

## ORIGINAL ARTICLE

## A Study on the Factors Influencing Obstructive Sleep Apnea Among Students of Medical College in Maharashtra

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### ABSTRACT

**Background:** Obstructive sleep apnea (OSA) is defined as a condition wherein there are repeated episodes of partial or complete obstruction of the respiratory passages during the sleep. Developing countries like India do not have much of the literature on the prevalence of OSA and OSAS. **Methodology:** The present study is a cross-sectional study done among the 320 students of Medical College. A standard pre-tested and validated sleep questionnaire, namely, a modified version of Wilconsin Sleep Cohort Questionnaire was administered, followed by some anthropometric measurements were done. **Results:** About 65.5% of the patients having H/O snoring had neck circumference (NC) >40 cm and it was found to be significant stating that, increased NC leads to snoring and in turn are having OSA. It was proved statistically significant with  $P < 0.0001$ . Similarly, it was also noted that, only 25.9% of the patients with H/O of snoring had consulted sleep physician regarding snoring and its management among 58 patients suffering from snoring issues. It was also found to be statistically significant ( $P < 0.0001$ ).

**Key words:** Obstructive sleep apnea, sleep disturbance, sleep

### INTRODUCTION

Obstructive sleep apnea (OSA) is defined as a condition wherein there are repeated episodes of partial or complete obstruction of the respiratory passages during the sleep.<sup>[1-3]</sup> Obstructed breathing response from the body is characterized as arousal of the brain, sympathetic activation, and oxygen desaturation in the blood.<sup>[4]</sup> A non-restorative sleep and sleep fragmentation are the result of repeated episodes of the upper airway obstruction. Patients with OSA complain of tiredness, excessive day-time sleepiness, insomnia, or morning headaches, but many are asymptomatic.<sup>[5,6,7]</sup> OSA has been associated with daytime hypersomnolence, automobile accidents, and increased cardiovascular morbidity and mortality.

In developed countries, OSA is one of the major contributors of morbidity and mortality.<sup>[8-18]</sup> Similarly, OSA is now being recognized in developing countries. OSA syndrome consists an additional component of excessive somnolence in the daytime has prevalence of 0.3–7.5% in general population

as per multiple studies known<sup>[19-25]</sup> which also depend on different definitions used for OSA and also the populations studied. Developing countries like India do not have much of the literature on the prevalence of OSA and OSAS. Some studies in India on OSA showed the prevalence between 4.4% and 13.7% as well as OSA syndrome to be between 2.4% and 2.8%. OSA, in Indian males, vary from 4.4% to 19.7% and in females it is between 2.5% and 7.4% according to various studies. The prevalence of OSAHS in males was observed to be from 2.4–7.5% and in females 1–2.1%.<sup>[2]</sup>

There are many studies showing the risk factors which are found to have an association with OSA. A risk factor identified to have a strong association with OSA is obesity and also recognized many parameters from different studies in determining the association with OSA namely: body mass index (BMI),<sup>[24,26-28]</sup> waist circumference (WC),<sup>[24,26]</sup> waist/

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hip ratio (WHR), neck circumference (NC),<sup>[24,27]</sup> neck-length (NL), percentage predicted NC (PPNC),<sup>[29]</sup> percentage of body fat,<sup>[21]</sup> and skin fold thickness (SFT).<sup>[27]</sup>

The diagnosis of OSA is sometimes difficult to make due to the non-specificity of symptoms among the subjects, and a low prevalence of the condition may be erroneously reported. Polysomnography studies may not be feasible in some settings, especially in developing nations with limited resources. The present study was done with an aim to assess the factors influencing OSA among the medical students.

## Objectives

The objectives are as follows:

1. To assess the symptoms of OSA among the medical students
2. To study the risk factors associated with OSA among the students identified with OSA.

## MATERIALS AND METHODOLOGY

### Study Setting and Design

It is a cross-sectional study done among the students of 18–26 years age group studying under DY Patil Medical College, Kolhapur, Maharashtra.

### Study Period

The study was conducted from January 2019 to March 2019.

### Study Sample

The sample was chosen due to the occurrence of sleep disturbance seen in day to day surroundings which lead to the finding that relates to the sleep disturbance and sleep imbalance (REM/NREM cycle) snoring, breathlessness, stress related sleeping disorder, and insomnia individuals.

### Sampling

Samples were chosen by stratified random sampling. Classes from MBBS 1 to 4 were all chosen and assuming 80 students from each class to be chosen. The class strength was around 150–200. Thus, every alternate student who gave consent for the study was chosen and sample of 320 was reached. Two students left the study due to some own personal issues. Thus, final sample undertaken for the study was 318.

## Inclusion and Exclusion Criteria

### Inclusion criteria

All the MBBS studying students coming under the age group of 18–26 years, MBBS students of DY Patil Medical College, Kolhapur, Maharashtra were included in the study.

### Exclusion criteria

Students who did not give consent; the students who were not found on two consecutive visits for collection of data; students of DY Patil Medical College other than MBBS were excluded from the study. Incomplete filled forms, unsatisfactory in nature were also excluded from the study.

## Operational Definitions

### Sleep apnea

It is disorder in which you have  $\geq 1$  pauses in breathing or shallow breaths while in sleep. It occurs when a person stops breathing for a brief period of  $\geq 10$  s in sleep. It is graded as mild, moderate, or severe depending upon the number of times breathing stops or become very shallow at sleep in an hour. Apneic episodes range from 5 to 100 in an h.  $>5$  apneic episodes per hour considered as abnormal. Apnea Hypopnea Index (AHI) is considered in grading. It is considered as:

None/Minimal: AHI  $<5/h$

Mild: AHI 5–15/h

Moderate: AHI 15–30/h

Severe: AHI  $>30/h$

### Screening Procedure

In the first part, a standard pre-tested and validated sleep questionnaire, namely, a modified version of Wilconsin Sleep Cohort Questionnaire (T. Young; personal communication; 2002) was administered after obtaining the consent, followed by some anthropometric measurements were done. The variables studied included demographic characteristics, sleep symptoms, medical history along with the medications used.<sup>[23]</sup>

A 4-pointlikert scale was used to quantify snoring and sleep-related choking. A 0 score indicates never snored, a score of 1 indicates a snoring frequency of less than once per week, a score of 2 indicates a snoring frequency of once or twice per week, a score of 3 indicates a snoring frequency of 3 or 4 times/week, and a score of 4 indicates a snoring frequency of more than 4 times a week. Based on this score, habitual snoring was defined as a score of  $>3$  point for snoring or choking. Similarly, habitual smoking<sup>[30]</sup> was defined as current smoking of  $>10$  cigarettes per day for  $>10$  years, and habitual drinking was defined as the consumption of  $>100$  g of alcohol per day for  $>10$  years.<sup>[31]</sup>

Data regarding the parts of the physical examination conducted were: Height, weight, BMI, NL, NC, PPNC, waist and hip girth, WHR, subscapular SFT, supriliac SFT, triceps SFT, biceps SFT, and BP were measured according to standard methods.<sup>[32]</sup> PPNC was computed using the following formula:  $PPNC = (1000 \times NC) / ([0.55 \times H] + 310)$ .<sup>[29]</sup>

Subjects were classified as obese when the BMI was  $>25$  kg/m<sup>2</sup>. Although the definition of obesity differs in

Western populations, a BMI of 25 kg/m<sup>2</sup> was used as the cutoff value for the population under study, as defined by the World Health Organization for the Indian population.<sup>[33]</sup> A WC of >102 cm in men and >88 cm in women<sup>[34]</sup> and a WHR of >0.95 in men and >0.88 in women were used as parameters of obesity in the analysis.<sup>[35]</sup>

### Statistical Analysis

Data collected from questionnaire and examination were entered into MS Excel Sheet and analyzed using a statistical software package (SPSS Version 20). Data variables were analyzed, descriptive statistics was done and expressed in the form of numbers and percentages. Pearson  $\chi^2$  test was done for discrete variables to find the association between the variables. All significance tests were two-sided, and  $P < 0.05$  was considered to be statistically significant.

### RESULTS

Descriptive statistics for the present study shows that among 318 students undertaken for the study; there are 14% of students residing in the home and remaining 86% stay in hostel. It was found from the study after survey using the questionnaire and the examination that, 19% students snored and rest 81% of the students did not snore. Following it, only 6% students have consulted sleep physician. It was known from examination that significantly there was rise in NC among 28.3% of the students measuring >40 cm whereas, rest 71.7% had NC <40 cm. It was also deduced from the study that, 86% students were non-smokers and only 8% were chronic smokers. Still 6% students did not reveal their habit on smoking when asked. Similarly, only 8% students had habit of drinking alcohol and rest 92% did not had habits of drinking alcohol.

Other risk factors were assessed and found that, 5% of patients were hypertensive and 8% suffering from anxiety also 6% suffering from depression and also found to have OSA [Table 1].

Table 2 shows elucidation of assessing the risk factors for OSA. Here snoring was considered as the dependent variable and was assessed with few of the risk factors. It can be seen from the table that, 65.5% of the patients having H/O snoring had NC >40 cm and it was found to be significant stating that, increased NC leads to snoring and in turn are having OSA. It was proved statistically significant with  $P < 0.0001$ . Similarly, it was also noted that, only 25.9% of the patients with H/O of snoring had consulted sleep physician regarding snoring and its management among 58 patients suffering from snoring issues. It was also found to be statistically significant ( $P < 0.0001$ ). Although only 7.9% of patients were found to be chronic alcoholic, in them 19/58 of the snoring patients were found to be chronic alcoholic with  $P < 0.0001$  from Fisher's exact test.

**Table 1: Descriptive statistics on the variables undertaken for the study**

Details of the study subjects	Frequency (%)
Number of students residing in home and hostel	
Home	45 (14%)
Hostel	273 (86%)
Consulted sleep physician in the past	
Yes	18 (6%)
No	300 (94%)
Circumference of the neck >16 inches (>40 cm)	
Yes	90 (28.3%)
No	228 (71.7%)
Snoring in sleep	
Yes	58 (19%)
No	260 (81%)
Often feel tired, fatigued or sleepy during the daytime	
Yes	180 (57%)
No	132 (41%)
No response	6 (2%)
Reasons for waking up at night	
To urinate	70 (22%)
To check phone	35 (11%)
Nightmares	41 (13%)
Others	10 (3%)
No reason	162 (51%)
Hours of sleep per night	
<4 h	3 (1%)
4–6 h	89 (28%)
6–8 h	194 (61%)
>8 h	32 (10%)
Bed time at night	
9 pm	7 (2%)
9–11 pm	41 (13%)
11 pm–12 am	92 (29%)
After 12 am	178 (56%)
Wake up time in the morning	
6 am	25 (8%)
6–8 am	185 (58%)
8–10 am	89 (28%)
After 10 am	19 (6%)
Chronic alcoholic	
Yes	25 (8%)
No	293 (92%)
Chronic smoker	
Yes	25 (8%)
No	272 (86%)
No response	20 (6%)
H/O Hypertension and on Rx	16 (5%)
H/O Anxiety and on Rx	25 (8%)
H/O Depression and on Rx	19 (6%)

**Table 2: Assessment of the risk factors for OSA**

Risk factors for OSA	Snoring			Remarks
	Yes 58 (18.2%)	No 260 (81.8%)	Total 318 (100.0%)	
NC				
>40 cm	38 (65.5)	52 (20.0)	90 (28.3)	$\chi^2=448.42$ , df=1, $P<0.0001$
<40 cm	20 (34.5)	208 (80.0)	228 (71.7)	
Consulted sleep physician				
Yes	15 (25.9)	3 (01.2)	18 (05.7)	Fishers' Exact; $P<0.0001$
No	43 (74.1)	257 (98.8)	300 (94.3)	
Chronic alcoholic				
Yes	19 (32.8)	6 (02.3)	25 (07.9)	Fishers' Exact; $P<0.0001$
No	39 (67.2)	254 (97.7)	293 (92.1)	

OSA: Obstructive sleep apnea, NC: Neck circumference

Other risk factors such as hours of sleep at night, bedtime for sleeping and wake up time in the morning also correlated with snoring rather OSA.

On survey, it was found that there were some reasons for getting up or being awake from sleep in the night. Reasons stated by the patients were as follows: About 22% woke up to urinate, 11% to check the phone, and 13% had night mares to awake from the sleep; while around half, that is, 51% of the patients did not had any reason to be awake, which could be due to other reasons who did not let to reveal it due to some issues.

## DISCUSSION

OSA is under diagnosed disorder and western countries suggested a higher prevalence of OSA, whereas a lesser number of studies found regarding OSA and OSA syndrome in the developing countries. OSA diagnosed on AHI and Epworth Sleepiness Questionnaire. In the current study, there is 18.2% of the patients are having snoring. In contrast to this, a study done in China by Chuang *et al.*, in 2008,<sup>[36]</sup> found that 59.1% of the patients reported with snoring, wherein 60.8% males and 42.5% females had snoring. Suwanprathes *et al.*<sup>[37]</sup> conducted a study on sleep in 2010 in Thailand and found 4.6% of the study population had snoring and EDS. A study done in Singapore by Khoo *et al.*<sup>[38]</sup> in 2004 suggested that, 6.8% of the total population complained of snoring.

A similar finding was noted in the study done by Singh *et al.*<sup>[39]</sup> in Uttar Pradesh, India, in 2011 among medical students, wherein 17.7% participants had snoring and rest 82.29% did not had snoring.

In the current study, it was found that, 7.9% participants were alcoholics. Among snoring group, 32.8% had habit

of drinking alcohol and 2.3% of non-snoring group were alcoholics and it was found to be significant that alcoholics were snoring and are having OSA. Similarly, a study done by Singh *et al.*<sup>[39]</sup> in Uttar Pradesh in India in 2011 found that, overall 6.02% were alcoholics and 7.22% of alcoholics were in snoring group, while 5.76% were in non-snoring group and did not show any difference among the two groups.

A study done by Sharma *et al.*<sup>[40]</sup> in 2003 in semi urban Delhi on general population found that, 25.8% participants were habitual snorers. Among the risk factors studied, it was noted that, 6.2% were alcoholics and 34.2% had hypertension. Similarly, in the current study, it was found that 18.2% were having snoring, 7.9% alcoholics, 8% smokers, and also 5% were hypertensives.

Further, the current study suggested a significant difference in the risk factors to that of snoring and non-snoring group. Some risk factors studied were NC and alcoholism. Also a similar finding was noticed in the study done by Sharma *et al.*<sup>[40]</sup> in 2003 in semi urban Delhi on general population, wherein a significant difference was noted similarly in the risk factors.

## CONCLUSION

From the current study, it was found that snoring is one of the characteristic finding in the diagnosis of OSA. OSA is still underdiagnosed. It has to be identified at the earliest possible period to avoid further consequences and reduces the morbidity and mortality. Risk factors mainly like obesity are the predisposing factor and which has an increased NC and other habits such as drinking, alcohol contributes toward OSA. Regular screening of the patients with history of snoring and other associated risk factors is very necessary to lead a healthy life.

## REFERENCES

1. Pretto JJ, Gyulay SG, Hensley MJ. Trends in anthropometry and severity of sleep-disordered breathing over two decades of diagnostic sleep studies in an Australian adult sleep laboratory. *Med J Aust* 2010;193:213-6.
2. Punjabi NM, Caffo BS, Goodwin JL, Gottlieb DJ, Newman AB, O'Connor GT, *et al.* Sleep-disordered breathing and mortality: A prospective cohort study. *PLoS Med* 2009;6:e1000132.
3. Park JG, Ramar K, Olson EJ. Updates on definition, consequences, and management of obstructive sleep apnea. *Mayo Clin Proc* 2011;86:549-55.
4. Heinzer R, Vat S, Marques-Vidal P, Marti-Soler H, Andries D, Tobback N, *et al.* Prevalence of sleep-disordered breathing in the general population: The HypnoLaus study. *Lancet Respir Med* 2015;3:310-8.
5. Mirrakhimov AE, Sooronbaev T, Mirrakhimov EM. Prevalence of obstructive sleep apnea in 464 Asian adults: A systematic review of the literature. *BMC Pulm Med* 2013;13:10.

6. 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.
7. Arnardottir ES, Bjornsdottir E, Olafsdottir KA, Benediksdottir B, Gislason T. 467 Obstructive sleepapnoea in the general population: Highly prevalent but minimal symptoms. *Eur Respir J* 2016;47:194-202.
8. Tilkian AG, Guilleminault C, Schroeder JS, Lehrman KL, Simmons FB, Dement WC. Sleep-induced apnea syndrome: Prevalence of cardiac arrhythmias and their reversal after tracheostomy. *Am J Med* 1977;63:348-58.
9. Grunstein RR, Stenlöf K, Hedner J, Sjöström L. Impact of obstructive sleep apnea and sleepiness on metabolic and cardiovascular risk factors in the Swedish obese subjects (SOS) Study. *Int J Obes Relat Metab Disord* 1995;19:410-8.
10. Fletcher EC. Obstructive sleep apnoea and cardiovascular morbidity. *Monaldi Arch Chest Dis* 1996;51:77-80.
11. Weil JV, Chermiack NS, Dempsey JA, Edelman NH, Phillipson EA, Remmers JE, *et al.* NHLBI workshop summary. Respiratory disorders of sleep. Pathophysiology, clinical implications, and therapeutic approaches. *Am Rev Respir Dis* 1987;136:755-61.
12. Fletcher EC. Obstructive sleep apnea and the kidney. *J Am Soc Nephrol* 1993;4:1111-21.
13. Phillipson EA. Sleep apnea: A major public health problem. *N Engl J Med* 1993;328:1271-3.
14. Strohl KP, Boehm KD, Denko CW, Novak RD, Decker MJ. Biochemical morbidity in sleep apnea. *Ear Nose Throat J* 1993;72:34, 39-41.
15. Bearpark H, Elliott L, Grunstein R, Cullen S, Schneider H, Althaus W, *et al.* Snoring and sleep apnea: A population study in Australian men. *Am J Respir Crit Care Med* 1995;151:1459-65.
16. Javaheri S. Central sleep apnea-hypopnea syndrome in heart failure: Prevalence, impact, and treatment. *Sleep* 1996;19:S229-31.
17. Javaheri S, Parker TJ, Liming JD, Corbett WS, Nishiyama H, Wexler L, *et al.* Sleep apnea in 81 ambulatory male patients with stable heart failure. Types and their prevalences, consequences, and presentations. *Circulation* 1998;97:2154-9.
18. Bixler EO, Vgontzas AN, Lin HM, Ten Have T, Leiby BE, Vela-Bueno A, *et al.* Association of hypertension and sleep-disordered breathing. *Arch Intern Med* 2000;160:2289-95.
19. McNicholas WT. Clinical diagnosis and assessment of obstructive sleep apnoea syndrome. *Monaldi Arch Chest Dis* 1997;52:37-42.
20. Cirignotta F, D'Alessandro R, Partinen M, Zucconi M, Cristina E, Gerardi R, *et al.* Prevalence of every night snoring and obstructive sleep apnoeas among 30-69-year-old men in Bologna, Italy. *Acta Neurol Scand* 1989;79:366-72.
21. Andreas S, Schulz R, Werner GS, Kreuzer H. Prevalence of obstructive sleep apnoea in patients with coronary artery disease. *Coron Artery Dis* 1996;7:541-5.
22. Stradling JR, Crosby JH. Predictors and prevalence of obstructive sleep apnoea and snoring in 1001 middle aged men. *Thorax* 1991;46:85-90.
23. Sutherland K, Lee RW, Cistulli PA. Obesity and craniofacial structure as risk factors for obstructive sleep apnoea: impact of ethnicity. *Respirology*. 2012;17:213-22.
24. Deegan PC, McNicholas WT. Predictive value of clinical features for the obstructive sleep apnoea syndrome. *Eur Respir J* 1996;9:117-24.
25. 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.
26. Seidell JC. Obesity, insulin resistance and diabetes-a worldwide epidemic. *Br J Nutr* 2000;83 Suppl 1:S5-8.
27. Schafer H, Pauleit D, Sudhop T, Gouni-Berthold I, Ewig S, Berthold HK. Body fat distribution, serum leptin, and cardiovascular risk factors in men with obstructive sleep apnea. *Chest* 2002;122:829-39.
28. Richman RM, Elliott LM, Burns CM, Bearpark HM, Steinbeck KS, Catterson ID. The prevalence of obstructive sleep apnoea in an obese female population. *Int J Obes Relat Metab Disord* 1994;18:173-7.
29. 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.
30. Minami J, Ishimitsu T, Matsuoka H. Effects of smoking cessation on blood pressure and heart rate variability in habitual smokers. *Hypertension* 1999;33:586-90.
31. Hauge T, Persson J, Sjolund K. Neuropeptides in the duodenal mucosa of chronic alcoholic heavy drinkers. *Alcohol Alcohol* 2001;36:213-8.
32. Sharma SK, Kurian S, Malik V, Mohan A, Banga A, Pandey RM, *et al.* A stepped approach for prediction of obstructive sleep apnea in overtly asymptomatic obese subjects: A hospital based study. *Sleep Med* 2004;5:351-7.
33. World Health Organization. In: ID Institute, editor. *The Asia Pacific Perspective: Redefining Obesity and Its Treatment 2000*. Sydney, Australia: International Diabetes Institute; 2000.
34. Han TS, van Leer EM. Waist circumference action levels in the identification of cardiovascular risk factors: Prevalence study in a random sample. *BMJ* 1995;311:1401-5.
35. Willet WC, Dietz WH, Colditz GA. Guidelines for healthy weight. *N Engl J Med* 1999;341:427-34.
36. Chuang LP, Hsu SC, Lin SW, Ko WS, Chen NH, Tsai YH, *et al.* Prevalence of snoring and witnessed apnea in Taiwanese adults. *Chang Gung Med J* 2008;31:175-81.
37. Suwanprathes P, Won C, Komoltri C, Nana A, Kotchabhakdi N, Guilleminault C. Epidemiology of sleep-related complaints associated with sleep-disordered breathing in Bangkok, Thailand. *Sleep Med* 2010;11:1025-30.
38. Khoo SM, Tan WC, Ng TP, Ho CH. Risk factors associated with habitual snoring and sleep-disordered breathing in a multi-ethnic Asian population: A population-based study. *Respir Med* 2004;98:557-66.
39. Singh V, Pandey S, Singh A, Gupta R, Prasad R, Negi MP. Study pattern of snoring and associated risk factors among medical students. *Biosci Trends* 2012;6:57-62.
40. Sharma SK, Kumpawat S, Banga A, Goel A. Prevalence and risk factors of obstructive sleep apnea syndrome in a population of Delhi, India. *Chest* 2006;130:149-56.