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Paediatrics

SLEEP DISORDERED BREATHING (SDB) IN CHILDREN WITH ASTHMA

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ABSTRACT Studies have postulated that sleep-disordered breathing (SDB) may be associated with the occurrence and exacerbation of asthma. However, there was limited quantitative evidence on the topic. This study aimed at investigating the prevalence and the association between SDB and asthma among 6-18 aged children. A total of 254 diagnosed cases of asthma were taken in this study, subjected to detailed history and clinical examination, a sleep questionnaire was filled, suspected cases of OSA were subjected to PSG. The prevalence rate of SDB symptoms was 39.8% in this study. Most common SDB in our study was Primary Snoring (42.5%) followed by hypopnea (39.6%), UARS (21.7%) and sleep apnea (8.9%) and all these were significantly associated with occurrence of asthma (P<0.05). PSG was positive in 3.5% cases. SDB was associated with occurrence and exacerbation of asthma. The clinical significance of our findings lies in the emphasis that children undergoing examinations or treatment for asthma should be routinely screened for sleep problems.

KEYWORDS : Sleep disordered breathing, Obstructive sleep apnea, Day time somnolence, Asthma, Upper Airway Resistance Syndrome.

INTRODUCTION

Sleep disordered breathing refers to a spectrum of abnormal breathing and /or gas exchange patterns during sleep. The spectrum of SDB includes Primary snoring, Upper airway resistance syndrome (UARS), Obstructive hypoventilation (hypopneas) and Sleep apnea. It represents increasing severity of upper airway obstruction. Primary snoring is also known as simple snoring/snoring without sleep apnea/noisy breathing during sleep/benign snoring/rhythmical snoring/continuous snoring. Primary snoring is not associated with ventilator abnormalities, such as hypoxia and hypercapnia. It is characterized by loud upper airway breathing sounds in sleep without episodes of apnea (cessation of breath). It is a relative risk factor for later development of OSA. Upper Airway Resistance Syndrome (UARS) represents increased inspiratory efforts with frequent arousals (Measured from EEG).

Obstructive Hypoventilation is the most common form of SDB in children. Though less severe, it represents a 50% reduction in air flow. Repeated hypopneas have consequences like those of frequent apneas.

Sleep apnea forms a part of spectrum of sleep disordered breathing. It is defined as cessation of respiration for ten seconds or more OR cessation of respiration for two or more respiratory cycles [1]

Asthma is one of the primary causes of chronic respiratory disorders[1]. Both obstructive sleep apnea (OSA) and asthma are prevalent diseases, and the incidences of them have shown a gradual increase recently. OSA usually involves the upper airways (nasal, oral, and pharyngeal passages), manifested with inspiratory flow limitation and repeated airway collapse during sleep, in combination with many daytime symptoms such as sleepiness, morning headaches, depression, concentration difficulties, and memory loss. Asthma is usually characterized by chronic inflammation, airway hyperresponsiveness (AHR), and reversible expiratory flow limitation. Asthma and SDB may coexist, as they are both inflammatory diseases of the lower and upper airway tract respectively [2]. Similar symptoms during the night may also lead to confusion in clinical history. The first report regarding the significant association between habitual snoring and history of exercise-induced asthma date back to1992[3]. The similarities and parallel rise of prevalence of both diseases in the last decade arise the question that if there is a relationship between asthma and SDB[4].

Suri et al and Bharti et al in a questionnaire-based survey determined the prevalence of sleep disordered breathing (SDB) in 4.8% of Indian school-going children[5,6] A detailed sleep history, a thorough physical examination, and sleep logs provide the foundation for accurate diagnosis, treatment, and possible referral for polysomnography (PSG). Overnight polysomnography (PSG) has been recommended as a "gold standard" for the diagnosis of sleep-related breathing disorders (SRBD), such as obstructive sleep apnea, in children and adolescents.

MATERIAL AND METHODS

The study was conducted in Department of Paediatrics, S.N. Medical College Agra, in collaboration with Psychiatry and ENT Department. All the children diagnosed as asthma on the basis of GINA guidelines were included in the study and were classified into 4 groups-intermittent, mild persistent, moderate persistent and severe persistent. After taking detailed informed consent, all the children were subjected to detailed history and clinical examination; a sleep questionnaire was filled. The children sleep habit questionnaire (CSHQ) is a retrospective, 45-item parent questionnaire that has been used in a number of studies to examine sleep behavior in young children[7-9].The CSHQ includes items relating to a number of key sleep domains that encompass the major presenting clinical sleep complaints: bedtime behavior and sleep onset; sleep duration; anxiety around sleep; behavior occurring during sleep and night wakings; sleep-disordered breathing; parasomnias; and morning waking/daytime sleepiness .We used modified form of this questionnaire. Patients of suspected obstructive sleep apnea on the basis of questionnaire (H/o snoring, apnea and feature of daytime somnolence) were subjected to polysomnography. Children with tuberculosis or having any neurological illness or intranasal steroids and antiepileptic drugs was excluded. Parents who had impaired hearing or speech impediment were also excluded.

Our study adopted scoreable respiratory parameter i.e. Respiratory Distress Index (RDI) as a parameter instead of AHI to measure SDB. Unlike AHI, RDI also evaluates RERA (Respiratory effort related arousals). These are arousal from sleep that do not technically meet the definition of Apnea and Hypopnea. Hence, the chances of picking up a sleep disordered event amongst snorers may have been higher in this study. [10-12]

RESULTS

254 cases taken for the study, around124(48.8%)of the cases were male and 130(51.2%) were female and gender was not a risk factor for SDB in cases of asthma. The cases were classified as GINA guidelines (2018). Out of 254 cases, 44.5% had intermittent Asthma, followed by mild persistent asthma 36.6%, moderate persistent asthma 14.52% and severe persistent asthma 4.7% cases respectively.

In our study, out of total 254 cases 101 (39.8%) cases having sleep disordered breathing related symptoms, out of which 43 (42.5%) were having primary snoring, 40(39.6%) had hypopnea and 22(21.7%) had UARS and 9(8.9%) had sleep apnea.

Among cases with snoring at night (n=43), majority of cases had intermittent asthma 30.2%, patients with hypopnea (n=40), majority of cases had moderate persistent asthma 47.2%, patients with UARS (n=22), majority of cases had mild persistent asthma 45.5%, the patients with sleep apnea(n=9),majority had severe persistent asthma.

Table 1: Asthma classification & distribution of cases according to SDB						
Asthma classification	SDB Distribution					Total (%)
	None (%)	Primary Snoring (%)	Hypopnea (%)	UARS (%)	Sleep apnea	
Intermittent	93 (60.8)	13 (30.2)	3(7.5)	3 (13.6)	0	113 (44.5)
Mild persistent	59 (38.6)	13 (30.2)	10(25)	10 (45.5)	2 (22.2)	93 (36.6)
Moderate persistent	1 (0.7)	11 (25.6)	22(55)	7 (31.8)	3 (33.3)	36 (14.2)
Severe persistent	0	6 (14.0)	5(12.5)	2 (9.1)	4 (44.4)	12 (4.7)
Total	153(100.0)	43 (100.0)	40(100.0)	22 (100.0)	9(100.0)	254 (100.0)
	Chi square test = 101.518, df = 9, p value <0.001					

In current study, 9 cases had positive polysomnography findings to reports these cases as OSA (Obstructive sleep apnea). Among these, cases with lowest RDI had lowest sleep apnea duration, normal heart rate, SpO2 in range of 91% – 95%. However, among cases with highest RDI had longest sleep apnea duration, increased heart rate and lower SpO2 in range of 71% – 75%.

Table 2: Comparison of RDI, apnea duration, vitals and EEG findings in positive polysomnography findings					
Sr. No	RDI Respiratory distress Index (obstructive apnea, hypopnea, RERA) per hour of sleep	Longest sleep apnea duration (in seconds)	Heart rate (per minute)	Minimal SpO2(%)	EEG (RERA) arousal
1	18.48	20.98	110 – 120	91-95%	Present
2	18.60	25	110 – 120	91-95%	Present
3	20.45	30	110 – 120	91-95%	Present
4	22.40	34	110 – 120	91-95%	Present
5	23.42	50	110 – 120	86-90%	Present
6	26.68	28	110 – 120	91-95%	Present
7	28.40	40	110 – 120	86-90%	Present
8	48.60	137.40	110 – 120	71-75%	Present
9	48.76	130.68	110 – 124	71-75%	Present

DISCUSSION

In our study a total of 254 asthmatic cases was taken, out of which 39.8% cases had sleep disordered breathing symptoms, which was on the basis CSHQ questionnaire.

Majority of cases 53.1% of asthma were between 6-9 yrs of age and most of them 90.6% having normal BMI. Zaffanello M et al 2017 in their study found that children with recurrent wheeze/asthma were younger and leaner.

The most common SDB was snoring, which was present 16.9% cases at night, 14.2% cases had obstructive sleep apnea at night, and 8.7% cases had Day Time Somnolence (DTS). Presence of snoring reported in the various studies of systematic review was 10.1% in a group of Germany children, 12% in the People's Republic of China[13], 14.6% in Australia, and 28% in Belgium. In recent years, an increased prevalence of sleep-related disorders, such as snoring, self-reported apnea, difficulty in inducing and maintaining sleep, and daytime sleepiness in asthmatic subjects has been reported[14].

Ravikiran et al in a cross-sectional study determined the excessive daytime sleepiness was 32.5% in school going children in Karnataka[15] while Suri et al who found it to be 24.3% in school going children of Delhi[16], in our study it was 8.7% cases and majority of them had mild persistent asthma.

The sleep behaviors of subjects were evaluated by Children's Sleep Habits Questionnaire (CSHQ), which was designed to assess sleep characteristics of pre-school and school aged children (4 to 12 years old)[17].

Various studies showed that children with asthma/wheeze were more likely to have a higher risk for habitual snoring and OSA than those without asthma. Children with wheezing had a significantly higher prevalence of snoring, and more nocturnal awakenings than non-wheezing children[18]. Our study also follows the same trend.

The relationship between asthma and SDB is bidirectional, and both are risk factors for each other.

Our study adopted scoreable respiratory parameter i.e. Respiratory Distress Index (RDI) as a parameter instead of AHI to measure SDB. Unlike AHI , RDI also evaluates RERA (Respiratory effort related to arousals). These are arousal from sleep that do not technically meet the definition of Apnea and Hypopnea. Hence, the chances of picking up a sleep disordered event amongst snorers may have been higher in this study[19-21].

CONCLUSION

The prevalence of SDB was 39.8% in asthmatic children in our study. Most common SDB symptom was snoring and most common SDB was obstructive sleep apnea. The present study also concludes that sleep disordered breathing was associated with occurrence and exacerbation of asthma. The clinical significance of our findings lies in the emphasis that children undergoing examination or treatment for asthma should be routinely screened for sleep problems.

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