

RESEARCH ARTICLE

Sleep Disturbances in Children with Attention – Deficit/ Hyperactivity Disorder (ADHD): Comparative Study with Healthy Siblings

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Abstract

Objectives: Sleep disturbances in children with ADHD impact their functioning and overall Quality of Life. This paper's purpose is to study the occurrence of sleep disturbances in children with ADHD, in comparison to their healthy siblings and further, within the ADHD group, to look for correlation between sleep disturbances and age, severity of symptoms, presentations of ADHD and illness parameters. **Methods:** The parents of 120 children of age group between 5-16 years, (60 children diagnosed with ADHD as per DSM-5 criteria and 60 of their healthy siblings) consecutively enrolled from a hospital's Child Psychiatry Outpatient services were interviewed using Child Sleep Habits Questionnaire (CSHQ) and severity of ADHD symptoms was rated using ADHD – RS. **Results:** Sleep disturbances are more prevalent in pharmacologically treated children with ADHD than their healthy siblings, reduce with increasing age and are found more in the Predominantly Hyperactive/impulsive presentation of ADHD. **Conclusion:** Sleep disturbances are more prevalent in pharmacologically treated ADHD, making it an important aspect of ADHD management.

Key Words: *sleep disturbances, ADHD, healthy siblings*

Résumé

Objectifs: Les perturbations du sommeil chez les enfants souffrant du TDAH influent sur leur fonctionnement et leur qualité de vie générale. Cet article vise à étudier l'occurrence des perturbations du sommeil chez les enfants souffrant du TDAH, en comparaison avec leurs frères et sœurs en santé et de plus, au sein du groupe de TDAH, à cerner les corrélations entre les perturbations du sommeil et l'âge, la gravité des symptômes, les présentations du TDAH et les paramètres de la maladie. **Méthodes:** Les parents de 120 enfants du groupe d'âge des 5-16 ans, (60 enfants ayant reçu un diagnostic de TDAH selon les critères du DSM-5 et 60 de leurs frères et sœurs en santé) inscrits consécutivement aux services ambulatoires en pédopsychiatrie d'un hôpital ont été interviewés à l'aide du questionnaire sur les habitudes de sommeil de l'enfant (CSHQ), et la gravité des symptômes du TDAH a été évaluée au moyen de l'échelle ADHD – RS. **Résultats:** Les perturbations du sommeil sont plus prévalentes chez les enfants souffrant du TDAH traités pharmacologiquement que chez leurs frères et sœurs en santé; elles diminuent avec l'âge et s'observent davantage dans la présentation à prédominance hyperactive/impulsive du TDAH. **Conclusion:** Les perturbations du sommeil sont plus prévalentes chez les enfants souffrant du TDAH traités pharmacologiquement, ce qui en fait un aspect important de la prise en charge du TDAH.

Mots clés: *perturbations du sommeil, TDAH, frères et sœurs en santé*

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Introduction

Attention-deficit/Hyperactivity Disorder (ADHD), a commonly diagnosed neurodevelopmental disorder affects approximately 5.3% of children and adolescents (Polanczyk, de Lima, Horta, Biederman, & Rohde, 2007). Developmentally inappropriate over activity, inattention, academic underachievement and impulsive behavior are characteristic symptoms (National Institutes of Health, 1998). DSM-5 describes three types: predominantly inattentive (ADHD – I); predominantly hyperactive/impulsive (ADHD-HI); and, combined (ADHD-C) (American Psychiatric Association, 2013).

Interest in research on sleep disturbances in ADHD is increasing with 60%-70% of children with ADHD reported to display mild to severe sleep problems (Sung, Hiscock, Sciberras & Efron, 2008; Efron, Lycett, & Sciberras, 2014). Parents of children with ADHD complain of sleep problems in 25-55% of their offspring (Corkum, Tannock & Moldofsky, 1998). Bedtime resistance, sleep-onset difficulties, night awakenings, difficulties with morning awakenings, sleep breathing problems, and daytime sleepiness are some of the issues (Cortese, Faraone, Konofal & Lecendreux, 2009); the most common problem being “difficulty falling asleep” (Sung et al., 2008). Children with sleep problems are found to have more behavioral, emotional, and social problems, difficulties with school attendance, increased impulsivity, hyperactivity, and aggressiveness and problems in mood, academic performance, and neurocognitive functioning (Paavonen et al., 2002; O’Brien et al., 2004; Randazzo, Muehlbach, Schweitzer & Walsh, 1998; Fallone, Owens & Deane, 2002). Thus, it has been postulated that children with ADHD and sleep problems could have poorer cognitive and behavioral outcomes than children with ADHD alone, thereby making sleep an important parameter to monitor in these children (Owens, 2005; Bullock & Schall, 2005; Bartholomew & Owens, 2006). Though significant, this is a relatively overlooked area of research (Gruber, 2009) and the actual nature of problems related to sleep in ADHD and their effects on behavior are still poorly understood (Kirov & Brand, 2014).

Research looking at the associations between the core symptoms of ADHD and subtypes with sleep problems has shown inconsistent results. Certain studies found no differences (LeBourgeois, Avis, Mixon, Olmi & Harsh, 2004) while others indicate a higher prevalence in the combined subtype (Kirov & Brand, 2014; Mayes et al., 2009). Mayes et al. also reported daytime sleepiness more frequently in the inattentive subtype.

The impact of co morbidities in ADHD on sleep is controversial. A meta-analysis (Cortese, Faraone, Konofal, & Lecendreux, 2006) noted presence of co morbidity to be “a key mediating variable” and found that in studies where co morbidities and medication status were controlled, sleep differences that were previously reported, became insignificant.

Link between co morbid anxiety/ depression and sleep disturbances is undisputed (Yoon, Jain & Shapiro, 2012; Ivanenko, Crabtree, O’Brien & Gozal, 2006), while in case of co morbid Oppositional Defiant Disorder, certain studies show significant sleep disturbances, like increased movements in sleep and resistance to going to bed and awakening in the morning (Corkum, Davidson, & MacPherson, 1999), while others show no difference (Mayes et al., 2009).

The type of medication used may also have an influence on sleep with some studies reporting no significant difference in medicated vs. unmedicated children (Mayes et al., 2009; Ball, Tierman, Janusz & Furr, 1997), while others show medicated children to have greater sleep problems (Stein, 1999; Stein et al., 2002).

Adding to the confusion has been the factor of differing measures to assess sleep which have yielded varying results. Studies that have used parental ratings (Ball, Tierman, Janusz & Furr, 1997) have more consistently reported increased prevalence of sleep problems in children with ADHD, when compared with healthy controls, siblings (Ring et al., 1998) or children with other behavioral and learning problems (Marcotte et al., 1998).

Previous studies also show that sleep can be influenced by various factors, with family environment having a significant impact (Becker, Langberg & Byars, 2015). Study designed using the child’s own healthy sibling as control, helps minimize the confounding role of environmental factors and also addresses the issue of inter rater reliability.

As discussed above, research in this area so far has been inconsistent and inconclusive. Very few studies have been conducted using siblings as control, and these have been marred with small sized samples and using checklists for the sleep assessment (Bhargava & Sethi, 2005; Ring et al., 1998). Thus, the purpose of this study is to examine the presence of sleep disturbances in children with ADHD in comparison with their healthy siblings by means of a comprehensive parent reported sleep screening questionnaire and to correlate sleep disturbances with parameters of age, severity of symptoms, presentations of ADHD, duration of illness and duration of treatment in order to shed more light on a clinically relevant and important aspect of ADHD.

Methods

Sample

With the approval of the Institutional Ethics Committee, parents of 60 children of age group 5-16 years, diagnosed with ADHD (as per DSM-5 criteria, ascertained by parent’s history regarding child’s behavior in various settings, letter from school describing behavior and interview with the child) (American Psychiatric Association, 2013) and who had a healthy sibling (i.e. no medical/psychiatric illness, including ADHD, as determined on history from parent,

Table 1. Comparison of Child Sleep Habits Questionnaire scores of both the groups						
Sr. no.	CSHQ domains	Group	Mean rank	Mann Whitney U test		
				U	Z	p
1	Bedtime resistance	ADHD	73.85	999	- 4.337	.000**
		Sibling	47.15			
2	Sleep – onset	ADHD	69.57	1256	- 3.972	.000**
		Sibling	51.43			
3	Sleep duration	ADHD	67.76	1364	- 3.389	.001**
		Sibling	53.24			
4	Sleep anxiety	ADHD	67.49	1380.5	- 2.293	.022*
		Sibling	53.51			
5	Night waking	ADHD	62.83	1660	- 1.023	.306
		Sibling	58.17			
6	Parasomnias	ADHD	63.00	1650	- .827	.408
		Sibling	58.00			
7	Sleep disordered breathing	ADHD	60.5	1800	.000	1.000
		Sibling	60.5			
8	Daytime sleepiness	ADHD	77.86	758.5	- 5.488	.000**
		Sibling	43.14			
9	TOTAL	ADHD	78.08	745	- 5.546	.000**
		Sibling	42.92			

** Correlation is significant at .01 level (2-tailed)
* Correlation is significant at .05 level (2-tailed)

report regarding behavior in various settings and interview with the child) in the same age group, were recruited consecutively from the Child Psychiatry Outpatient services of a Tertiary Care Hospital in Mumbai, India, this being a sample of convenience. On the child agreeing to participate in the study, consent was obtained from the parents. Children with Intellectual disability (ascertained by history, academic records and interview, in conceptual, social and practical domains) and who were on any sedative, hypnotic or antihistaminic medications at the time of the study were excluded. Diagnosis of primary sleep disorders (such as restless leg syndrome, obstructive sleep apnea) which may manifest with ADHD – like symptoms, leading to misdiagnosis were excluded (Yoon et al., 2012). Other co morbid psychiatric/medical/chronic illnesses that could independently cause sleep disturbances such as depression/anxiety disorders, substance use disorders, autism spectrum disorder, epilepsy, bronchial asthma, etc. were also excluded.

Assessment

The parents were interviewed regarding socio-demographic details and details pertaining to illness (“Since what age were the symptoms of inattention &/or hyperactivity/impulsivity observed at home, school, etc.?”) and treatment variables (“Since how many months has child been receiving treatment for ADHD in form of Occupational therapy, medications or both?”) in case of the child with ADHD.

Child’s Sleep Habits Questionnaire (CSHQ) (Owen, Spirito & McGuinn, 2000), a comprehensive 32-item parent-report sleep screening instrument was used for the evaluation of sleep disturbances in both the child with ADHD, and the sibling. The parents were asked to recall sleep behaviors occurring during a typical recent week while answering the questionnaire. The items on the scale are grouped into eight subscales which relate to key sleep domains, i.e. Bedtime Resistance, Sleep onset-delay, Sleep duration, Sleep anxiety, Night waking, Parasomnias, Sleep-disordered breathing, Daytime sleepiness. Cronbach’s α in clinical sample is 0.78 with coefficients for subscales ranging from 0.56 (Parasomnias) to 0.93 (Sleep disordered breathing). To assess the severity of ADHD symptoms, ADHD – RS, an 18-item clinician rated scale was used (Zhang, Faries, Vowles & Michelson, 2005). As symptoms in both DSM 5 and earlier versions are the same, this scale based on DSM-IV was used. Chronbach’s α is 0.795 for total score, 0.724 for inattention subscale and 0.825 for hyperactive/impulsive subscale.

Analysis

For the demographic variables, descriptive analysis was done. As the data was non parametric, Mann Whitney U test was used to compare the total score and subscale scores of CSHQ between the two groups. Within the ADHD group, relation of the sleep disturbances with age, severity of

CSHQ total score (Spearman's rho)		Age		Severity (ADHD-RS score)	Duration of illness	Duration of Treatment
		6 – 10 yrs (n=22)	11 – 16 yrs (n=38)			
		Correlation coefficient	-.285	-.417**	.229	-.185
Sig. (2 – tailed)	.198	.009	.079	.157	.816	

** Correlation is significant at the 0.01 level (2-tailed).

Sr. no.	Subscale scores of CSHQ	6 – 10 yrs age group (n=22) Spearman's rho		11 – 16 yrs age group (n=38) Spearman's rho	
		Correlation coefficient	Sig. (2 – tailed)	Correlation coefficient	Sig. (2 – tailed)
		1	Bedtime resistance	-.161	.475
2	Sleep – onset	.452*	.035	-.321*	.049
3	Sleep Duration	.072	.752	.034	.837
4	Sleep Anxiety	-.158	.481	-.445**	.005
5	Night Wakings	-.231	.301	-.003	.984
6	Parasomnias	-.272	.221	-.387*	.016
7	Sleep disordered breathing	.266	.231	.	.
8	Daytime sleepiness	-.295	.182	-.201	.226

* Correlation is significant at the 0.05 level (2-tailed);
** Correlation is significant at the 0.01 level (2-tailed)

symptoms, illness parameters (duration of illness and duration of treatment) and presentation of ADHD was analyzed using Spearman rho correlation and Kruskal – Wallis test. p value of <0.05 was considered statistically significant.

Results

Demographics

Mean age of children was 11.62 years in the ADHD group and 10.92 years in the sibling group. 70% in the ADHD group and 45% in the control group were males.

Disease Profile (ADHD group)

The average duration of illness was 4.9 years, with maximum duration being 12 years. Majority of the group were of the Combined presentation (46.67%) followed by the Predominantly Inattentive presentation (45%). Among the 43.33% which had co-morbidity, 61.54% had Specific Learning Disability and 38.46% had Oppositional Defiant Disorder.

86.67% of the children were on treatment, with the average duration of treatment being 7.2 months. Among those

on treatment, 76.92% were only on medications, 3.85% were only on Occupational therapy and 19.23% were on both Medications and Occupational therapy. Most of the children were on Methylphenidate (N=25). Atomoxetine (N=14) and Risperidone (N=7), as single therapy and in combination with Methylphenidate (N=4) were the other medications being prescribed.

Child Sleep Habits Questionnaire (CSHQ) scores

The median total score of the CSHQ in the ADHD group was 47.5 and in the Sibling group was 39 (Table 1). Mann Whitney U test revealed significant differences in sleep disturbances between the two groups, with the ADHD group showing a higher mean, i.e. more sleep disturbances in the subscales of Bedtime resistance, Sleep – onset, Sleep duration, Sleep anxiety, Daytime sleepiness and Total score. Analyses controlling for gender did not affect the result [Mann Whitney U test; ADHD group (Md = 49, n = 23) and healthy sibling group (Md = 37, n = 23), U = 99.5, p = .00].

Correlation of factors in ADHD group with CSHQ scores

Table 4. Comparison of CSHQ scores among presentations of ADHD

Sr. no.	CHSQ domains	Presentation of ADHD*	Mean rank	Kruskal – Wallis test		
				χ^2	df	p
1	Bedtime Resistance	A	27.56	4.637	2	.098
		B	20.2			
		C	35.18			
2	Sleep onset	A	30.65	1.012	2	.603
		B	24.2			
		C	31.48			
3	Sleep duration	A	30.69	.171	2	.918
		B	28.0			
		C	30.77			
4	Sleep anxiety	A	29.31	.690	2	.708
		B	26.7			
		C	32.32			
5	Night waking	A	29.59	.502	2	.778
		B	28.4			
		C	31.75			
6	Parasomnias	A	29.15	.423	2	.810
		B	29.5			
		C	31.98			
7	Sleep disordered breathing	A	31.11	1.222	2	.543
		B	30.0			
		C	30.0			
8	Daytime sleepiness	A	35.94	4.83	2	.089
		B	26.5			
		C	25.96			
9	TOTAL	A	23.15	9.458	2	.009**
		B	42.60			
		C	35.43			

** Correlation is significant at the 0.01 level (2-tailed)
*A = Predominantly Inattentive, B = Predominantly Hyperactive/impulsive, C = Combined

Spearman's Rank Order Correlation (ρ) showed a significant negative correlation between the CSHQ total score and age of the child (age group 11-16 yrs) ($r = -.408$, $p = .001$), with lesser sleep disturbances with increasing age. No significant correlations for parameters of severity of ADHD symptoms, duration of illness and treatment (Table 2).

Further exploration in the subscales of the CSHQ showed significant negative correlations between age and subscales of Bedtime resistance, sleep onset, sleep anxiety and parasomnias (Table 3).

A Kruskal-Wallis test revealed statistically significant differences in sleep disturbances across the three presentations of ADHD (Gp1, $n = 27$: Inattentive, Gp2, $n = 5$: Hyperactive, Gp3, $n = 28$: Combined), χ^2 (2, $n = 60$) = 9.458, $p =$

.009. The Predominantly Hyperactive/impulsive presentation recorded the highest Total median score ($Md = 61$), followed by the Combined ($Md = 49.5$), and the Predominantly Inattentive presentation ($Md = 43$). Further exploration into the subscales showed no significant findings (Table 4). A Mann Whitney U test showed no significant differences in sleep disturbances between children in ADHD group with and without co morbidity (Table 5).

Discussion

The current study aimed at a comparison of sleep disturbances between children with ADHD and their healthy siblings. In our analysis, we found sleep disturbances significantly more in the ADHD group than their siblings, which is in accordance with previous studies (Ring et al., 1998;

Table 5. Comparison of CSHQ scores in ADHD group between those with and without co morbidity

Sr. No.	CSHQ domains	Group*	Mean rank	Mann Whitney U test		
				U	Z	p
1	Bedtime resistance	A	27.03	324	-1.784	.074
		B	35.04			
2	Sleep – onset	A	29.04	392	-.863	.388
		B	32.40			
3	Sleep duration	A	29.75	416.5	-.47	.638
		B	31.48			
4	Sleep anxiety	A	28.7	382.5	-.904	.366
		B	32.79			
5	Night waking	A	29.03	392	-.984	.325
		B	32.42			
6	Parasomnias	A	28.25	365.5	-1.204	.229
		B	33.44			
7	Sleep disordered breathing	A	30.88	429	-.874	.382
		B	30.00			
8	Daytime sleepiness	A	33.56	338	-1.56	.119
		B	26.5			
9	TOTAL	A	32.07	388.5	-.800	.424
		B	28.44			

*A = No co morbidity, B = Co morbidity

Bhargava & Sethi, 2005). Furthermore, we found these disturbances to be specifically in the subscales of bedtime resistance, sleep onset difficulties, sleep duration, sleep anxiety and daytime sleepiness.

Looking into the relationships between sleep problems and demographic and illness variables, we found a reduction in sleep disturbances with increasing age (significant in 11-16 yrs age group). These differences were seen in the subscales of Bedtime resistance, Sleep onset, Sleep anxiety and Parasomnias. This could be related to the behavior of the child changing with maturity in actions as the child grows or probable reduction in symptoms of ADHD with increasing age. There is also a possibility of parents being less aware of sleep problems in adolescent age compared to the younger children, as only a parent rated scale was used. The study found no significant relationship of sleep disturbances with the illness parameters of severity, duration of illness and duration of treatment.

Our study showed the Predominantly Hyperactive/impulsive presentation of ADHD to have the highest prevalence of sleep disturbances (total score), followed by the Combined and then the Predominantly Inattentive presentation and this difference was statistically significant. The subscale scores showed no significant differences, though daytime sleepiness was found to be more common in the Predominantly Inattentive presentation. Our findings differ in this regard from Mayes et al. (2009) who reported highest

prevalence to be in the combined subtype, while Corkum et al. (Corkum, Davidson, & MacPherson, 2011) found sleepiness to be more frequent in the Inattentive subtype. We found no significant differences in sleep disturbances in those with co morbidities of Specific Learning Disability and ODD, similar to as reported by Mayes et al. (2009). We were unable to explore with regard to the impact of medications on sleep due to the diverse variety of treatment modalities used in the ADHD group thereby rendering only a very small number in each group of medication.

Limitations

The major limitation of this study was that it was a Hospital based study. The Sleep Questionnaire used was parent rated only and subjective, relying on parents recall. No structured interview was used in the ADHD diagnostic procedure. Due to differences in the treatment modalities, we were unable to explore the impact of medications on sleep. Also, caution is to be maintained in interpreting data in Predominantly Hyperactive/impulsive presentation as it is a small sample and regarding the co morbidity of ODD as it by itself is seen in some studies to independently cause sleep related issues.

Conclusion

Our study shows that sleep disturbances are more prevalent in children with pharmacologically treated ADHD when compared to their healthy siblings, especially in the

predominantly hyperactive/impulsive subtype and reduce with increasing age. The main sleep related issues found were bedtime resistance, sleep onset difficulties, sleep duration, sleep anxiety and daytime sleepiness. Clinically this illustrates the importance of specifically assessing and monitoring for the issues related to sleep in children with ADHD. Further research into all factors likely to impact the same, including medications are the need of the hour which will help provide a comprehensive approach to the management of ADHD.

Acknowledgements / Conflicts of Interest

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References

- American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders. 5th ed. Washington, DC: The Association.
- Ball, J. D., Tiernan, M., Janusz, J., & Furr, A. (1997). Sleep patterns among children with attention-deficit hyperactivity disorder: A reexamination of parent perceptions. *Journal of Pediatric Psychology*, 22, 389-398.
- Bartholomew, K., & Owens, J. (2006). Sleep and ADHD: A review. *Medicine and Health Rhode Island*, 89(3), 91-93.
- Becker, S. P., Langberg, J. M., & Byars, K. C. (2015). Advancing a biopsychosocial and contextual model of sleep in adolescence: A review and introduction to the special issue. *Journal of Youth and Adolescence*, 44, 239-270.
- Bhargava, S. C., & Sethi, S. (2005). Sleep disorders in children with ADHD. *Indian Journal of Psychiatry*, 47, 113-115.
- Bullock, G. L., & Schall, U. (2005). Dyssomnia in children diagnosed with attention deficit hyperactivity disorder: A critical review. *Australian & New Zealand Journal of Psychiatry*, 39(5), 373-377.
- Corkum, P., Tannock, R., & Moldofsky, H. (1998). Sleep disturbances in children with attention-deficit/hyperactivity disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, 37, 637-646.
- Corkum, P., Moldofsky, H., Hogg-Johnson, S., Humphries, T., & Tannock, R. (1999). Sleep problems in children with attention-deficit/hyperactivity disorder: Impact of subtype, comorbidity, and stimulant medication. *Journal of the American Academy of Child and Adolescent Psychiatry*, 38, 1285-1293.
- Corkum, P., Davidson, F., & MacPherson, M. (2011). A framework for the assessment and treatment of sleep problems in children with attention-deficit/hyperactivity disorder. *Pediatric Clinics of North America*, 58, 667-683.
- Cortese, S., Konofal, E., Yareman, N., Mouren, M. C., & Lecendreux, M. (2006). Sleep and alertness in children with attention-deficit/hyperactivity disorder: A systematic review of the literature. *Sleep*, 29, 504-511.
- Cortese, S., Faraone, S. V., Konofal, E., & Lecendreux, M. (2009). Sleep in children with attention-deficit/hyperactivity disorder: Meta-analysis of subjective and objective studies. *Journal of the American Academy of Child and Adolescent Psychiatry*, 48, 894-908.
- Efron, D., Lycett, K., & Sciberras, E. (2014). Use of sleep medication in children with ADHD. *Sleep Medicine*, 15, 472-475.
- Fallone, G., Owens, J. A., & Deane, J. (2002). Sleepiness in children and adolescents: Clinical implications. *Sleep Medicine Review*, 6(4), 287-306.
- Gruber, R. (2009). Sleep characteristics of children and adolescents with attention-deficit hyperactivity disorder. *Child and Adolescent Psychiatric Clinics of North America*, 18, 863-876.
- Ivanenko, A., Crabtree, V. M., O'Brein, L. M., & Gozal, D. (2006). Sleep complaints and Psychiatric symptoms in children evaluated at a pediatric mental health clinic. *Journal of Clinical Sleep Medicine*, 2(1), 42-48.
- Kirov, R., & Brand, S. (2014). Sleep problems and their effect in ADHD. *Expert Review of Neurotherapeutics*, 14(3), 287-299.
- LeBourgeois, M. K., Avis, K., Mixon, M., Olmi, J., & Harsh, J. (2004). Snoring, sleep quality, and sleepiness across attention-deficit/hyperactivity disorder subtypes. *Sleep*, 27, 520-525.
- Marcotte, A., Thacher, P. V., Butters, M., Bortz, J., Acebo, C., & Carskadon, M. A. (1998). Parental report of sleep problems in children with attentional and learning disorders. *Journal of Developmental and Behavioral Pediatrics*, 19, 178-186.
- Mayes, S. D., Calhoun, S. L., Bixler, E. O., Vgontzas, A. N., Mahr, F., Hillwig-Garcia, J.,...Parvin, M. (2009). ADHD subtypes and comorbid anxiety, depression, and oppositional-defiant disorder: Differences in sleep problems. *Journal of Pediatric Psychology*, 34, 328-337.
- National Institutes of Health (1998). Diagnosis and treatment of attention-deficit hyperactivity disorder (ADHD). *NIH Consensus Statement*, 16(2), 1-37.
- O'Brien, L. M., Mervis, C. B., Holbrook, C. R., Bruner, J. L., Klaus, C. J., Rutherford, J.,...Gozal, D. (2004). Neurobehavioral implications of habitual snoring in children. *Pediatrics*, 114(1), 44-49.
- Owens, J., Spirito, A., & McGuinn, M. (2000). The Children's Sleep Habits Questionnaire (CSHQ): Psychometric Properties of a Survey Instrument for School-Aged Children. *Sleep*, 23(8), 1-9.
- Owens, J. A. (2005). The ADHD and sleep conundrum: A review. *Journal of Developmental and Behavioral Pediatrics*, 26(4), 312-322.
- Paavonen, E. J., Almqvist, F., Tamminen, T., Moilanen, I., Piha, J., Räsänen, E., & Aronen, T. (2002). Poor sleep and psychiatric symptoms at school: An epidemiological study. *European Child and Adolescent Psychiatry*, 11(1), 10-17.
- Polanczyk, G., de Lima, M. S., Horta, B. L., Biederman, J., & Rohde, L. A. (2007). The worldwide prevalence of ADHD: A systematic review and meta-regression analysis. *American Journal of Psychiatry*, 164, 942-948.
- Randazzo, A. C., Muehlbach, M. J., Schweitzer, P. K., & Walsh, J. K. (1998). Cognitive function following acute sleep restriction in children ages 10-14. *Sleep*, 21(8), 861-868.
- Ring, A., Stein, D., Barak, Y., Teicher, A., Hadjez, J., Elizur, A., & Weizman, A. (1998). Sleep disturbances in children with attention – deficit/hyperactivity disorder: a comparative study with healthy siblings. *Journal of Learning Disabilities*, 31, 572-578.
- Stein, M. A. (1999). Unravelling sleep problems in treated and untreated children with ADHD. *Journal of Child and Adolescent Psychopharmacology*, 9, 157-168.
- Stein, D., Pat-Horenczyk, R., Blank, S., Dagan, Y., Barak, Y., & Gumpel, T. P. (2002). Sleep disturbances in adolescents with symptoms of Attention-Deficit/ Hyperactivity Disorder. *Journal of Learning Disabilities*, 35, 268-275.
- Sung, V., Hiscock, H., Sciberras, E., & Efron, D. (2008). Sleep problems in children with attention-deficit/hyperactivity disorder: Prevalence and the effect on the child and family. *Archives of Pediatric and Adolescent Medicine*, 162, 336-342.
- Yoon, S. Y. R., Jain, U., & Shapiro, C. (2012). Sleep in attention-deficit/hyperactivity disorder in children and adults: Past, present, and future. *Sleep Medicine Reviews*, 16, 371-388.
- Zhang, S., Faries, D. E., Vowles, M., & Michelson, D. (2005). ADHD Rating scale IV: Psychometric properties from a multinational study as a clinician-administered instrument. *International Journal of Methods in Psychiatric Research*, 14(4), 186-201.