COVID-19; pandemic; sleep habits; quality of life

INTRODUCTION

Medical literature shows that children are less susceptible to 2019-Corona virus disease (COVID-19) for now, but children are defined as the group most affected by the psychosocial impact of the pandemic (1). Pandemics such as COVID-19 are known to pose potential risks to child development due to the risk of disease, home confinement, social isolation and increased stress levels of parents (2). It is also known that school closures, lack of outdoor activity and exercise, changes in eating and sleeping habits are likely to disrupt children's lifestyles and potentially trigger of various psychiatric symptoms (3).

Sleep is very important for physical and mental health in children and adolescents (4). Although we do not yet know exactly how sleep is affected by the COVID-19 pandemic, it is known that there is a high potential for sleep problems to occur or worsen during this period (5). It has been emphasized that children and adolescents with pre-existing mental health problems, especially adolescents with anxiety or depression, may be particularly prone to COVID-related concerns and rumination, which can interfere with the onset and quality of sleep during COVID-19 pandemic (1). It has also been stated that increasing sleep problems during the COVID-19 epidemic is also possible to contribute to psychopathology, and poor sleep may cause negative affect, ultimately leading to increased sensitivity to mood and anxiety problems (1). The prevalence of depressive and anxiety symptoms, and a combination of depressive and anxiety symptoms

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was reported to be 43.7%, 37.4%, and 31.3%, respectively in Chinese high school students during the COVID-19 outbreak (6).

Sleep is also thought to be directly involved in the pathological process of COVID-19. As a molecular mechanism of this action, it has been suggested that angiotensin converting enzyme (ACE-2), considered to be a SARS CoV-2 spike receptor, may cause changes in circadian rhythm indirectly through the renin angiotensin system, pointing out a possible link between COVID-19 and circadian rhythm (7). Another suggested mechanism is related to cytokines. It has been reported that sleep plays a role in the modulation of the synthesis and secretion of a number of cytokines, such as interleukin (IL-6) and tumor necrosis factor (TNF-a), which are closely related to cytokine storm, and disruption of the circadian rhythm may cause certain cytokine peaks to shift from night to day (8,9). It is also known that adequate sleep of good quality supports the immune system (8).

In literature related to COVID-19 pandemic, there are studies on sleep and quality of life in the adult group. Sleep and quality of life have also been examined in children in different studies. However, we encountered no study examining both sleep habits and quality of life in children during COVID-19 pandemic. This study focused on the changes in sleeping habits and quality of life in children during COVID-19 pandemic.

MATERIALS and METHODS

This study is conducted in the outpatient clinic of Düzce University Faculty of Medicine, Department of Child and Adolescent Psychiatry during the COVID-19 pandemic period of 2020. 60 children between the ages of 8-13, who were brought to the Child and Adolescent Psychiatry outpatient's clinic for general counseling by their mothers and not diagnosed with any psychiatric disorder in the pre-pandemic period according to clinical assessment and "Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children- Present and Lifetime Version (KSADS-PL)" semi-structured interview tool and Diagnostic and Statistical Manual of Mental Disorders (DSM 5), clinically normal intelligence level, did not have any medical illness that required treatment were called back to the outpatient's clinic by phone after four months' of COVID-19 pandemic. Children's Sleep Habits Questionnaire (CSHQ)- Short Form, Pediatric Quality of Life Inventory (PesdQL) parent forms were administered to mothers and Screen for Child Anxiety Related Disorders (SCARED), Children's Depression Inventory (CDI) self-report scales were administered to children. They were asked to respond both according to pre- pandemic and pandemic states. In socio- demografic form, there were additional questions about COVID-19 pandemic, such as total screen time (television, tablet, phone) of the children during the non-school period, where the children received information about COVID-19 and whether the children had a covid-positive relative / friend or experienced a life event that would increase their anxiety levels other than COVID-19 pandemic. All children gave verbal consent and the families gave written informed consent. This study was performed in accordance with the ethical standards of Helsinki Declaration. Ethics committee approval was obtained from Duzce University Ethics Committee (No: 2020/169).

Measures

1.Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children- Present and Lifetime Version (K-SADSPL)- Turkish: This is a semi-structured interview tool that evaluates current and lifelong psychopathology in children and adolescents developed by Kaufman et al (10). The Turkish reliability and validity studies were performed (11,12).

2.Children's Sleep Habits Questionnaire (CSHQ)-Short Form: This scale developed by Owens et al. evaluates sleep habits. CSHQ is a 45-item questionnaire for parent reporting, including items related to key sleep domains such as bedtime resistance, delayed sleep onset, sleep duration, sleep anxiety, night awakenings, parasomnias, daytime sleepiness and sleep-disordered breathing (13). The Turkish reliability and validity study of the scale was conducted by Fiş et al (14).

3. Pediatric Quality of Life Inventory (PesdQL): The scale developed by Varni et al. evaluates the health-related quality of life in children between the ages of 2 and 18, in dimensions of physical health, emotional functionality, social functionality and school functionality. Scores are calculated in three final dimensions. Firstly, a total score is found for physical functioning. Emotional, social and school functioning scores are calculated to find the total psycho-social functioning score. Lastly, a calculation is made of the scale's total score (15). The Turkish reliability and validity study of the scale was conducted by Çakın-Memik et al. (16).

4.Screening for Child Anxiety-Related Disorders (SCARED): This scale was developed by Birmaher et al. to assess anxiety in children. The SCARED is a questionnaire measuring five child and adolescent anxiety symptom dimensions; somatic/panic, generalized anxiety, separation anxiety, social phobia and school phobia. The scale consists of 41 items of 3-point each (0 = not correct or hardly any true, 1 = sometimes true, and 2 = true or usually true) and ranges from 0 to 82 (17). The Turkish validity and reliability study of the scale was conducted (18).

5.Child Depression Inventory (CDI): Likert type self-report scale was developed to evaluate the symptoms of depression in children between the ages of 6-17. CDI is quantitatively scored reflecting increasing symptom severity and evaluates the main symptoms of depression (19). Turkish validity and reliability study of the scale was conducted by Oy (20).

Statistical analyses

Regarding previous studies, an alpha level of 0.05 for detecting an effect size of d = 0.4 (small to moderate) will achieve 80.0 % power with a sample size of 52 (21,22). In our study, we were able to enroll 60 patients with 85.0% power. Statistical Program for Social Sciences Version 21.0 (SPSS™, IBM Inc., Armonk, NY) was used for statistical analysis. Nominal data were summarized as counts and frequencies. Non-normally distributed quantitative data were shown as medians and inter-quartile ranges while normally distributed quantitative data were summarized as means and standard deviations. Wilcoxon Signed rank test was used for comparisons. Spearman correlation analysis was used for correlational analysis. P was set at 0.05 (two-tailed).

RESULTS

A total of 60 (53.3% male n: 32, 46.7% female n: 28) children aged 8-13 years without active psychiatric and physical complaints were included in the study. The mean age of the children was determined as 10.22 ± 2.35 years. The families of 50 (83.3%) children were in the middle income group, and the families of 10 (16.7%) children were in the high income group. The mothers of 4 (6.7%) children were primary school graduates, 25 (41.7%) were high school graduates, and 31 (51.7%) were university graduates. The father of 2 (3.3%) children was primary school, the father of 18 (30%) children was high school, and the father of 40 (67.7%) children were university graduates. The children received the information about COVID-19 mostly from their families (53.3% n: 32). 32 children received the information about COVID-19 from families (53.3%), 5 children from television (8.3%), 2 children from the internet (3.3%), 12 children from families and television (20.0%), 9 children from families, television and internet (%15). The total screen time (television, tablet, phone) of the children during the non-school period was found to be 6.88 ± 2.66 hours. None of the children had a covid-positive relative / friend, and none of them had recently experienced a life event that would increase their anxiety levels other than COVID-19 pandemic.

Changes in CSHQ subscales before and after the pandemic are listed in Table 1. "Bedtime resistance", "Delayed sleep onset", "Night awakenings", "Parasomnias", "Daytime sleepiness" scale scores increased statistically significantly during the pandemic period (p= 0.001, p=0.003, p=0.003, p= 0.012, p= 0.002, respectively). Age was not found to be correlated with sleep habits or quality of life (p > 0.05). A statistically significant decrease was found in all PedsQL scale scores compared to the pre-pandemic period (Table 2). (School functionality scores were not taken into account, as schools were closed at the beginning of the pandemic.) Correlations related to pandemic period between CSHQ subscales and PedsQL scale scores were shown in Table 3. All CSHQ subscales except "Sleep duration" were found to be statistically strongly correlated with PedsQL scale scores. There was no correlation between "Sleep duration" and PedsQL scale scores.

Table 1. COVID-19 related changes in sleep problems according to Children's Sleep Habits Questionnaire (CSHQ) in children

Median, IQR	Pre-pandemic (n:60)	Pandemic period (n:60)	Z	p	E.S
Bedtime resistance	7.50 (4)	10.0(4.75)	-4.456[b]	**0.001**	0.58
Delayed sleep onset	1.0 (0.0)	1.0 (1.0)	-2.964[b]	**0.003**	0.38
Sleep duration	3.0 (1.0)	3.0 (1.0)	-.738[b]	0.46	-
Sleep anxiety	5.0 (3.75)	5 (5)	-1.503[b]	0.133	-
Night awakenings	3.0 (1.0)	4.0 (2)	-3.022[b]	**0.003**	0.39
Parasomnias	8 (2)	8.0 (2.5)	-2.519[b]	**0.012**	0.33
Daytime sleepiness	11.0 (4.0)	11.50 (3.75)	-3.051[b]	**0.002**	0.39
Sleep-disordered breathing	3.24 (1.0)	3.0 (0.0)	-1.463[c]	0.143	-

[a]Wilcoxon Signed Ranks Test, [b]Based on negative ranks, [c]Based on positive rank

Table 2. COVID-19 related changes in sleep problems according to Pediatric Quality of Life Inventory (PedsQL) in children

Median, IQR	Pre-pandemic (n:60)	Pandemic period (n:60)	Z	p	E.S
Physical Health Summary	87.50 (25.0)	78.12 (26.72)	-3.630[b]	**0.001**	0.47
Emotional Functioning	85.0 (20.0)	80.0 (27.50)	-3.081[b]	**0.002**	0.40
Social Functioning	95.0 (15.0)	95.0 (28.75)	-2.945[b]	**0.003**	0.38
Psychosocial Health Summary	90.0 (19.38)	82.50 (24.38)	-3.141[b]	**0.002**	0.41
Total Scale Score	88.43 (18.59)	78.46 (24.65)	-4.201[b]	**0.001**	0.54

[a]Wilcoxon Signed Ranks Test, [b]Based on negative ranks

Statistically significant increases were found in SCARED anxiety and CDI depression scale scores of children during the pandemic period compared to the pre-pandemic period Table 4. Correlations related to pandemic period between CSHQ subscales and SCARED, CDI scale scores were shown in Table 5. Also, correlations between PedsQL scale scores and SCARED, CDI scale scores were shown in Table 6. Anxiety and depression scores were found to be correlated with both sleep problems and decrease in psychosocial quality of life domains except "social anxiety".

Table 3. Correlations between Children's Sleep Habits Questionnaire (CSHQ) and Pediatric Quality of Life Inventory (PedsQL)

r p	Physical health summary	Emotional functioning	Social functioning	Psychosocial health summary	Total quality of life
Bedtime resistance	**-0.302***	**-0.757****	**-0.445****	**-0.673****	**-0.517****
	0.019	**<0.001**	**<0.001**	**<0.001**	**<0.001**
Delayed sleep onset	**0.148**	**-0.520****	**-0.406****	**-0.520****	**-0.353****
	0.258	**<0.001**	**0.001**	**<0.001**	**0.006**
Sleep duration	-0.134	-0.174	-0.059	-0.149	-0.123
	0.309	0.185	0.653	0.255	0.349
Sleep anxiety	**-0.261***	**-0.615****	**-0.323***	**-0.517****	**-0.412****
	0.044	**<0.001**	**0.012**	**<0.001**	**0.001**
Night awakenings	**-0.282**	**-0.564****	**-0.374****	**-0.522****	**-0.416****
	0.029	**<0.001**	**0.003**	**<0.001**	**0.001**
Parasomnias	0.188	**-0.359****	**-0.411****	**-0.411****	**0.316***
	0.150	**0.005**	**0.001**	**0.001**	**0.014**
Sleep-disordered breathing	**-0.289***	**-0.282***	**-0.260***	**-0.294***	**-0.299***
	0.025	**0.029**	**0.045**	**0.022**	**0.020**
Daytime sleepiness	**-0.265***	-0.093	-0.001	-0.045	-0.144
	0.040	0.480	0.996	0.735	0.271

Spearman's correlation analysis; *p<0.05, p<0.01

Table 4. COVID-19 related changes in anxiety and depression levels of children

Median, IQR	Pre-pandemic (n:60)	Pandemic period (n:60)	Z	p	E.S
Anxiety Disorder Total (SCARED)	16.0 (13.0)	20.0 (13.50)	-3.240[b]	**0.001**	0.42
Somatic/ Panic	3.0 (2.0)	4.0 (6.0)	-3.599[b]	**0.001**	0.46
Generalized Anxiety	3.0 (5.0)	4.0 (5.0)	-2.662[b]	**0.008**	0.34
Separation Anxiety	4.0 (4.0)	4.0 (4.0)	-.650[b]	0.515	-
Social Anxiety	4.50 (5.75)	5.00 (7.75)	-1.225[b]	0.220	-
School phobia	0.0 (2.0)	0.0 (2.0)	-.814[b]	0.416	-
Children's Depression Inventory (CDI)	7(5.75)	9(6.75)	-3.897[b]	**0.001**	0.50

[a]Wilcoxon Signed Ranks Test, [b]Based on negative ranks

Table 5. Correlations between sleep habits and anxiety, depression

r p	Somatic/Panic	Generalized Anxiety	Separation Anxiety	Social Anxiety	School Phobia	Total SCARED	CDI
Bedtime resistance	0.155	0.243	0.266*	-0.002	0.169	0.226	0.352**
	0.236	0.062	0.040	0.988	0.196	0.082	0.006
Delayed sleep onset	0.237	0.290*	0.403**	0.229	0.324*	0.347**	0.217
	0.068	0.025	0.001	0.079	0.011	0.007	0.096
Sleep duration	-0.249	-0.220	-0.032	-0.022	0.044	-0.106	-0.159
	0.056	0.091	0.806	0.867	0.740	0.420	0.226
	0.076	0.091	0.243	0.066	0.247	0.201	0.258*
	0.564	0.489	0.062	0.615	0.057	0.123	0.047
Night awakenings	0.305*	0.256*	0.184	0.115	0.156	0.262*	0.139
	0.018	0.049	0.160	0.382	0.235	0.043	0.291
Parasomnias	0.401**	0.358**	0.149	0.187	0.129	0.373**	0.174
	0.001	0.005	0.255	0.152	0.340	0.003	0.184
Daytime sleepiness	-0.070	-0.105	0.040	-0.020	0.093	-0.014	-0.027
	0.593	0.424	0.760	0.878	0.479	0.918	0.837
Sleep-disordered breathing	0.198	0.051	0.141	-0.029	0.298*	0.171	-0.054
	0.128	0.701	0.284	0.823	0.021	0.192	0.684

Spearman's correlation analysis, *p<0.05, p<0.01

Table 6. Correlations between quality of life and anxiety, depression

r p	Somatic/Panic	Generalized Anxiety	Separation Anxiety	Social Anxiety	School Phobia	Total SCARED	CDI
Physical Health	-0,124	-0,068	-0,029	0,050	-0,083	-0,153	-0,097
	0,344	0,605	0,826	0,702	0,530	0,244	0,460
Emotional Functioning	-0,342**	-0,438**	-0,266*	-0,103	-0,282*	-0,383**	-0,422**
	0,008	0,000	0,040	0,434	0,029	0,002	0,001
Social Functioning	-0,444**	-0,370**	-0,322*	-0,168	-0,192	-0,425**	-0,380**
	0,000	0,004	0,012	0,200	0,143	0,001	0,003
Psychosocial Health Summary	-0,415**	-0,454**	-0,328*	-0,152	-0,271*	-0,449**	-0,434**
	0,001	0,000	0,011	0,246	0,036	0,000	0,001
Total Scale Score	-0,306*	-0,326*	-0,245	-0,121	-0,246	-0,360**	-0,354**
	0,017	0,011	0,059	0,356	0,058	0,005	0,006

Spearman's correlation analysis, *p<0.05, p<0.01

DISCUSSION

In this study, we investigated the effects of COVID-19 pandemic on sleep habits and quality of life in children. We found that in covid pandemic; "Bedtime resistance", "Delayed sleep onset", "Night awakenings", "Parasomnias", "Daytime sleepiness" increased, health related quality of life of children decreased and that sleep disturbances were correlated with poor quality of life except "Sleep duration". In addition, we found that anxiety, depressive symptoms increased and were correlated with both sleep problems and decrease in psychosocial quality of life domains except "social anxiety".

Our results are in line with the literature of COVID-19 pandemic. It was stated that confinement and changes in daily routines, higher anxiety levels, less daylight exposure, excessive blue light exposure due to spending a lot of time in the digital environment, changes in dietary habits, and decreased physical activity might have negative effects on sleep quality (1,5,23). It was emphasized that isolation and confinement are likely to affect health and sleep due to inactivity and overeating (1,24). It was stated that changes in families' finances, health concerns, and uncertainty about the future can increase stress levels in children and adolescents, causing sleep difficulties (25). Depression or anxiety are known as risk factors for insomnia (26,27). It has been stated that depression and anxiety act as powerful mediators in the relationship between internet gaming disorder (IGD) and insomnia and quality of life (28). Similarly, in our study, we found that anxiety and depression scores were increased and correlated with both sleep problems and decrease in quality of life except "social anxiety". In line with our results, anxiety and depression levels were found to be increased up to 43.7%, 37.4% in Chinese adolescents. Authors emphasized that everyone might develop anxiety and depressive symptoms in the face of acute stressful events and authors indicated awareness of COVID-19 (COVID-19 knowledge, prevention and control measures) as the protective factor for depressive and anxiety symptoms (6). Similar to our results, in a review, high rates of anxiety, depression were reported in children during COVID outbreak (29). We found no difference in "social anxiety" during pandemic period and no correlation between "social anxiety" and sleep problems or quality of life. The reason for this result may be that home confinement restricted social interactions of children.

On the other hand, it is known that sleep disorders have a significant effect on attention, emotional health, immune system, academic performance (1,30) and insufficient sleep causes anxiety and mood swings (31,32). Poorer sleep quality was reported to be associated with more-negative mood during COVID-19 lockdown (33). Similarly, it has been reported that poor sleep might induce negative affect, and this might lead increase in sensitivity to mood and anxiety symptoms. It has also been stated that poor sleep might lead to more attentional and oppositional problems for some adolescents, resulting in symptoms resembling ADHD (4). This data is in accordance with the results of our study that sleep disturbances are related to poor quality of life in all dimensions including psychosocial quality of life.

Similar to the results of our study, it was found that during home confinement, sleep timing changed significantly due to getting into bed and waking up later, spending more time in bed, and poorer sleep quality. People with higher levels of depression and anxiety were reported to have more difficulty in sleeping (34). Similarly, it was reported that during covid confinement children showed changes in their sleep patterns in the form of later bedtimes and wake times and longer night sleep times compared to conventional times (35). In another study, COVID-19 confinement was reported to reduce physical activity levels, increasing both screen exposure and sleep duration (36). Similar results were found in a study conducted with Italian children and adolescents during COVID-19 confinement with the increase in sleep duration (37). However, we found no significant change in "Sleep duration" and no correlation between "Sleep duration" and quality of life dimensions. Similar to our study, in another study conducted in children aged 6-72 months, most of the mothers reported no change in sleep duration (23).

Taken together the results of those studies and our results, it is plausible to conclude that sleep duration is not affected negatively by covid pandemic. However, the negative outcome may be that of chronobiological shift towards “eveningness”. In fact, results of sleep habits in our study (increased “Bedtime resistance”, “Delayed sleep onset”, “Night awakenings”, “Parasomnias”, “Daytime sleepiness”) may indicate the chronobiological shift towards “eveningness”. It has been stated that the consequences of the COVID-19 pandemic likely affected sleep behavior and delayed sleep timing. It is stated that this kind of transition from going to bed late and waking up late towards "eveningness" is associated with poor health and less physical activity in adolescents (38). This consequences are all in line with the quality of life results of our study and the correlations of sleep habits and quality of life. However, in one study, children themselves reported their quality of life scores generally well during COVID-19 pandemic, but parents reported that their children gained weight during the pandemic and sleep tendency and internet usage increased (39). In that study, different from our study, children's self reports were examined. The contradictory result may be due to children reporting their quality of life differently from their parents. Children may have more positive beliefs about themselves.

Among limitations of our study are small sample size and correlational design of the study. Those may limit the generalizability of the results. Also, we did not used an objective test to evalute intellectual capacity. Despite this limitations, our study reached a satisfying power and we used structured clinical assesments.

CONCLUSION

In summary, the results of our study indicates that COVID-19 pandemic may affect sleep habits and quality of life of children and interventions targeted to regulate sleep habits are important for well-being of children during and after the pandemic. In addition, the results of increased anxiety and depression levels and the correlations between anxiety, depression with sleep problems and worse quality of life indicates the importance of evaluating anxiety and depression among children during COVID-19 pandemic.

Conflict of interest : The authors declare that they have no competing interest.

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