

Sleep Problems and Aggressive Behavior in Children with ADHD

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ABSTRACT

Objective: Aggression is a disruptive behavior that limits children's ability for a better adjustment. As commonly reported, sleep problems is associated with the presentation of aggression in ADHD children. In this study, we aimed to investigate the association between sleep problems and aggressive behavior in children with ADHD.

Methods: The study method is correlational and cross-sectional. The study population consists of children that were diagnosed with ADHD for the first time in Shiraz (south of Iran). Fifty eight children (41 boys, 17 girls) clinically diagnosed with Attention Deficit-Hyperactivity Disorder, by a child and adolescence psychiatrist, participated in this study. They were enrolled by accessible sampling. Their ages ranged from 6 to 13 years (mean age=8.06 years, SD=1.59). None of The children were Medicaid recipients and participated in our study before beginning their medical treatment. Child Behavior Checklist (CBCL) and Children's Sleep Habits Questionnaire (CSHQ) were used for data collection. For data analysis descriptive statistics, significance tests, Pearson correlation coefficient, independent samples t-test and regression analyses, were used.

Results: Children with ADHD showed a high prevalence of sleep problems, a significantly higher rate that reported before. Needing parent in room to sleep⁷ (56.9%) was the most prevalent problem. With regard to Sleep habits, sleep duration was age-related ($F=17.58$, $P<0.001$). Correlations between sleep problems and aggression were significant. Parasomnias wake-up time, daytime sleepiness and sleep duration were main predictors of aggressive behavior in children with ADHD and accounted for 56% of variance of aggression. No significant gender differences in sleep habits were observed.

Conclusions: As aggressive behavior is a frequently reported problem in patients with ADHD, the results of the study may present a basis for effective diagnosis and treatment planning.

Keywords:

Sleep problems, Aggressive behavior, ADHD

1. Introduction

Attention Deficit Hyperactivity Disorder is the most common neuro-developmental disorder of childhood (Rowland, Lesesne & Abramowitz, 2002). It starts early in life and is suggested to have high impact on an individual's socialization (Retz & Rösler, 2009). One of psychiatric conditions associated with aggression that

maybe identified in childhood is ADHD (Patel & Barzman, 2013; Danciu, 2011; Retz & Rösler, 2009; Barzman & Findling, 2008; Connor et al. 2002; DSM-IV-TR; APA, 2000; Barkley, 1998). Those who have worked with this population are aware that children displaying challenging, aggressive and confrontational behaviors that often struggle with interpersonal relationships which have a significant negative impact on not only the individual but also the society as a whole (Hansen, Meissler,

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Ovens, 2000; Hinshaw & Melnick, 1995). ADHD is a prevalent disorder and consideration of comorbidities by practitioners and clinicians make the diagnoses and treatment approaches less complicate. In recent years not only childhood problems are taken into consideration by clinicians but also a wide range of research has been conducted to make this developmental stage more predictable. Some factors could be associated with aggressive behavior in children with ADHD. These factors may be related to either child's environment or the interaction of parent and the child. Regarding to ADHD prevalence and its impacts on latter stage of development, paying a close attention to ADHD comorbidities could be useful for a better understanding of aggressive behavior. The aim of the current study was to investigate the association between sleep problems and aggressive behavior in children with ADHD.

Sleep problems in children with ADHD are common (Sung et al., 2008). According to Cortese et al. (2006), children with ADHD have higher daytime sleepiness, more movements in sleep (Corkum, Tannock & Moldofsky, 1998), and higher Apnea-Hypopnea Index compared with normal children. De Yurumez and Kilic (2013) in their study reported that the frequency of sleep problems in ADHD group was 84.8%, higher than the control group. They indicated that the ADHD group had more night wakings than the control group, so night waking that cause a partitioned sleep may be an important sign in ADHD. Stein et al. (2001) reported that their results raise the possibility that the increasing prevalence of depression, ADHD, and other psychiatric disorders in children and adolescents could be at least and in part attributable to sleep problems early in life. Parental reports of sleep problems have also been associated with several

child psychiatric disorders, including ADHD (Corkum, Tannock, Moldofsky, 1998).

Clinical observations suggest that sleep problems may be a causal factor in the development of reactive aggression, violence (Kamphuis, Meerlo, Koolhaas, & Lancel, 2012) and externalizing behaviors (Stein et al., 2001). Roth, Kramer, and Lutz (1976) revealed that after sleep deprivation, individuals have been shown to score significantly higher in tests of aggression. In children and adolescents, poor sleep appears to be associated with aggression (O'Brien, 2009; Dahl, 2006). Clinically, however, there are many manifestations of the poor sleep, including inattention, externalizing behaviors, poor emotional control, and daytime sleepiness and when these children receive treatment for sleep disruption, their behaviors improve and ADHD symptoms or aggression alleviate. But as O'Brien (2009) noted not many large-scale studies have systematically investigated the impact of inadequate sleep on children and only a few studies have documented and quantified the relationship between sleeping problems and latent or acted-upon aggression (Alves-Ferreira, Costa, & Santos, 2012). The prevalence of sleep problems and its relation to aggressive behavior in children with ADHD have not been rigorously studied, especially in Iranian ADHD sample. So in this study, we aimed to investigate the association between sleep problems and aggressive behavior in children with ADHD.

2. Methods

The study method is correlational and cross-sectional. The study population consists of children that were diagnosed with ADHD for the first time in Shiraz (south of Iran). Sample included children and their parents,

Table 1. Mean and SD of CSHQ subscales.

	No.	Mean	SD
Bedtime resistance	55	11.36	2.68
Sleep onset delay	58	2.08	0.82
Sleep duration	58	5.55	1.79
Sleep anxiety	58	8.01	2.35
Night wakening	58	4.53	1.74
Parasomnia	58	9.74	2.53
Sleep-disordered breathing	56	3.94	1.25
Daytime sleepiness	57	13.05	3.40
CSHQ	52	53.46	9.10

Table 2. Pearson correlations between CSHQ and aggression.

	Aggression
Bedtime	0.27
Wake-up time	0.36**
Sleep duration	0.12
Bedtime resistance	0.25
Sleep onset delay	0.23
Sleep duration	0.33**
Sleep anxiety	0.12
Night waking	0.32*
Parasomnias	0.40**
Sleep-disordered breathing	0.15
Daytime sleepiness	0.34**
CSHQ	0.54**

** = $P < 0.01$, * = $P < 0.05$

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currently attending an inner-city outpatient psychiatric clinic in Shiraz, Southern Iran. They were enrolled by accessible sampling. The criteria for selection were; 1) Clinically diagnosed with attention deficit-hyperactivity disorder (ADHD) by a child and adolescence psychiatrist (41 males, 17 females) 2) Aged between 6 and 13 years (mean age=8.06 years, SD=1.59), and 3) No Medicaid recipients and participated in our study before beginning their medical treatment. Children were excluded from the study if they had any other significant psychiatric disorders. Respondents of the questionnaires were parents of children with ADHD. All but three of the parents who completed the questionnaire were female and they fill out the questionnaires during 2 month of referral. Informed consent was obtained from each of parents and it was emphasized that participation was voluntary and confidential.

Child Behavior Checklist: CBCL comprised 113 items on a 3-point Likert scale (0=not true; 1=somewhat or sometimes true; 2=very true or often true). It has 2 broadband scales (internalizing and externalizing) and a total score. Here, the aggressive behavior (18 items) subscale of broadband externalizing problem scale was used to assess aggressive behavior in children with ADHD. CBCL for ages 6–18 years has demonstrated good test-retest reliability and good cross-informant correlations among parents for the competence scales, the empirically based problem scales, and the DSM-Oriented scales (Achenbach & Rescorla, 2001). It has well-documented reliability and validity for assessing behavioral problems among Iranian sample. Intercorrelations among the

scales ranged from 0.50 to .81 ($P < 0.01$); internal consistency reliabilities (coefficient alphas) for children ranged from 0.65 to 0.85; and test-retest reliabilities (using the Pearson r) ranged from 0.32 to 0.67 (Minaei, 2006).

Children's Sleep Habits Questionnaire: CSHQ is a retrospective, 33-item parent questionnaire in which 3 items ask for information about sleep patterns (i.e. bedtime, morning wake-up time, and daily total sleep duration). Items are rated on a 3-point scale: "usually" if the sleep behavior occurred 5 to 7 times per week; "sometimes" for 2 to 4 times per week; and "rarely" for 0 to 1 time per week. The questionnaire includes items relating to a number of key sleep domains: bedtime behavior and sleep onset, sleep duration, anxiety around sleep, behaviors occurring during sleep and night waking, sleep-disordered breathing, Parasomnias, and morning waking/daytime sleepiness. Parents are asked to recall sleep behaviors occurring over a "typical" recent week. CSHQ showed adequate internal consistency for both the community sample (=0.68) and the clinical sample (=0.78). Its test-retest reliability lies between 0.62 and 0.79; its sensitivity was 0.80, and specificity as 0.72 (Owens, Spirito, & McGuinn, 2000). In this study, the Cronbach α of the CSHQ total score was 0.78. For data analysis descriptive statistics, significance tests, Pearson correlation coefficient, independent samples t-test and regression analyses, were used. All statistics were performed with SPSS (version 19.0).

Table 3. Summary of significant regression findings.

CSHQ Subscales	STD	β t	P
Parasomnias	0.361	2.94	0.006
Wake-up time	0.333	2.85	0.008
Daytime sleepiness	0.305	2.60	0.014
Sleep duration	0.262	2.32	0.027

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3. Results

The primarily focus in this study was to investigate the sleep patterns and problems in children with ADHD. Mean bedtime was 22:06 p.m. (range, 200:00–24:00), and mean wake-up time was 8:08 a.m. (range, 5:30–11:30). Mean sleep duration was 10 hours, eleven minutes (range, 6–12.5 h). Table 1 shows the mean and standard deviation of sleep problems of children with ADHD. By age increment sleep duration significantly decreased ($F=17.58$, $P<0.001$). Sleep schedules (bedtime and wake-up time) were not age-related. An independent-samples t-test was conducted to compare sleep habits in male female children with ADHD. There was no significant difference in wake-up time scores for male ($M=8.1$, $SD=0.46$) and female ($M=8.2$, $SD=1.52$), $t(48)=-0.56$, $P=578$. No significant gender differences in bedtime, and sleep duration were observed.

This study included frequencies for specific sleep problems of children with ADHD. ‘Needing parent in room to sleep’ (56.9%) was the most prevalent problem. The other common sleep problems (defined as occurring “usually”) were: ‘afraid of sleeping alone’ (41.4%), ‘afraid to sleep in the dark’ (39.7%), ‘difficulty falling asleep in 20 min’ and ‘not sleeping same amount each day’ (37.9%), ‘going to bed at different times’ (36.2%), ‘falls asleep in own bed’ (32.8%), restless, ‘moving a lot’ and ‘awakening by others in the morning’ (29.3%), ‘hard time getting out of bed’ (27.6%), ‘trouble sleeping away’ (25.9%), ‘falling asleep in other’s bed’ (23.2%), ‘taking a long time to be alert’ (22.8%), ‘moving to other’s bed in night’ (22.4%), and ‘waking up in a bad mood’ (20.7%). However, ‘sleepwalking’ (1.7%), and ‘awakening screaming or sweating’ (3.4%) were specific sleep

problems with the lowest prevalence in children with ADHD.

Sleep Problems and Aggression

As shown in Table 2, significant correlations were found between CSHQ total score and aggression in children with ADHD ($r=0.54$; $P<0.01$). Of 8 sleep problems, parasomnias were significantly correlated with aggression with the highest correlation ($r=0.40$; $P<0.01$). Daytime sleepiness ($r=0.34$; $P<0.01$), sleep duration($r=0.33$; $P<0.01$), and night waking ($r=0.32$; $P<0.05$) were also associated with aggressive behavior in children with ADHD. Wake-up time was the only subtype of sleep patterns which was associated with aggression ($r=0.36$; $P<0.01$). To examine normality of data distribution Kolmogorov Smirnov test was conducted and the results of these tests showed that all variables in the data are normally distributed.

To examine the associations of sleep problems and sleep habits with aggressive behavior in children with ADHD, stepwise linear regression analysis was conducted. Bedtime resistance, sleep onset delay, sleep duration, sleep anxiety, night wakings, parasomnias, sleep disordered breathing, daytime sleepiness and 2 of sleep/wake patterns (night bedtime and morning wake-up time) as well as gender, were entered for stepwise regression analysis. Four variables were found to be significantly associated with increased likelihood of aggressive behavior. In the final model, predictors were as follows: parasomnias ($\beta=0.361$), wake-up time ($\beta=0.333$), daytime sleepiness ($\beta=0.305$) and sleep duration ($\beta=0.267$). In step 1, ‘parasomnias’ entered ($R^2=0.33$), in step 2, ‘wake-up time’ entered ($R^2=0.44$), in step 3, ‘daytime sleepiness’ entered ($R^2=0.51$), in the fourth step ‘sleep duration’ entered and

Table 4. Significance of difference between gender in CSHQ.

	Gender	N	Mean	SD	t	df	Sig.
CSHQ	Male	35	53.5143	9.14707	0.059	50	0.889
	Female	17	53.3529	9.28669			

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Table 5. Significance of difference between gender in aggression.

	Gender	N	Mean	SD	t	df	Sig.
Aggression	Male	41	20.5366	8.81220	0.985	56	0.005
	Female	17	18.2941	4.89598			

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R² changed to 0.56. An examination of the beta-weights revealed that these variables were positive predictors of aggression in children with ADHD and accounted for 56% of variance of aggressive behavior (Table 3). Then, the differences in independent variables and in aggressive behavior between male and female individuals were compared with t-test (Table 4 & 5). The overall score of CSHQ ($t=0.059$, $P=0.889$), its subscales, and sleep patterns showed no significant differences between the sexes. On the contrary, males' aggression was significantly higher ($t=0.985$, $P=0.005$) than that of female children with ADHD.

4. Discussion

This study was conducted to investigate the relationship between sleeping problems and aggressive behavior in children with ADHD. Primary descriptive data analysis suggested that sleep problems are surprisingly common in children with ADHD. In an almost recent study of sleep and ADHD, the prevalence of sleep problems was reported at 73% (Sung, et al. 2008). Consistent with our study, sleep problems have been reported with both subjective reports (parental) (Corkum, Tannock, & Moldofsky, 1998) and objective documentation (de Yurumez & Kilic, 2013) in children with ADHD.

In contrast to parental reports, fewer over reporting of sleep problems in objective measures could be found. With regard to sleep patterns, sleep duration decreased with increasing age and was found as an age-related habit. This finding was consistent with some reports in the literature (e.g. Liu, et al. 2005). "Afraid to sleep in the dark", "afraid of sleeping alone" and "needing parent in room to sleep" were the most common sleep problems with the estimated prevalence of 39.7%-56.9%. These findings show that children with ADHD may bear sleep problems which are associated with behavioral problems and could affect daily activities directly or indirectly.

Correlations between sleep problems and aggressive behavior were significant for children with ADHD in our study. Consistent with our hypothesis, aggression was positively associated with one of sleep pattern (wake up time) and specific sleep problems (parasomnias, daytime sleepiness, sleep duration and night wakening). Al-

though this relationship has been found in other studies (e.g. Stein et al., 2001), the nature of the correlation does not lead us to infer causality, i.e. this relationship does not mean that sleep problems are the primary cause of aggression in children with ADHD. The results of the current study demonstrate interesting and significant findings. Of 8 subscales of CSHQ and 3 subscales of sleep patterns, parasomnias, daytime sleepiness, sleep duration and wake-up time appear to be the best positive predictor of aggression in children with ADHD. As mentioned, sleep problems and sleep habits may predict aggressive behavior in children with ADHD. But no significant differences between female and male children with ADHD were found with regard to independent variables. As aggressive behavior is a common reported problem of ADHD population, the results of the study may provide a basis for effective diagnosis and treatment planning. Current psychology approaches like cognitive-behavioral therapy, which contain educational implications, may consider sleep patterns and problems. Given the positive relationship between sleep problems and aggressive behavior, identifying and working with sleep problems could prevent behavioral problems. Moreover, future research with experimental method may lead to investigate the effectiveness of sleep improvement on behavioral problems.

This study has its limitations. The small number of samples might affect the statistical results. Therefore, our findings have to be considered with caution. Another limitation of the study was the absence of a control group. So the causal relationship between sensory processing and aggression is not certain. This problem could overcome in future studies by conducting a causal-comparative study. Furthermore, future research could focus on investigating the sleep problems and patterns in ADHD subtypes.

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