Original Research Article

Clinical profile of sleep apnea syndrome in a tertiary care center

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Abstract

Introduction: Sleep related breathing disorders refer to an abnormal respiratory pattern (e.g.: apneas, hypopneas, or respiratory effort related arousals) or an abnormal reduction in gas exchange (e.g., hypoventilation) during sleep. They tend to repetitively alter sleep duration and architecture, resulting in daytime symptoms, signs, or organ system dysfunction. **Materials and Methods:** All patients attended Chest OPD with complaints of sleep disordered breathing (SDB) like Snoring, excessive day time sleepiness, witnessed breathing pause, nocturnal choking, as well as patients referred from other departments for evaluation of SDB were taken up for further screening. All patients attended Chest OPD with complaints of sleep disordered breathing (SDB) like Snoring, excessive day time sleepiness, witnessed breathing pause, nocturnal choking, as well as patients referred from other departments for evaluation of SDB were taken up for further screening. **Results:** There were 33 (63.46%) males and 19 (36.53%) females in the study population. Patients with age >40 years were 40 (79.9%). Patients with BMI ≤ 25.0 Kg/mt² were 14(26.9%); BMI >25.0 and ≤ 30 Kg/mt² were 8(15.38%); BMI > 30 kg/m² were 30(57.7%). 9(47.3%) females had neck circumference >15 inches and 10 (52.63%) males had neck circumference >17 inches which was considered as risk factor for Sleep apnea. There were no other obvious significant anthropometric abnormalities on clinical examination. 22(42.30%) subjects had hypertension (according to JNC 8 criteria). 7(13.46%) patients had diabetes mellitus. The symptomatology of the subjects is summarized in Table5. The most common symptoms were snoring 28(53.8%), excessive day time sleepiness 28(53.8%), Witnessed breathing pause 21(40.4%), frequent awakening 19(36.5%) and difficulty in falling asleep 17(32.7%). **Conclusion:** It is important from clinician point of view to take detail history and thorough clinical examination to suspect SDB and refer them to centers where PSG is conducted. This is possible if awareness for SDBs is increased among general population and physicians, including its effects on individuals' physical, mental and social health and also needs to be emphasized that it is amenable to cure. Overall, polysomnography is an effective tool for diagnosis of SDBs and should be carried out in patients with symptoms suggestive of SDBs and also in patients having other co morbidities which are known to be associated with SDB.

Key Words: apneas, hypopneas, SDB, PSG, BMI.

Introduction

Sleep related breathing disorders refer to an abnormal respiratory pattern (e.g.: apneas, hypopneas, or respiratory effort related arousals) or an abnormal reduction in gas exchange (e.g., hypoventilation) during sleep. They tend to repetitively alter sleep duration and architecture, resulting in daytime symptoms, signs, or organ system dysfunction. Sleep related breathing disorders are best characterized by polysomnography that has captured one or more periods of rapid eye movement (REM) sleep, as severe perturbations can be common during REM sleep[1]. Epidemiological studies have revealed a high prevalence of sleep-disordered breathing in the community (up to 20%)[2].

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A subset of these patients has concurrent symptoms of excessive daytime sleepiness attributable to their nocturnal breathing disorder and is classified as having obstructive sleep apnea/hypopnea syndrome (4–5% of the middle-aged population). There is strong evidence for an association of sleep apnea with cardiovascular and cerebrovascular morbidity, as well as adverse public health consequences. Treatment and diagnosis have remained largely unchanged over the past 25 yrs[3].

Sleep disorder breathing is now recognized to be an important health issue in western countries[4] due to its high prevalence and the growing evidence of its significant association with morbidity and possibly mortality. There have been many epidemiological studies that aim to establish the prevalence of SDB and obstructive sleep apnea syndrome (OSAS) in various populations. Previous studies from the united states, united kingdom, and Australia have been reported prevalence rates of SDB in middle-aged men to be in the range of 5 to 26%, using different diagnostic methods and criteria and that of symptomatic sleep apnea in the range of 3 to 4%[9,6,7]. Major etiological factors such as obesity and craniofacial anatomic predisposition are both genetically and environmentally influenced, and it is therefore pertinent to determine the prevalence of sleep apnea in different populations[5].

The gold standard technique for the diagnosis of sleep apnea and related disorders is overnight polysomnography, although increasing attention is being paid to development of limited diagnostic systems for use in clinical practice, which accesses cardiorespiratory variables during overnight studies. These latter systems require a lower level of logistic support than polysomnography and many are suitable for home-based sleep studies. Polysomnography is an overnight study during which multiple physiological signals are monitored in the sleeping patients. The signals collected can be classified into three primary groups: those related to recognizing sleep (Electroencephalogram, electrooculogram, and sub mental electromyogram), those related to cardiac arrhythmia monitoring (ECG), and those related to respiration (airflow, thoracoabdominal effort and oximetry). Airflow can be monitored in several ways, including an oronasal thermistor, inductive plethysmography, or nasal cannula/pressure transducer system. Monitoring of nasal pressure has become the preferred approach for measuring airflow because the signal is semi quantitative and approximates airflow measurements obtained from a pneumatocography, the "gold standard" for measurements of airflow[6].

Aims and Objectives

- To study prevalence of sleep apnea in patients who are undergoing sleep study in Department of Respiratory Medicine, GIMSR, GITAM (Deemed to be University) during the period of January 2021 to June 2021.
- To study severity of Apnea/Hypopnea index in patients undergoing Sleep study and correlate it with E.S.S (Epworth Sleepiness Score).
- To identify the risk factors for sleep apnea.

Materials and methods

Study Sample

This study was prospective observational type of study, was carried out in 52 patients who underwent sleep study in Department of Respiratory Medicine, GIMSR, GITAM (Deemed to be University).

Sample size (N)

Sample size was calculated by the following formula.

Sample size **(N) = 4 x P x Q /L²**, where

P= prevalence (The Prevalence of OSA in our Hospital is 3%)

Q = 1 – P

L = Experimental error (5%)

N = 46.56 ≈ 47.

Inclusion criteria

1. Patients complaining of snoring, excessive day time sleepiness and other symptoms of sleep disordered breathing.
2. Patients with risk factors such as Obesity, Uncontrolled Hypertension, and Diabetes mellitus complaining of symptoms of sleep disordered breathing.

Exclusion criteria

1) Age < 18 years.

2) Critically ill, mentally ill, uncooperative patient.

3) Pregnancy.

Period of study

The study was conducted over a period of 6 months (From January 2021 to June 2021)

Place of study

Type 1 Polysomnography study was conducted at Sleep lab in Department of Respiratory Medicine, GIMSR, GITAM (Deemed to be University)..

Statistical analysis

Statistical analyses done by using Statistical Package for Social Sciences (SPSS; version 19.0). A 'P'value was calculated using Fisher's exact test of significance for categorical variables and one-tailed student 't' test was used for continuous variables. For comparison between multiple groups, analysis of variance (ANOVA) was used. Sensitivity, specificity, positive and negative predictive values (PPV, NPV) were calculated where relevant.

Equipment

The study was conducted by the polysomnography machine "The Alice PDx (Philips Respironics)" which was used to perform sleep studies in hospital under our supervision.

1. 21 channel Polysomnography [The Alice PDx (Philips Respironics)]
2. Measures of body habitus recorded by standard anthropometric methods.

PSG consisted of continuous polygraphic recording from surface leads for the following parameters.

1.	EEG	Electro-encephalogram
2.	EOG	Electro-oculogram
3.	EMG	Electro-myogram
4.	ECG	Electro-cardiogram
5.	Pressure transducers	For nasal airflow
6.	Impedance belts	For Thoracic and abdominal respiratory efforts
7.	Pulse oximetry	For oxyhemoglobin level
8.	Snoring sensor	For snoring
9.	Position Sensors	For leg and body position

Methodology

1. All patients attended Chest OPD with complaints of sleep disordered breathing (SDB) like Snoring, excessive day time sleepiness, witnessed breathing pause, nocturnal choking, as well as patients referred from other departments for evaluation of SDB were taken up for further screening.
2. A .History given both by the patient and the bed partner, and clinical examination of such patients were recorded as per a proforma given below.

B. Their Epworth Sleepiness Scores (ESS) was calculated. Based, on ESS, three groups were identified- those with mild sleepiness (ESS≤ 10), moderate sleepiness (ESS 11-16) and severe sleepiness (ESS >16).

C. Based on the BMI, subjects were divided into three groups, those with BMI ≤ 24.9 kg/m², ≥25Kg/m² to ≤ 30 Kg/m² and >30 Kg/m² (as per the WHO definition of obesity for Indian and the western population).

D. Neck circumference was measured at the superior border of the cricothyroid membrane with the subjects in the upright position.

E.*Nocturia*, a symptom, was used to mean that the patient was waking to pass urine more frequently than normal, ie more than once per night

F. History and Vital parameters are noted before and after PSG. The presence or absence of comorbidities and the treatment history recorded based on history and review of patient's medical documents.

G. Chest X-ray, ECG, and baseline SpO_2 recordings were done for all patients.

3. All these patients were subjected to PSG and monitored whole night in the sleep lab.

4. Interpretation of PSG Data was scored according to the standard criteria. An abnormal breathing event during objectively measured

sleep was defined according to the commonly used clinical criteria i.e. drop in the peak thermal sensor excursion by ≥ 90% of baseline, the duration of the event lasts at least 10sec (apnea) and the nasal pressure excursions drop by ≥30% of base line, duration of this drop occurs for a period lasting at least 10 sec with ≥ 4% desaturation from pre-event baseline (hypopnea). The average number of episodes of apnea and hypopnea per hour of sleep (the apnea-hypopnea index [AHI]) was calculated as the summary measurement of SDB. Arousals were identified according to established criteria. Respiratory effort related arousal (RERA) was defined as flattening in the airflow signal ≥ 10sec followed by an arousal and an abrupt reversal in flow to a round shape, that does not qualify as hypopnea.

5. Patients with AHI > 5 were taken up for further analysis.
6. ESS scores and AHI scores were recorded and tabulated with other findings in the clinical profile of patients.
7. Data was collected at the end of study will be analysed to compare the ESS scores, AHI scores, the various predisposing conditions for sleep disordered breathing, clinical presentation and various sequelae of the same.

Fig 1: Patient With Polysomnography Machine

Fig 2: Patient with Polysomnography Machine.

Fig 3: A Patient Undergoing Polysomnography in Sleep Lab.

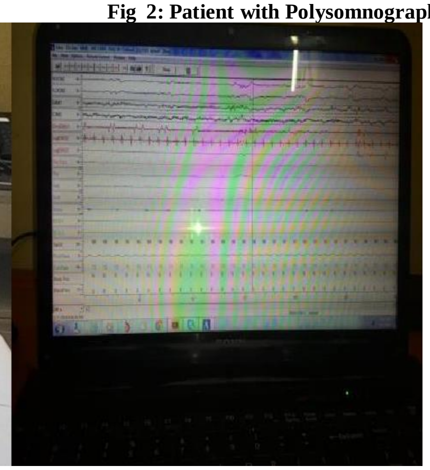


Fig 4: Patient Monitoring While Polysomnography

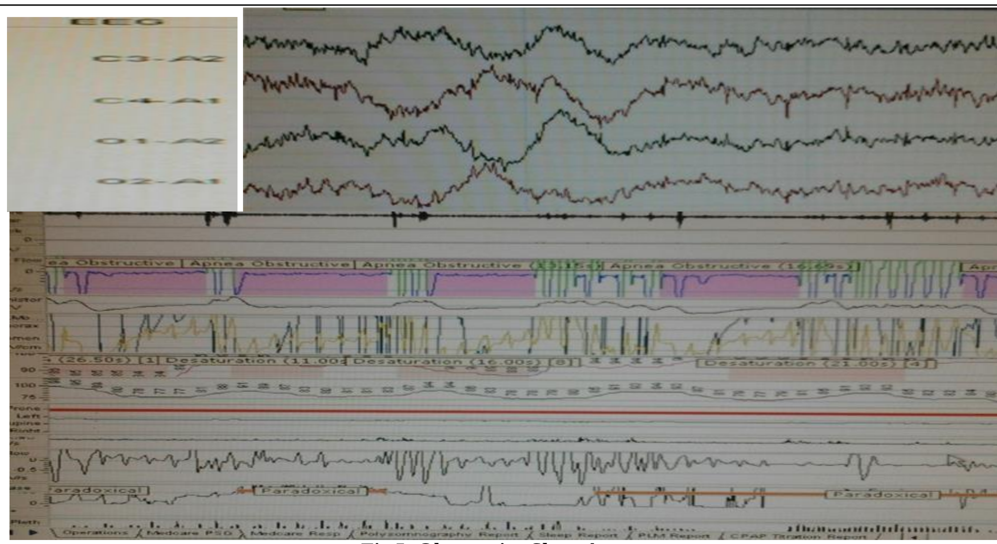


Fig 5: Obstructive Sleep Apnea

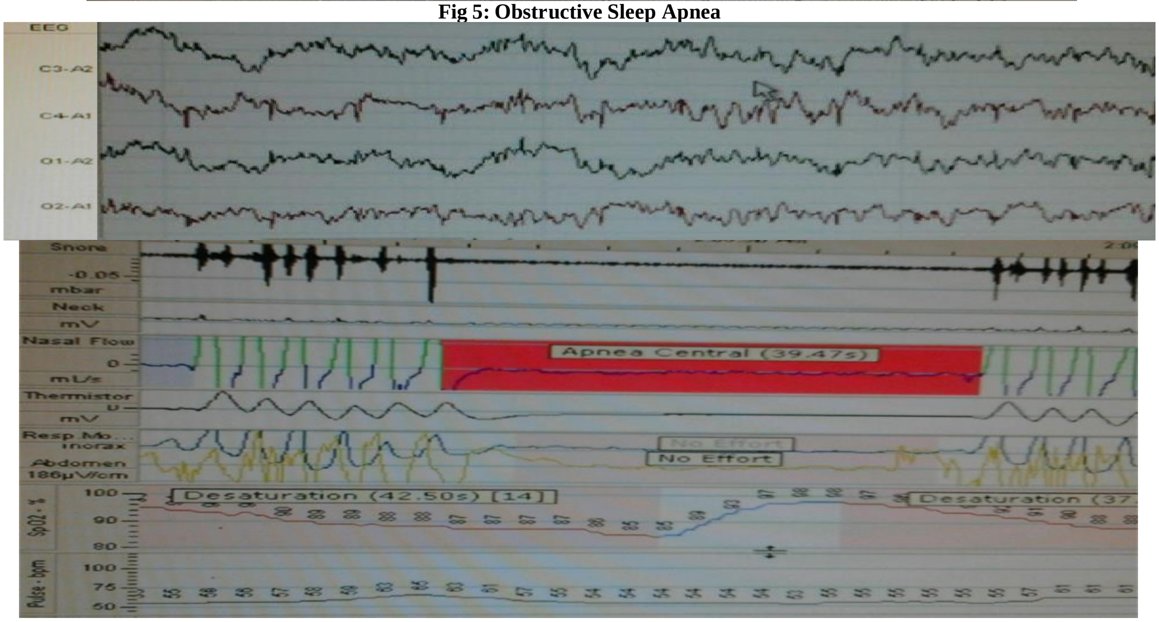


Fig 6: Central Sleep Apnea

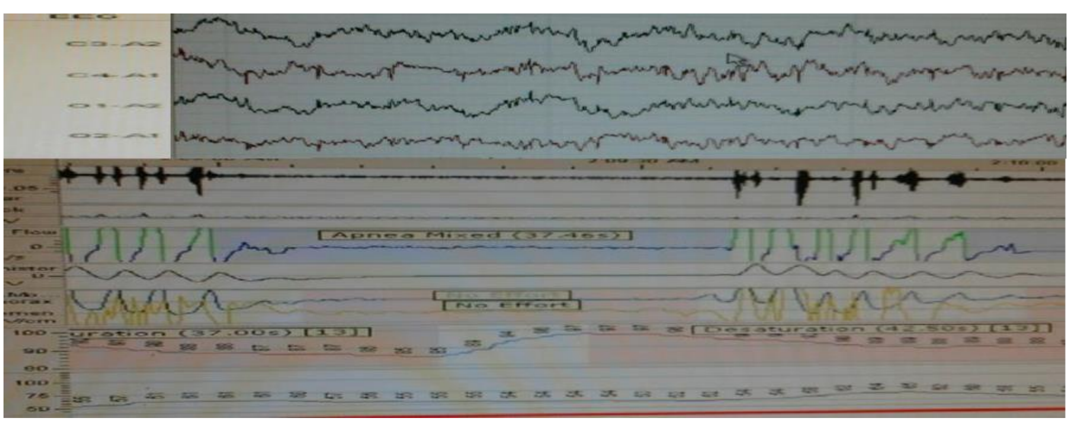
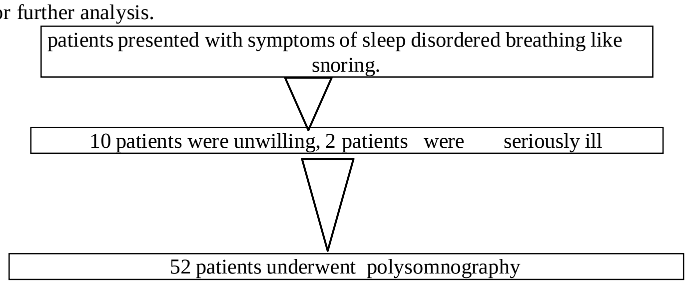


Fig 7: Mixed Sleep Apnea

Results

The recruitment of cases was continued till 52 patients met the criteria mentioned for inclusion in the study. 64 patients presented with complaints of snoring, breathing pauses and other symptoms of sleep disorder breathing during this period. Out of these, 52 patients met criteria for inclusion in the study and were taken up for further analysis.

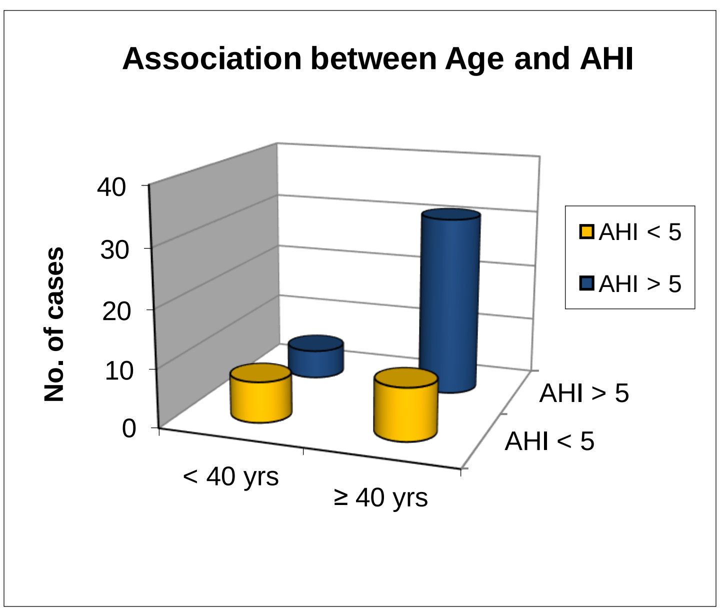


The demographic characteristics of the study population and the results of clinical assessment are summarized in Table 4.

There were 33 (63.46%) males and 19 (36.53%) females in the study population. Patients with age >40 years were 40 (79.9%). Patients with BMI ≤ 25.0 Kg/mt² were 14(26.9%); BMI >25.0 and ≤ 30 Kg/mt² were 8(15.38%); BMI > 30 kg/m² were 30(57.7%). 9(47.3%) females had neck circumference >15 inches and 10 (52.63%) males had neck circumference >17 inches which was considered as risk factor for Sleep apnea. There were no other obvious significant anthropometric abnormalities on clinical examination. 22(42.30%) subjects had hypertension (according to JNC 8 criteria). 7(13.46%) patients had diabetes mellitus.The symptomatology of the subjects is summarized in Table5.The most common symptoms were snoring 28(53.8%), excessive day time sleepiness 28(53.8%), Witnessed breathing pause 21(40.4%), frequent awakening 19(36.5%) and difficulty in falling asleep 17(32.7%).

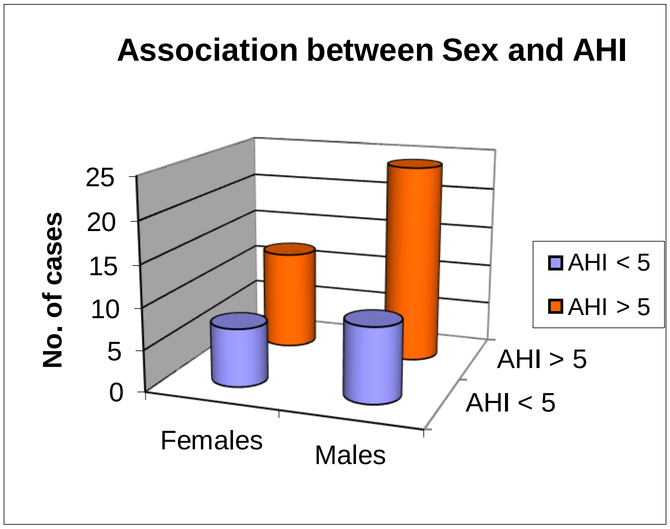
Table 4: Demographic profile and Clinical evaluation:

Variables	Numbers/ counts	Percentage
Males	33	65.5
Females	19	36.5
Age ≤ 40 Age >40	12 40	23.07 76.9
BMI ≤25.0 25.0 - ≤30 >30	14 8 30	26.9 15.4 57.7
Alcohol consumers	17	32.7
Smokers	17	32.7
ESS <11 11-16 >16	28 13 11	53.8 25.0 21.2
Neck circumference Female > 15 inches Male > 17 inches	19	36.5
Hypertension	22	42.30



Age in years	AHI < 5 (OSA Absent)	AHI>5 (OSA Present)
< 40	(58.3%)	5 (41.6%)
>40	(22.5%)	31(77.5%)
$\chi 2(df=1)$ 4.009, p=0.045, significant		

Fig8:. Association between age and AHI value. It shows that 31 patients of age ≥ 40 years had AHI >5



Gender	AHI < 5 (OSA Absent)	AHI >5 (OSA Present)
Female	7 (36.8%)	12 (63.1%)
Male	9 (27.27%)	24 (72.72%)
χ2(df=1) 0.166,p=0.683, non-significant		

Fig 9:Association between Sex and AHI. It shows that 24 males as compared to 12 females had AHI > 5.

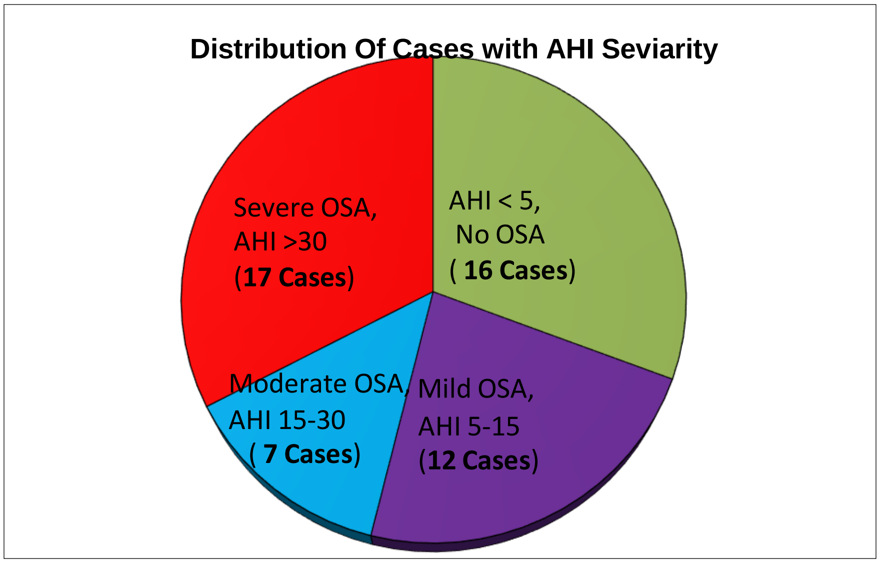


Fig 10: Severity of the disease with AHI.

Snoring	AHI < 5 (OSA Absent)	AHI >5 (OSA Present)
Present	15(53.57%)	13(46.42%)
Absent	1(4.1%)	23(95.8%)
χ2(df=1) 12.58, p<0.001 highly significant		

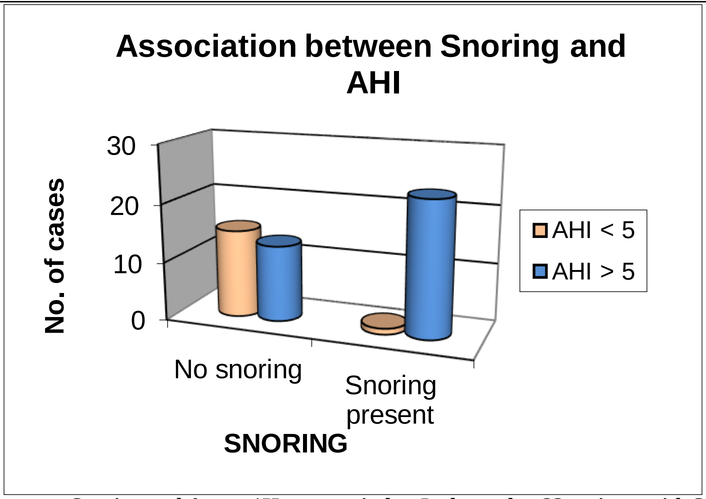
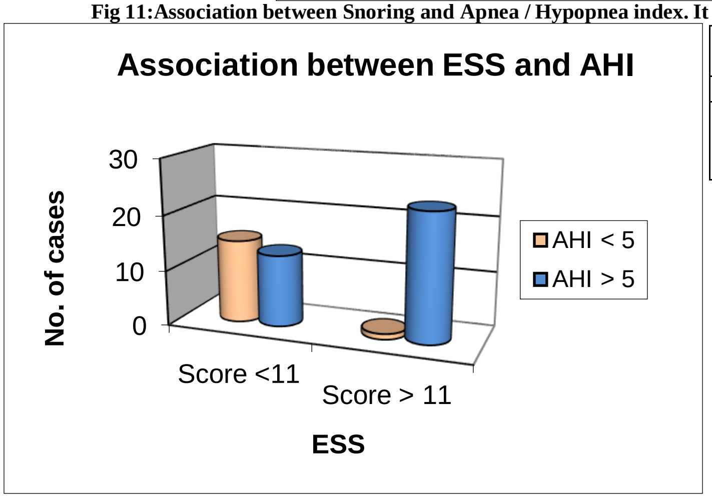
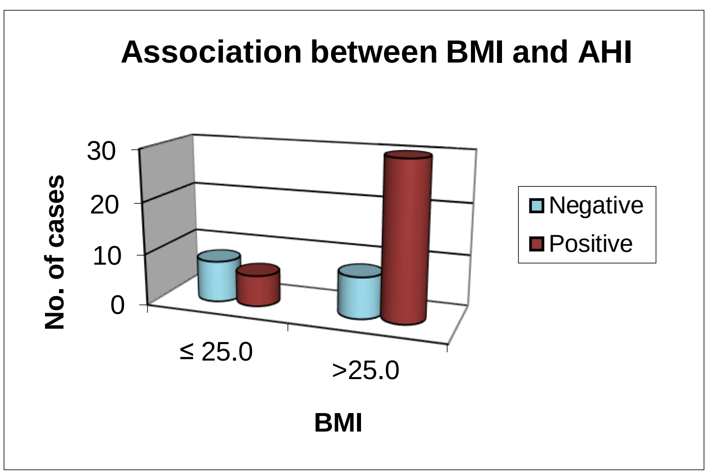


Fig 11:Association between Snoring and Apnea / Hypopnea index. It shows that 23 patients with Snoring had AHI >5.



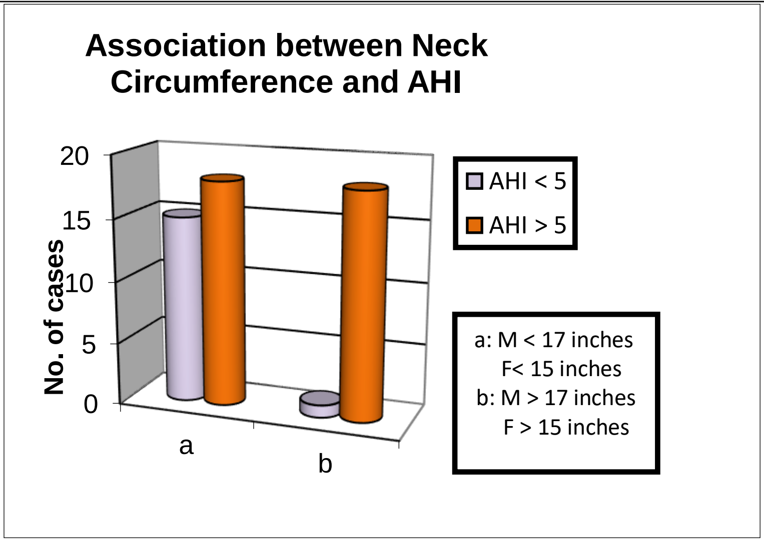
ESS	AHI < 5 (OSA Absent)	AHI > 5 (OSA Present)
< 11	15(53.57%)	13(46.42%)
>11	1(4.1%)	23(95.8%)
	χ2(df=1) 12.58, p<0.001 highly significant	

Fig 12:Association between Epworth sleep scale and Apnea / Hypopnea index. It shows that 23 patients with Epworth sleep scale score>11 had AHI >5.



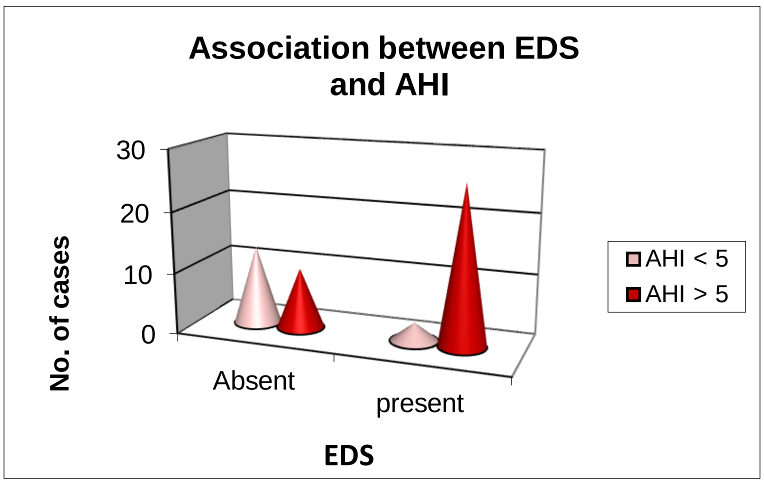
BMI Kg/mt²	AHI < 5 (OSA Absent)	AHI > 5 (OSA Present)
≤25.0	8 (57.14%)	6 (42.85%)
>25.0	8 (21.05%)	30 (78.94%)
	χ2 (df=1) 4.67, p<0.031, significant	

Fig 13: Association Body Mass Index and Apnea/ Hypopnea index. It shows that 30 patients with BMI >25.0 had AHI >5.



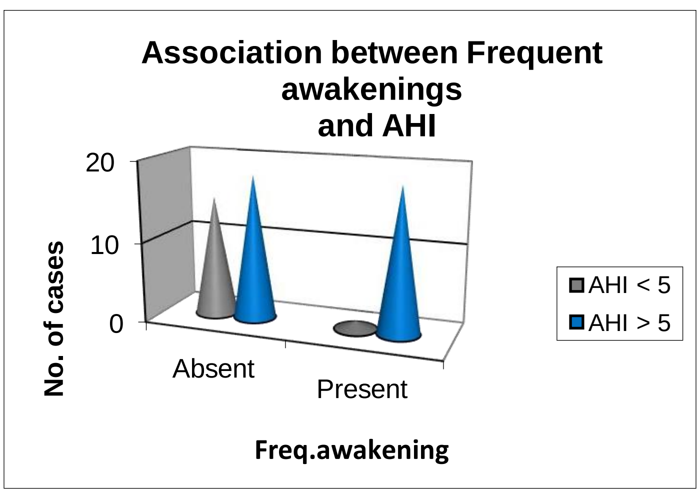
Neck Circucumfe-rence	AHI < 5 (OSA Absent)	AHI > 5 (OSA Present)
a: M<17 F<15	15 (45.4%)	18 (54.5%)
b: M>17 F>15	1 (5.2%)	18 (94.7%)
χ2(df=1) 7.35, p=0.007 Significant		

Fig 14: Association between neck circumference and AHI. It shows that 18 patients with neck circumference >15 inches for females and >17 inches for males had AHI>5.



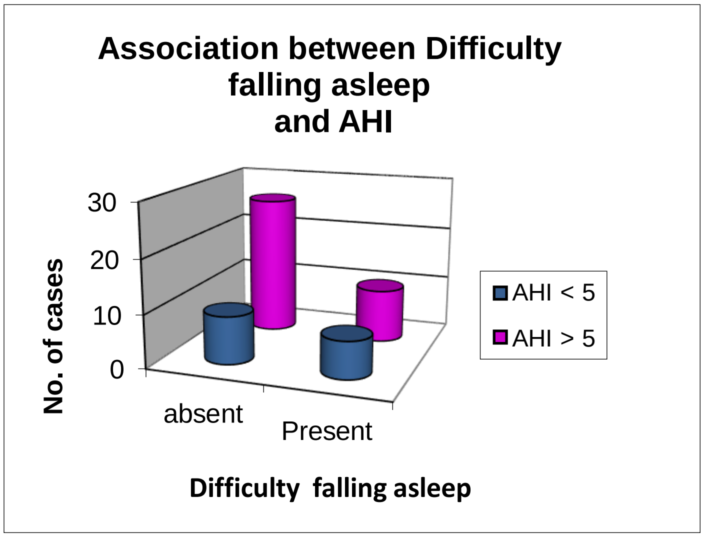
EDS	AHI < 5 (OSA Absent)	AHI > 5 (OSA Present)
Present	3(10.34%)	26(89.6%)
Absent	13(56.52%)	10(43.47%)
χ2(df=1) 10.73, p=0.001, significant.		

Fig 15: Association between Excessive Day time Sleepiness and AHI. It shows that 26 patients with excessive day time sleepiness had AHI > 5.



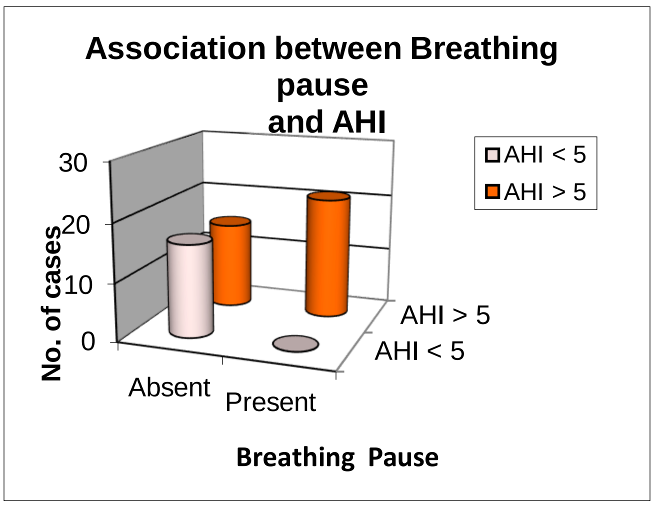
Frequent Awakening	AHI < 5 (OSA Absent)	AHI > 5 (OSA Present)
Present	1(5.26%)	18(94.73%)
Absent	15(45.45%)	18(54.54%)
χ2(df=1) 7.35,p=0.007, significant		

Fig 16: Association between Frequent awakening and AHI. It shows that 18 patients with frequent awakening had AHI > 5.



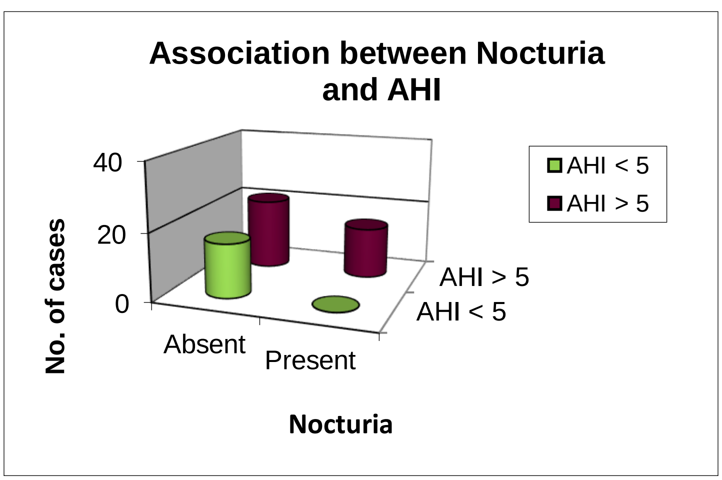
DFA	AHI < 5 (OSA Absent)	AHI > 5 (OSA Present)
Present	7(41.17%)	10(58.82%)
Absent	9(25.7%)	26(74.28%)
χ2 (df=1) 0.66,p-0.416, non-significant		

Fig 17 Association between Difficulty in falling asleep and AHI. It shows that 10 patients with difficulty in falling asleep had AHI >5.



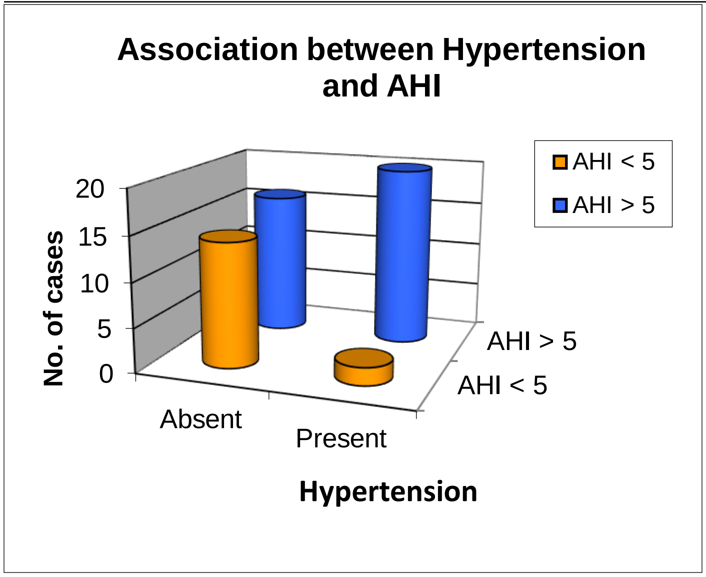
Breathing pause	**AHI < 5 (OSA Absent)**	**AHI > 5 (OSA Present)**
Present	0	21(100%)
Absent	16(48.48%)	15(45.45%)
χ2(df=1) 13.32, p<0.001 Highly significant		

Fig 18: Association between Breathing pause and AHI. It shows that 21 patients with breathing pause had AHI >5.



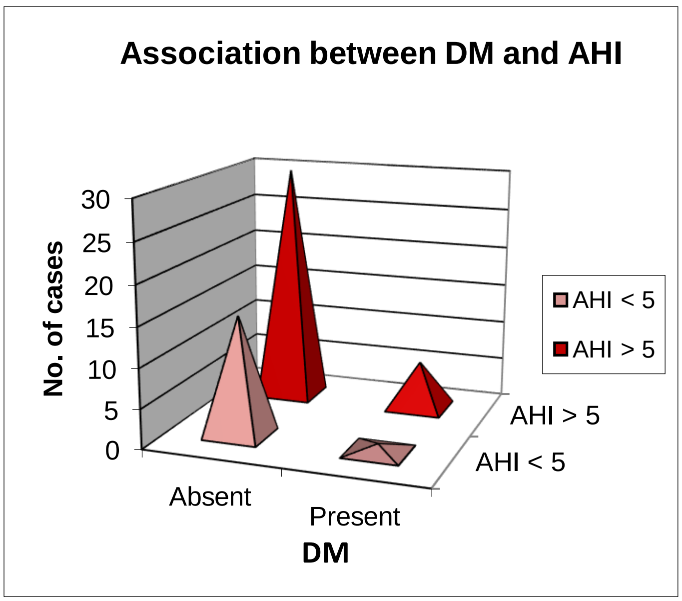
Nocturia	**AHI < 5 (OSA Absent)**	**AHI > 5 (OSA Present)**
Present	0	15(100%)
Absent	16(43.24%)	21(56.75%)
χ2(df=1) 7.45, p=0.006, significant		

Fig 19: Association between Nocturia and AHI. It shows that 15 patients with nocturia had AHI >5.



Hypertension	AHI < 5 (OSA Absent)	AHI > 5 (OSA Present)
Present	2(9.09%)	20(90.90%)
Absent	14(46.66%)	16(48.48%)
$\chi 2$ (df=1) 6.74, p=0.009, significant		

Fig 20: Association between Hypertension and AHI. It shows that 20 patients with hypertension had AHI >5.



DM	AHI < 5 (OSA Absent)	AHI > 5 (OSA Present)
Present	1(14.28%)	6(85.7%)
Absent	15(33.33%)	30(66.66%)
Fisher Exact test=0.40, not significant		

Fig 21: Association between Diabetes Mellitus and AHI. It shows that 6 patients with Diabetes Mellitus had AHI >5.

Table 5: Symptomatology

Symptom	Count	Percentage %
Snoring	29	55.8
EDS	29	55.8
ESS < 11 11-16 >16	28 13 11	53.8 25.0 21.2
Frequent awakening	19	36.5
Cognitive impairment	2	3.8
Difficulty in falling asleep	17	32.7
Morning Head ache	2	3.8
Nasal Congestion	3	5.8
Witnessed Breathing pauses	21	40.4
Witnessed choking	15	28.8
Witnessed body movement	14	26.5
Nocturia	15	28.8

Table 6: Co-relation of Binomial variables with severity of Sleep Apnea according to AHI

Variables	AHI				P-Value
	< 5 N=16	5 - 15 N=12	15-30 N=7	>30 N=17	
Alcohol consumer	2	4	2	9	0.08, NS
Smokers	3	5	2	7	0.268, NS
Gender (males)	9	8	5	11	0.683, NS
Age >40 <40	10 7	11 0	5 2	14 3	0.045, S
BMI ≤25.0 >25.0 & ≤30 > 30	8 0 8	4 2 6	0 1 6	2 5 10	0.031, S
EDS	3	5	5	16	0.001
Freq Awakening	1	3	4	11	0.007
Difficulty in falling asleep	7	6	1	3	0.416
Morning Head ache	0	0	1	1	0.857
Breathing pauses	1	3	4	13	0.001
Witnessed choking	0	1	3	11	0.857
Body Movements	1	0	2	11	0.057
Nocturia	2	3	1	9	0.006

Table 7: Odds Ratios for Binomial Variables.

Risk Factor	AHI < 5		AHI >5		Odds Ratio	95% CI		P-Value
	Present	Absent	Present	Absent		Lower	Higher	
Age > 40	9	7	31	5	4.82	1.23	18.91	0.045
Alcohol	2	14	15	21	5	0.98	25.34	0.08
Smoking	3	13	14	22	2.76	0.66	11.44	0.268
EDS	3	13	26	10	11.2	2.64	48.12	0.001
Frequent Awakening	1	15	18	18	15	1.78	125.85	0.007
Snoring	3	13	26	10	11.2	2.64	48.12	0.001
Body movements	1	15	13	23	8.47	1.002	71.73	0.057
Neck Circumference	1	15	18	18	15	1.79	125.85	0.007
BMI	8	8	30	6	5	1.34	18.6	0.031
Diabetes Mellitus	1	5	6	30	3.31	0.36	29.9	0.40
Hyper Tension	2	14	20	16	8.75	1.73	44.2	0.009

P-value of <0.05 is statistically significant.
P-value of<0.01 is highly significant.

Based on the polysomnography studies 36(69.23%) patients had obstructive sleep apnea (Figs 3), of these 12 (23.1%), 7 (13.5%) and 17 (32.7%) subjects, had mild, moderate and severe sleep apnea respectively. Since most of the respiratory events were obstructive (characterized by an increasing ventilator effort and paradoxical breathing), the specific pattern of apnea episodes was not taken into account in the statistical analysis. However, four patients showed significant number of central and mixed apneas (4 & 5 Figs), though the majority of events were still obstructive. Out of these one patient had Hypothyroidism and two patients had OSA with OHS which is known to be associated with reduced central respiratory drive and thus central apneas.[147, 148] The severity of the disease was defined by AHI. The highest AHI found was 91.6/hr in a patient with Metabolic Syndrome (Obesity, Dyslipidemia, Diabetes and Hypertension).

The co-relation of various risk factors and symptoms (Binomial Variables) with the severity of the disease according to AHI is tabulated in Table6 and shown in Graphs1 to 13.Odds ratios were tabulated for the binomial variables to determine the odds for developing the disease. These are tabulated in Table7.Sleep apnea was more severe in alcohol consumers and smokers and male gender, but statistically not significant. Co-relation of age > 40 years was statistically significant. Among the symptoms, snoring, excessive day time sleepiness, frequent awakening were statistically significant and witnessed breathing pause was highly statistically significant with the severity of the disease.There were 22 (42.30%) patients with hypertension and it shows statistically significant with sleep apnea.Two patients had Hypothyroidism, one with mild AHI and was not on treatment and she was referred to endocrinologist to start treatment and the other patient was on drugs for hypothyroidism but was not controlled and was having severe sleep apnea.

Three patients were having CAD (two with severe AHI and one with mild AHI) and all were on treatment. Four had dyslipidemia/ hyperlipidemia among them one was having AHI <5 i.e. no sleep apnea, two had moderate sleep apnea and one had severe sleep apnea. Four patients had bronchial asthma and all were not having sleep apnea and were on regular treatment. Seven had COPD (clinical, radiological and ECG were suggestive of COPD) of these two had sever sleep apnea, one moderate sleep apnea, two had mild sleep apnea and were on regular treatment for COPD. Both Bronchial asthma and COPD were confirmed by spirometry. ENT evaluation revealed one case of allergic rhinitis (moderate sleep apnea), two cases of elongated uvula (one moderate sleep apnea and other with severe sleep apnea), four cases of macroglossia (one moderate sleep apnea and three severe sleep apnea), ten had DNS (six severe sleep apnea, one moderate sleep apnea, two mild sleep apnea, one with AHI < 5). All patients with AHI of > 5 were advised to reduce weight and CPAP treatment.

Discussion

Few studies have been conducted in the past to study the clinical profile in patients of sleep disordered breathing in the Indian population. Udwadia and colleagues and Sharma et al have conducted population based studies to study the prevalence of the disorder in the Indian community as well as the community prevalent risk factors and associations with the disease. BMI, neck girth, and history of diabetes mellitus were significantly associated with SDB and history of snoring, EDS, nocturnal choking, recurrent awakening from sleep, unrefreshing sleep, and day time fatigue were noted to have significant association with the disorder in the former study. However, because of methodological issues, including significant selection bias in terms of gender as well as socioeconomic status of the recruited subjects, the results of this study cannot be extrapolated to the general population. Moreover; they performed home sleep studies using a portable limited polysomnography machine. In the latter study, the authors attributed the Male gender, age, obesity defined by a high BMI, and waist-to-hip ratio as independent risk factors for OSA[7].We carried out a sleep-Clinic based study, where patients having snoring and diagnosed to have Sleep Apnea / Sleep disordered breathing were studied for their clinical features and to assess the relationship between the severity of the disease (by AHI) and various associations of disorder (risk factors, presentation and sequelae). Ours is a hospital population based study, and hence the prevalence of risk factors and sequelae were expected to be higher than the population- based studies. Similarly the severity of the disease was expected to be higher. Based on polysomnography studies, 36(69.23%) patients had obstructive sleep apnea, of these12 (23.1%), 7 (13.5%) and 17 (32.7%) subjects, had mild, moderate and severe sleep apnea respectively. Among them 12(33.33%) were females and 24(66.66%) were males had obstructive sleep apnea syndrome. It is found that the prevalence of mild, moderate and severe disease among the patients of sleep apnea were as 4(33.33%), 2(16.66%) and 6(50%) in females and 8(33.33%), 5(20.83%) and 11(45.83%) in males respectively.Compared to this, Young et al investigated the association of sex, age, race, snoring, and obesity with SDB in community-dwelling adults, using data from 6119 participants in the Sleep Heart Health Study (SHHS), a multicenter cohort study of SDB and cardiovascular disease, and found prevalence of mild, moderate and severe disease among the patients of SDB as 53%, 29% and 18%, respectively. IP et al conducted community studies of Sleep-Disordered breathing in middle aged Chinese men and women in Hong Kong. They reported the prevalence of mild, moderate and severe disease among the patients of SDB as 43.83%, 26.78% and 22.02% in males 54.41%, 27.94% and 17.64% in females. The higher prevalence of severe disease in this study is arguably due to the clinic-based model of the study and highlights the fact that with the presently prevalent knowledge and awareness of SDB among patients and referring physicians, a large number of cases with mild to moderate disease go undetected and surface only when the disease is severe[8].

In our study age of study population was 18 years and above. However, the results suggested that age may be an independent predictor of OSA. 40(76.9%) of the patients were above 40 years of age and of these 14(35%) had severe disease (AHI>30), compared to 5(9.61%) with moderate and 11(21.1%) with mild disease. This age association with sleep apnea achieved statistical significance ($P = 0.045$). The correlation between age and OSA has been studied by various researchers, yielding disparate results with a suggestion of a rise in the prevalence of OSA with age. Ip and colleagues found that the prevalence of OSA tends to rise in older population and that this was independent of obesity. However some researchers have concluded that these effects occur only in middle age and that age ceases to be an independent risk factor for OSA beyond middle age. Among Indian studies, Udwadia et al did not find age to be a significant risk factor in their study, and no trend in the prevalence of SDB with increasing age was seen. The highest prevalence was seen in the age group 45-54 years, but it was not significantly higher than the prevalence in the other two age groups. Contrary to this Sharma et al reported that older subjects (i.e.>45 years of age) had more than three times the increased risk of having OSA and age was determined to be an independent predictor of OSA[9].In our study, male 33(63.46%) as compared to female 19(36.53%) did not show significant association with the severity of disease. This was not in accordance with the results of other studies. The reasons for this could be that it was a hospital based study and the sample size was not large. The gender differences in the prevalence and severity of sleep apnea are multifactorial. Some of the most commonly proposed hypothesis includes differences in the effect of weight, differences in body fat distribution, abnormalities in upper airway mechanics, control of breathing, and structural differences in upper airway dimensions. In the study conducted by Sharma and colleagues, male gender was associated with a 10-fold higher risk of having OSA. Zamarron et al. chose a sample of 76 subjects, 50 to 70 years of age, from the electoral census in a small study in 1999. It was found that 28.9% of those surveyed had an AHI $\geq$ 5, and there were no significant difference between men (28%) and women (30%)[10].

Conclusion

In this study, Out of 52 patients attending PSG at GIMSR, GITAM (Deemed to be University) 36(69.23%) patients had Obstructive sleep apnea syndrome. Apart from hypertension and obesity many patients with diabetes mellitus, dyslipidemia and coronary artery disease had severe OSA; these points towards association of obstructive sleep apnea syndrome with obesity and metabolic syndrome X, which is not rare in Indian population, and needs further studies targeted especially to this group to substantiate this association.

It is important from clinician point of view to take detail history and thorough clinical examination to suspect SDB and refer them to centers where PSG is conducted. This is possible if awareness for SDBs is increased among general population and physicians, including its effects on individuals' physical, mental and social health and also needs to be emphasized that it is amenable to cure. Overall, polysomnography is an effective tool for diagnosis of SDBs and should be carried out in patients with symptoms suggestive of SDBs and also in patients having other co morbidities which are known to be associated with SDB.

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