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Relationship between Sleep Problems in Children with Attention-Deficit/Hyperactivity Disorder and Mental Health of their Parents

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ABSTRACT

Background and Objective: Sleep disorder is a complex comorbidity in children with attention-deficit/hyperactivity disorder (ADHD), and there is generally a reciprocal effect between them. Considering its adverse consequences on children and their families, the aim of this study was to investigate the frequency of sleep disorders in children with ADHD and the relationship between the sleep problems and mental health of their parents.

Methods: In this cross-sectional study, 100 ADHD children aged 4-12 years were selected using simple and available sampling method among all children referred to the Pediatric Psychiatric Clinic of Yahyanejad Hospital during 2020. The data were collected using a demographic questionnaire, Children's Sleep Habits Questionnaire (CSHQ) for children and Depression Anxiety Stress Scale-21(DASS-21) for both parents completed by the same researcher through an interview method. A value of $p<0.05$ was statistically considered significant.

Findings: One hundred 4-12-year-old children with a mean age of 7.72±2.31 years participated in this study. The mean CSHQ for ADHD children was 54.07 ± 6.29. The most common sleep disorders were bedtime resistance (92%), sleep duration (69%) and sleep anxiety (64%). There was a relationship between CSHQ score with depression (R=0.31, P=0.002), anxiety (R=0.26, P=0.008) and stress (R=0.23, P=0.02) in mothers.

Conclusion: Bedtime resistance was the most common complaint of ADHD children. Moreover, sleep problems in children were related to depression, stress and anxiety in their mothers.

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Introduction

Attention deficit/hyperactivity disorder (ADHD), affecting 5-10% of children, is the most common neurodevelopmental disorder in childhood according to the baseline study population [1]. Two population-based studies from Iran [2] and the United States [3] on 6-18-year-old children showed that the ADHA was diagnosed in 4 and 8.2% of Iranian and American children, respectively. ADHD is characterized by the presence of persistent symptoms of inattention and/or hyperactive-impulsive behavior due to impaired cognitive and psychological dysfunction, leading to life disability in children [4].

ADHD children are at increased risk for sleep disorders [5]. The prevalence of sleep problems in ADHD individuals is in the range of 35-70 % and varies as a function of ADHD subtype, gender, psychiatric comorbidities, age and medication use [6-9]. Clinically, sleep problems are found in approximately 25–50% of ADHD individuals [1], and according to the reports of parents, they are estimated at 25-55% [10].

Among sleep disturbances, sleep onset delay and sleep duration were more common in ADHD children and adolescents. Sleep disturbances may exacerbate problems of ADHD children including emotional, social and adaptive functioning, inattentiveness, hyperactivity and distractibility [10]. Thus, from a clinical view, it is a significant challenge for the psychiatrist and treatment team to clear the cause of the sleep disorders and to plan an effective treatment pattern [11]. Sleep problems become more important in these children and may affect many areas of ADHD children's lives and their families. Numerous studies have examined the effects of sleep disorders on the quality of life and performance in ADHD children [3-5, 7, 10, 12, 13]. For example, nighttime sleep disorders may exacerbate problems such as behavioral disorders, daytime fatigue as well as mood and attention disorders in ADHD children, negatively affecting their quality of life as well as academic achievement [5].

Sung et.al [12] found that the sleep disorder in ADHD children was related to poorer functioning and lower quality of life. Although it is clear that these children are at risk for academic, social, emotional and communication problems, it is not yet clear what harm threatens the parents of these children. It is likely that their parents may need medical and psychological help. Unfortunately, few studies have been done on this subject whose clarification is likely to affect the treatment and management of ADHD children. Therefore, the aim of the present study was to investigate the frequency of sleep disorders in ADHD children and the relationship between the sleep problems of these children and mental health of their parents.

Methods

Study design and participations

A cross-sectional study was conducted on 100 ADHD children and their parents were selected using simple and available sampling method among all children referred to the Pediatric Psychiatric Outpatient Clinic of Yahyanejad Hospital (affiliated with Babol University of Medical Sciences) during 2020.

Inclusion criteria were 4-12-year-old children diagnosed with ADHD by a child psychiatrist based on the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria [2] and children who did not take Ritalin or other medication used to treat ADHD for at least four weeks. Exclusion criteria included children with a history of neurodegenerative disease, seizures, metabolic disorders, cancer and other psychiatric disorders including schizophrenia, mood disorders, anxiety disorders, autism spectrum disorder and psychomotor retardation. The parents and their children were interviewed, aware of the study as well as they completed the required questionnaires and written consent. After a full description of the current study, the participation of parents was voluntary and then, the written informed consent was obtained from parents of children.

Measures

In order to gather the data for the study, three tools had been used including the demographic questionnaire, Children's Sleep Habits Questionnaire (CSHQ) and Depression Anxiety Stress Scale-21(DASS-21). The CSHQ was

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completed by the researcher via the individual interview with mothers for sleep disorders of their children and the DASS-21 filled by the same researcher for the mental health of both parents. The time for each interview was 15-20 minutes.

The demographic questionnaire included age, gender and birth order of children as well as education level of parents. The CSHQ [14] was used to evaluate sleep problems and habits according to children's caregivers [15]. The CSHQ had eight domains: parasomnias (7 items), daytime sleepiness (8 items), bedtime resistance (6 items), sleep-disordered breathing (3 items), sleep anxiety (4 items), night wakings (3 items), sleep onset delay (one item) and sleep duration (3 items), but the CSHQ contained 35 items since two of these items including the sleep anxiety and bedtime resistance domains were the same. The parents were asked to report the sleep habits of their children one week ago. All items were categorized based on a three-point scale: rarely=1 (0-1 time/week), sometimes=2 (2-4 times/week), and usually=3 (5-7 times/week). Higher scores indicated more difficulties in sleep habits. The sleep disorder was considered in subscale items of CSHQ if the values were higher than one standard deviation from the mean in each sleeping area. Validate Persian version of the CSHQ was applied in a previous study [16] and the Cronbach's alpha was 0.97 for ADHD children.

The third scale was the DASS-21 which measured the mental health of parents [15]. The parents were asked to complete it according to the symptoms that their ADHD children experienced during the past 4 weeks. Clinical cutoffs were individually calculated for all 3 subscales so that the scores greater than 5,7,11 and 14 represented mild, moderate, severe and very severe depression, scores greater than 4, 6, 8, and 10 demonstrated mild, moderate, severe and very severe anxiety, as well as scores greater than 5,7,11 and 14 illustrated mild, moderate, severe and very severe stress, respectively.

Statistical analysis

Data were analyzed using SPSS 22. Firstly, the normality of data was tested through a one-sample Kolmogorov-Smirnov test. To describe the variables, descriptive analyses (percentage, frequency, standard deviation and mean) were applied. The comparison was done by Chi-squared test, and the relationship between CSHQ and DASS-21 scores was evaluated using the Pearson correlation test. A value of $p<0.05$ was statistically considered significant.

Results

One hundred 4-12-year-old children with a mean age of 7.72±2.31 years participated in this study for 12 months. The findings showed the mean of total sleep disorder in ADHD children as reported by their parents was 54.07±6.29. The mean score of bedtime resistance, sleep anxiety, parasomnias, sleep-onset delay, night waking, sleep-disordered breathing, sleep duration and daytime sleepiness was 12.97±2.69, 7.27±2.21, 9.81± 2.32, 1.53±79, 3.76±1.08, 3.36±0.83, 4.82±0.90 and 10.55±2.76, respectively. Demographic data and the comparison of the mean of total sleep disorder between variables are summarized in table 1, indicating that there is no significant difference in the mean of sleep disorder based on demographic data among ADHD children.

In total, 99% of ADHD children had a sleep disorder. The frequency of sleep complications according to the subscales was 92, 64, 46, 33, 24, 69, 19 and 21% for bedtime resistance, sleep anxiety, parasomnias, sleep-onset delay, night waking, sleep duration, daytime sleepiness and sleep-disordered breathing, respectively. Based on the DASS-21 scale, 63, 54 and 44% of mothers of ADHD children had healthy scores in the anxiety, depression and stress levels, as well as 72, 65 and 58% of their fathers had scores less than 7, 4 and 7 in the anxiety, depression and stress levels, respectively (Figure 1 and 2). The relationship between sleep disorders in children with ADHD and DASS-21 scale in parents evaluated using the Pearson correlation test is shown in table 2. There were statistically significant relationships between the total score of CSHQ with depression (R=0.31, P=0.002) in parents and anxiety (R=0.26, P=0.008) as well as stress (R=0.23, P=0.02) in their mothers. Moreover, statistically significant relationships were found between the parasomnias with anxiety, depression and stress in their fathers and mothers.

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Table 1. Demographic characteristics and the comparison of the mean of total sleep disorder in ADHD children

Variables		Mean ± SD	P value
Age	<6 years	53.4±5.35	0.42
	>6 years	54.43±6.76	
Sex	Male	53.75±6.21	0.39
	Female	55.04±6.59	
Birth order	Firstborn	54.00±6.19	0.9
	2≥	54.16±6.49	
Mother education status	> High school	54.73±6.39	0.11
	High school	54.98±6.45	
	Academic	51.93±5.62	
Father education status	> High school	54.93±6.77	0.12
	High school	54.81±5.32	
	Academic	52.07±6.08	

Table 2. Pearson correlation analysis between the scores of DASS-21 sub-scales for parents and Children's Sleep Habits Questionnaire

Variables	Mother			Father		
	Depression r	Stress P-value	Anxiety r	Depression P-value	Stress r	Anxiety P-value
Sleep anxiety	0.059	0.55	0.03	0.76	0.1	0.3
Parasomnias	0.33	0.001	0.29	0.004	0.23	0.02
Sleep-onset delay	0.13	0.19	0.10	0.30	0.06	0.55
Night waking	-0.13	0.18	-0.02	0.82	0.02	0.84
Daytime sleepiness	-0.03	0.72	-0.05	0.57	-0.08	0.39
Sleep-disordered breathing.	0.19	0.05	0.06	0.53	0.21	0.04
Sleep duration	0.13	0.18	0.18	0.07	0.15	0.14
Bedtime resistance	0.13	0.19	0.10	0.30	0.06	0.55
Total CSHQ	0.31	0.002	0.23	0.02	0.26	0.008

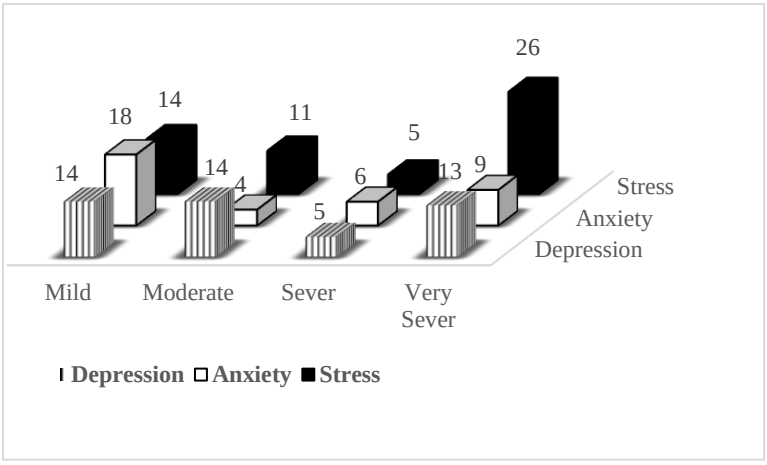

Figure 1. The frequency of depression, anxiety and stress in mothers of children with ADHD

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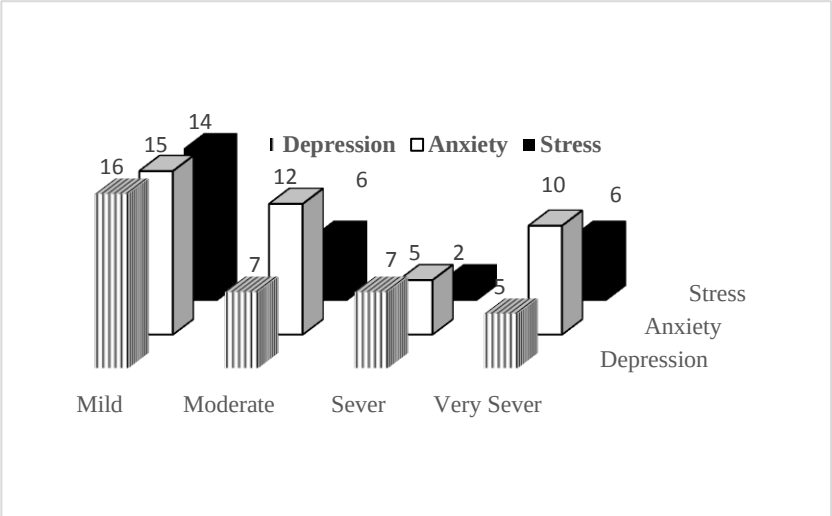

Figure 2. The frequency of depression, anxiety and stress in fathers of children with ADHD

Discussion

The ongoing study showed that there was a significant relationship between CSHQ scores in children with ADHD and mental health in parents, especially in their mothers. The majority of children with ADHD experienced sleep problems, and the most common disorders included bedtime resistance, sleep duration and sleep anxiety, respectively. Based on some reports, the prevalence of sleep disorders in ADHD people is in the range of 35–70 %. The relationship between ADHD and sleep disturbance is intricate and difficult to explain since ADHD and sleep problems can induce the same symptoms and they seem to have a synergistic effect on each other [5, 6]. On the other hand, more children and adolescents with ADHD suffer from other mental disorders such as bipolar disorder, post-traumatic stress disorder, depression, autism, anxiety disorders and so on as well as often, these comorbidities are related to sleep disturbances. Furthermore, using psychostimulant drugs by ADHD children may lead to sleep problems in these patients. Therefore, multifaceted and complex interactions between sleep disorders and ADHD can lead to diagnostic and therapeutic challenges in these patients [6, 9, 17].

The mean score of CSHQ was different in several studies [5, 18, 19]. It was 58.4±8.3 [18], 56.2±8.9 [19] and 64.77±18.43 [5]. Some researchers reported a prevalence of 86.5% [20], 32.07% [21], 73.3% [12] and 30.4% [13] of sleep problems. Some factors can affect the prevalence of sleep disorders in ADHD people, such as age, gender, ADHD subtype, other mental disorders and the use of psychotropic drugs [6, 8, 9]. Moreover, these differences can be explained considering the Coronavirus disease of 2019 (COVID-19) pandemic because the current study was done during the pandemic period when most governments had enforced quarantine as well as public and occupational restrictions. Sibley et al. suggested the most prevalent problems in young adults and adolescents with ADHD during the COVID-19 pandemic were social isolation, motivation problems, challenges of the virtual learning environment and boredom. Compared to the previous months, these problems became more severe during the pandemic [22].

Considering that 65% of the studied children are school age, the COVID-19-related school closures have influenced their activities and recreated them at home and indoors. Due to these restrictions, they have to stay at home, and inevitably, they have participated in virtual classes, requiring more attention and focus as well as they have spent more time on media such as playing video games and watching television, leading to sleep disorders based on the study of Becker et al. [17].

In contrast to the current study, Liu et al. [23] evaluated the sleep patterns and disturbances in two groups of children; one, in the period of COVID-19 pandemic and the other, over a school term, normally, one year ago. Their findings revealed that

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the prevalence of total sleep disorder was 55.6 and 77.7% for the samples during COVID-19 and normal school term, respectively. Compared to the present study, both studied children were without ADHD. However, sleep problems are partly related to handling ADHD and controlling comorbid psychiatric conditions associated with ADHD in these children. Such disorders can be due to the tension and turmoil in ADHD children and/or their parents [10].

Sleep problems are partly related to the control of hyperactivity and its associated complications. The present findings showed that sleep problems were associated with poorer mental health in parents, especially in mothers. Mothers spend more time with their children than fathers and they are more involved in their children's problems and treatment process. These concerns may affect the mental health of mothers more than that of fathers.

However, no other studies have reported the lack of association between sleep problems and mothers' mental health in children with ADHD. Sleep problems in healthy children are a known risk factor for maternal depression and stress [24]. Consistent with the ongoing study, different studies indicated that depression and anxiety were significantly more in mothers of children with psychiatric disorders [25, 26]. Some studies found a relationship between sleep problems in children and mental health of families. A study showed even sleep disorders in children without ADHD were a risk factor for stress and depression in their mothers [24]. In the study of Sung et al., sleep disorders were found to be an important predictor of psychological problems in caregivers of ADHD children. As they were 2.7 times more likely to have depression and anxiety when compared with caregivers of children without ADHD [12]. The evaluation of a sleep disturbance in ADHD children in this area and its relationship with parents' mood and mental health for the first time was an important strength of this study.

Limitations of the study

One of the main limitations of the study was the lack of a control group due to the COVID-19 pandemic, resulting in that outpatient visits to clinics were severely reduced and the closure of schools made it difficult to access the appropriate control group. Other limitations are that comorbidities with ADHD such as bipolar disorder, post-traumatic stress disorder, autism and anxiety disorders which are often associated with sleep disturbances were not evaluated in the current study as well as this study was conducted during the COVID-19 pandemic which was likely to affect the results of the present study.

Conclusion

Sleep disorders were very common in ADHD children aged 4-10 years, and the most common sleep disorders were bedtime resistance. The relationship between CSHQ scores and mental health in parents was statistically significant. It is recommended that longitudinal analyses should be performed during periods without restrictions such as pandemic to identify the relationship between ADHD and sleep disorders and to design trials in order to manage these disorders in ADHD children.

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Ethical approval

The current study was approved by the Ethics Committee of Babol University of Medical Sciences (IR.MUBABOL.REC1399.405).

Conflict of interest

There is no conflict of interest.

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