Research Article

Prevalence of obstructive sleep apnea and central apnea in Overweight and Obese children

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Abstract

Introduction: Obstructive sleep disordered breathing with snoring, breathing through the mouth, apnea during sleep is very common among children. Many of these children outgrow the condition as the symptoms are very mild and reduce with age. Enlargement of adenoids or tonsils can lead to tonsilolectomey and adenoidectomy, further leading to OSA. **Materials and Methods:** 46 obese or overweight children between the ages 3-15 years with suspected sleep apnea were subjected to vigorous physical and clinical examinations. Demographic details were noted apart from details such as sleep pattern, symptoms and snoring, daily routine, health history etc with reference to the Paediatric Sleep Questionnaire (PSQ). All the children underwent polysomnography testing, Apnea- Hypopnea Index (AHI), oxygen saturation, desaturation levels and sleep efficiency. **Results**: Out of the 46 children, 29 (59.2%) were boys and 17 (40.8%) were girls. The girls were older than the boys with their mean age being 8.6 in comparison to 5.9 of the boys. 31 patients were overweight and 15 were obese. Obstructive sleep apnea was observed in 18 (39.1%) patients with 9 patients each presenting with mild OSA and moderate to severe OSA. Central apnea was observed in 4 obese and 2 overweight children. AHI and desaturation levels were significantly higher among the OSA patients than in the normal range in the other patients. **Conclusion:** Though all snoring cases may not be OSA but most of the OSA cases are associated with snoring, it is therefore advisable that all the snoring children with other presentation of SDB be screened for OSA and central apnea.

Keywords: Obstructive Sleep Apnea, Central Apnea, Obese children, Overweight Children

Introduction

Obstructive sleep disordered breathing is very common among children. Snoring, breathing through the mouth, apnea during sleep often prompts the parents to seek medical help. It is estimated that3-12% of the children snore during sleep and 1-10% suffer from obstructive sleep apnea (OSA) [1-3]. In most of these children, the symptoms are very mild and have been observed to reduce with age. Many of the children outgrow the condition. Many a times, OSA results due to adenotonsillar hypertrophy, neuromuscular disease and craniofacial abnormalities [3]. When a child's breathing is disrupted, the body perceives this as a choking phenomenon, thereby reducing the heart rate, increasing the blood pressure, activates and arouses the brain, hence disrupting the sleep. Oxygen levels also drop [4].

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The children with sleep apnea syndromes often show a failure to thrive, some of them being below 25th percentile by weight [5,6].

The main cause is said to be occlusion of the upper respiratory tract associated with an upper airway anatomic abnormality like hyperplasia of the adenoid and/or tonsillar tissue as the major cause [5]. Sometimes, even CO_2 retention and cardiovascular complications can take place [6,7]. Most of the time, this enlargement of adenoids or tonsils can lead to tonsillectomy and adenoidectomy, further leading to OSA [8-10]. The risk is higher in the overweight

children because fat deposits around the neck and throat can also narrow the airway resulting in disordered breathing [4].

Sleep disordered breathing in children is a public health problem, especially due to the increasing rates of obesity and hyperactivity. It has been reported that the underlying sleep disordered breathing was observed in a large percentage of children with hyperactivity and inattentive [11].

This study was conducted to identify the prevalence of disordered breathing in sleep and obstructive sleep apnea in our area.

Materials and Methods

This study was conducted in the department of Pediatrics at Viswabharathi Medical College during the period of 2 years. 46 obese or overweight children between the ages 3-15 years with suspected sleep apnea were included into the study. All the children were subjected to complete physical and clinical examinations. Demographic details such as age, sex, weight, height and BMI were noted. Details such as sleep pattern, symptoms and snoring, daily routine, health history etc were noted with reference to the Paediatric Sleep Questionnaire (PSQ).

Further, questions on tonsillectomy, adenoidectomy were also asked. Details on smokers at home, infection of the child with tonsillitis, otitis media, bronchitis, cold etc were also noted.

All the children underwent polysomnography testing. The scoring of the electronic data was performed manually in accordance to the established criteria. Sleep time (in minutes) was estimated the following morning on the estimation of parents/nurses and the Static Charge sensitive bed (SCSB).

Arterial oxygen saturation (SaO2) was measured simultaneously with both a finger and a flex probe with two pulse oximeters. OSA was defined according to the International Classification of Sleep Disorders and classified as per American Academy of Sleep Medicine (AASM) criteria [12]. A AHI greater than 1 (Average: 0.1-0.5 events per hour) or a minimum oxygen saturation of less than 92% was considered abnormal. The Apnea – hypopnea index (AHI) was calculated as number of apneas and hypopneas per hour of sleep. Sleep efficiency, arousal Index were also identified.

Blood samples were taken in the morning for measuring the thyroid-stimulating hormone levels and other routine blood values.

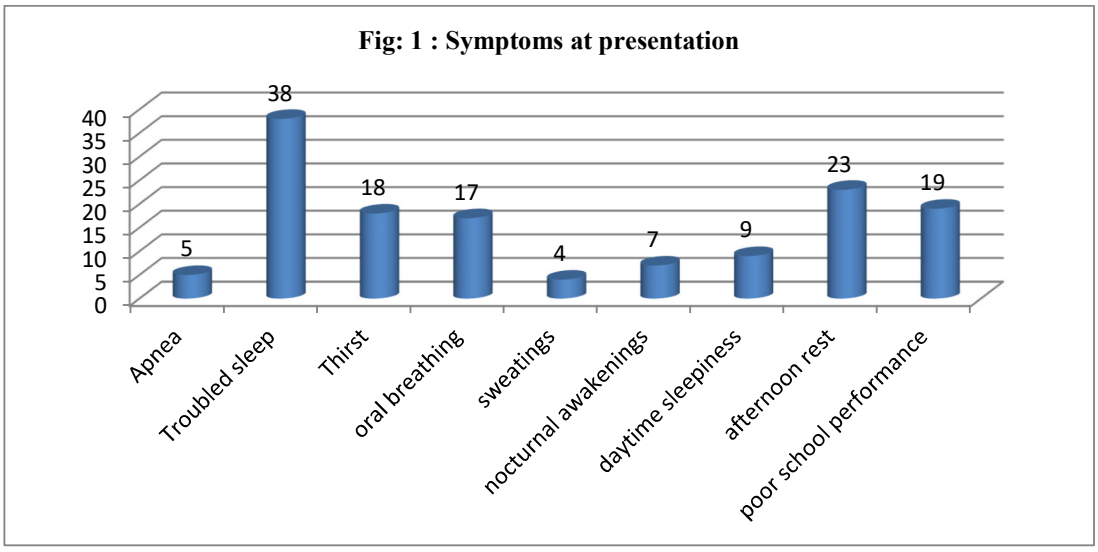
Results

Out of the 46 children, 29 (59.2%) were boys and 17 (40.8%) were girls. The girls were older than the boys with their mean age being 8.6 in comparison to 5.9 of the boys. The general demographic details is given in Table:1. 31 patients were overweight and 15 were obese

Table-1: Demographic details of the patients

Characteristics	Boys	Girls
Overweight (n=31)	20 (64.5%)	11 (35.5%)
Obese (n=15)	9 (60%)	6 (40%)
Mean age (in years)	5.9 ± 2.1	8.6 ± 4.3
Passive smoking	17 (58.6%)	12 (70.6%)
Tonsillectomy	1 (3.4%)	1 (5.9%)
Adenoidectomy	8 (27.6%)	4 (23.5%)

Of the symptoms that were observed at the time of presentation, the most common was troubled sleep followed by sleeping in the afternoon by 23 children. 19 children showed decreased performance at school due to exhaustion. 9 of these children were sleepy during the day also (Fig:1).



Obstructive sleep apnea was observed in 18 (39.1%) patients among whom mild OSA was seen in 9 children and similar was the case with moderate to severe OSA with 9 children. Central apnea or total absence of breathing was observed in 6 children among which, 4 were obese and 2 were overweight (Table: 2)

Table-2: Presence of snoring and apnea in overweight and obese children

	Overweight Children (n = 31)	Obese Children (n = 15)	Total (n = 46)
Normal	**1** **1**	**5**	**1** **6**
Snoring	**5**	**2**	**7**
Mild OSA	**6**	**3**	**9**
Moderate to severe OSA	**7**	**2**	**9**
Central Apnea	**2**	**3**	**5**

There was no difference in the total sleep time, REM and sleep efficiency among all the children. AHI was significantly higher among the OSA patients while in the normal range in the other patients. The desaturation index was also higher in the OSA and Central apnea children while they were in the normal range in Normal and snoring children (Table:3).

Table- 3: Sleep indices in children

	Normal	Snoring	Mild OSA	Moderate to severe OSA	Central apnea
Total Sleep time in (hrs)	7 . 4	7 . 1	7 . 5	7 . 4	7 . 8
REM (% of TST)	2 2	2 1	2 0 . 9	2 1	2 3
Sleep efficiency	8 8 . 4 %	8 4 . 2 %	8 5 . 1 %	8 4 . 4 %	8 2 . 8 %
A H I	0 . 4 5	0 . 3 3	1 . 4 5	1 . 6 5	0 . 6 7
SaO2 nadir (%)	9 4 . 3	8 8 . 3	8 3 . 1	8 3 . 3	8 4
Mean SaO2	9 6 . 2	9 6 . 9	9 5 . 7	9 6 . 1	9 4 . 1
Desaturation Index	0 . 5	1 . 3	4 . 1	4 . 2	4 . 7

Discussion

The prevalence of OSA among children is said to be lesser than that in adults[12-14]. The rate was similar in studies of snoring children preoperatively [8,10] and a higher prevalence was observed in children with Down's syndrome[15].

There were more number of boys affected by sleep disorders compared to the girls although girls were older than the boys. A similar result was observed in a study by Gislason et al who also found girls to be older than boys among children suffering from apneic episodes [22].

Brunetti et al also reported the younger children were at a greater risk of OSA than the older ones because of the volumetric adenoids/rhinopharynx ratio varies and the obstruction is easily caused in the younger ones than the older children [23, 24].

We were unable to study this aspect as our sample size was too small. The prevalence of OSA was found to be similar in boys and girls in a study by Anuntaseree et al [27].

The symptoms at the time of presentation were most commonly troubled sleep with many of the children taking afternoon rest due to exhaustion. Nocturnal sweating was also seen in a few patients with thirst and oral breathing to be other common complaints.

Many of the children did poorly in school due to the insufficient sleep. A similar presentation was reported in a study by Brunetti et al with troubled sleep, nocturnal sweating, and oral breathing being significantly more frequent than other symptoms among the children with OSA [23].

In our study, the prevalence of OSA among children in our study was 32.6%. it should be considered that we had taken into account only the symptomatic, overweight and obese children so the prevalence is higher.

Prevalence of OSA was observed in 41.9% of the overweight children and in 33.3% of the obese children. This higher prevalence of OSA in overweight children rather than obese were corroborated by other similar studies also [16-21].

We had observed a prevalence of central apnea in 10.9% of the cases. This result was slightly lower than a similar study by Verhulst et al [16]. As in their study our study also showed it to be associated with serious desaturation, as was also reported by Marcus et al[20].

The body mass index among the children were considerably lower than that of the adults. And there seemed to be no significant difference to the fat and OSA among the children when compared to the adults. Although we had very few cases of enlarged tonsils, they seem to be a major rsik facor for OSA which was in agreement to studies by Verhulst et al[16] and Wing et al [21].

The AHI index was higher among the OSA patients with most of them showing more than 3 episodes per hour which was associated with >4% oxygen desaturation. Similar results were noted in the study by Gilason et al [22].

It is important to identify the predictors of OSA, which we have shown to be snoring, nocturnal sweating, oral breathing and daily sleepiness as was corroborated in earlier studies [25]. Passive smoking in the children also seems to be an important factor in OSA which was corroborated by Corbo et al [26].

Conclusion

The prevalence of Sleep Disorder Breathing and OSA is highly prevalent among the obese and the overweight children, which may lead to various complications in future. Though all snoring cases may not be OSA but most of the OSA cases are associated with snoring, It is therefore advisable that all the snoring children with other presentation of SDB be screened for OSA and central apnea.

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