Original Article

To study the effectiveness of sleep apnea clinical score (SACS) as pretest probability in OSAS

D S Totewad[1*], M M Mahindrakar[2], V R Kapse[3], D G Mhaisekar[4]

[1]Assistant Professor, [2]Professor, [3]Associate Professor, [4]Professor, Department of Pulmonanry Medicine, Dr. S. C. G. M. C. Nanded, Maharashtra, INDIA.
Email: dtotewad@gmail.com

Abstract

Prospective study was conducted in 106 patients with sleep related symptoms in tertiary care center in govt. medical college Nanded over a period of 18 months. Of all these 106 patients pre test probability was performed using sleep apnea clinical score for the presence of OSAS. A simple way of using SACS is, calculation of adjusted neck circumference i.e. measured Neck circumference in centimetres (cm) with addition of 3 cm for Snoring, 3 cm for witnessed Apnea and 4 cm for systemic Hypertension Depending upon the calculation of adjusted Neck circumference, the risk of having OSAS is graded as follows: Low risk <43, Moderate risk 43 to 47.9, High risk > 48, Polysomnography was performed for diagnosis of OSAS, AHI of >5 considered diagnostic of OSA. Correlation was established by applying chi square test between SACS and OSA. 14/31 (45.16%) had OSA when their SACS was low, 30/43(69.76%) patients with moderate risk had OSA and 26/32 (81.25%) with high risk had OSA. Of 75 patients with moderate to high risk 56 (74.66%) patients found to have OSA by polysomnography. Thus correlation between SACS and OSA was highly significant. (p value= 0.008261)

Keywords: SACS – sleep apnea clinical score, OSA – obstructive sleep apnea.

[*]**Address for Correspondence:**
Dr. Dattatray Totewad, "DHRUV" House no.5, Samarth Nagar, Nanded, Maharashtra, INDIA.
Email: dtotewad@gmail.com
Received Date: 10/12/2015 Revised Date: 29/01/2016 Accepted Date: 12/02/2016

Access this article online	
Quick Response Code:	Website: www.statperson.com
	DOI: 01 March 2016

INTRODUCTION

"Sleep" is natural periodic state of rest of mind and body, in which eyes are usually close and consciousness is completely or partially lost so that there is decrease in bodily movement and responciveness to external stimuli. Sleep disordered breathing includes spectrum of condition including snoring, upper airway resistance syndrome and obstructive sleep apnea. The most severe of which is obstructive sleep apnea syndrome (OSAS). It is potentially disabling condition characterised by disruptive snoring, episodes of complete or partial pharyngeal obstruction during sleep that leads to nocturnal hypoxemia, frequent nocturnal arousal and excessive day time sleepiness. Prevalence of obstructive sleep apnea (OSA) varies in different population. In most of the studies it varies from 3–7%. In india prevalence of obstructive sleep apnea is 7.5 % in males and 4.5% in females. Factors that increase vulnerabilty of obstructive sleep apnea includes age, male sex, obesity, craniofacial abnormalities, family history, certain health behaviour such as smoking, alcohol abuse, neck size, certain Genetic disorder, hypothyroidism and acromegaly. Diagnosis of OSA was done by presence of loud snoring, Excessive day time somnolence, recurrent night time awakening, choking or gasping, un refreshing sleep, day time fatigue and polysomnographic evidence of AHI>5. The use of an evidence-based clinical prediction tool to accurately assess the pretest probability of OSAS can outperform clinical estimates by sleep specialists.[29] The Sleep Apnea Clinical Score (SACS) is a screening tool based on: Snoring, Witnessed episodes of apnea, Neck circumference and Systemic hypertension. Other pretest probability tests include ESS, STOP-BANG, Berlin score.

MATERIAL AND METHODS

A prospective observational hospital-based study was conducted. The study group consisted of 106 consecutive

How to site this article: D S Totewad, M M Mahindrakar, V R Kapse, D G Mhaisekar. To study the effectiveness of sleep apnea clinical score (SACS) as pretest probability in OSAS. *International Journal of Recent Trends in Science and Technology*. March 2016; 18(2): 241-245. http://www.statperson.com (accessed 02 March 2016).

patients, who attended our out patients department and patient admitted in ward (General Medicine and Pulmonary Medicine) for clinical symptoms suggestive of OSAS and diagnosed cases of Systemic Hypertension, D.M. with impaired glucose tolerance, Hypothyroidism who are on treatment. The symptoms were either identified by themselves or by their physician and were referred to our department for a sleep study to confirm the diagnosis of OSAS**.**

Inclusion Criteria

1. Patients with Age >13 yrs.
2. Patients attending to outpatient department and admitted in ward presenting with various sleep related symptoms that is
3. Excessive day time somnolence
4. Snoring
5. Fragmented sleep etc
6. Diagnosed cases of Systemic Hypertension, D.M. with impaired glucose tolerance, Hypothyroidism with sleep related symptoms.
7. Patients giving informed consent

Exclusion Criteria

1. Age < 13 yrs.
2. Patients admitted with life threatening conditions like acute respiratory failure, critical metabolic acidosis, altered sensorium, hypotension, left ventricular failure.
3. Acute exacerbation of COPD/bronchial asthma, acute myocardial infarction, acute stroke.
4. Uncooperative patients.
5. Patients not giving consent

Methods

At baseline, the patient's medical history was recorded and a limited physical examination was performed. The medical history chiefly included inquiry about symptoms of OSAS, namely, snoring and its intensity, presence of choking or witnessed breathing pauses, recurrent awakenings from sleep, excessive daytime sleepiness (measured by using the Epworth Sleepiness Scale score), non-refreshing sleep, increased irritability and lapses in concentration. The limited physical examination included measurement of height in metres, weight in kilograms, body mass index [BMI=weight/ (height) ^{2} in kilograms per metre square], neck, waist and hip circumferences in inches and blood pressure. Neck circumference was measured at the cricothyroid level, waist circumference midway between 12th rib and iliac crest, and hip circumference at the level of greater trochanter, using a measuring tape. All study subjects were screened for OSAS using SACS score, and divided into three categories low < 43, moderate 43-48 and high > 48. All patients with mild and moderate to high SACS underwent a sleep study consisting of an overnight polysomnographic examination, which included an EEG (C3-M2, C4-M1, O2-M1, and O3-M2), bilateral electrooculogram, chin and lower leg electromyogram, nasal and mouth airflow, thoracic and abdominal respiratory movements, ECG, oxygen saturation measured by finger oximetry, and body position. For this study, Sleep virtual BW 2 computerized polysomnography machine with 20 channel inputs was used. Sleep staging was done manually and classified into Awake, nonrapid eye movement (NREM) sleep with Stages I, II, III and IV, and rapid eye movement (REM) sleep. The episodes of apnea were defined as complete cessation of airflow for ≥10 s, and hypopnea consisted of a ≥50% reduction in oronasal airflow accompanied by a reduction in oxygen saturation measured by pulse oximetry of at least 4%. Apnea events were classified as obstructive, mixed, or central, according to the presence or absence of breathing efforts with thoraco abdominal paradox. AHI was determined by the frequency of these events per hour during sleep time based on the results of the overnight polysomnography. Polysomnographic data, including respiratory arousal index, minimal oxygen saturation, total sleep time, and desaturation index, were also collected. Sleep data recorded by the computer was checked manually for scoring of sleep stages apneas and hypopnoeas regarding each subject. Severity of obstructive sleep Apnea was classified as:

Mild: AHI of more than or equal to 5 but less than 15

Moderate: AHI of more than or equal to 15 but less than 30

Severe: AHI of more than or equal to 30

Relation was established between SACS and OSA.

RESULTS

A total number of 106 patients were included in study. Patients were stratified according to their SACS score into low, moderate, high probability as

1. SACS score less than 43 – total no. of 31 patients
2. SACS score 43 to 47.9 - total no. of 43 patients
3. SACS score > 48 – total no. of 32 patients

As observed in table 1, from the study population of 106 patients 31 (29.24%) patients were with low SACS, 43 (40.57%) Were found to had moderate risk and 32 (30.19%) patients were found to have high risk. (Pie Graph). In 31 Patients with low SACS, positive sleep study that is AHI>5 was found in 14 patients (45.16%), and in 43 patients with moderate risk 30 (69.76%) patients were found to have OSA, Of 32 patients with high risk 26(81.25%) patients had AHI>5. 75 patients with moderate to high SACS, 56 (74.66%) patients found to have positive sleep study. (Bar Graph**).**

Table 1: Showing risk of OSAS based on SACS

Risk of OSAS (based on SACS)	No. of patients (n=106)	No.Of Patients With Positive Sleep Study	% of Pt.with Positive Sleep Study
Low	31(29.24%)	14	45.16
Moderate	43(40.57%)	30	69.76
High	32(30.19%)	26	81.25
Total	**106(100%)**	**70**	**66.03**

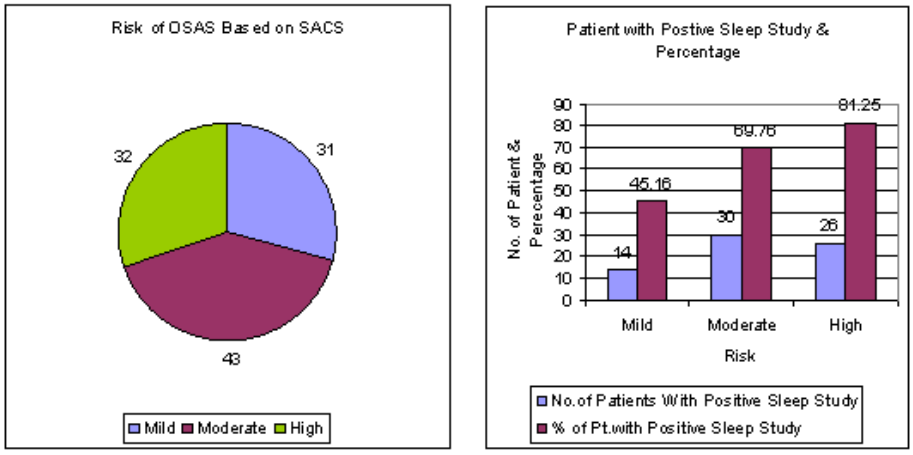

Figure 1: Risk of osas based on sacs

Table 2: Showing correlation between AHI and SACS

SACS ↓ AHI →	<5	5-15	16-30	>30	Total
<43 (LOW)	17	10	3	1	31
43-47.9 (MODERATE)	13	14	9	7	43
>48 (HIGH)	06	5	8	13	32
Total	**36**	**28**	**21**	**21**	**106**

As shown in table 2, 56 patients found to have obstructive sleep apnea of 75 patients with moderate to high SACS score, and also the severity of OSA was also increased in patients with moderate to severe OSA. Correlation between SACS score and presence of OSA was highly significant. (p value - 0.008261).

DISCUSSION

"Sleep" is natural periodic state of rest of mind and body, in which eyes are usually close and consciousness is completely or partially lost so that there is decrease in bodily movement and responciveness to external stimuli.[1] Everybody snores sometimes, or at least: most people snore sometime during their lifetime. "Everybody" does not only include humans, since also animals and cartoon heroes snore. In the worlds of literature and cinema, an audible sleep is often used as a metaphor for a good sleep. However, as all practitioners of sleep medicine know, snoring and a good sleep are sometimes the opposites of each other. Snoring definitely becomes menacing when combined with impaired quality of sleep and/or difficulties of breathing during sleep, such as in obstructive sleep apnea. Almost thirty five years ago obstructive sleep apnea was considered to be a medical curiosity that was of little importance, and snoring was merely the subject of humor than one of serious investigation. Although the clinical manifestations of sleep apnea syndrome have been described as early as in the fat boy Joe in Charles Dickens Pickwick Papers, it was Gastaut in 1965 who provided the first detailed polygraphic description of the manifestations of this sleep related breathing disorder.[2]

Definition of Obstructive sleep apnea

Obstructive sleep apnea is characterised by repetitive pattern of upper airway collapsibility, airflow obstruction and resultant arousal, Pauses in breathing called apneas (total cessation of breathing) last for greater than 10 seconds. Obstructive sleep apnea syndrome (OSAS) is characterised by repetitive episodes of partial or complete cessation of breathing during sleep usually accompanied by oxyhemoglobin desaturation.[3,4,5] The apnea hypopnea index (AHI), the number of apneas and hypopneas per hour of sleep is the standard metric used to quantitate the severity of OSA. although AHI proved to be superior metric for accessing the overall effect of OSA, it excludes the degree of oxygen desaturation degree of hypoventilation and total number of arousal. Obstructive sleep apnea syndrome is said to be present when, An AHI of greater than 5 with symptoms of excessive day time sleepiness, unrefreshing sleep and chronic fatigue are present.[4] Prevalence of obstructive sleep apnea (OSA) varies in different population. In most of the studies it

varies from 3–7%. in india prevalence of obstructive sleep apnea is 7.5 % in males and 4.5% in females.[6] Prevalence of obstructive sleep apnea in india[6]

1. Udawadia *et al* (2004) – 7.5 % in male insurance claimer.
2. Sharma *et al* (2006) – 3.8 %
3. Reddy *et al* (2007) – 2.7 %.[4]

Clinical features of obstructive sleep apnea[7] Loud habitual snoring witnessed apneas, nocturnal awakening gasping and choking episode during sleep. Nocturia un refreshing sleep, morning headaches excessive day time sleepiness, automobile or work related accidents, irritability, memory loss and personality changes, decreased libido, impotence. There are some differences in the clinical presentation of breathing disorders during sleep between the sexes. Especially striking, in comparison to men, is the previous history of depression and hypothyroid disease and the presenting complaint of insomnia in women. Men were more likely to have a history of witnessed apnea, day time sleepiness, consume more caffeinated beverages, and admit to greater alcohol consumption. [7]

Diagnosis of Obstructive sleep apnea[8]

Individual must fulfil the criterion A OR B + C to be diagnosed with OSAS..

A: Excessive day time somnolence that is not explained by other factors.

B: Two or more of the following that are not explained by other factors

- Choking or gasping during sleep.
- Recurrent awakening from sleep.
- Unrefreshing sleep.
- Day time fatigue.
- Impaired concentration.

C – Overnight polysomnographic monitoring demonstrate more than 5 obstructed events per hour of sleep or greater than 30 event per 6 hour of sleep. These events may include the combination of apnea, hypopnea and respiratory effort related arousals (RERA). severity of OSA according to apnea hypopnea index (AHI) is classified as MILD OSA – when AHI is 5 to15,Moderate OSA with AHI 15 to 30, and severe OSA when AHI is greater than 30.[9] Condition in which Obstructive sleep apnea should be suspected[10]

- Systemic hypertension
- Obesity
- Myocardial infarction
- Cerebrovascular accident
- Pulmonary hypertension
- Type II diabetes mellitus
- Nocturnal cardiac arrhymthmias
- Driver involved in a sleep-related automobile crash

Determining the clinical probability of OSAS

Objective sleeping respiratory disturbance associated with daytime sleepiness define the OSAS. Therefore, measures of daytime sleepiness and clinical prediction scores are important to determine probability of OSAS. The Epworth Sleepiness scale (ESS) [11] is a simple, self-administered questionnaire which is a measure of the probability of falling asleep in a variety of situations i.e. the level of daytime sleepiness. In this questionnaire the patient himself assesses his chances of dozing in the following situations, Sitting and reading, Watching TV, Sitting inactive in a public place (e.g. a theatre or a meeting), As a passenger in a car for an hour without a break, Lying down to rest in the afternoon when circumstances permit, Sitting and talking to someone, Sitting quietly after a lunch without alcohol, In a car, while stopped for a few minutes in traffic. Total ESS scores distinguish patients with primary snoring from those with OSAS. A higher score (up to 24) indicates more sleepiness and correlates with the severity of OSAS.[12] The use of an evidence-based clinical prediction tool to accurately assess the pretest probability of OSAS can outperform clinical estimates by sleep specialists.[29] The Sleep Apnea Clinical Score (SACS)[13] is a screening tool based on:

- Snoring
- Witnessed episodes of apnea
- eck circumference and Systemic hypertension

A simple way of using SACS is calculation of adjusted neck circumference i.e. measured Neck circumference in centimetres (cm) with addition of 3 cm for Snoring, 3 cm for witnessed Apnea and 4 cm for systemic Hypertension Depending upon the calculation of adjusted Neck circumference, the risk of having OSAS is graded as follows:

- Less than 43 cm - Low risk
- Between 43 to 47.9 cm – Intermediate risk
- More than or equal to 48 cm - High risk [14]

In our study patients were screened for presence of OSA based on their SACS score. It was observed that 66.03 % of patients were found to have OSA, and it was also observed that as SACS score increases that is in moderate to high score 75, 56 patients 74.66% found to have obstructive sleep apnea. So SACS score can be used effectively as pretest probability in diagnosing OSA.

CONCLUSION

SACS can be used effectively as pretest probability in diagnosing OSA, as SACS increases chance of diagnosing OSA also increases and also AHI.

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Source of Support: None Declared
Conflict of Interest: None Declared