

Symptoms of Attention-deficit Hyperactivity Disorder and Sleep Difficulties in Children with Mouth Breathing

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Abstract

Background: Attention deficit hyperactivity disorder (ADHD) is a prominent diagnosis for behavioral issues in children; however, many of these kids may have sleeping issues due to oral breathing but have been wrongly diagnosed as ADHD. **Aim:** The present study was designed with the goal of determining the relationship between sleep disruptions and ADHD symptoms in children who breathe through their mouths. **Methods and Materials:** Using a semi-structured proforma, a children's sleep habit questionnaire, and the Diagnostic and Statistical Manual of Mental Disorders, version 5, a cross-sectional study was conducted on 200 mouth-breathing children aged 7–12 years. **Results:** The longer the sleep time, lesser are the signs of hyperactivity ($P \leq 0.05$). Similarly, the higher the day sleep, the lower the hyperactivity level ($P < 0.01$). Daytime tiredness and inattention were also found to have a statistically meaningful (positive) connection ($P < 0.01$). That is, the greater sleep during the day, the greater the lack of concentration. **Conclusion:** The symptoms of ADHD are also found in children having mouth breathing. Children having features of this disorder should be assessed for mouth breathing so that early diagnosis and management can be carried out to prevent unwanted medicines and therapies for ADHD.

Keywords: ADHD, Mouth breathing, Sleep disorders.

INTRODUCTION

Respiration is a fundamental biological activity of the organism that is typically performed through the nose. Excessive nasal impedance, which is driven primarily by physical reasons such as tonsil enlargement, turbinate enlargement, sneezing, oropharyngeal tumors, viral infections or inflammatory disorders, and structural changes in the structure of the nose, leads to oral or mouth breathing in infants.^[1] Despite the treatment of these conditions, oral respiration has been proven to remain in the vast majority of instances due to habitual breathing through the oral cavity. This could lead to inconsistencies in facial muscles and craniofacial architecture, compromising stomatognathic functional balance. Kids with continuous mouth breathing have been found to have abnormal sleeping habits and sleep disorders, according to researchers.^[2]

Problems such as trouble in maintaining concentration in school, quick fatigue, tiredness, and behavioral issues are also common in such kids. Because these characteristics are comparable to those of attention deficit hyperactivity disorder (ADHD), several kids experiencing sleeping disorders are

misdiagnosed with ADHD. Children with respiratory issues such as snore, mouth breathing, or insomnia are forty to hundred times more likely to experience behavioral disorders similar to ADHD, according to research.^[3] ADHD is a prominent diagnosis for behavioral issues in children; however, many of these kids may have sleeping issues due to oral breathing but have been wrongly diagnosed as ADHD.

As a result, these children may take ADHD medication, which has vascular and other harmful impacts on children's wellbeing like decrease in body weight and height).^[1] The uncertainty could lead to an increase in the number of youngsters with ADHD, and the medications to manage them could aggravate

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the condition. Oral breathing should indeed be included in the differential diagnosis of ADHD so that acceptable or optimum oral breathing management can be sought to minimize medication administration if oral breathing is a source of ADHD features. As a result, the cumulative burden of disease and medical costs for these kids may be reduced.^[4]

The present study was designed with the goal of determining the relationship between sleep disruptions and ADHD symptoms in children who breathe through their mouths.

METHODS AND MATERIALS

This study was of the cross-sectional type carried out in a tertiary care center. After the institutional ethics committee approval, 200 children with mouth breathing in the age group of 7–12 years were selected for participation in the study. Out of 420 children (between 7 and 12 years of age) screened, 200 children showed a positive result for mouth breathing and were then interviewed after taking consent (assent) from their parent/family member who has accompanied the child to the hospital. Children with an already diagnosed psychiatric or neuropsychiatric disorder affecting attention and behavior were excluded from the study after the assessment by a psychiatrist. This study aimed to assess the sleep disturbances and the pattern of ADHD symptoms in children with mouth breathing along with finding the correlation between symptoms of ADHD and sleep disturbances.

The assessment was done across the following tools.

Children's sleep habits questionnaire (CSHQ)

CSHQ was used for assessing sleep disturbances and quality of sleep. CSHQ is a 45-item parent questionnaire (retrospective assessment) utilized for examining sleep behavior in children (young). It includes questions related to various sleep domains that are usually the presenting sleep complaints found in children.

For appropriate psychometric evaluation analysis, some of the items were eliminated. The remaining 35 items were then grouped into eight subscales as following sleep domains:

(1) Bedtime resistance, (2) sleep onset delay, (3) sleep duration, (4) sleep anxiety, (5) night wakings, (6) parasomnias, (7) sleep-disordered breathing, and (8) daytime sleepiness.

The total score sleep disturbance score included all 8 domains, but consisted of only 33 items as two of the items on bedtime resistance and sleep anxiety subscales are similar. The cut-off score of 41 has a sensitivity of 0.80 and up to 0.72 specificity.

Diagnostic and statistical manual of mental disorder 5 (DSM 5)

DSM 5 was utilized for the assessment of ADHD symptoms such as hyperactivity, inattention, and impulsivity. It is a diagnostic manual used to diagnose ADHD. It consists of nine symptoms of inattention and nine features of hyperactivity and impulsivity.

The study was conducted over 3 months period. Each interview required around 20 min. CSHQ was applied based on information from the parents. Children with difficulty in interacting because of severe dental or medical problems were excluded from the study.

Statistical analysis

Data collected were statistically analyzed with the Statistical Package for the Social Science (SPSS version 22). Along with derivation of mean and standard deviation, Chi-square and Pearson's correlation coefficient test were used for analysis. $P < 0.05$ was considered statistically significant.

RESULTS

Around 140 were males 60 were females. The mean age was 10.31 ± 1.92 years. 130 had a convex facial profile while 70 had convex facial profile (Table 1). Sleep-disordered breathing had the maximum weighted mean according to CSHQ subscales, which was followed by sleep onset delay then daytime sleepiness. Parasomnia had the minimum average score (Table 2).

In subjects with mouth breathing having Angle class I malocclusion, features of lack of concentration were considerably lower ($P = 0.01$), although other dentofacial variables had no significant link with features of lack of concentration (Table 3). Hyperactivity and several dentofacial variables were found to have a statistically significant relationship. Patients with mouth breathing had significantly greater hyperactivity symptoms due to increased overjet

Table 1: Sociodemographic and dentofacial profile of mouth breather

Sociodemographic and dentofacial factors		
Age	Mean	SD
	10.31	1.92
Gender	Male	Female
	140	60
Malocclusion	Class 1	Class 2
	77	23
Facial profile	Convex	Straight
	130	70
Overjet	Normal	Increased
	84	116
Overbite	Normal	Increased
	100	100
Upper lip length	Normal	Short
	46	154
Upper lip tonicity	Normal	Hypotonic
	80	120
Lower lip tonicity	Hypertrophic	Hyperactive mentalis
	8	42
Lip competency	Competent	Incompetent
	54	142
Tongue thrust	Present	Absent
	46	154

($P = 0.04$), reduced upper lip length ($P = 0.02$), and hypotonicity of the upper lip ($P = 0.05$). The CSHQ subscale of sleep time and daytime drowsiness with hyperactivity were found to have a statistically significant negative relationship on Pearson's correlation test. The longer the sleep time, lesser are the signs of hyperactivity ($P \leq 0.05$). Similarly, the higher the day sleep, the lower the hyperactivity level ($P < 0.01$). Daytime tiredness and inattention were also found to have a statistically meaningful (positive) connection ($P < 0.01$). That is, the greater sleep during the day, the greater the lack of concentration (Table 4).

DISCUSSION

ADHD is a vital diagnosis for behavioral problems in children. However, many of these children may have sleeping problems as an outcome of oral breathing leading to being wrongly diagnosed as ADHD. As a result, these children are being administered medication for management of ADHD, which

has vascular and other harmful impacts on children's wellbeing like decrease in body weight and height. The uncertainty regarding ADHD and sleep disturbances in mouth breathing could lead to an increase in the number of youngsters with ADHD, and the medications to manage them could aggravate the condition. The current study was performed with the goal of determining the relationship between sleep disruptions and ADHD symptoms in children who breathe through their mouths.^[5,6]

It was observed in our study that the longer the sleep time, lesser are the signs of hyperactivity (an important symptom of ADHD). Similarly, the higher the sleeping during the day, the lower the hyperactivity level. Daytime tiredness and inattention were also found to have a statistically meaningful (positive) connection. That is, the greater sleep during the day, the greater the lack of concentration. The CSHQ subscale of sleep time

Table 2: Mean score of sleep disturbances on CSHQ subscales

CSHQ parameters	Mean	SD
Bedtime resistance	1.21	0.62
Sleep onset delay	1.48	0.78
Sleep duration	1.02	0.61
Parasomnia	0.71	0.34
Night walking	0.8	0.6
Sleep anxiety	0.81	0.61
Sleep-disordered breathing	1.51	0.81
Daytime sleepiness	1.41	0.69

CSHQ: Children's sleep habits questionnaire

Table 3: Correlation between the mean of symptoms of inattention and dentofacial factors

Mean of symptoms of inattention	Facial profile-convex	Facial profile-straight	P-value
<3.37	68	44	0.81
>3.37	52	26	
	Malocclusion-class 1	Malocclusion-class 2	
<3.37	106	16	0.01
>3.37	52	26	
	Overjet-normal	Overjet-increased	
<3.37	44	78	0.13
>3.37	40	38	
	Overbite-normal	Overbite-increased	
<3.37	56	66	0.3
>3.37	44	34	
	Upper lip length-normal	Upper lip length-short	
<3.37	22	100	0.13
>3.37	24	54	
	Upper lip tonicity-normal	Hypotonicity	
<3.37	56	66	0.13
>3.37	24	54	

Table 4: Correlation between sleep disturbances and mean of symptoms of ADHD

Pearson's correlation		
Subscales of CSHQ	Total symptoms of inattention	Total symptoms of hyperactivity
BR		
Pearson correlation	-0.066	-0.052
P-value	0.551	0.687
n	200	200
SOD		
Pearson correlation	0.052	0.034
P-value	0.612	0.745
n	101	101
SD		
Pearson correlation	-0.112	-0.214*
P-value	0.311	0.021
n	200	200
SA		
Pearson correlation	0.082	0.172
P-value	0.312	0.116
n	200	200
NW		
Pearson correlation	0.163	0.027
Sig. (two-tailed)	0.137	0.721
n	200	200
PARA		
Pearson correlation	-0.007	-0.273
P-value	0.851	0.086
n	190	190
SDB		
Pearson correlation	-0.190	-0.005
P-value	0.059	0.957
n	200	200
DTS		
Pearson correlation	0.263**	-0.401**
P-value	0.007	0.001
n	200	200

ADHD: Attention deficit hyperactivity disorder, CSHQ: Children's sleep habits questionnaire

and daytime drowsiness with hyperactivity were found to have a statistically significant negative relationship.

Mouth breathing has been proven to remain in the vast majority of instances even after surgical intervention due to habitual breathing through the oral cavity. This could lead to inconsistencies in facial muscles and craniofacial architecture, compromising overall stomatognathic functional balance. Children with continuous mouth breathing have been found to have abnormal sleeping habits and sleep disorders, according to researchers.^[7]

Health issues such as lack of concentration in school, quick fatigue, tiredness, and behavioral issues are also common in such children. Because these characteristics are comparable to those of ADHD, several kids experiencing sleeping disorders are misdiagnosed with ADHD. Children with respiratory issues such as snore, mouth breathing, or insomnia are forty to hundred times more likely to experience behavioral disorders similar to ADHD, according to research.^[8]

In our study, sleep-disordered breathing had the maximum weighted mean according to CSHQ subscales, which was followed by sleep onset delay then daytime sleepiness. Parasomnia had the minimum average score. Patients with mouth breathing had significantly greater hyperactivity symptoms due to increased overjet, reduced upper lip length, and hypotonicity of the upper lip.

The results are in accordance with the results of previous studies by Chervin *et al.* and Obrien *et al.* There were some studies also which have different opinion from our study. The difference may be due to different geographical locations. Oral breathing should therefore included in the differential diagnosis of ADHD so that adequate oral breathing management can be carried out to minimize medication administration if oral breathing is a source of ADHD features.^[9,10]

CONCLUSION

The symptoms of ADHD are also found in children having mouth breathing. Children having features of this disorder should be assessed for mouth breathing so that early diagnosis and management can be carried out to prevent unwanted medicines and therapies for ADHD.

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