



ORIGINAL RESEARCH PAPER

Physiology

THE OCCURRENCE OF OBSTRUCTIVE SLEEP APNEA-HYPOPNEA SYNDROME AMONG CENTRAL INDIAN RURAL POPULATION

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ABSTRACT
 Undiagnosed Obstructive Sleep Apnea-hypopnea syndrome (OSAHS) portrays a major public health problem worldwide. OSAHS is associated with several co-morbidities. Various global epidemiological studies reported OSAHS prevalence data predominantly from white population which may not be applicable to other racial groups. Therefore, the present study was proposed with the objectives to estimate prevalence and to determine risk factors of OSAHS in rural population of Central India. A cross-sectional community based prevalence study was conducted in two stages. In stage 1 of the study, 2020 subjects were interviewed using modified Berlin questionnaire and 68 high risk subjects were identified. In stage 2 of the study, polysomnography was performed in 40 subjects using "Sleepcare" system. 5 % participants were found to have OSA: 2.5% had mild OSA, 2.5 % had moderate OSA. No one had severe degree of OSA. We conclude that the occurrence of OSAHS is 5% in central Indian rural population.

INTRODUCTION

Obstructive Sleep Apnea-hypopnea syndrome (OSAHS) is a sleep disorder which is characterized by repetitive complete or partial upper airway obstruction during sleep, disruptive snoring, nocturnal hypoxemia, recurrent awakening from sleep and excessive daytime sleepiness (EDS). Undiagnosed OSAHS portrays a major public health problem worldwide.⁽¹⁾ Causes of OSAHS are multifactorial and the chronic intermittent nature of the physiologic perturbations related with this disorder is at the root cause of its associated morbidity. Craniofacial abnormality and upper airway soft tissue changes are reported as its important determinants. Heavy snoring associate with it produces pharyngeal trauma and possibly edema or inflammation, which in turn may narrow the upper airway.⁽²⁾ Obesity is also considered as a major risk factor for its development.

In India, obese individuals have nearly four times higher risk of having OSAHS as compared to non-obese individuals independent of age and gender. Western studies reported that metabolic abnormalities of dyslipidaemia, insulin resistance, leptin and adiponectin levels have an OSAHS is associated with several co-morbidities including acute myocardial infarction, heart failure, arrhythmias, refractory hypertension, cerebro-vascular diseases, impotence, metabolic syndrome and psychiatric co-morbid conditions such as depression, anxiety, posttraumatic stress disorder, psychosis and bipolar disorder.⁽³⁾ Studies have reported that 75% of adult OSAHS remains undiagnosed.⁽⁵⁾ Polysomnography (PSG) which is considered as gold standard for diagnosing this condition may not be feasible in some setting, especially in developing nation with limited resources. Therefore, most studies have been conducted in dual stage manner, in which subjects are first screened with questionnaire and then those subjects who are found to be highly susceptible to sleep apnea are recruited for PSG testing.

Various global epidemiological studies reported OSAHS prevalence data predominantly from white population which may not be applicable to other racial groups. Moreover, majority of risk factors associated with OSAHS have genetic and environmental influence which further necessitates the determination of its prevalence and risk factors in different population. In Indian

context, available prevalence data is collected mainly from urban area which may not represent the rural population due to wide socio-economic, geographic and ethnic diversity present here. India is too vast and diverse country and huge gulf exists between urban and rural population. The existing published Indian studies represent the population which is better educated, employed and of better socio-economic class and status than impoverished Indian villagers. Therefore, OSAHS data in this urban population cannot be extrapolated to the overall Indian population.

Hence, the present study was proposed with the objectives to estimate prevalence and to determine risk factors of OSAHS in rural population of Central India.

MATERIALS AND METHODS:

A cross-sectional community based prevalence study was conducted in two stages. Two stage sampling technique was used to select the required study subjects. Electoral roll acted as sampling frame for each of the selected cluster from which the systematic sampling was done. All people (males and females) aged 18-65 years residing in an area under PHC, Kharangana (Gode) constituted the study population.

In stage 1 of the study, 2020 subjects were interviewed using modified Berlin questionnaire and 68 high risk subjects were identified. A limited physical examination was performed in which height(cm), weight(kg), body mass index(kg/m²), neck length(cm), neck circumference(cm), percentage predicted neck circumference(%), waist circumference(cm), hip circumference(cm), waist hip ratio, mid arm circumference(cm), blood pressure(mm of Hg) and fasting blood sugar(mg/dL) was measured according to standard methods. Information on risk factors like age, sex, socio-economic status, smoking, alcohol was also collected. In stage 2 of the study, polysomnography was performed in 40 subjects.

Scoring of Epworth Sleepiness Scale (ESS) was carried out in all subjects. Polysomnography (PSG) tests was performed using "Sleepcare system" available in clinical neurophysiology unit. The subjects were asked to lie in a supine position and relax in a warm and quiet room with temperature of 30°C. Polysomnography

consisted of continuous polygraphic recording from surface leads for electroencephalography, electrooculography, electromyography, electrocardiography, thermistors for nasal and oral airflow, thoracic and abdominal impedance belts for respiratory effort, pulse oximeter for oxyhemoglobin level, tracheal microphone for snoring, and sensors for leg and sleep position. Polysomnography records were scored manually. Sleep data and arousals were scored according to established standard criteria(6). Respiratory events were scored according to AASM criteria(7) : apnea was defined as complete cessation of airflow lasting 10 s or more; hypopnea was defined as either a 50% reduction in airflow for 10 s or more or a less than 50% but discernible reduction in airflow accompanied either by a decrease in oxyhemoglobin saturation of 3% or an arousal. Apnea-hypopnea index (AHI) the average number of episodes of apnea and hypopnea per hour of sleep was calculated as the summary measurement of sleep-disordered breathing. Sleep efficiency which is the ratio of total sleep time to amount of time spent in bed is also noted. Excessive daytime Sleepiness (EDS) was assessed based on the Epworth sleepiness scale (ESS) score. A score of >10 was considered to be suggestive of EDS. OSA was defined as an AHI score of ≥ 5 and OSAHS was defined as the presence of EDS with an AHI of ≥ 5 . The study was approved by the Institutional Ethics committee.

Statistical Analysis:

All data was abstracted on a standardized data collection form. Statistical analysis was done using Microsoft office Excel 2007 version. Values obtained were expressed in the form of mean and standard deviation (SD). Participants were categorized by AHI into mild (5–14.9), moderate (15–29.9), and severe (≥ 30) OSA. P value was taken as significant if found to be less than 0.05.

RESULTS:

Polysomnography study was conducted in forty subjects. There were 18 males and 22 females study participants. Demographic profile of participant's characteristics are depicted in Table No.1. Anthropometric and polysomnographic features are illustrated in Table 2 and 3. All the anthropometric and polysomnographic parameters like BMI, neck circumference, neck length, midarm circumference, sleep efficiency, AHI, arousal index, oxygen desaturation, periodic leg movements (PLM) and ESS were found to be in upper range in males as compared to females however, the difference was not statistically significant. Sleep apnea severity is denoted by Apnea-hypopnoea index which was found to be in normal range both in males and females. In total study subjects, sleep efficiency was around 51% only. PLMs and arousal index per hour were 1.3 and 1.19 respectively which can be considered within normal limits. Desaturation was not much in total study subjects. ESS The level of daytime sleepiness, denoted by ESS was also found to be in normal range. Out of 40 subjects 2.5 % had mild OSA, 2.5 % had moderate OSA .Severe degree of OSA was not detected in any subject. 95 % participants did not have OSA (Table 4 and 5).

Table 1: Demographic profile of subjects in whom sleep study done

Age Group(Years)	Male (n)	Female (n)	Above poverty line(n)	Below poverty line(n)	Smokers(n)	Alcoholics(n)
18-30	1	1	1	1	0	1
31-40	2	12	10	4	0	2
41-50	4	4	7	1	0	3
51-60	9	4	8	5	4	7
61-70	2	1	2	1	0	2
Total	18	22	28	12	4	15

Table 2: Anthropometric profile of subjects

Physiological Variables	Minimum	Maximum	Mean	Std. Deviation
Height(cm)	140	175	154.98	8.67
Weight(kg)	40	75	56.15	9.17
BMI(kg/m2)	18.03	32.46	23.45	3.99

Neck length(cm)	14	36	19.75	4.05
Neck circumference (cm)	16	43	33.63	5.07
Waist circumference (cm)	59	105	81.25	12.58
Hip circumference (cm)	78	120	90.95	8.71
Mid-arm circumference (cm)	22	40	26.95	3.71
Systolic BP(mmHg)	96	160	128.6	11.16
Diastolic BP(mm Hg)	70	108	89.05	10.29
Fasting Blood sugar(mg/dl)	72	219	107.5	25.6

Table 3: Polysomnographic profile of subjects

Parameters	Total subjects (n=40)	Male (n =18)	Female (n =22)
Sleep efficiency(%)	51.77 \pm 25.05	49.37 \pm 27.18	42 \pm 19.19
Apnea-hypopnea index	3.95 \pm 5.15	3.52 \pm 4.28	3.35 \pm 6.10
Arousal index per hour	1.19 \pm 0.75	1.45 \pm 0.83	1.11 \pm 0.58
PLMs perhour (median value)	1.3	2.5	1.55
Oxygen saturation nadir	90.28 \pm 1.51	91.95 \pm 2.44	88.77 \pm 3.50
Epworth Sleepiness Score	7.9 \pm 3.6	8.0 \pm 2.5	7.7 \pm 2.7

Data are mean \pm SD. PLM– Periodic Leg Movements (it is expressed by its median value)

Table 4. Occurrence of OSA in total studied subjects.

Groups	Total subjects (n=40)
Subjects with OSA	2 (5%)
Subjects without OSA	38 (95%)

Table 5. Distribution of OSAHS according to severity.

Severity of OSAHS	No. of subjects
Mild (AHI5-14.9)	1(2.5%)
Moderate (AHI15-29.9)	1(2.5%)
Severe (AHI 30)	0
Total OSAHS subjects (AHI \geq 5)	2(5%)

DISCUSSION:

This study was aimed to evaluate the prevalence of Obstructive Sleep Apnea Hypopnea Syndrome (OSAHS) in rural patients residing in this geographic set-up of Central India. In all the patients Sleep study was carried out using Sleep care system. Sleep data was scored according to standard criteria.

We found its occurrence in 5% of the subjects. Our findings are comparable with the previous studies.^(8,9) A number of epidemiological studies have been conducted to in various ethnic and racial group to find out the prevalence of OSAHS. However, data in Indian community is sparse. Data generated by the studies conducted on white population may not be applicable to Indian population. The definitive diagnostic test for OSAHS is sleep study. This test is quite expensive and is not affordable for majority of Indians. Further, being developing country India is resource limited country, so for each and every patients who is suspected of having OSAHS, it is not possible to do sleep study (Polysomnography). Hence, in this study we have screened the subjects with the help of Modified Berlin Questionnaire, so as to identify the subjects who are at high risk of having OSAHS and in those subjects polysomnography was conducted.

We used the gold standard diagnostic study (Polysomnography) for our study population. According to American and Australian guidelines also PSG is considered to be gold standard for OSAHS.^(10,11) We applied cut-off of AHI at > 5 per hour for defining

OSAHS. This is in accordance with the previous study.(12) Sharma SK et al(12) estimated the prevalence of OSAHS to be 3.6%. This is comparable with our findings. The gender-wise occurrence of OSAHS found to be 4.96% and 2.03% in males and females respectively according to the report by Sharma SK et al(12). In present study, we have not yet calculated the gender wise distribution of OSAHS prevalence. Our findings fall within the range of previously published studies. Udwadia ZF et al(13) reported the estimated prevalence of OSAHS to be 7.5%. Young T et al(14) found the prevalence in male and females to be 2% and 4% respectively. Ip MS et al (15) observed the prevalence of OSAHS in middle aged men and women from Hong Kong to be 4.1% and 2.1 % respectively. Our findings are in agreement with these reports.

CONCLUSION:

Based upon the observation in this study, it may be concluded that prevalence of OSAHS is 5% in central Indian rural population.

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