

# Sleep habits, parasomnias and associated behaviors in school children with Attention Deficit Hyperactivity Disorder (ADHD)

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**SUMMARY:** Rodopman-Arman A, Perdahlı-Fiş N, Ekinci Ö, Berkem M. Sleep habits, parasomnias and associated behaviors in school children with Attention Deficit Hyperactivity Disorder (ADHD). Turk J Pediatr 2011; 53: 397-403.

Considerable clinical data support an association between sleep problems and Attention Deficit Hyperactivity Disorder (ADHD). We aimed to investigate the sleep habits, associated parasomnias and behavioral symptoms in primary school children with ADHD. Forty primary school children with a clinical diagnosis of ADHD and 40 age-sex-matched healthy community controls were recruited. The Children's Sleep Habits Questionnaire providing information regarding sleep habits and nighttime and daytime symptoms was used. About 22% of children with ADHD (versus 2.9% of the controls) needed their parents to accompany them while going to sleep ( $p: 0.008$ ). Transitional objects were needed by 8.1% of ADHD children in contrast to 2.9% of controls. Nightmares, overactivity during sleep, habitual snoring, and bed-wetting were significantly higher in the ADHD group. ADHD children needed significantly more time to go to sleep on school days ( $p<0.02$ ). Children undergoing evaluation for ADHD should be routinely screened for sleep disturbances.

**Key words:** sleep habits, Attention Deficit Hyperactivity Disorder, parasomnia, school children, behavior.

Sleep-related problems are frequently encountered in many of the developmental psychopathologies. Attention Deficit Hyperactivity Disorder (ADHD) is the most frequently diagnosed pediatric neurodevelopmental disorder, with a prevalence of 3–12%<sup>1,2</sup>. In some situations, unrecognized medical conditions underlie the problematic externalizing behaviors, including sleep disorders<sup>3,4</sup>. Considerable clinical as well as empirical data support an association between sleep problems and ADHD in children<sup>5-7</sup>. Particularly, difficulties in initiating and maintaining sleep are frequently reported in children with ADHD<sup>4,5</sup>. However, the relationship between ADHD and sleep problems seems to be complex and bidirectional in recent studies<sup>3,8,9</sup>. Basic sleep habits include environmental, scheduling (e.g., regular bedtime and wake-up schedule), sleep practice (e.g., bedtime routine, presence of a family member or an object while sleeping), and physiologic

factors that promote optimal sleep<sup>10</sup>. Studies have suggested that implementation of good sleep habits alone may be adequate for a successful management of sleep initiation problems in children with ADHD<sup>11,12</sup>.

Parents of those with ADHD and children with ADHD report sleep difficulties more frequently than healthy children and their parents in most studies<sup>4,6,10,12</sup>. In contrast, sleep hygiene in association with parasomnias and behavioral parameters have not been mentioned very often in school children with ADHD. We aimed to investigate the sleep habits, associated parasomnias, and behavioral symptoms in primary school children with ADHD and community control subjects.

## Material and Methods

The study sample consisted of 40 primary school children with a clinical diagnosis of ADHD who admitted to the Child Psychiatry

Clinic in a university hospital, and 40 age-sex-matched healthy community controls. The patients were randomly recruited from a large pool of ADHD outpatients, which represented approximately 30% of the 1500 new outpatient admissions per year. The study interval was six months. Approvals by the Regional Director of Education, which serves as the Institute of Human Subject Protection Committee for the schools in İstanbul, as well as by the Institutional Review Board of Marmara University Medical School were obtained prior to the case-control study. Children with combined type of ADHD were diagnosed with Kiddie-Schedule for Affective Disorders and Schizophrenia (KADS)-Present and Lifetime version (KSADS-PL)<sup>13</sup>, a semi-structured clinical schedule, Turkish version<sup>14</sup>. Only the threshold conditions of KSADS-PL were taken into consideration for the comorbidity. Children who had an Intelligence Quotient (IQ) below 70 and who suffered from major sensorimotor disabilities (such as blindness, deafness and cerebral palsy), psychosis or autism were excluded from the study. Wechsler Intelligence Scale for Children Revised (WISC-R)<sup>15</sup> was administered to children for evaluating the IQ levels using the Turkish adaptation made by Savaşır and Şahin<sup>16</sup>. The diagnosis of learning disorder was given if there was a discordance between the WISC-R subscales and if the patient's academic problems well-matched the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) criteria for learning disorder. Additionally, subjects with ADHD who were on pharmacotherapy and subjects with comorbid anxiety/depressive disorders were also excluded to avoid the over-interpretation of sleep disorders. The community subjects having T scores <+2SD by Conners' Parent Scales were randomly recruited from a larger pool of a prior study group<sup>17</sup>.

In this case-control study, we utilized a semi-structured parental sleep questionnaire, the Children's Sleep Habits Questionnaire (CSHQ), designed by Owens et al.<sup>18</sup>, which was formulated according to the former guidelines of Carroll<sup>19</sup> and Brouillette et al.<sup>20</sup>. The validity and the reliability of Turkish version of the CSHQ were studied in 1749 elementary school children<sup>21</sup>. The Cronbach alpha coefficient was determined as 0.78. The test-retest correlation coefficient was 0.81. There were statistically

significant relationships between all behavioral and emotional parameters and the presence of sleep problems. The CSHQ, which is a parent proxy-report, is a valid and reliable instrument for assessing sleep habits and screening for possible sleep problems in Turkish children.

An envelope containing the questionnaire and a personally addressed letter asking for parental consent were given. The questionnaire was completed by the parents. It provided information regarding sleep habits, nighttime symptoms (total sleep time, sleep latency, habitual snoring, restless sleep, sleep arousals, nocturnal enuresis, night terrors, nightmares, somnambulism, sleep talking, and bruxism) and daytime symptoms (sleepiness in different situations), and learning disabilities of children. Parents reported the behavioral measures on a 4-point Likert scale as: 0 (never), 1 (occasionally), 2 (often), and 3 (always).

Parameters were considered positive if they were reported by parents on the parental questionnaire as either 'often' or 'always' on a 4-point Likert scale. Similarly, the answer to the question of 'What do you think about your child's academic performance?' was scored from 'failure (0)' to 'successful (3)' on a 4-point scale. Sleepiness score was maintained by the mean score of the sum of 'often' or 'always' answers to the questions such as 'Does your child feel sleepy in different conditions such as in public places, while watching TV, or while playing with friends?'

### Data Analysis

Statistical analysis was done using a statistical software package (Version 11.0 for Windows; SPSS, Chicago, IL). Comparisons between two groups were done using independent t-tests for continuous variables. The prevalence of symptoms in study groups was compared by Pearson chi-square analysis. One-way ANOVA was applied for the nominal values. Bonferroni corrections were applied to control for multiple comparisons. Data were summarized with means and SD unless otherwise indicated, and the level of significance was set at  $p < 0.05$ .

### Results

All of the ADHD patients were of combined type, and they were medication-free. There

were 11 ADHD children with comorbidity (ADHD-C) apart from depression and anxiety (5 were additionally diagnosed as learning disability, 3 as oppositional defiant disorder (ODD), 2 as enuresis nocturna, and 1 as chronic tic disorder). Table I outlines the demographic characteristics of the subjects. The gender distribution and the age range were similar between the two groups. The ADHD group was composed of 32 boys and 8 girls and the healthy control group was composed of 30 boys and 10 girls. The mean age was 9.1±1.5 years (age range: 7-13 years) for the ADHD group and 9.3±1.3 years (age range: 7.1-13.2 years) for the healthy controls. The groups in our study did not differ with regard to sociodemographic variables (Table I).

Characteristics of sleep habits are presented in Table II. Children with ADHD, combined type only (52.3%) and the ADHD-C group (63.7%) were found to be less likely to sleep alone than healthy controls (88.6%) (p: 0.03). The percentage of children who needed their parents to remain by their side during sleep onset was 22.7% in ADHD, combined type only, and 18.1% in the ADHD-C group vs. 2.9% in controls (p: 0.008). Transitional objects were needed by 8.1% of ADHD children in contrast to 2.9% of controls (Table II).

Table III shows the time of sleep onset and sleep latency in the study groups. The sleep latencies of children with ADHD during

the weekdays (21.6±22 vs. 15.8±12.8 (in minutes± SD), p: 0.03) and on weekends (21.6±19.1 versus 14.9±11.7 (in minutes± SD), p: 0.001) were longer than in the normal controls (Table III).

As shown in Table IV, there were significant differences in the rates of nighttime symptoms between children with ADHD and normal controls. The rates of nightmares (p: 0.001), nocturnal enuresis (p: 0.001), habitual snoring (p: 0.007), and restless sleep (p: 0.02) were higher in children with ADHD (Table IV).

The prevalences of daytime symptoms in ADHD children and normal controls are shown in Table V. Daytime sleepiness score was considerably higher in the ADHD group (p<0.001). Compared with normal controls, children with ADHD had significantly higher scores in learning disability (38.8% vs. 11.1%; p: 0.01) and lower academic performance (5.9% and 1.8% of the subjects, respectively, failed in school; p: 0.02) (Table V).

**Discussion**

In our study, school children with ADHD had significantly higher sleep-related problems regarding sleep habits such as bedtime resistance, sleep latency and parasomnias as well as daytime behavioral parameters, i.e. increased sleepiness, when compared to controls. These results were compatible with the previous literature indicating that both disturbances in

**Table I.** Demographic Characteristics of 44 Children with ADHD and 40 Control Subjects

	ADHD (n= 44)	Controls (n= 40)	P value
Mean age (y; range)	9.1 ± 1.5 (7.2- 13.5)	9.3 ± 1.3 (7.1- 13.2)	0.24
Male gender	32 (80%)	30 (75%)	0.36
Maternal educational status			
Primary school	18 (45%)	19 (47.5%)	
Junior high (middle) school	13 (32.5%)	14 (35%)	
High school	7 (17.5%)	6 (15%)	0.08
College or higher	2 (5%)	1 (2.5%)	
Maternal labor status			
Housewife (not working)	32 (80%)	31 (77.5%)	
State officer ‡	4 (10%)	5 (12.5%)	
Manual worker †	3 (7.5%)	2 (5%)	0.09
Other	1 (2.5%)	2 (5%)	

† Manual worker indicates those with a position that requires handwork (i.e. cleaning services, textile industry, tailor assistance, etc.). They may or may not be governmentally insured.

‡ State officer indicates those with high school or university education, usually engaged in office work, and who have governmental health insurance (i.e. nurse, doctor, lawyer, teacher, etc.).

**Table II.** Characteristics of Sleep Habits in the Study Groups

	ADHD-combined only (n=33)	ADHD with comorbidity (n=11)	Controls (n=40)	P value
The mode of sleep settlement, %				
Alone	52.3	63.7	88.6	0.03
With the help of mother/father	22.7	18.1	2.9	0.008
With transitional objects	8.1	9.1	2.9	0.03
In the living room with others/while watching TV	2.7	-	3.8	0.14
Other	8.7	9.1	9.3	0.87

sleep<sup>4</sup> and related daytime problems<sup>9,11,12</sup> were frequently reported by the parents of children with ADHD. Sleep problems were reported in about 25-50% of children and adolescents who had ADHD<sup>7,12,22</sup>, which might further worsen the ADHD symptomatology<sup>23,24</sup>.

In the present study, daytime sleepiness, learning disabilities and failure at school were significantly higher in the ADHD group. According to a review of related literature by Cortese et al.<sup>8</sup>, although no significant alterations in sleep macro-architecture were found compared with controls, children with ADHD had significantly higher daytime sleepiness and were more restless during sleep in this study. In a child with ADHD, sleep disturbances such as parasomnias may result in sleep fragmentation, which may consequently lead to excessive daytime fatigue<sup>25,26</sup>. This may interfere with several aspects of daytime functioning, such as attention and learning, which are crucial for good performance at school<sup>4,27,28</sup>.

Similar to the findings of Hvolby et al.<sup>26</sup>, difficulties relating to bedtime and sleep settlement were significantly more frequent in both the ADHD-combined only group and the ADHD-C group than in the controls in our study. Children with ADHD showed prolonged sleep onset, but there was no difference

regarding the total sleep time per night on weekdays versus weekends.

In many of the subjective studies based on parental reports<sup>25-30</sup>, children with ADHD had significantly higher bedtime resistance, more sleep-onset difficulties, sleep disordered breathing<sup>31,32</sup>, and daytime sleepiness compared with the controls.

There might be several explanations for increased bedtime resistance. First, it is possible that the increased resistance to sleep encountered in these children may reflect problematic parent-child interaction, i.e. the significant need for parents and/or transitional objects nearby during sleep settlement, which is quite common in ADHD<sup>33</sup>. Second, most of the families of children with ADHD have inappropriate sleep habits, including environmental, scheduling and sleep practice<sup>4,7,34</sup>, which may also contribute to the problems with sleep initiation and sleep maintenance.

Our results are compatible with the previous literature and showed that school children with ADHD have significantly higher sleep-related problems. Previous literature indicates that both the sleep disorder symptoms<sup>4</sup> and related daytime problems<sup>9, 11,12</sup> are frequently reported by parents in ADHD. In correlation with the literature, our results revealed that

**Table III.** Time of Sleep Onset and Sleep Latency in Study Groups

	ADHD	Controls	P value
Total sleep time, min±SD			
Weekdays	596.2±67.7	595±74.7	0.2
Weekend	601±96.7	616.8±65.7	0.6
Sleep latency, min±SD			
Weekdays	21.6±22	15.8 ± 12.8	0.03
Weekend	21.6±19.1	14.9±11.7	0.001

**Table IV.** The Prevalence of Nighttime Symptoms in ADHD and Control Groups

Nighttime symptoms, %	ADHD	Controls	P value
Sleep awakenings, %	3.8	2.3	0.1
Restless sleep, %	23.1	13.9	0.02*
Nocturnal enuresis, %	15.1	3.3	0.001*
Habitual snoring,%	19.3	7.2	0.007*
Nightmares,%	32	5.2	0.001*
Excessive vocalizations during sleep, %	52	22.2	0.07
Bruxism, %	43.1	17.1	0.1

\*Significant results where Bonferroni procedure is applied. Significance levels were set after the Bonferroni procedure.

children with ADHD had higher scores in various domains of sleep problems and related functioning.

When limitations are taken into consideration, our study mainly relied on subjective measures of parental reports rather than objectively collected sleep measures such as polysomnography. On the other hand, extensive clinical evaluation of ADHD children was made by KSADS-PL. A considerably lower incidence of ODD comorbidity in our study group might be explained due to exclusion of subthreshold conditions in KSADS-PL. Additionally, we excluded the ADHD children with comorbid anxiety/depressive disorders to avoid the over-interpretation of sleep disorders. That might also result in a further decrease in the rate of ODD comorbidity, which is commonly seen in depressive ADHD cases<sup>35</sup>. We also excluded the patients with psychiatric comorbidity and those who were on medications in order to minimize their possible confounding effects on sleep and behavioral variables.

In conclusion, children undergoing evaluation for ADHD should be screened routinely for sleep disturbances. This screening may include the evaluation of psychotropic medication use, comorbid psychiatric conditions, circadian rhythm disorders, sleep hygiene problems, and

parental reactions<sup>4,8,11</sup>. Children undergoing evaluation for ADHD should be screened routinely for sleep disturbances and would benefit from an assessment regarding the sleep profiles. Behavioral and time-based regulations on sleep may have positive effects on the daytime symptom profile of children with ADHD.

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**Table V.** The Prevalence of Daytime Symptoms in the ADHD and Control Groups

Daytime symptoms, %	ADHD	Controls	P value
Sleepiness score §	0.38 ± 0.64	0.17 ± 0.31	0.000
Learning disability, %	38.8	11.1	0.01
Academic performance, (% of subjects who failed at school)	5.9	1.8	0.02

§ Sleepiness score was determined by the mean score of the sum of 'often' or 'always' responses to the questions such as 'Does your child feel sleepy in different conditions, such as in public places, while watching TV, or while playing with friends?'

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