Volume 18, No.3, July - September 2012

ORIGINAL ARTICLE

Experience of Limited Sleep Study in Diagnosis of Obstructive Sleep Apnea (OSA) among symptomatic patients in Pulmonology Unit Khyber Teaching Hospital, Peshawar

Rukhsana Farooqi, Saadia Ashraf, Hussain Ahmed, Akhter Ali Khan, Naved Khan, Mukhtiar Zaman

ABSTRACT

BACKGROUND: Obstructive Sleep Apnea (OSA) is an important medical condition leading to significant mortality and morbidity. Population based studies revealed that 4% of man and 2% of women more than 50 years of age have symptomatic OSA. OSA is suspected by symptoms of snoring, tiredness, observed apnea, hyper-somnolence with high Epworth Sleepiness Scale (ESS) and Body Mass Index (BMI) of more than 30, but polysomnography is the old standard for the diagnosis of OSA.

METHODOLOGY: The study was conducted in Pulmonology Unit, Khyber Teaching Hospital (KTH) Peshawar from January 2007 to July 2010. After taking history about snoring, irritability, hypersomnalence, observed apnea, all patients were scored as per ESS tool another measurements. such as BMI, neck circumference; abdominal and hip girth were recorded. Past history about asthma and Ischemic Heart Disease (IHD) was inquired. After optimizing treatmen for asthma and IHD. patients underwent diagnostic study and afterward therapeutic study if the Apnoea and Hypo- apnoea Index (AHI) was higher than 15. We recorded different parameters such as saturation, leak, snoring, minute ventilation, AHI, duration of AHI and positive pressure required to abolish the AHI, Sleep diary was maintained manually by the technician for correlation with study results.

RESULT: Thirty-nine patients were subjected to limited polysomnography in Khyber Teaching Hospital (KTH) Peshawar. Out of 39 patients, male were 20 (51.39%) and female were 19 (48.7%). The mean age was 53.2 years (SD\pm9.2). The presenting symptoms were snoring 38 (97.4%), irritability in 25 (64.1%), hypersomnolence in 29 (74.4%), and witnessed apnea in 24 (61%) patients. Mean ESS score 13.1 .1(50\pm5.2) with maximum score of 24 and minimum of 0 score. Only 5 (15.2%) patients had history of asthma and 14 (42.4%) had IHD. The BMI was high with mean of 38 ((SD\pm8.7) Mean neck circumference of study participants was 43.3 cm (SD4.8), abdominal girth was 123.6 cm (SD\pm13.05) and hip girth was 121.4 cm ((SD\pm13.6) Diagnostic sleep study revealed that 14(36%) patients had AHI less than 15 per hour and were not subjected to therapeutic sleep study which was conducted only in 27 (64%) patients with average AHI events per hour 50 1

(SD\pm30,1) suggestive of Sleep Apnoea Syndrome. During Diagnostic study in 27 patients mean minute ventilation was 4.4 (SD\pm1,2), and average AHI events per hour 50.1(SD\pm30.1) and during Therapeutic study of the same 27 patients the mean minute ventilation improved to 5.5 (SD\pm1.2) and average AHI event per hour were reduced to 5 (SD\pm3.4) per hour with the mean positive pressure of 10.8 cm of water with minimum of 7 and maximum of 15.

CONCLUSION: OSA is a common problem in patients who are obese and suffer from snoring. The limited polysomnography is useful diagnostic tool in making the diagnosis of OSA among high risk patient.

KEYWORDS: Obstructive Sleep Apnea (OSA); Epworth Sleepiness Scale (ESS); Continuous Positive Air Pressure (CPAP); Automatic Positive Air Pressure (APAP); Apnea Hypo apnea Index (AHI).

INTRODUCTION:

Obstructive Sleep Apnea (OSA) is an important medical condition having significant morbidity and mortality OSA was clinically known for more then forty years, but outside medical field its awareness is slow to develop. This situation changed when population based studies revealed high prevalence in adults Population based studies revealed that 4% of men and 2% of women more then 50 years of age have symptomatic OSA.

OSA is defined as elevated number of obstructive Apnea and Hypo Apnea episodes per hour of sleep or apnea-hypo apnea index AHI and normal sleep will have AHI fewer than 5 per hour. Apneas are defined as the cessation of airflow for 10 seconds, and hypo apneas is 50% or more reduction in the flow. Severity is calculated according to number of events per hour and severe OSA may be defined as having AHI of 30 or more per hour throughout night in conjunction with hyper somnolence, snoring, witnessed apnea and related problems in daytime function like fatigue, poor memory and concentration.

Obesity have long been associated with OSA but its correlation depends on sex, age, ethnicity and specific distribution of excessive fat in the body. Increase BMI more then 30 and a variety of body habitus measuring neck morphology-14, general and central obesity 2.5.15.16.17 have been associated with OSA.

As part of OSA workup obtaining a good sleep history and use of objective sleepiness scale is very important. Somnolence is quantified using Epworth Sleepiness Scale (ESS) which is a self administered questionnaire with 8 questions to rate on 4-point scale from 0 to 3. It provides a measure of person's general level of daytime sleepiness. The ESS score is the

sum of 8 item scores range between 0-24.Higher the score, higher the persons level of daytime sleepiness. A score 10 or more is sleepy and 18 or more is very sleepy

The gold standard investigation is a diagnostic sleep study. A variety of which exist from full polysomnography to limited sleep studies which includes pulse oximetry recording, noise recordings, pressure measurements and markers of arousals. Most UK centers now accept the limited sleep setups as studies have shown that full polysomnography offers no advantage in the diagnosis of OSA except the diagnosis of narcolepsy and some parasomnias it is considerably more complex, expensive and time consuming19.

While the Full Polysomnography is a comprehensive recording of biophysical changes occurs during sleep, a polysomnogram can record about twelve channels, which records EEG, Airflow, chin muscle tone, leg movements, eye movements, heart rhythm, oxygen saturation and one belt for chest wall movement, and abdominal movements. Each channel data can be recorded over a night stay in a sleep lab.

In order to study the role of limited sleep study in our setup we are sharing the data of 39 patients who were subjected to limited polysomnography.

MATERIALS AND METHODS:

The clinical record of all the patients, subjected for sleep study in Pulmonology unit, were analyzed from January 2008 to July 2010; these patients included admitted cases in our unit as well as referred from other unit like ENT Unit, Medical Units Khyber Teaching Hospital (KTH) Peshawar. The patients were registered and history of snoring, irritability, hypersomnolence and witnessed apnea was taken. The hypersomnolence of excessive daytime sleepiness was scored by Epworth Sleepiness Scale (ESS). A past history of asthma and Ischemic Heart Disease (IHD) were taken. BMI was calculated for each patient. Other examination include neck circumference, abdominal and hip girth were also recorded.

After optimizing treatment for asthma and IHD, patients under went sleep study using portable Diagnostic system for sleep-Disordered Breathing(Auto set Spirit by Resmed) with the provision of recording nine physiological parameters, collectively or individually. The nine parameters are nasal pressure, oral flow, Thorax effort, abdominal effort, snore, position, oxygen saturation, pulse and activity. The following channels can be derived Snore pressure, Nasal flow, Flattening, Pulse wave form, Oxygen saturation. The diagnostic study was conducted with constant CPAP of 4 cm of water pressure on the first night to make the diagnosis and if AHI is more than 15 than the study is repeated on auto CPAP to see the pressure required to abolish or reduce the AHI score the following night. The records were analyzed in the morning for parameters like pulse oximetory, minute

ventilation, snoring, apnea-hypo apnea index API and Apnea-hypo apnea events. A sleep diary was maintained to record the sleep and arousal time and snore record, to correlate with study result. The results of study were analyzed by SPSS17

RESULTS:

Out of 39 patients, 19 (48.7%) were females and 20 (51.3%) were males (table I). The mean age was 53.2 years (range: 38-89 years). The presenting symptoms were snoring in 38 (97%), tiredness in 25 (64.1%), hypersomnalence in 29 (74.4%) and witnessed apnea in 24 (61.5%) patients (Table II).

Table I: Gender Distribution of Patients

Sex	Frequency	Percent
Male	20	51.3
Female	19	48.7
Total	39	100

Excessive sleepiness was scored by Epworth Sleepiness Scale (ESS) with statistical mean was 13 and maximum was 24. Five (15.2%) patients had history of Asthma and 14 (42.4%) IHD. The mean BMI was 38 (range 27-66). The mean neck circumference of the study participant was 43.3 cm (range 32-54 cm), mean abdominal girth was123 cm (range 92-150 cm), and mean hip girth was 121cm (range 101.2- 150 cm) (Table III).

Out of 39 patients, 25 underwent both diagnostic study with CPAP and therapeutic study with auto CPAP for two consecutive nights. 14 patients after applying CPAP were found AHI less then 15 and were not subjected to auto CPAP as having mild or no OSA. While 2 patients having high suspicion of OSA was directly applied auto CPAP.

Table II: Symptoms of Patients

Symptoms	Frequency	Percent
Snoring	38	97.4%
Irritability	25	64.1%
Hypersomnolence	29	74.4%
Witnessed apnea	24	61%
Total	39	100%

During diagnostic study with CPAP the minute ventilation was 4.6, and average AHI events per hour were 50.1 1(SD\pm30.1), while the pressure was of course fixed on 4. The therapeutic study was done in 25 patient with auto CPAP the minute ventilation increased to 5.5, AHI events per hour to 5.02(SD+ 3.4) from 50.1 per hour, a significant improvement. The auto CPAP mean pressure was 10.8 cm of water (range 7-15) in patients who underwent the therapeutic study. The limited sleep study was useful to make the diagnosis of OSA and the auto CPAP pressure of average of 10.8 cm was enough to reduce the AHI significantly (Table IV).

Table III: Examination Findings of Patients

Variables	Number	Mean	Std deviation	Range
Age	39	53.23 years	9.2	38-89 years
BMI	37	38.4	8.7	27-66
Neck circumference	37	43.3 cm	4.8	32-54 cm
Abdominal girth	37	123.6 cm	13.05	92-150 cm
Hip girth	31	121.4 cm	13.6	101.2-150 cm
ESS	37	13.1	5.2	0-24

DISCUSSION:

OSA is a common health problem with a higher then expected prevalence We analyzed the result of 39 patients who were registered for diagnosis of OSA in our sleep lab Out of these 39 patients who presented to us, 20 (51.3%) were male and 19 (48.7%) were female. Population based studies reveals 2 to 3 fold greater risk for men than women 20 and sex hormones may have role in pathogenesis of OSA in male. There is clear sex sex differences in upper airway morphology and fat deposition which has been proposed to account for higher male risk for OSA22,

Table IV: Sleep Lab Parameters

Mode	Number	Minute Ventilation	Std Deviation	AHI Events	Std	Average pressure
CPAP-night 1	23	4.6	1.4	50.1	301	4
Auto CPAP night 2	25*	5.5	1.4	5	3.4	10.8

*2 patients did not have diagnostic study because of high suspicion and were subjected to direct Auto CPAP

The mean age of our study group was 53 years (range 38-89 years). Several studies have found that OSA is highly prevalent in people older than 65 years of age. Cleveland Family study showed that the prevalence of OSA is higher in those over 60 years of age, 32% in female and 42 in male of age group (60 to 99 years), and 4% in female and 22% In male in age group (40 to 60 years)

The most common presenting symptom was snoring in 38 (97%) patients, followed by hyper somnolence in 29 (74,4%), and witnessed apnea in 24 (61%) patients. In one local study, the frequency of snoring

was 46% which is highest of all other symptoms. This is the main troublesome symptom, which brings the patient and his close relatives to the clinics. The sleepiness is scored on ESS. In our study group, the mean ESS score 13 (range 0-24), it is important diagnostic toll for diagnosis of OSA, its advantage is that it is cheap to use and easy to administer in a large number of people. More than 12 ESS score is significant to diagnose OSA, Majority of our patient have high ESS with a mean of 13.

In our study, IHD was found in 14 (42%) patients while 5 (15.2%) patients were having underlying asthma. Many studies have shown that obstructive respiratory events cause temporary cardiovascular disturbances leading to long term cardiovascular remodeling. OSA can cause vascular injury and atherosclerosis due to hypoxemia, chror.ic sympathetic hyper activity 27-30, and elevated pulmonary blood pressure and heart failure32. The BMI was high with the mean of 38; it is comparable with European sleep apnea data base analysis (ESADA) which showed morbid obesity with BMI more than 35 in more than 21% male and 28% female33, but in a sleep data from Singapore34 the mean BMI was found 27 which is relatively lower than European and Asian communities. Mean neck circumference was 43.3cm, abdominal girth was 123 cm and hip circumference 121 cms, studies has showed that apnea-hypoapenea index is positively related with age, BMI and anthropometric finding like abdominal circumference, hip circumference and abdominal girth[3]5,

During diagnostic study with CPAP the minute ventilation was 4.6, and average AHI events per hour were 50.1(SD\pm30.1) The therapeutic study was done in 25 patient with auto CPAP the minute ventilation increased to 5.5, AHI events per hour to 5.02(SD\pm3.4) from 50.1 per hour, a significant improvement. The auto CPAP mean pressure was 10.8 cm of water (range 7-15) in patients who underwent the therapeutic study. The limited sleep study was useful to make the diagnosis of OSA.

CONCLUSION:

OSA is a common health problem predominantly of over weight middle age people who suffer from snoring. The limited polysomnography is useful diagnostic tool in making the diagnosis of OSA among high risk patient.

REFERENCES

1. Guilleminault C, Tilkian A, Dement WC. The sleep apnea syndromes. Annu Rev Med. 1976;27:465-84.
2. Bearpark H, Elliott L, Grunstein R, Hedner J, Cullen S, Schneider H, et al. Occurrence and correlates of sleep disordered breathing in the Australian town of Busselton: a preliminary analysis. Sleep. 1993;16:53-55.

3. Gislason T. Almqvist M, Eriksson G, Taube A, Boman G. Prevalence of sleep apnea syndrome among Swedish men: an epidemiological study. J Clin Epidemiol. 1988; 41:571-6.
4. Kripke DF, Ancoli-Istael S. Klauber MR, Wingard DL, Mason WJ, Mullaney DJ. Prevalence of sleep- disordered breathing in ages 40-64 years: a population-based survey. Sleep. 1997;20:65-76.
5. Young T, Palta M, Dempsey J, Skatrud J, Weber S, Badr S. The occurrence of sleep-disordered breathing among middle-aged adults. N Engl J Med. 1993: 328: 1230-5.
6. Strollo PJ Jr, Rogers RM. Obstructive sleep apnea. N Engl J Med. 1996; 334;99-104.
7. Epstein LJ, Kristo D, Strollo PJ, Friedman N, Malhoira A, Patil SP, et al. Clinical guild line for the evaluation, management and long-term care of obstructive sleep apnea in adults. J Clin Sleep Med. 2009;5(3):263-76.
8. Enright PL, Newman AB, Wahl PW, Manolio TA, Manolio TA, Haponik EF, et al. Prevalence and correlates of snoring and observed apneas in 5,201 older adults. Sleep. 1996; 19: 531-8.
9. 102:1371-1376. Jennum P, Hein HO, Suadicani P, Gyntelberg F. Cardiovascular risk factors in snorers ta cross sectional study of 3,323 men aged 54 to 74 years. The Copenhagen Male study. Chest. 1992.
10. Jennum P, Sjol A. Snoring, sleep apnoea and cardiovascular risk factors: the MONICA II study. Int J Epidemiol.1993; 22:439-44.
11. Davies RJ, Stradling JR. The relationship between neck circumference, radiographic pharyngeal anatomy, and the obstructive sleep apnoea syndrome. Eur Respir J. 1990: 3:509-14.
12. Davies RJ, Ali NJ, Stradling JR. Neck circumference and other clinical features in the diagnosis of the obstructive sleep apnoea syndrome. Thorax. 1992;47: 101-5.
13. Hoffstein V, Mateika S. Differences in abdominal and neck circumferences in patients with and without obstructive sleep apnoea. Eur Respir J. 1992;5:377-81.
14. Katz I, Stradling J, Slutsk AS, Zamel N, Hoffstein V. Do patients with obstructive sleep apnea have thick necks? Am Rev Respir Dir. 1990;141:1228-31.
15. Millman RP, Carlisle CC, McGreevy ST, Eveloff SF, Levinson PD, Body fat distribution and sleep apnea severity in women. Chest. 1995;107:362-66.
16. Shinohara E, Kihara S, Yamashita S, Yamane M, Nishida M, Arai T, et al. Visceral fat accumulation as an important risk factor for obstructive sleep apnoea syndrom in obese subjects. J Intern Med. 1997;241:11-18.
17. Newman AB, Nieto FJ, Guidry U, Lind BK, Redline S, Shahar E, et al. Relation of sleep disordered breathing to cardiovascular disease risk factors: The Sleep Heart Health Study. Am J Epidemiol. 2001;154: 50-59.

18. Johns MW.A. new method for measuring daytime sleepiness: the Epworth Sleepiness Scale. Sleep. 1991;14:540-45.
19. Whitelaw WA, Brant RF, Flemons WW. Clinical usefulness of home oximetry compared with polysomnography for assessment ofsleep apneas. Am J Respir Crit Care Med. 2005; 171:188-93.
20. Strohl, Redline S. Recognition of obstructive sleep apnea. Am a. Am J Respir Crit Care Med. 1996;154:274-289.
21. Krystal A, Edinger J, Wohlgemuth W, Marsh Sleep in peri-menopausal and post-menopausal women. Sleep Med Rev. 1998;2:243-53.
22. Schwab RJ.Sex differences and sleep apnea. Thorax. 1999;54:284-85.
23. Ancoli-Israel S, Kripke D, Klauber M, Mason W, Fell R, Kaplan O. Sleep-disordered breathing in community-dwelling elderly. Sleep. 1991;14: 486-95.
24. Redline S. Epidemiology of sleep-disordered breathing. Semin Respir Crit Care Med. 1998;19:113-122.
25. Haqqee R, Hussain SF, Mujib M, Ahmad HRA. Hospital based preliminary report on sleep disordered breathing in Pakistani population. J Ayub Med Coll. 2002;14(3):2-4.
26. Gainer JL. Hypoxia and atherosclerosis: re-evaluation of an old hypothesis. Atherosclerosis. 1987;68:263-66.
27. Carlson JT. Hedner J. Elam M, Ejnell H, Sellgren J, Wallin BG. Augmented resting sympathetic activity in awake patients with obstructive sleep apnea. Chest. 1993;103: 1763-1768.
28. Dimsdale JE, Coy T, Ziegler MG, Ancoli-Israel S, Clausen J. The effect of sleep apnea on plasma and urinary catecholamines. Sleep. 1995;18:377-381.
29. Fletcher EC, Miller J, Schaaf JW, Fletcher JG. Urinary catecholamines before and after catracheostomy in patients with obstructive sleep apnea and hypertension. Sleep. 1987;10:35 44.
30. Narkiewicz K, van de Borne PJ, Cooley RL, Dyken ME, Sorners VK. Sympathetic activity in obese subjects with and without obstructive sleep apnea. Circulation. 1998: 98:772-776.31.
31. Guidry UC, Mendes LA, Evans JC, Levy D, O'Connor GT, Larson MG, et al. Echocardiographic features of the right heart in sleep-disordered breathing: the Framingham Heart Study. Am J Respir Crit Care Med. 2001; 164: 933-938.
32. Bradley TD. Right and left ventricular functional impairment and sleep apnea. Clin Chest Med. 1992; 13:459-479.
33. Hedner J, Grote L, Bonsignore M, McNicholas W, Lavie P Parati G Sliwinski P, et al. The European Sleep Apnea Database (ESADA) - Report From 22 European Sleep Laboratories Eur Respit. 2011 38(3):635-42.

34. Lim LL, Tham KW, Fook-Chong SM. Obstructive sleep apnoea in Singapore: polysomnography data from a tertiary sleep disorders unit. Ann Acad Med Singapore. 2008: 37(8):629-36
35. Vagiakis E, Kapsimalis F, Lagogianni I, Perraki H, Minaritzoglou A, Alexandropoulou K, et al. Gender differences on polysomnographic findings in Greek subjects with obstructive sleep apnea syndrome. Sleep Med. 2006;7(5): 424-30.