

Association between Sleep Habits and Quality of Life in Children with Attention Deficit Hyperactivity Disorder

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Abstract Background: Attention Deficit Hyperactivity Disorder (ADHD) is one of the most common chronic disorders which influence millions of children worldwide. It is a neurodevelopmental disorder that has a great impact on children in a critical period of development, the treatment of which extends over years. **Aim:** This study examined the association between sleep habits and quality of life in children with ADHD. **Methods:** By using a descriptive cross-sectional study conducted on one hundred sixteen of children with ADHD attending the child psychiatric outpatient clinic of Mansoura University Hospitals. Three tools were used for data collection: A structured questionnaire of the socio-demographic and clinical features, the Children's Sleep Habits Questionnaire (CSHQ), and the Pediatric Quality of Life Inventory (PedsQL™). **Results:** The total mean (\pm SD) of sleep habits was 64.77 ± 18.43 . The studied children rated themselves significantly better than their parents in all domains of PedsQL™ ($P < 0.0001$) and there were statistically significant associations between CSHQ score and PedsQL™ score ($P \leq 0.001$). **Conclusion and recommendation:** Sleep disorders are significantly associated with poor physical and psychosocial quality of life. It is possible that such sleep interventions in children with ADHD can enhance their quality of life.

Keywords: Sleep Habits, quality of life (QoL), Attention Deficit Hyperactivity Disorder (ADHD)

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1. Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is a widespread neurodevelopmental disorder with prevalence of 5-10% among children in school age and 2-4% among adults. The main characteristics of ADHD are early onset, pervasive, and persistent inattention, impulsivity, and overactivity that is inappropriate with child's developmental age [1]. Children with ADHD mostly experience other disorders that comorbid with their illness including internalizing and externalizing disorders that solely affect children's cognition, social relationships, emotions, and school performance, and they are also at risk of sleep disturbances [2].

Prior researches reported that 50-70% of children with ADHD have sleep disturbances, including problems in initiating sleep (bedtime resistance or late sleep onset) and problems in maintaining sleep (restlessness or recurrent nocturnal awakening) [3,4]. Recent studies found higher averages of sleep problems in children with ADHD than control groups as reported by their parents [5,6]. In this respect, studies which used sleep objective measures indicated that children with ADHD experience poor sleep

efficiency, short sleep durations, and high delayed onset sleep, and high Sleep-disordered breathing compared with same-aged peers [7].

Sleep difficulties in children with ADHD can be caused by such factors including unhealthy habits of sleep (e.g., electronics in the bedroom, inconsistent bed and wake times, exposure to bright lights of computer later at night, caffeine use) or comorbidities such as internalizing or externalizing disorders [8]. At present, the diagnostic and Statistical manuals for ADHD include restless and sleep disturbances, but were later excluded as being non-specific symptoms. However, the associations between ADHD and sleep problems have been an important area of clinical interests and outstanding researches, because disturbed sleep in children with ADHD exhibit significant challenges for parents and for health care providers and may elevate daytime symptoms of ADHD [9].

Children with ADHD having sleep problems, sleep fragmentations, or sleep restrictions may also have excessive daytime fatigue, mood disturbances, attention and behavioral problems, all of which are critical for academic performance and a better quality of life (QoL) [10,11]. It is well-known that children having ADHD are at high risk for difficulties in emotional, social and adaptive functioning, poor academic performance, and

poor interpersonal relationships which in later life lead to poor psychosocial outcome. The chronic nature of ADHD and its consequences impair one or more components of the QoL [12].

The concept of quality of life (QoL) has been interpreted in several ways. The most common and used concept of QoL is that is an individual's perception of the effect of health condition on different life aspects including physical, mental, and psychosocial functioning [1]. Although QoL is subjective, children were previously thought that they have not the ability to describe their QoL. However, self-report is now mandatory for children as they become having an important role in the process of assessing and understanding their health and QoL according to their capabilities and limitations. However, for both self-reports and observer based reports, usually the parents' are important for the understanding of the child's perception as well as the family's perception of their child's QoL [12].

2. Significance of the Study

Sleep disturbances have a wide unfavorable effect on children with ADHD. The main aim of holistic nursing care for children with ADHD is pursuing "a complete health status of physical, emotional, mental, and psychosocial well-being", the World Health Organization definition of health. At the same time, QoL is a global assessment for ADHD children depending on the multidimensional concept of health is QoL [13]. Thus, assessment of sleep problems and QoL can help the nurses to recognize life areas that are especially disturbed for children and their parents. Appropriate intervention and support according to these assessments can therefore be implemented [14].

3. Aim of the Study

The study was designed to examine whether there is an association between sleep habits and quality of life (QoL) in children with Attention Deficit Hyperactivity Disorder (ADHD).

4. Methods

4.1. Research Design

The study was used a descriptive cross-sectional research design to achieve its aim.

4.2. Setting

The study was carried out at the child psychiatric outpatient clinic settings in Mansoura University Hospitals, Egypt.

4.3. Sample

To be eligible for the current study, a convenient sample of 116 of children with ADHD and their parents/caregivers participated in the present study. Diagnosis of

ADHD was made by a child psychiatrist based on the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria [2]. **Inclusion criteria** for children recruited in the study were: children aged between 6 and 12 years, had primary diagnosis of ADHD, children attending child psychiatry settings with their parents who lived together at home, and children attending school. Children and their parents were interviewed, informed of the study, filled out the written consent, and complete the required questionnaires. **Exclusion criteria:** Children with documented history of seizures, neurodegenerative disease, head injury, or mental retardation were excluded.

4.4. Tools of Data Collection

In order to collect the necessary data for this study, three tools had been used.

The first was a structured questionnaire related to socio demographic and clinical features of the studied children designed by the researcher on Arabic format in suitable language to suit parent's and children's level of understanding. It covered the following items: Characteristics of the studied children such as age, gender, residence, level of education, family income, and type of ADHD, family history of ADHD and psychiatric illnesses, and comorbidities.

The second tool was the Children's Sleep Habits Questionnaire (CSHQ), the abbreviated version, which assessed sleep problems and habits according to children's caregivers [15]. The CSHQ composed of 33 items reflecting sleep difficulties and 3 items about time of wake up, bedtime, and duration of sleep. The CSHQ reflected eight domains: Daytime sleepiness (8items), parasomnias (7items), bedtime resistance (6items), sleep anxiety (4items), sleep-disordered breathing (3items), night wakings (3items), sleep duration (3items), and sleep onset delay (one item), but it consisted of 35 items because two of the items on the bedtime resistance and sleep anxiety domains were identical. Parents reported sleep habits of their children one week ago. All items are rated 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 reflect more difficulties in sleep habits. Arabic version of the CSHQ was used in a prior study in our community. Cronbach's alpha (reliability analysis) was 0.85 for children with ADHD [16].

The third tool was The Paediatric Quality of Life Inventory (PedsQL), Mapi Research Trust company, France, distributes the PedsQL™ internationally) which developed to quantify QoL of children and adolescents aged 2-18 years. It is composed of equivalent child self-report and parent proxy-report forms obtainable in numerous international languages including Arabic with Cronbach's alpha greater than 0.70 [17].

The items for each of the forms are essentially identical, differing in developmentally appropriate language. The PedsQL 4.0 generic core scales – Arabic Egypt, consisted of 23 questions and evaluated how frequently of a trouble the child has had over the past month encompassing 8 items for physical functioning and 15 items for psychosocial functioning (emotional, social, and school functioning). Mean of each subscale was computed as the

sum of the items divided by the number of items answered. Interpretation of the scale reveals the mean performance as total scale score (TSS). Child performance was scored on 0-4 scale. The responses for each item are reverse recorded and linearly converted into a 0-100 scale as follows: 0 = 100, 1 = 75, 2 = 50, 3 = 25, and 4 = 0. The scale score for each dimension and TSS were calculated with higher results reflecting better QoL [18].

4.5. Pilot Study

Pilot study was carried out on 20 children diagnosed with ADHD to check feasibility, clarity, and applicability of the study questionnaire, to appreciate the suitable time needed for completing the questionnaire, and to recognize obstacles that may be faced during collecting data.

4.6. Procedure

This study started in March 2019 and continued for three months on children with ADHD received treatment and follow-up from child psychiatry outpatient clinics settings. The tools were filled by the researcher using the interview method on an individual basis. Time for each interview was from 15-20 minutes.

4.7. Ethical Consideration

The study was accepted by Faculty of Nursing, Mansoura University, Egypt and the head of the department of child psychiatry setting in Mansoura University Hospitals. After complete description of the study, written informed consent was obtained from parents of the studied children. Parents were informed that their participation was on a voluntary basis and were assured that all data would be treated confidentially and publications would include aggregate data only.

4.8. Data Analysis

Data were analyzed with SPSS version 22. The normality of data was first tested with one-sample Kolmogorov-Smirnov test. Descriptive analyses (frequency, percentage, mean, and standard deviation) were conducted to describe the variables. Pearson correlation coefficient used to calculate correlation between continuous parametric data. For parametric data, the two groups were compared with Student t test.

5. Results

Official Results in Table 1 show the socio-demographic and clinical features of the studied children. It is evident from this table that more than three quarters (78.4%) of the studied children were males while only 21.6% of them were females. As well as, children age ranged between 6-12 years old with a mean age \pm SD of 8.06 ± 1.58 years. More than half (57.8%) of the studied children were from urban areas and also 47.4% of them, their families had not enough monthly income.

More than two fifth (41.4%) of the studied children had ADHD since 2-4 years ago. The frequencies of ADHD

types were; 25% (n = 29) for inattentive type, 26.7% (n = 31) for hyperactive/ impulsive type, and 48.3% (n = 56) for combined type. Learning and language disorders comorbidity were present in more than one quarter (28.4%) of the studied children. In addition, 14.7% and 19.8% of the studied children had family history of ADHD and psychiatric illnesses respectively.

Table 2 demonstrates the sleep habits of the studied children as reported by their parents. The mean (\pm SD) bedtime resistance of the studied children with ADHD was 11.82 ± 2.73 , the mean sleep anxiety was 7.77 ± 2.92 , the mean parasomnias was 13.43 ± 4.17 , and the total mean of sleep habits was 64.77 ± 18.43 .

Table 1. Socio-demographic and Clinical Features of the Studied Children (n = 116).

Socio-demographic and Clinical Features	N (%)
Gender	
Male	91 (78.4)
Female	25 (21.6)
Age in Years	
6 : <8	57 (49.1)
8 : <10	38 (32.8)
10 : 12	21 (18.1)
Mean \pm SD	8.06 \pm 1.85
Residence	
Urban	67 (57.8)
Rural	49 (42.2)
Family Income	
Enough	61 (52.6)
Not Enough	55 (47.4)
Duration of illness	
< 2 Years	27(23.3)
2 - 4 Years	48 (41.4)
> 4 Years	41 (35.3)
Type of ADHD	
Inattentive	29 (25)
Hyperactive/ Impulsive	31 (26.7)
Combined	56 (48.3)
ADHD Comorbidities	
No Comorbidities	29 (25)
Disruptive Disorders	25 (21.6)
Autism Spectrum Disorder	17 (14.7)
Learning and Language Disorder	33 (28.4)
Mood Disorder	12 (10.3)
Family History of ADHD	
Yes	17 (14.7)
No	99 (85.3)
Family History of Psychiatric Illnesses	
Yes	23 (19.8)
No	93 (80.2)

Table 2. The Children's Sleep Habits Questionnaire Scale (CSHQ) Scores (n = 116).

Sleep Habits	Mean \pm SD
Bedtime resistance	11.82 \pm 2.73
Sleep-onset delay	2.08 \pm 0.62
Sleep duration	5.8 \pm 2.11
Sleep anxiety	7.77 \pm 2.92
Night wakings	4.24 \pm 1.48
Parasomnias	13.34 \pm 3.78
Sleep-disordered breathing	4.26 \pm 1.44
Daytime sleepiness	15.43 \pm 4.17
Total CSHQ Score	64.77\pm18.43

Table 3. Mean Scores of Children and their Parents on the Domains of Pediatric Quality of Life Inventory (PedsQL™) (n = 116).

Sleep Habits	Child (Self-Report) Score		Parent (Proxy-Report) Score		t-test	P-Value
	Mean ± SD		Mean ± SD			
Physical functioning	70.98±17.52		68.1±16.97		8.748	≤0.001*
Emotional functioning	55.77±17.77		48.83±13.06		11.236	≤0.001*
Social functioning	63.83±20.11		58.49±17.6		13.054	≤0.001*
School functioning	53.1±15.82		47.15±14.35		15.379	≤0.001*
Psychosocial functioning	57.57±17.6		51.49±14.82		17.361	≤0.001*
Total PedsQL™ Score	62.23±17.46		57.27±15.5		17.245	≤0.001*

(*) Statistically significant at p < 0.05

Table 4. Pearson Correlation Analysis between the Children’s Sleep Habits Questionnaire (CSHQ) scores and Pediatric Quality of Life Inventory(PedsQL™) (n = 116).

Variables	Child (Self-Report)						Parent (Proxy-Report)					
	Physical Functioning		Psychosocial Functioning		Total PedsQL™ Score		Physical Functioning		Psychosocial Functioning		Total PedsQL™ Score	
	r	P-value	r	P-value	r	P-value	r	P-value	r	P-value	r	P-value
Bedtime resistance	-0.977-	≤0.001*	-0.977-	≤0.001*	-0.983-	≤0.001*	-0.978-	≤0.001*	-0.961-	≤0.001*	-0.972-	≤0.001*
Sleep-onset delay	-0.877-	≤0.001*	-0.874-	≤0.001*	-0.881-	≤0.001*	-0.904-	≤0.001*	-0.872-	≤0.001*	-0.888-	≤0.001*
Sleep duration	-0.970-	≤0.001*	-0.967-	≤0.001*	-0.974-	≤0.001*	-0.954-	≤0.001*	-0.959-	≤0.001*	-0.962-	≤0.001*
Sleep anxiety	-0.973-	≤0.001*	-0.976-	≤0.001*	-0.981-	≤0.001*	-0.959-	≤0.001*	-0.969-	≤0.001*	-0.970-	≤0.001*
Night wakings	-0.877-	≤0.001*	-0.911-	≤0.001*	-0.905-	≤0.001*	-0.909-	≤0.001*	-0.948-	≤0.001*	-0.938-	≤0.001*
Parasomnias	-0.866-	≤0.001*	-0.867-	≤0.001*	-0.872-	≤0.001*	-0.897-	≤0.001*	-0.880-	≤0.001*	-0.890-	≤0.001*
Sleep-disordered breathing	-0.892-	≤0.001*	-0.927-	≤0.001*	-0.921-	≤0.001*	-0.914-	≤0.001*	-0.954-	≤0.001*	-0.944-	≤0.001*
Daytime sleepiness	-0.979-	≤0.001*	-0.986-	≤0.001*	-0.990-	≤0.001*	-0.980-	≤0.001*	-0.976-	≤0.001*	-0.982-	≤0.001*
Total CSHQ Score	-0.980-	≤0.001*	-0.988-	≤0.001*	-0.992-	≤0.001*	-0.989-	≤0.001*	-0.989-	≤0.001*	-0.993-	≤0.001*

P-value determined by Pearson correlation coefficient (r), (*) Statistically significant at p < 0.05

Table 3 indicates the domains of QoL as rated by children with ADHD and their parents. It is observed that children rated themselves significantly better than their parents in all domains of PedsQL™ (P < 0.0001). The highest scores were reported on the physical domain of QoL (70.98 ± 17.52 and 68.1± 16.97 for child self-report and parent proxy report respectively). On the other hand the lowest scores were reported on the school functioning domain of QoL (53.1 ± 15.82 and 47.15 ± 14.35 for child self-report and parent proxy report respectively).

To examine the association between sleep habits and QoL of the studied children with ADHD, Pearson correlation analyses were calculated. As seen in Table 4, statistical significant associations were found between the overall score of CSHQ and PedsQL™ (child self-report and parent proxy report; P≤0.001).

6. Discussion

ADHD is a neurodevelopmental disorder that affects children in a critical period of development, the treatment of which extends over years [12]. The current findings indicate that children with ADHD have high rates of sleep disturbances include bedtime resistance, difficulties with

sleep onset and maintenance, parasomnias, sleepwalking, sleep anxiety, and sleep-disordered breathing. These results reflect findings of prior studies indicating that children with ADHD experience elevated frequencies of sleep disturbances when compared with researches on normative samples.

Possible explanations could be given for these results by that children with ADHD are mostly inattentive, distracted easily by any stimuli, and find difficulties in stopping and neglecting interruptions, and then in going to bed. Thus, they’re in bed, it is difficult to calm their mind or stopping talking about day’s event and being relaxed enough to sleep normally. In addition, prior researches thought that one reason of sleep disorders is because ADHD may corrupt circadian rhythm, the ideal wake-cycle of sleep [19,20].

The current study results are consistent with those of prior researches that have indicated high rates of sleep disturbances in children with ADHD. A previous study has shown that the main features of sleep behaviors in children with ADHD including restless during sleep, resistance in going to bed at bedtime, night awakenings, and waking too early [21]. Another study conducted on Egyptian children with ADHD found that group of children with ADHD had significant high scores in

global sleep disturbance of CSHQ than control group [22]. Moreover, Vaidyanathan, Shah, and Gayal [23] compared sleep problems between children with ADHD and their healthy siblings and found that sleep disturbances significantly more in the ADHD group than their siblings, and these disturbances to be specifically in the subscales of bedtime resistance, difficulties of sleep onset, duration of sleep, sleep anxiety, and daytime sleep. In addition, Abd El-Hay et al. [9] revealed an association between some sleep parameters and ADHD. The ADHD patients had significantly delayed sleep onset and decreased sleep duration. Also, they had significantly decreased REM sleep and increased number of awakenings.

The present study findings provided an understanding of the differences between parents and their children with ADHD in the rating of their QoL. Accordingly, Al Habib et al. [12] indicated that the child's report should be taken into account whenever the child is capable of reporting through communication and intellectual ability, as reliance on parent's proxy report provides an incomplete picture of the child's QoL. However, the parental report of the QoL of children with ADHD is also necessary to achieve a comprehensive view of the child's status.

According to the current study results, the studied children and their parents rated the physical domain of QoL better than the psychosocial domain. Children with ADHD frequently have trouble staying focused, sitting still, and controlling their emotions and behaviors which consider the intrinsic features of ADHD. These features can lead to dependency, impaired social skills, being isolated, and poor academic performance which leading to poorer psychosocial outcomes. These findings are compatible with prior researches that reported poorer psychosocial QoL of children with ADHD [12,24,25]. Similarly, Danckaerts et al. [14] reported that children having ADHD as a primary diagnosis are high risk of poorer QoL in domains of family functioning, peer relationships, academic functioning, peer relations, and daily functioning.

The key finding of our study is those children with high overall CSHQ scores experienced poor scores on physical, psychosocial, and overall PedsQLTM. Sleep problems have wide negative effects on children with ADHD. Problems in initiating and maintaining sleep mostly lead to exhaustion and drowsiness. This abnormal circle of sleeplessness and sleepiness can influence may influence child functioning including physical functioning, psychosocial functioning, and school performance. In a similar vein, prior researches indicated that children with ADHD and sleep disturbances experience higher impairments in physical, psychosocial, and overall QoL [8,26]. Similarly, prior researches reported that sleep disturbances in children with ADHD have a significant association with poor QoL and poor academic performance [10,27,28,4].

7. Limitations of the Study

In our study, we faced some limitations. Firstly, the study design was cross-sectional design and thus causality can't be inferred. Secondly, parents rated sleep habits by themselves that may increase the possibility for inaccuracy and bias.

8. Conclusion

Children with ADHD have higher rates of sleep problems include bedtime resistance, difficulties with sleep onset and maintenance, parasomnias, sleepwalking, sleep anxiety, and sleep-disordered breathing. These sleep disorders are strongly associated with poorer physical and psychosocial quality of life.

9. Recommendations

It is possible that such sleep interventions in children with ADHD can enhance their QoL. Future researches need to be longitudinal studies to identify the temporal direction of the associations between ADHD, sleep disturbances, and QoL. In the meantime, health care providers especially nurses caring for children with ADHD as to assess their sleep, and if the child experienced the problem, this must be addressed and managed. Considering a control group, either in the outpatient service or from the community, in further researches about ADHD, sleep problems, and QoL may be benefit in determining if there is increasing risk of sleep disturbances in children with ADHD compared with control group.

10. Clinical Implications

The results of the current study indicate that it is particularly important for children with ADHD to have comprehensive assessments of sleep difficulties by health care providers before starting treatment of ADHD, given that these problems that mimic ADHD symptoms may also cause adverse outcomes including poor physical functioning, poor psychosocial functioning, overall QoL.

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