IS THERE ANY CORRELATION BETWEEN OBSTRUCTIVE SLEEP APNOEA AND BODY MASS INDEX IN HYPERTENSIVE SUBJECT

Verma R, Singh S, Anwer E, Prasad R*, O P Garg

Department of Physiology, *Department of Pulmonary Medicine**

Era's Lucknow Medical College & Hospital, Sarfarazganj Lucknow, U.P., India-226003

Address for correspondence

Dr. Seema Singh
Department of Physiology
Era's Lucknow Medical College &
Hospital, Lucknow-226003
Email: singh_seema2007.com
Contact no: +91-9451993425

ABSTRACT

To know the any correlation in obstructive sleep apnea and body mass index in hypertensive Subjects.

Obstructive sleep apnoea (OSA) is increasingly being recognized as a major health burden with a strong focus on the associated cardiovascular risk. OSA is a considered as secondary hypertension. Its episodes produce surges in systolic and diastolic pressure that keep mean blood pressure levels elevated at night. In many patients, blood pressure remains elevated during the daytime, when breathing is normal.

This was a cross-sectional study conducted on 100 hypertensive subjects both male and female to evaluate the correlation between obstructive sleep apnoea and body mass index in hypertensive subjects in Department of Physiology, Department of Pulmonary Medicine and department of Medicine, at Era's Lucknow Medical College & Hospital, Era University, Lucknow.

In these 100 subjects there are underweight (n=5) high risk 1 and low risk 4, Normal (n=52) high risk 18 and low risk 34 Overweight (n=33) high risk 19 and low risk 14 and Obese (n=10) high risk 4 and low risk 6. Average BMI in high risk subjects (n=42) is 25.49±3.88 and in low risk subjects (24.14±5.02) with pvalve0.150 (p>0.05).

Early identification of BMI and OSA in hypertensive's subject management may reduce the development of cardiovascular risk in hypertensive subjects

KEYWORDS: To know the any correlation in obstructive sleep apnea and body mass index in hypertensive Subjects.

INTRODUCTION

Obstructive sleep apnoea (OSA) is increasingly being recognized as a major health burden with a strong focus on the associated cardiovascular risk. Studies from the last two decades have provided strong evidence for a causal role of OSA in the development of systemic hypertension (1).

OSA is defined as the occurrence of an average 5 or more episodes of obstructive respiratory events apnoea, hypopnoea or respiratory effort related arousals per hour of sleep with either sleep related symptoms or co morbidities or more than 15 such episodes without any sleep related symptoms or comorbidities (2).

Apnoea hypopnoea index more than 5 events per hour is used to define obstructive sleep apnoea with obstructive or mixed events comprising more than 50% of the total (3).

OSA is characterized by recurrent upper airway obstruction caused by a loss of pharyngeal muscle tone during sleep. OSA is highly associated with obesity and cardiovascular and metabolic complications, increasing cardiovascular morbidity and mortality (4).

Repetitive upper airway obstructions during sleep lead to fluctuations in blood oxygen levels. These recurrent cycles of hypoxemia and re oxygenation are termed intermittent hypoxia (IH), the most prominent feature of OSA that may contribute to increased production of reactive oxygen species (ROS) and oxidative stress. Sympathetic nerve activation (SNA) is another major outcome of the apnoea/hypopnoea (5).

In India the prevalence of obstructive sleep apnoea is 19.7% in the male population and 7.4% in the female population (6).

Alcohol consumption was significantly associated with increased risk of Sleep Disorder compared to non-drinkers, light drinkers and heavy drinkers. Sleep quality and severity of sleep disorder is worst in heavy drinkers. Heavy alcohol consumption may increase the Metabolic Syndrome and deteriorate sleep in relation to the amount of alcohol intake (7).

Berlin Questionnaire is sensitive and specific for the diagnosis of OSA. It is about 85.5% accurate (8).

According to Indian hypertension guidelines, 2013, hypertension in adults aged 18 years and older is, defined as systolic blood pressure ≥ 140 mmHg and

diastolic blood pressure ≥90 mmHg(9).

According to WHO and the International Society of Hypertension (ISH). Worldwide, raised blood pressure is estimated to cause 7.5 million deaths, about 12.8% of the total of all deaths (10-11).

Hence this study was planned to know the any correlation in obstructive sleep apnea and body mass index in hypertensive Subjects.

AIMS & OBJECTIVES

To know the any correlation in obstructive sleep apnea and body mass index in hypertensive Subjects.

MATERIAL AND METHODS

This is a cross sectional study in which 100 hypertensive subject were enrolled both male and female, in Department of Physiology, Department of Pulmonary Medicine and department of Medicine, at Era's Lucknow Medical College & Hospital, Era University, Lucknow.

Inclusion Criteria

• Hypertensive subject both male & female

Exclusion Criteria

• Pregnant women.

• Having any other systemic disease like chronic obstructive pulmonary disease, chronic renal disease and other cardiac disease except hypertension.

• Subject taking medicine for immunosuppressive disease.

· H/o of chronic smoking, alcohol, and using Sedatives medicine.

METHODOLOGY

All subject was explained about the protocol of the study and a written consent was obtained. After enrolment, a general and systemic examination was done and a proper case history was recorded to confirm that the subjects selected were apparently healthy.

All selected subjects from OPD department of medicine blood pressure was measured by mercury sphygmomanometer in the sitting position after at least 5 min of rest according to Indian Guidelines on Hypertension (I.G.H.)-III (2013)[9] systolic blood pressure ≥140 and diastolic blood pressure≥90.

OSA is initially assessed by modified Berlin questionnaire. Subjects will be categorized into 2 group

• Low risk snoring group

• high risk snoring group as per Modified Berlin questionnaire

MODIFIED BERLIN QUESTIONNAIRE

Screening questions:

1. Do you snore?

2. Do you feel tired after waking up from sleep?

3. Do you feel you are obese?

4. Are you a hypertensive?

CATEGORY 1

Q1. Do you snore?

Yes (1)

No (0)

Do not know/refused (0)

Q2. If u snore, your snoring is

Slightly louder than breathing (0)

As loud as talking (0)

Louder than talking (1)

Very loud, can be heard in adjacent rooms (1)

Do not know/refused (0)

Q3. How often do you score?

Nearly every day (1)

3 to 4 nights per week (1)

1 to 2 nights per week (0)

1 to 2 nights per month (0)

Never or nearly never/do not know (0)

Q4. Has your snoring ever bothered other people?

Yes (1)

No (0)

Do not know/refused (0)

Q5. Has anyone noticed that you quit breathing during sleep?

Nearly everyday (2)

3 to 4 times a week (2)

1 to 2 times a week (0)

1 to 2 times a month(0)

Never or nearly never/do not know/refused (0)

CATEGORY 2

Q6. How often do you feel tired or fatigued after your sleep ?

Nearly everyday (1)

3 to 4 times a week (1)

1 to 2 times a week (0)

1 to 2 times a month (0)

Never or nearly never/do not know/refused (0)

Q7. During your wake time, do you feel tired, fatigued, or not uptopar ?

Nearly everyday (1)

3 to 4 times a week (1)

1 to 2 times a week (0)

1 to 2 times a month (0)

Never or nearly never/do not know/refused (0)

Q8. Have you ever fallen asleep while waiting in a line to meet your doctor?

Nearly everyday (1)

3 to 4 times a week (1)

1 to 2 times a week (0)

1 to 2 times a month (0)

Never or nearly never/do not know/refused (0)

Q9. Have you ever fallen asleep while watching television at your home during daytime? If yes, how frequently?

Nearly everyday (1)

3 to 4 times a week (1)

1 to 2 times a week (0)

1 to 2 times a month (0)

Never or nearly never/do not know/refused (0)

Q10. Have you ever fallen asleep while waiting in a line to pay your electricity and telephone bills? If yes, how frequently?

Nearly everyday (1)

3 to 4 times a week (1)

1 to 2 times a week (0)

1 to 2 times a month (0)

Never or nearly never/do not know/refused (0)

CATEGORY 3

Q11. Do you have high BP ?

Yes (1)

No (0)

Do not know/refused (0)

Q12. BMI, kg/m^2

> 25 (1) $\leq$ 25 (0)

SCORING

Category 1 is positive with $\geq$ 2 positive responses to questions 1-5.

Category 2 is positive with $\geq$ 2 positive responses to questions 6-10.

Category 3 is positive with a self-report of high BP and/or a BMI > 25kg/m^2.

High Risk of OSA – Two or more categories scored as positive.

Low Risk of OSA – Less than two categories scored as positive.

These subject then underwent recording of anthropometric parameters like height (in meter) measured using measuring tape and weight (in kilograms) by standard weighing scale, and Body mass index(BMI) is calculated according to the formula:

$$\frac{Weight\ (Kg)}{Height^2\ (Meter)^2}$$

WHO criteria (12)

BMI	Classification
< 18.5	Underweight
18.5–24.9	Normal
25.0–29.9	Overweight
$\geq$30.0	Obese

Statistical Analysis

Data was analyzed using Statistical Package for Social Sciences, version 23 (SPSS Inc., Chicago, IL). Results for continuous variables are presented as mean ± standard deviation, whereas results for categorical variables are presented as number (percentage). Student t test and chi square test was used to assess associations of high risk for OSA with elevated hypertension, high systolic BP, high diastolic BP. The level $P < 0.05$ was considered as the cut off value or significance.

RESULTS

This cross-sectional study was conducted on 100 hypertensive subjects both male and female in the Department of Physiology, Department of Pulmonary Medicine and department of Medicine, at Era's Lucknow Medical College &Hospital, Lucknow. fulfilling the inclusion criteria were included in study. There were 55 males and 45 females were included which mean age 47.48 years with standard deviation of 12.4 in our study.
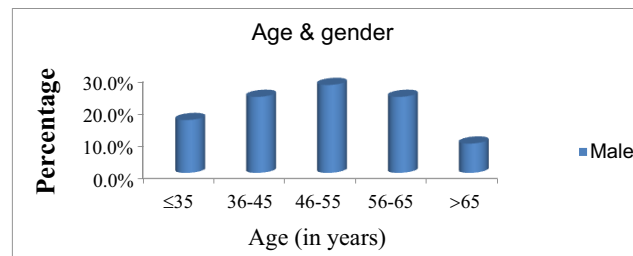

Fig 1: Age Wise Distribution Of Hypertensive Subjects Included In Study

Below Table Enumerates The Clinical Profile Of The Study Of Population.

Mean weight of all studied subjects was recorded as 63.17±12.9)(kilogram), mean height was 1.59±0.1(meters), Body Mass Index(BMI) as 24.70±4.6 (kg/m²). Systolic Blood Pressure was recorded as 155.49±13.3 mmHg where as Diastolic Blood Pressure as 95.62±5.9 mmHg.

Hemodynamic parameters (n=100)	Mean±SD	Range (Min-Max)
Weight (in kg)	63.17±12.9	34-116
Height (in meters)	1.59±0.1	1.36-1.90
BMI (kg/m²)	24.70±4.6	15.31-39.56
SBP (mmHg)	155.49±13.3	140-200
DBP (mmHg)	95.62±5.9	90-100

Table 1: Distribution Of Hemodynamic And Anthropometric Parameters Of Study Participants

Comparison Of Anthropometric And Hemodynamic Details Of Male And Female

Significant association was observed among following parameters weight, height while others were not significant. There was no significant difference between the mean BMI of males compared to female participants (24.251±3.99 vs. 25.18±5.15, p>0.05 respectively). Similarly systolic blood pressure and diastolic blood pressure, were similar between male and female participants.

Parameters (n=100)	Male n=55 (Mean±SD)	Female n=45 (Mean±SD)	P value	T value
Weight (in kg)	66.87±12.59	58.64±12.01	0.001	3.3199
Height (in meters)	1.65±0.07	1.53±0.07	<0.01	8.5285
BMI (kg/m²)	24.25±3.99	25.18±5.15	0.560	1.0174
SBP (mmHg)	156.18±10.52	155.07±10.15	0.593	0.5333
DBP (mmHg)	96.11±5.57	95.02±6.35	0.364	0.9140

Table 2: Comparison Of Anthropometric Comparison Of Anthropometric And Hemodynamic And Hemodynamic Details Of Male And Female Below Table Describes

*p value<0.01= statistically highly significant; p value <0.05= statistically significant; pvalue>0.05=statistically non-significant

Association Between Anthropometric Details & Osa Risk Of Study Participants

Below table illustrates association between anthropometric details & Obstructive Sleep Apnoea risk of studied population. Significant association was observed for Body Mass Index and Systolic Blood Pressure and diastolic Blood Pressure.

Anthropometric variable (n=100)	OSA High Risk n=42 (Mean±SD)	OSA Low Risk n=58 (Mean±SD)	P value	T value
BMI (kg/m2)	25.49±3.88	24.14±5.02	0.150	1.4555
SBP (mmHg)	161.93±8.51	156.10±10.92	<0.01	2.8824
DBP (mmHg)	96.52±6.25	95.45±5.96	0.385	0.8682

Table 3: Association Between Anthropometric Details & OSA Risk Of Study Participants

*p value<0.01= Statistically highly significant; p value <0.05= statistically significant; p value>0.05= statistically non-significant
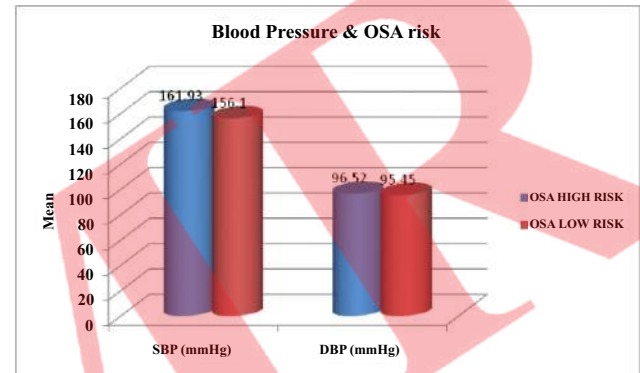

Fig 2: Distribution Of Study Participant On The Basis Of Blood Pressure & Obstructive Sleep Apnoea Risk

Below table describes the association between OSA risk and Body Mass Index. The association was observed to be statistically significant among all the categories.

BMI (kg/m2)		OSA RISK High Risk (n=42)	OSA RISK Low Risk (n=58)	Total (n=100)	P value
<18.50	Underweight	1	4	5	
18.50 to 24.99	Normal	18	34	52	0.141
25.00 to 29.99	Over weight	19	14	33	
>30.00	Obese	4	6	10	

Table 4: Association Between BMI & OSA Risk

DISCUSSION

Studies from around the world have consistently shown body weight as the strongest risk factor for obstructive sleep apnoea. In the Wisconsin Sleep Cohort study, a one standard deviation difference in body mass index (BMI) was associated with a 4-fold increase in disease prevalence Other population- and community-based studies conducted in the United States and other countries have confirmed that excess body weight is uniformly associated with a graded increase in prevalence of obstructive sleep apnoea ,Several epidemiologic studies have described the higher incidence of snoring and sleep apnoea among men compared to their female counterparts.

This study showed that overweight and obese subjects having high body mass index were high risk of

Obstructive Sleep Apnoea in comparison to normal weight subject, which is in accordance with the study done by Paul E. Peppard et al in 2013 (13) who stated that overweight and obesity are strong causal factors for SDB, and Prevalence of SDB among adults has increased substantially.

This study showed that hypertensive who were overweight and obese having high body mass index were found to have strongly statistically significant (P<0.05) higher systolic and diastolic blood pressure.

This study shows that hypertensive's who were overweight or obese were more likely to be having sleep related disorders OSA than those with normal body mass index. Similarly, a higher percentage of overweight and obese subjects were found to be at a high risk of obstructive sleep apnoea using the Berlin questionnaire. which is with in accordance to the study done by Adeseye Abiodun Akintunde et al in year (2012) (14) on snoring and Obstructive Sleep Apnoea syndrome among hypertensive 'Nigerians' shows that prevalence of OSA was also higher among over weight, hypertensive and obese, hypertensive subjects than normal body mass index hypertensive subjects. which was in accordance with the similar results.

This study also revealed that A positive relationship between Obstructive Sleep Apnoea and risk of high incidence hypertension. Which is Accordance with the study done by David A. Calhoun et al in (2010) on Sleep and Hypertension which demonstrated strong correlation between the severity of obstructive sleep apnoea and the risk and severity of hypertension, Also a prospective studies of patients with Obstructive Sleep Apnoea demonstrate a positive relationship between Obstructive Sleep Apnoea and risk of high incidence hypertension.

CONCLUSION

Obstructive Sleep Apnoea in hypertensive subjects was calculated in percentage and the data was analyzed using Statistical Package for Social Sciences, version 23at the end of the study, the following conclusion was draw.

A strong correlation between OSA risk and Body Mass Index in hypertensive subject was found that, the association was observed to be statistically significant among all the categories. Underweight1 in high risk,4 in low risk and in Normal 18 in high risk 34 in low risk, in Overweight 19 high risk 14 low risk.

Early identification of BMI and OSA in hypertensive's subject management may reduce the development of cardiovascular risk in hypertensive subjects.

Study Limitations

It is a small study, but on the basis of the conclusion

drawn, further research can be undertaken with a larger sample size to ascertain any significant relation OSA with BMI v/s underweight normal weight overweight and obese and Hypertension.

Therefore early identification of BMI and OSA in hypertensive subject and management of sleep related disorders such as Obstructive Sleep Apnoea and obesity can further reduce the cardiovascular risk of hypertensive subjects.

REFERENCES

1. Craig L Phillips. Hypertension and obstructive sleep apnoea :Nature and science of sleep. 2013; 5: 43–52.

2. Consensus & Evidence-Based INOSA GUIDELINES (Indian initiative on Obstructive Sleep Apnoea Guidelines) First Edition-2014.1:11-14. http://icmr.nic.in/guide/INOSA %20 Guideline%202014/INOSA_english.pdf .

3. Grippi A M, Eliass A J Fisman A E, Kotloff M R,Pack I A; Pulmonary disease disorders, 5e: McGraw-Hill Global Education; 2015; 14:99 1510-1575.

4. Csiszer Iren C, Arpad S, Reka S, Adriana N. The Metabolic Syndrome and its Correlations with the Obstructive Sleep Apnea Syndrome. Indian Journal of Applied Research. 2011;3(8):50-52.

5. Harish M., Shukoor SR, Dharmic S; Comparative Study of Sleep Apnoea in Chronic Bronchitis and Emphysema :World J. Med. Sci.2014; 10 (1): 50-55.

6. Pham L,Schwartz A; The pathogenesis of obstructive sleep apnoea: Thorax Disv. 2015; 7(8):1358-1372.

7. Choi S, Lee S, Joo E.; Habitual Alcohol Consumption and Metabolic Syndrome in Patients with Sleep Disordered Breathing :PLOS ONE. 2016;11(8):e0161276 Pham L, Schwartz A; The pathogenesis of obstructive sleep apnoea: Thorax Disv. 2015;7(8):1358-1372.

8. Gus M, Goncalves S, Martinez D, de Abreu Silva E, Moreira L, Fuchs S et al; Risk for Obstructive Sleep Apnoea by Berlin Questionnaire, But Not Daytime Sleepiness, Is Associated With Resistant Hypertension: A Case-control Study.American Journal of Hypertension 2008;21(7):832-835.

9. Billimoria A R, Maiya M , Mukherjee Sukumar, Munjal YP et al. Indian Guidelines on

Hypertension (I.G.H.)-III. 2013; 61(2): 34-36.

10. WHO | Raised blood pressure [Internet]. Who.int. 2018 [cited 8 October 2018]. Available from:http://www.who.int/gho/ned/risk_factors/blood_pressure_prevalence_text/en/

11. Garg R, Prasad R, Jabeed P, Singh A, Saheer S, Verma R. A; comparative study on the clinical and polysomnographic pattern of obstructive sleep apnoea among obese and non-obese subjects: Annals of Thoracic Medicine. 2012;7(1):26.

12. WHO | Global Database on Body Mass Index [cited 8 October 2018]. Apps. who. int. 2018. http://appa.who.int/bmi/index.jsp?introPage=intro_3.html

13. Paul E. Peppard, Terry Young, Jodi H. Barnet, Mari Palta, Erika W. Hagen, Khin Mae Hla; Increased Prevalence of Sleep-Disordered Breathing in adult : sam J Epidemiol 2013 May 1; 177(9): 1006–1014..

14. Adeseye Abiodun Akintunde, Oluyomi Oluseun Okunola, Rotimi Oluyombo, Yussuf Olatunji Oladosu, Oladimeji George Opadijo;Snoring and obstructive sleep apnoea syndrome among q hypertensive Nigerians:prevalence and clinical correlates: The Pan African Medical Journal. 2012;11:75.