

Obstructive Sleep Apnoea: A Survey

George Francis^{1*} Mathew M Alani² Susan Mathew³ Reba PB⁴ Paul Kariyatty⁵ Dhanya Damodaran⁶
Joseph Lijo⁷ Donny Philip varughese⁸

¹Professor and Head, Department of Prosthodontics, St. Gregorios Dental College, Chelad, Kothamangalam, Kerala, India.

²Professor, Department of Prosthodontics, St. Gregorios Dental College, Chelad, Kothamangalam, Kerala, India.

³Professor, Department of Prosthodontics, St. Gregorios Dental College, Chelad, Kothamangalam, Kerala, India.

⁴Senior Lecturer, Department of Prosthodontics, St. Gregorios Dental College, Chelad, Kothamangalam, Kerala, India.

⁵Senior Lecturer, Department of Prosthodontics, St. Gregorios Dental College, Chelad, Kothamangalam, Kerala, India.

⁶Senior Lecturer, Department of Prosthodontics, St. Gregorios Dental College, Chelad, Kothamangalam, Kerala, India.

⁷Reader, Department of Oral Surgery, Malabar Dental College, Edappal, Malappuram, Kerala, India.

⁸Senior Lecturer, Department of Prosthodontics, St. Gregorios Dental College, Chelad, Kothamangalam, Kerala, India.

ABSTRACT

Background: The objective of this study was to assess the occurrence of obstructive sleep apnoea in patients who reported for treatment to the Department of Prosthodontics and correlating the results with their existing medical conditions.

Material and methods: A total of 100 patients filled consent for being the part of the study and completed a valid self administered questionnaire. The survey was done during October - November 2015 in the Department of Prosthodontics, St Gregorios Dental College, Chelad, Kerala.

Results: Out of 100 subjects surveyed 71 subjects reported that they are getting satisfactory sleep and 29 are not satisfied with their sleep.

Conclusion: Many individuals with non satisfactory sleep were overweight or obese which in turn shows a correlation between sleep apnoea and overweight.

Keywords: Obstructive sleep apnoea, interruption of sleep, morning headaches.

INTRODUCTION

Normal sleep is a naturally recurring state of mind characterized by altered consciousness,, relatively inhibited sensory activity, inhibition of voluntary muscles and reduced interactions with surroundings. Normal sleep is mainly divided into two types i.e., Rapid eye movement (REM) and Non Rapid eye movement. Sleep cycles usually repeat every 90 -110 minutes.

During REM sleep, there is a generalized inhibition of skeletal muscles including intercostals, accessory, and pharyngeal dilators. Thus, ventilation during REM is virtually dependent on

diaphragmatic function, and upper airway function is more precarious than during NREM. The resistance of the system is increased and at the same time both chemical and mechanical sensors are depressed. Considerable individual variation exists in the threshold for arousal in response to chemical and mechanical/behavioral drive. This variation in responsiveness may be an important risk factor for OSA.

Abnormal sleep

Pathophysiologic mechanism of snoring and OSA, although fully not understood can be explained by either the obstacle theory or the

Received: Feb. 11, 2016; Accepted: May. 18, 2016

*Correspondence Dr. George Francis.

Department of Prosthodontics, St. Gregorios Dental College, Chelad, Kothamangalam, Kerala, India.

Email: Not Disclosed

Bernoulli theory. According to the obstacle theory, an increased negative pressure during inspiration retracts the structures of the pharynx and makes them vibrate in the airflow to produce snore and possible obstruction in OSA.

The Bernoulli theory assumes that according to the principle of Bernoulli (1738), the velocity of streaming air is higher and the pressure lower at a constriction of a tube compared with the larger part. This may cause inward suction of the pharyngeal structures in a constricted area and snores by the vibration of wall structures.¹

Sleep apnea is a sleep disorder characterized by pauses in breathing or instances of shallow /infrequent breathing during sleep. Each pause in breathing called apnea can last for several seconds to several minutes and may occur by definition, at least 5 times in an hour.

Sleep apnea can be categorized into three:

- i) Obstructive sleep apnea (OSA)
- ii) Central sleep apnea (CSA)
- iii) Complex /Mixed sleep apnea (combination of the two above)

The common signs and symptoms seen in sleep apnea are snoring, sleepiness during the day, morning headaches. A common measurement of sleep apnea is the apnea –hypopnea index (AHI). This is an average that represents the combined number of apnea and hypopneas that occur per hour of sleep.² Sleep apnea can be diagnosed by polysomnography and Home oximetry. Polysomnography measures the pauses in breathing. Sleep apnea can occur in any age group but prevalence increase between middle and older age group and it occurs more commonly in men (4%) than in women (2%).³ Obstructive sleep apnoea (OSA) is the most common sleep apnoea, increasingly being recognized as an important health issue in the last two to three decades. It is characterized by frequent episodes of upper airway collapse during sleep, causing recurrent arousals, intermittent hypoxia, hypercapnia, sleep fragmentation and poor sleep quality. Because the jaws and related structures influence the development of this syndrome, dentists play an important role in both identifying patients who

should be assessed by sleep specialists and providing treatments to improve their quality of life in affected individuals.

MATERIALS AND METHODS

The study was conducted in St Gregorios Dental College, Chelad from October 2015 to November 2015. Ethical approval of this study was obtained from ethical review board of St Gregorios Dental College. The purpose of this study was explained to patients and informed consent was taken. A total of 100 patients who reported to the Department of Prosthodontics for treatment were assessed. Data was collected by giving self administered questionnaire to the participants. Study participants were briefed about the need and importance of precise information and asked to fill the questionnaire.

QUESTIONNAIRE

1. Age
2. Sex
3. Are you satisfied with your sleep?
4. Are you restless during sleep?
5. Do you have frequent pauses in breathing while you sleep?
6. Does anybody have informed that, you snore loudly during sleep?
7. Do you have high blood pressure?
8. Are you very sleepy or tired during day time?
9. Do you have difficulty in concentrating, being productive and completing tasks at work?
10. Do you feel sleepy while driving?
11. Do you sweat excessively while sleeping?
12. Do you have headaches in the morning?
13. Do you have tonsillitis?
14. Are you overweight?

RESULTS

Study was done in different age groups:

- 21 to 30 yrs-----6
- 31 to 40 yrs-----25
- 41 to 50 yrs-----26
- 51 to 60 yrs-----25
- 61 to 70 yrs-----12
- 71 to 80 yrs-----3
- 81 to 91 yrs-----3

Study subjects include males -38, females-62.

- ❖ 71 subjects reported that they are getting satisfactory sleep and 29 are not satisfied with their sleep.
- ❖ 26 subjects reported that they are restless during sleep and 74 are not restless during sleep.
- ❖ 21 subjects reported that they are having frequent pauses during sleep and 79 do not awake in between sleep.
- ❖ 47 subjects reported that they snore loudly during sleep and 53 do not snore.
- ❖ 22 subjects have high blood pressure and 78 do not have high blood pressure.
- ❖ 68 subjects reported that they feel tired and sleepy during day time 32 reported that they do not feel tired and sleepy.
- ❖ 49 subjects reported that they lack concentration and memory and 51 do not.
- ❖ 7 feel sleepy during driving and 93 do not feel sleepy during driving.
- ❖ 21 subjects sweat excessively during sleep and 79 do not sweat excessively.
- ❖ 14 subjects reported that they wake up due to headache during sleep and 86 do not wake up during sleep due to headache.
- ❖ 31 subjects have recurrent tonsillitis and 69 are not affected.
- ❖ 23 subjects are overweight.(Tab1, Fig1)

DISCUSSION

Obstructive sleep apnoea(OSA) is the most common type of sleep apnea and it occurs due to the obstruction of upper airway. It usually lasts for 20 -40 seconds. It occurs as a result of muscle relaxation during sleep, followed by collapse of soft tissue in the back of throat blocking the upper airway. These repetitive pauses are followed by decrease in the saturation of blood oxygen.⁵ Obstructive sleep apnoea is accompanied with snoring where the patient is mostly unaware and is reported by the partner.⁶

There are 3 types of Obstructive sleep apnoea based on AHI

- Mild OSA: AHI of 5-15

It is involuntary sleepiness during activities that require little attention such as watching TV or reading.

- Moderate OSA: AHI of 15 – 30

It is involuntary sleepiness during activities that require some attention such as meetings or presentations.

- Severe OSA: AHI of more than 30

Involuntary sleepiness during activities that require more active attention such as talking or driving.^{2,4}

Usually, it occurs in people who are obese, middle aged men or who have large adenoids and tonsils, those with nasal congestion, excessive alcohol and smoking. As age increases, muscle tone is increased which tends to be weaker thus more likely to collapse and block the airway.⁷ Common signs seen are snoring, daytime sleepiness, and fatigue. Less commonly seen are morning headaches, drowsiness, night sweats, and forgetfulness.⁸

All these causes increase the risk for stroke, diabetes, heart attacks, heart failure.⁹

MANAGEMENT

1) CPAP (CONTINUOUS POSITIVE AIRWAY PRESSURE)

Nasal continuous positive airway pressure (nCPAP) remains the treatment of choice for OSA of moderate or greater severity (grades 1–3). Introduced in 1981 by Sullivan, this highly effective treatment prevents airway obstruction by pneumatically splinting open the upper airway. This results in marked improvements in oximetry and abolishes the episodic hypertension. Although somewhat uncomfortable and cumbersome, the often dramatic improvement in symptoms seen in patients on nCPAP explains the generally high rate of compliance (> 80%). Airflow is delivered from a blower unit to the patient via a facemask. A nasal mask is preferred unless there is an excessive escape of air from the mouth. A wide range of styles and sizes is available. Intranasal masks may be of benefit to patients with a moustache or narrow, collapsing nares. Air is vented through a fixed

orifice in or near the mask and the pressure controlled by varying the pump speed. The majority of patients require pressures between 7 and 15 cmH₂O.¹³

2) VPAP (VARIABLE POSITIVE AIRWAY PRESSURE)

Uses an electronic circuit to monitor the patient's breathing, and provides two different pressures, a higher one during inhalation and a lower pressure during exhalation. This system is more expensive, and is sometimes used with patients who have other coexisting respiratory problems and/or who find breathing out against an increased pressure to be uncomfortable or disruptive to their sleep.

3) NASAL EPAP

This is a bandage like device placed over the nostrils that utilizes a person's own breathing to create positive airway pressure to prevent obstructed breathing.

4) AUTOMATIC (APAP)

Also known as "Auto CPAP" is the newest form of such treatment. An APAP machine incorporates pressure sensors and a computer which continuously monitors the patient's breathing performance.

5) SURGERY

Surgery is a treatment option for OSA when non-invasive treatments such as CPAP or oral appliances have been unsuccessful. It is most effective when there is an obvious anatomic deformity that can be corrected to alleviate the breathing problem. Otherwise, surgical options most often address the problem by reducing or removing tissue from the soft palate, uvula, tonsils, adenoids or tongue. More complex surgery may be performed to adjust craniofacial bone structures. Surgical options may require multiple operations, and positive results may not be permanent. One of the most common surgical methods is **uvulopalatopharyngoplasty** (UPPP), which trims the size of the soft palate and may involve the removal of the tonsils and uvula.

Adenotonsillectomy, the surgical removal of the tonsils and adenoids, is the most common treatment

option for children with OSA. Other children with sleep apnea may benefit from CPAP.

6) BEHAVIOURAL CHANGES

Weight loss benefits many people with sleep apnea, and changing from back-sleeping to side-sleeping may help those with mild cases of OSA.

7) POSITION THERAPY

A treatment used for patients suffering from mild OSA. Patients are advised to stay off of the back while sleeping and raise the head of the bed to reduce symptoms.

8) ORAL APPLIANCES

Oral appliances are indicated for use in patients with primary snoring, mild and moderate OSA, and who do not respond or are not appropriate candidates for treatment with behavioral measures such as weight loss or sleep position change.¹⁰ The effects of mandibular advancement on upper airway anatomical relationship are:¹¹

- Elevates the base of the tongue.
- Tenses the palatoglossus muscle and pulls the soft palate forward.
- Decompress tissues around the pharynx and allows the pharynx to expand.
- Helps stabilize lateral pharyngeal wall by applying tension to pharyngomandibular raphe which is coupled to pharyngeal constrictors.
- Splays the tonsillar arches formed by palatoglossus and palatopharyngeal muscles which leads to further stabilization of lateral pharyngeal wall.

9) MANDIBULAR ADVANCEMENT DEVICES (MADS)

While sleeping, this splint acts by slightly moving the lower jaw forward; which tightens the soft tissues and muscles of upper airway to prevent obstruction of airway. It is non-invasive, easily reversible and permits free jaw movement.¹²

10) TONGUE REPOSITIONING MANOEUVERS WITH ORAL SHIELDS

The appliance is an improvisation of oral screens by attaching a funnel anteriorly which is covered by a membrane. The membrane funnel oral shields enables the patient to form negative intraoral

Table 1: Questionnaire.

Questionnaire	Yes	No
Are you satisfied with your sleep?	71	29
Are you restless during sleep?	26	74
Do you have frequent pauses in breathing while you sleep?	21	79
Does anybody have informed that you snore loudly during sleep?	47	53
Do you have high blood pressure?	22	78
Are you very sleepy or tired during day time?	68	32
Do you have difficulty in concentrating, being productive and completing tasks at work?	49	51
Do you feel sleepy while driving?	7	93
Do you sweat excessively while sleeping?	21	79
Do you have headaches in the morning?	14	86
Do you have tonsillitis?	31	69
Are you overweight?	23	77

pressure during and after deglutition and thus continuously train a tongue position at hard palate with close tongue velum contact which is needed for posterior mouth closure. This concept has been found to be effective in training of nasal breathing, oral rest position, and nocturnal assistance of mouth closure.

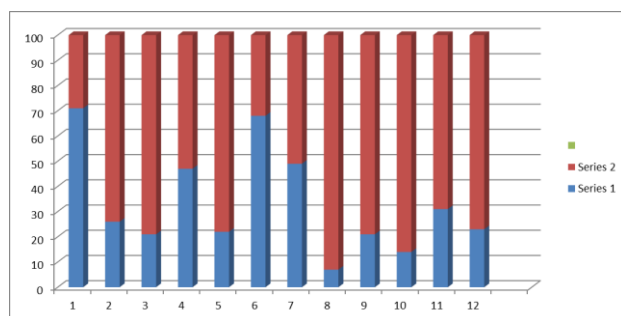


Fig 1: Graph showing overweight subject.

11) SOFT PALATE LIFTING APPLIANCE

Used in patients with excessive or pendulous tissue in the oral pharyngeal region that obstructs the airway and causes snoring.

CENTRAL SLEEP APNEA

Central sleep apnea usually occurs when there is a temporary failure of the brain to recognize the signals and controls the muscles responsible for breathing. The symptoms are common to that of

OSA except for snoring which isn't prevalent in CSA as in OSA.

Some conditions which could be responsible for CSA include Parkinson's disease or any medical conditions that could affect the brainstem or heart failures.

Management of CSA is often the first line treatment options for the underlying disorder.

- Treating existing conditions that are causing CSA is often the first line in treatment options for the disorder.
- Continuous positive airway pressure (CPAP). Similar to OSA, one of the first treatment options for CSA is the use of CPAP therapy. A CPAP device includes a breathing mask that sleep apnea sufferers wear when sleeping. Just enough consistent air pressure is delivered via the mask to the patient's airways to keep the tissue that otherwise would collapse (and cause breathing pauses and snoring) from closing during sleep. CPAP devices are effective in treating sleep apnea but do not cure the disorder. If you discontinue using your CPAP device, your sleep apnea may return.
- Bilevel positive airway pressure (BPAP). Bilevel positive airway pressure is similar to CPAP except that BPAP adjusts the level of air being

delivered depending on whether the patient is inhaling or exhaling. During inhalation, an electronic sensor tells the BPAP to send more air through the mask to clear the apnea-causing obstruction. When the user exhales, the air pressure is reduced. This decrease is helpful for sleep apnea sufferers who have a rough time breathing out against the constant pressure of a CPAP machine.

- **Adaptive-servo ventilation (ASV).** The Adaptive-servo ventilation device monitors breathing and adjusts air flow appropriately through the mask to match how the patient would be normally breathing if awake. This adjustment can be made quickly as soon as the ASV detects that the patient is not breathing correctly (as is the case with central sleep apnea, when the brain doesn't signal the body to take a breath). When the patient exhales or after the patient resumes a normal breathing pattern, ASV adjusts the pressure again.¹⁴
- **Medications.** Certain medications, such as acetazolamide (Diamox) or theophylline (Theo-24, Theochron, others), have been used to stimulate breathing in people with central sleep apnea. Medications may be prescribed when positive airway pressure therapy fails to be efficient.

MIXED SLEEP APNEA

It is a combination of obstructive sleep apnoea and central sleep apnoea. In patients where the treatment was done as in obstructive sleep apnoea; some still had difficulties and showed symptoms of central sleep apnoea. Management of mixed sleep apnea is varied from continuous positive airway pressure to bilevel positive airway therapy and adaptive servo ventilation. There is still no best treatment for mixed sleep apnoea.

A proper analysis of sleep pattern is essential to identify those affected by sleep disorders. In this survey conducted among patients reported in the Department of Prosthodontics it was observed that 29% of patients were affected by sleep disorders. Among the patients with sleep disorders almost 80% were obese. This shows there is a strong correlation between obesity and sleep disorders. 48% of patients with sleep disorders

reported that they suffered from morning headache. This considerably affects the quality of life and even causes problems in social and professional life. During the survey, it was seen that most of the patients were unaware of their condition. It is recommended that further surveys and awareness programs on sleep disorder identification should be conducted. Early identification and timely referral to a specialist is mandatory to improve the quality of life of the affected patients.

CONCLUSION

Many individuals with non satisfactory sleep were overweight or obese which in turn shows a correlation between sleep apnoea and overweight. This study shows that sleep apnoea is seen commonly in patients who are obese or overweight and they show high incidence in hypertensive patients and they show tiredness during daytime and may feel sleepy during driving. People having sleep apnoea shows snoring as a major symptom.

This study shows that sleep apnoeic patients show symptoms like: Insomnia, difficulty in concentrating, morning headaches, restlessness. Regular and ongoing follow up is needed with sleep medicine specialists who will check whether the treatment is working and whether there are any side effects of the treatment.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Engelke W, Repetto G, Mendoza-Gaertner M, Knoesel M. Functional treatment of snoring using oral shields in conjunction with the tongue repositioning manoeuvre. *Int J Odontostomatol* 2007;1:133-9.
2. The Report of an American Academy of Sleep Medicine Task Force. Sleep-related breathing disorders in adults: Recommendations for syndrome definition and measurement techniques in clinical research. *Sleep* 1999; 21 : 667-89.
3. Young T, Palta M, Dempsey J, Skatrud J, Weber S, Badr S. The occurrence of sleep-disordered

breathing in middle-aged adults. *N Engl J Med* 1993; 328(17):1230-5.

4. The Report of an American Academy of Sleep Medicine Task Force. Sleep-related breathing disorders in adults: Recommendations for syndrome definition and measurement techniques in clinical research. *Sleep* 1999; 21 : 667-89.

5. "Obstructive Sleep Apnea Syndrome (780.53-0)". The International Classification of Sleep Disorders (PDF). Westchester, Illinois: American Academy of Sleep Medicine. 2001.pp. 52-8. Retrieved 2010-09-11.

6. Gale SD ,Hopkins RO (2004) . "Effects of hypoxia on the brain : neuroimaging and neuropsychological findings following carbon monoxide poisoning and obstructive sleep apnea "J Int Neuropsychol Soc 10 (1): 60 -71 doi . 10.1017 ?SI355617704101082 . PMID 14751008

7, 8, 9. Villaneuva ATC, Buchanan PR, Yee BJ, G runstein RR. Ethnicity and obstructive sleep apnoea. *Sleep Med Rev* 2005; 9: 419-36.

10. Ivanhoe JR, Attanasio R. Sleep disorders and oral devices. *Dent Clin North Am* 2001;45: 73358

11. Mohsenin N, Mostofi MT, Mohsenin V. The role of oral appliances in treating obstructive sleep apnea. *J Am Dent Assoc* 2003;134:442-9.

12. Chan AS , Lee RW ,Cistulli PA; Lee;Cistulli (August 2007) "Dental Appliance treatment for obstructive sleep apnea "Chest 132 (2):693 -9. doi :10 . 1378 /chest .06 -2038. PMID17699143

13. Morgenthaler TI, Aurora RN, Brown T et al. Practice parameters for the use of autotitrating continuous positive airway pressure devices for titrating pressures and treating adult patients with obstructive sleep apnea syndrome an update for 2007. An American Academy of sleep Medicine report. *Sleep* 2008; 31:141 7

14. Kushida CA, Littner MR, Hirshkowitz M et al. Practice parameters for the use of continuous and bilevel positive airway pressure devices to treat adult patients with sleep related breathing disorders. *Sleep* 2006 ;29:375-80.