ORIGINAL ARTICLE

A Study of Excessive Day Time Sleepiness in Asthma

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Abstract

A study was conducted in the Department of Respiratory Medicine, Nil Ratan Sircar Medical College, Kolkata over a period of two years on 120 uncomplicated stable adult asthmatics selected by random sampling to assess the incidence of Excessive Daytime Sleepiness (EDS) in patients with asthma, and to find out its correlation with the severity and the level of control of asthma. Diagnosis of asthma and its severity and level of control were assessed clinically, by peak flow meter and by spirometry. EDS was assessed by (Epworth Sleepiness Scale score > 10). We found incidence of EDS was 30.8% where as EDS in general population of Kolkata was 11.3% (Z = 4.627, P = < 0.05). We also found a definite correlation between EDS with the severity of asthma (5.9% in intermittent, 19.4% in mild persistent, 39.3% in moderate and 83.3% in severe asthmatics) and the level of control (none in good level of control, 25.5% in fair level of control and 58.9% in poor level of control of asthma). However there was no correlation between the mode of diagnosis of asthma and EDS (31.8% in asthmatics diagnosed clinically, 25% by peak flow meter and 31.6% by spirometry).

Keywords: asthma, sleep, excessive daytime sleepiness

Introduction

Since the first report of Obstructive Sleep Apnoea (OSA) by Guilliminault et al,[1] Excessive Daytime Sleepiness(EDS) is increasingly recognized as a major public health problem. Apnoea is defined as complete cessation of breathing for 10 seconds or more and hypopnoeas is defined as more than 50% diminishing of airflow or oxygen desaturations more than 3% for 10 seconds or more. According to the Winconsin Sleep Cohort Study[2] the prevalence of asymptomatic sleep apnea [with an apnea-hypopnea index (AHI) of > 5] was 24% in men and 9% in women aged 30-60 yrs and that of symptomatic sleep apnea [with AHI $\geq$ 5 with excessive day time sleepiness] was 4% and 2% respectively.

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A hypothetical OSA-asthma relationship that has implications on the diagnosis and management of patients presenting with either condition singly has been proposed[3].

This hypothesis had been supported by the fact that nocturnal continuous positive airway pressure treatment did improve asthma quality of life[4]. But this hypothetical association of asthma and OSA, though described anecdotally, has not been systematically studied. In this study we interviewed 120 asthma patients to find out co-incidence of EDS in asthma, and its co-relation with the severity and the control of asthma.

Material and methods

This study was conducted in the Department of Respiratory Medicine, Nil Ratan Sircar Medical College, Kolkata from 1st January'2005 to 31st December'2006. We included only stable, uncomplicated, and adult asthmatics (age < 14 year had been excluded). Those patients who had signs of upper airway obstruction, such

as deviation of the nasal septum, hypertrophic conchae inferiones, soft palate or uvular disease, hypertrophic tongue or tonsils, retrognathia or problem of sinuses were excluded from the study. Patients with obesity (body mass index > 30) and a large neck circumference (> 44cm) were excluded from the study as they had a definite correlation with OSA. Asthma was diagnosed on the basis of clinical (intermittent shortness of breathing, wheeze, complete remission in between attacks, little tenacious expectoration, positive family history and history of other allergic disorders), or by peak flow meter (demonstration of early morning dipping) or by spirometry (demonstrating more than 12% reversibility of FEV_1 with absolute increase ≥ 200ml). Severity and control of asthma were assessed again clinically and by peak expiratory flow rate (PEFR) and by spirometer. Patients were selected by systematic random sampling using every fifth asthmatics according to selection criteria to get a 20 % sample of the daily asthma attendance. The first case was selected by simple random sampling. All patients were then interviewed using a proforma based on Epworth Sleepiness Scale (ESS)[5](Table no.1). The total ESS score was recorded on individual basis and the population was divided into "Excessive Daytime Sleepiness (EDS)" group and "No EDS" group depending on ESS score ≥ 10 and < 10 respectively. Finally data collected were analyzed by standard statistical methods, using Z test difference of two means and Pearson's correlation coefficient. For difference of percentage of sleepiness among male and female asthmatics Z test difference of two proportions was used.

Table 1: Epworth Sleepiness Scale (ESS)

How likely are you to fall asleep or doze off in the following situations, during the daytime in contrast to just feeling tired? These questions refer to your usual way of life in recent months even if you have not done some of these things recently. Try to work out how they would have affected you.

Use the following scale to choose the most appropriate number for each situation.

0 = would never doze off

1 = Slight chance of dozing

2 = Moderate chance of dozing

3 = High chance of dozing

SITUATIONS	CHANCE OF DOZING (Write 0,1,2,or3)
1. Sitting and reading	……
2. Watching TV	……
3. Sitting inactive in a public place such as in a theater or meeting	……
4. As a passenger in a vehicle (bus/car) for an hour without a break	……
5. Lying down to rest in the afternoon when circumstances permit	……
6. Sitting, talking to someone	……
7. Sitting quietly after a lunch without alcohol	……
8. In a vehicle (bus/car) while stopped for a few minutes in a traffic jam	……
Total score	……

Result and analysis

Out of 120 asthmatics 54 were male and 65 were female. Age distribution of subjects were 17,19,31,19,15 and 9 in the age group of 14-25, 26-35, 36-45, 46-55, 56-65 and more than 65 years of age. Asthma was diagnosed clinically in 66, by peak flow meter (PFM) in 16 and by spirometry in 38 subjects. In our study group (Table no. 2) 6 (5%) had severe asthma with either fair or poor (83.3%) level of control, 61 (50%) had moderate persisting asthma with majority being in the fair(42.6%) or poor (44.3%) level of control, 36 (30%) had mild persisting asthma with good (25%), fair (55.6%) or poor (19.4%) level of control, and 17 (14.2%) had intermittent asthma with either good (53%) or fair (47%) level of control.

Table 2: Distribution of subjects, male / female (M / F), as regards severity of asthma and level of control

Severity of asthma	Level of control			
	Good (M/F)	Fair (M/F)	Poor (M/F)	Total (M/F)
Intermittent	9 (4/5)	8 (4/4)	0	17 (8/9)
Mild persisting	9 (5/4)	20 (10/10)	7 (3/4)	36 (18/18)
Moderate persisting	8 (3/5)	26 (11/15)	27 (11/16)	61 (25/36)
Severe	0	1 (0/1)	5 (3/2)	6 (3/3)
Total	26 (12/14)	55 (25/30)	39 (17/22)	120 (54/66)

We found 10.8% of our patients smoked, 3.4% consumed alcohol and 10% took sleeping pills. Forty-eight percent cases complained of daytime sleepiness in leisure times, of them 15.8% had attacks of sleep even during active work. Sleep disturbances were reported in 58.3% of subjects of them 19% had troublesome sleep disturbances. Choking attacks during sleep were reported in 36.7% cases of them 7.5% had startling attacks. Snoring was observed in 36.7% of patients and among them 14% had disturbing snoring. Spouses noticed long stops in breathing in 16.7% of patients and among them

1.7% had alarming episodes. Tiredness in the morning, morning headache and chest pain were observed in 58.3%, 40.8% and 41.7% cases respectively. Hypertension and nocturnal urinary frequency were found in 16.5% and 10% patients where as symptoms suggestive of gastro-esophageal reflux were found in 57.5% patients. Personality changes indicating chronic sleep deprivation was noticed in 20% subjects.

We did not find EDS in asthmatics with good level of control, however we got EDS in 14 out of 55(25.4%) asthmatics with fair level of control and in 23 out of 39(58.9%) of asthmatics with poor level of control. EDS (Table no. 3) was found in 5.9% of intermittent asthmatics, 19.4% of mild persistent, 39.3% of moderate persistent and 83.3% of severe asthmatics. Amongst male subjects EDS was found in 1(12.5%) intermittent, 2(11.1%) mild persistent, 11(44%) moderate persistent and 2(66.7%) severe asthmatics on the other hand in females EDS was found in 5(27.8%) mild, 13(36.1%) moderate and 3(100%) severe asthmatics. A total of 37 among our study sample of 120 (30.8%) had high EDS of them 16(29.6%) were male and 21 (31.8%) were female. The incidence of EDS in general population is reported as 4% in male and 2% in female[2]. The difference of percentage of males in study group and male in general population was statistically significant (Z = 4.12 and P < 0.05). Similarly the difference in percentage in female was also statistically significant (Z = 5.49 and P < 0.05).

Table 3: Incidence of EDS (ESS > 10) in male / female asthmatics and its relation with severity of asthma

Severity of asthma	Male (%)	Female (%)	Total (%)
Intermittent	1 (12.5%)	0	1 (5.9%)
Mild persisting	2 (11.1%)	5 (27.8%)	7 (19.4%)
Moderate persisting	11 (44%)	13 (36.1%)	24 (39.3%)
Severe	2 (66.7%)	3 (100%)	5 (83.3%)
Total	16(29.6%)	21(31.8%)	37(30.8%)

Z test for male = 4.12 and Z test value for female = 5.49

We calculated mean and standard deviation of ESS score in asthmatics with different severity categories and different level of control (Table no. 4). The mean ESS scores had an increasing trend with severity of asthma as well as with decreasing level of control (Fig. 1). The only exception was in one case with severe asthma, so it can be disregarded. The differences between the ESS scores of good and fair control with intermittent and mild persisting asthma were statistically not significant. But the differences in scores in good and fair control and between fair and poor control in moderate persistent

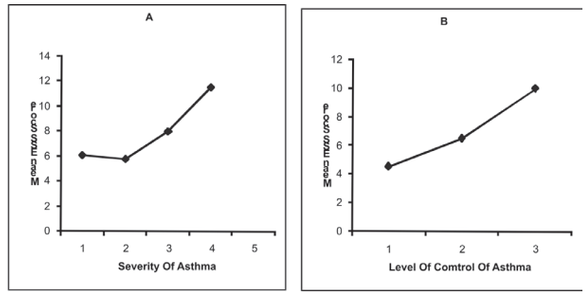

Figure 1: Showing the mean ESS scores had an increasing trend with severity of asthma (A) and with decreasing level of control (B)

Table 4: ESS scoring (mean + SD) as regards severity of asthma and the level of control

Severity of asthma	Level of control			Z test	P value
	Good (a)	Fair (b)	Poor (c)		
Intermittent	5.33 ± 1.50	6.88 ± 1.96	0	a vs b = 1.8	P > 0.05
Mild persisting	4.67 ± 3.91	5.90 ± 4.23	6.86 ± 1.28	b vs b = 0.76 b vs c = 0.90	P > 0.05 P > 0.05
Moderate persisting	3.63 ± 3.07	6.54 ± 4.13	10.63 ± 4.40	a vs b = 2.15 b vs c = 3.49	P < 0.05 P < 0.05
Severe	0	15 ± 0	10.8 ± 2.5		

asthma were both statistically significant (Z = 2.15, P < 0.05 and Z = 3.49, P < 0.05). We found the total ESS score increased for each category of asthmatics with decreasing level of control and there was a positive correlation with severity as well as level of control (Table no. 5).

Table 5: ESS scoring (Total) as regards severity of asthma and the level of control

Severity of asthma	Level of control				Mean score
	Good	Fair	Poor	Total	
Intermittent	48	55	0	103	6.059 ± 1.854
Mild persistent	42	118	48	208	5.778 ± 4.015
Moderate persistent	29	170	287	486	7.967 ± 4.813
Severe	0	15	54	69	11.500 ± 2.922
Total	119	358	389	866	
Mean score	4.577 ± 2.518	6.509 ± 4.032	9.974 ± 4.258	7.217 ± 4.390	

We did not find EDS for good level of control and only 1 EDS in intermittent asthmatics. EDS (Table no. 6) with fair level of control was highest in patients diagnosed by spirometry (30%) followed by PFM (28.5%) and least by clinical diagnosis (21.4%), and similarly with poor level of control group EDS was found in asthmatics diagnoses by spirometry (66.7%) followed by clinical diagnosis (57.7%) and then by PFM (50%). EDS (Table no. 7) in mild persistent category was found 20% in clinical as well as PFM group followed by spirometry group (18.2%), but in moderate persistent category highest EDS was found in spirometry group

(42.9%), followed by clinical (38.7%) and least with PFM group (33.3%). In totality 21 out of 66 (31.8%) subjects diagnosed clinically, 4 out of 16 (25%) diagnosed by PFM and 12 out of 38 (31.6%) diagnosed by spirometry had EDS.

Table 6: Distribution of EDS among patients according to the mode of diagnosis and the level of control

Mode of diagnosis	Level of control						Total
	Good		Fair		Poor		
	No EDS	EDS	No EDS	EDS	No EDS	EDS	
Clinical	12	-	22	06	11	15	66
PFM	05	-	05	02	02	02	16
Spirometry	09	-	14	06	03	06	38
Total	26	-	41	14	16	23	120

Table 7: Distribution of EDS among patients according to the mode of diagnosis and the severity of asthma

Mode of diagnosis	Severity of asthma								Total
	Intermittent		Mild		Moderate		Severe		
	No EDS	EDS	No EDS	EDS	No EDS	EDS	No EDS	EDS	
Clinical	10	01	16	04	19	12	0	04	66
PFM	02	--	04	01	06	03	0	0	16
Spirometry	04	--	09	02	12	09	01	01	38
Total	16	01	29	07	37	24	01	05	120

Discussion

Untreated OSA decreases cognitive function, impaired psychomotor function, increases risk of accident and post operative complications, and increases cardio-vascular morbidity as a result of increased pulmonary and systemic hypertension, cardiac arrhythmias, and ischemic heart diseases. It has been well documented that some of the patients with obstructive airway diseases is also suffering from SDB, and simultaneous management of both diseases are essential. A number of placebo-controlled trials have proved nasal continuous positive pressure ventilation as an effective mode of treatment[4] Unfortunately, the awareness of symptoms and signs of SDB is poor even among doctors.

Polysomnography (PSG), the gold standard in the diagnosis of SDB, is costly and has limited availability. It has been widely accepted that EDS as calculated by ESS score has good positive prediction value, and can be used as a good screening tool for the diagnosis of SDB. One study, in India (AIIMS, New Delhi), concluded that patients with SDB have significant high ESS score[6]. EDS prevalence have wide variation in different countries (20% in Karachi[7], Pakistan and 31% in one survey in US[8]). A population based controlled study in Kolkata found 11.3% EDS by ESS score in general population[9]. In our study we found incidence of EDS by ESS score in asthmatics 30.8%, and that is statistically significant ($Z = 4.627$ and $P < 0.05$) In our study we observed EDS increased with increasing severity of asthma (5.8% in intermittent asthmatics where as it was 83.3% in severe asthma) as well as level of control of disease (none in good level of control to 58.9% in poor level of control group). But we did not get any relation of EDS with the mode of diagnosis of asthma as we get similar incidence of EDS in clinical and spirometry group. We got more EDS in female asthmatics though in general population EDS is more common in males.

So, we conclude that prevalence of EDS as a surrogate marker for Sleep Disturbed Breathing is more in asthmatics and it increases with the increasing severity and the decreasing level of control of asthma.

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