Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(3), 2721-2726 | ISSN:2251-6727

A Cross-Sectional Study on the Prevalence of Obstructive Sleep Apnea in Patients with Uncontrolled Hypertension

Dr. B. Gayathri[1], Dr. U. Akhil krishnan[2], Dr. K. Pukazhenthi[3*]

[1,2]Assistant professor, Department of Respiratory medicine, Madha Medical College and Research Institute, Chennai, Tamil Nadu, India

[3]Associate professor, Department of Respiratory medicine, Madha Medical College and Research Institute, Chennai, Tamil Nadu, India

[*]**Corresponding Author**: Dr. K. Pukazhenthi

(Received Date: 12/04/2025 Revised Date: 08/05/2025 Accepted Date: 21/06/2025)

KEYWORDS

Prevalence, Obstructive, Sleep Apnea, Uncontrolled Hypertension

ABSTRACT:

Background:

Obstructive sleep apnoea (OSA) affects roughly half of patients with essential hypertension, while essential hypertension affects roughly half of patients with obstructive sleep apnea. If OSA is not treated, it can result in even resistant hypertension. These two things are frequently considered as a continuity of the same process and coexist. Due mostly to a lack of knowledge, 80–90% of OSA patients go untreated.

Material and methods:

This cross-sectional study was conducted in a tertiary care hospital during a one-year period. 179 hypertensive individuals who were older than 18 years were added to the trial after giving their informed consent. The STOP-BANG questionnaire was used to screen for OSA in all patients. Overnight polysomnography was used to confirm the diagnosis of OSA (AHI ≥5) in patients with scores of ≥3. Non-OSA patients were defined as those having an AHI <5 and a STOP-BANG score ≥2 or ≥3.

Results:

OSA was present in more than half (72.5%) of the research participants. Their mean age was 54.21±10.32 years, with a range of 18 to 75 years. It was discovered that the mean age of OSA cases was marginally greater than that of non-OSA individuals. The most of OSA cases were male. As BMI increased, there was a corresponding rise in both the prevalence and severity of OSA. It was found that the OSA group had considerably greater levels of triglycerides (TG), low-density lipoprotein (LDL), and high-density lipoprotein (HDL) than the non-OSA group.

Conclusion:

OSA was present in over half of our hypertensive individuals. These two illnesses are known as a deadly combination because they frequently coexist. Physicians should be more suspicious of early diagnosis and treatment in order to improve quality of life, lower the number of traffic accidents, and improve cardiovascular outcomes.

INTRODUCTION:

Hypertension continues to be a critical public health issue, contributing significantly to cardiovascular morbidity and mortality around the world.1,2 Many people still struggle to achieve adequate blood pressure (BP) control, even with advancements in medication and lifestyle therapies.3, 4 The treatment of resistant hypertension, which is characterized by blood pressure that stays over target levels even when three antihypertensive medications of various classes are taken at the same time, is very difficult.5. According to new

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(3), 2721-2726 | ISSN:2251-6727

research, obstructive sleep apnoea (OSA) and resistant hypertension may interact significantly, with OSA potentially making hypertension worse and making treatment more difficult.6–8

Intermittent hypoxia is a result of oxidative stress and vascular endothelial dysfunction brought on by OSA. On the other hand, low nitric oxide levels and an overabundance of sympathetic vasoconstrictor actions result in hypertension.9. Frequent episodes of apnoea also cause the sympathetic nervous system to become stimulated, which impacts the chemoreceptors involved in systemic inflammation and blood pressure regulation. Resistant hypertension is caused by the interaction of an overactive sympathetic vasoconstrictor and decreased nitric oxide.10–12 In patients with OSA, blood pressure control is crucial. Continuous positive airway pressure (CPAP) therapy, which is used to treat OSA, has been demonstrated in studies to help control blood pressure.13. As a result, diagnosing OSA in patients with uncontrolled hypertension is essential both as a therapy target and as an aggravating factor.

People at high risk for OSA are identified using the STOP-BANG questionnaire, a validated and popular screening tool, based on characteristics like snoring, fatigue, witnessed apneas, high blood pressure, body mass index (BMI), age, neck size, and sex.14 There is a shortage of evidence on Asian people, despite the fact that the association between OSA and resistant hypertension has been thoroughly investigated in western groups.15. Hence the purpose of this study was to investigate the prevalence of OSA in patients with hypertension.

MATERIALS AND METHODS:

A one-year cross-sectional observational study was undertaken at the Department of Medicine at a tertiary care hospital in Tamil Nadu.

Inclusion criteria:

The study included hypertensive patients who were at least eighteen years old and competent to give their permission. According to the 2018 European Society of Cardiology (ESC)/European Society of Hypertension (ESH) criteria, hypertension was defined as either known cases of hypertension receiving treatment or newly diagnosed patients with blood pressure ≥ 140 systolic blood pressure (SBP) and/or ≥90 diastolic blood pressure (DBP).

Exclusion criteria:

The study excluded individuals with glomerular filtration rate (GFR) < 15 m l/min/m2, end-stage renal disease (ESRD), chronic liver disease, coron ary artery disease, congestive heart failure, and establish ed chronic respiratory conditions (asthma, chronic obstr uctive pulmonary disease, COPD), diabetes mellitus, thyroid dysfunction, acquired immune deficiency syndrome (AIDS), drug misuse, depression, pregnancy, alcoholism, evident airway abnormalities, and any history of craniofacial, neck, or surgical trauma.

Data collection procedure:

The study was conducted after getting approval from Institutional Ethics Committee. All hypertension patients who were enrolled in this study had a physical examination and a thorough history that included information about their age, sex, underlying medical conditions, smoking, drinking, and activity. The standard office blood pressure measuring technique was used to take the blood pressure. In addition to blood pressure, each patient's height, weight, waist circumference, upper arm circumference, and neck circumference were assessed. Obesity was classified as having a BMI more than 25 kg/m2. Abdominal ultrasonography, thyroid profile, random blood glucose, renal function test, lipid profile, complete blood count, and serum electrolytes were all examined in each patient. The eight-item STOP-BANG questionnaire was handed out to all patients. It questioned about snoring, daytime fatigue, apnoea observed, high blood pressure, body mass index, age, neck circumference, and gender, in order to check for OSA. Every item received one point. We employed a cut-off value of three in line with earlier research since a score of ≥3 has a high sensitivity to identify OSA. Patients who scored at least three had polysomnography for the entire night. OSA was categorized using the Apnoea-Hypopnea Index (AHI) as mild (AHI 5–14), moderate (AHI 15–30), and severe (AHI >30).

Statistical Analysis:

For statistical analysis, IBM Corp., Armonk, NY's Statistical Package for Social Sciences (SPSS) version

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(3), 2721-2726 | ISSN:2251-6727

24.0 statistical analysis software was utilized. The student's t-test for analysis of variance (ANOVA) was used to compare the group of continuous variables, and the chi-square test was used to examine discrete data. The values were shown as mean ± SD and as a number (%). A p-value of less than 0.05 was considered as statistically significant.

RESULTS:

After obtaining the informed consent, 200 hypertension patients who met the inclusion criteria were added to the study. In order to be eligible for the polysomnography, each individual had to complete the STOP-BANG questionnaire. 145 individuals (72.5%) had a STOP-BANG score of ≥3 and were undergoing polysomnography, whereas 55 (27.5%) cases had a score of ≤2, had very little risk of obstructive sleep apnoea, and were not eligible for polysomnography (**Table 1**).

STOP-BANG score	No. of cases(n=200)	Percentage
score of ≤2	55	27.5
score of ≥3	145	72.5

Table 1: STOP-BANG score of the participants

46 of the 145 patients who had polysomnography had an AHI score of less than 5.0, while the remaining 99 patients had an AHI value of ≥5 (**Table 2**). OSA was only identified in these 99 cases. A correlation between an increase in the STOP-BANG score and an increase in the AHI score was noted. Those with a STOP-BANG score of 3 (2.75 ± 3.6) had the lowest AHI score, which increased to 61.2 ± 18.1 for those with a score of 8. There was a statistically significant correlation between the AHI score and the STOP-BANG score (**Table 3**).

Polysomnography	No. of cases	Percentage
AHI < 5.0	46	32
AHI ≥ 5.0	99	68

Table 2: Polysomnography in hypertensive patients with a STOP-BANG score of ≥3 (n=145)

STOP-BANG score	No. of cases (n=145)	Min. AHI score	Max. AHI score	Mean ± SD
3	34	2	15	2.75 ± 3.6
4	35	2	95	14.1 ± 15.3
5	26	4	113	34.2 ± 27.2
6	21	5	148	39.3 ± 24.7
7	16	32	112	61.2 ± 18.1
8	13	40	85	27.4 ± 26.8

Table 3: Association of the STOP-BANG score and AHI score

55 hypertensive subjects with an AHI score of less than five were not determined to be at risk for OSA, despite having either a STOP-BANG score of ≥2 or ≥3 following the administration of the STOP-BANG questionnaire and subsequent polysomnography of screened cases. The remaining 145 (72.5%) individuals were diagnosed with OSA if their AHI score was ≥5 and their STOP-BANG score was ≥3. Accordingly, 72.5% of hypertensive subjects (n=200) had OSA (**Table 4**). 40 (27.5%) of the 145 OSA cases had AHI scores between 5 and 14, which were categorized as mild; 33 (22.7%) had AHI scores between 15 and 30, which were categorized as moderate; and the remaining 72 (49.6%) cases with an AHI score more than 30 were categorized as severe OSA.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(3), 2721-2726 | ISSN:2251-6727

Group	Description	No. of patients	Percentage
OSA	Hypertensive patients with a STOP-BANG score of ≥3 and AHI ≥5	145	72.5
Non-OSA	Hypertensive patients with a STOP-BANG score of ≤2 or score ≥3 but AHI <5	55	27.5
		200	100

Table 4: Prevalence of OSA in the hypertensive population

The mean age of the hypertension cases in our study was 54.21±10.32 years, with a range of 18 to 75 years. Although the mean age of OSA cases was slightly higher (54.02±10.32 years) than that of non-OSA cases (52.24±11.33 years), there was no statistically significant difference between the two groups. The percentage of non-OSA cases was higher than the percentage of OSA cases in lower age groups, such as those under 40, whereas the percentage of OSA cases was higher than the percentage of non-OSA cases in higher age groups. This association was likewise not determined to be significant statistically.128 (64%) of the 200 cases who were included in the study were male, while the remaining cases were female.

Significant variations were noted in the levels of triglycerides, HDL, and LDL between OSA and non-OSA patients. It was discovered that OSA patients had much lower HDL levels than non-OSA patients. It was discovered that the triglyceride and LDL levels in OSA patients were noticeably greater than those in non-OSA patients. No significant connection between the severity of OSA and the above factors was discovered.

DISCUSSION:

The majority of adults suffer from obstructive sleep apnoea (OSA), a serious sleep problem. Obesity, male sex, aging, and high blood pressure are the main risk factors for OSA. One possible cause of resistant hypertension is OSA. Due to a lack of knowledge and insufficient screening, a significant percentage of hypertension individuals have concurrent OSA, which is typically left untreated. The majority of research on the prevalence of OSA in hypertension comes from sources outside of India [16].200 hypertension cases were screened for OSA in the current study utilizing the STOP-BANG questionnaire. Of them, polysomnography was performed on 145 (72.5%) cases with a STOP-BANG score of ≥3. Of the individuals who had polysomnography, 99 (68%) had an AHI of ≥5, while 46 (32%) had an AHI of <5.0. OSA was only identified in these 145 cases. Consequently, 72.5% of our hypertensive patient had OSA.

There was a tendency of rising AHI scores in tandem with rising STOP-BANG scores. It was determined that there was a statistically significant correlation between the AHI score and the STOP-BANG score. In 2017, Ricardo Luiz de Menezes Duarte et al. carried out a study that was comparable. They discovered that at all AHI cut-off points, an increase in specificity corresponded with an increase in score. The STOP-BANG questionnaire is the most effective OSA screening tool, per their research [17]. Elizabeth S. Muxfeldt et al. conducted a cross-sectional investigation of 422 patients with resistant hypertension (RHT) who underwent full-night polysomnography (mean age = 62.4 ± 9.9 years; 31.3% male). Moderate/severe OSA (55%) and OSA (82%) were extremely common in RHT individuals [18].

The average age of the patients who participated in our study was 54.21±10.32 years. Compared to non-OSA cases (52.24±11.33), the mean age of OSA cases (54.21±10.32) was marginally higher. The mean age of the patients in the study by Cristopher John Worsnop et al. was 60.9+2 for treated hypertensives and 58+2.1 for untreated hypertensives, respectively. These findings are consistent with our study [19]. According to our research, growing older is a major risk factor for OSA. 128 (64%) of the 200 cases who were included in the study were male, while the remaining cases were female. A statistical analysis revealed that this difference was substantial.

Vahid Mohsenin et al., who examined 736 instances of OSA, found that there were more males than females. Hedner et al.'s study on 141 hypertensive patients in primary care also supported this one, finding that there was an independent association between hypertension and OSA in males but not in females and

that the prevalence of OSA was higher in males than in females [20, 21].

According to the study, OSA is linked to greater BMI, and as BMI rises, so does the severity of OSA. Therefore, it may be concluded that as BMI rises, so does the prevalence and severity of OSA. Gary D. Foster et al. provided support for this, as their study showed that over 86% of participants had OSA with an AHI of ≥5 events/h. AHI was 20.5 ± 16.8 events/h on average. Those with a higher BMI were more likely to have severe OSA (odds ratio 1.1; 95% CI 1.0-1.2; P = 0.03) [22].

Khin Mae Hla et al. conducted a cross-sectional community-based study in which they measured blood pressure in people with and without sleep disordered breathing while they were awake and asleep. The Wisconsin Sleep Cohort Study included 147 men and women, ages 30 to 60, who were chosen from among Wisconsin State employees. Participants with sleep apnoea had considerably higher mean blood pressure than those without the condition. Participants with a history of snoring or sleep apnoea had significantly higher blood pressure fluctuation during sleep than those without ($P < 0.05$) [16]. AHI ≥5 was present in 38% of the 34 untreated hypertensives, 38% of the 34 treated hypertensives, and 4% of the 25 normotensives, according to Christopher John Worsnop et al.

Thikriat S. Al-Jewair et al., who examined 200 consecutive male and female dental patients, provide support for our study. 81.8% of the males and 18.2% of the females ($p<0.05$) exhibited habitual snoring. Nine percent (n=17) of the sample experienced breathing pauses during sleep more than once each week. Compared to 21.7% of females, 78.3% of males had a high risk of OSA [23].

CONCLUSION:

OSA affected over half of the research participants. Severe OSA is far more likely to develop in male individuals with elevated weight, BMI, and uncontrolled hypertension. Because OSA is much more common in hypertensive patients, these patients should be easily screened using a straightforward questionnaire. Polysomnography may then be used for early diagnosis and treatment to lower morbidity and mortality and enhance quality of life.

CONFLICT OF INTEREST:

The authors declare that they have no conflicts of interest.

REFERENCES:

1. Zhou B, Perel P, Mensah GA, Ezzati M. Global epidemiology, health burden and effective interventions for elevated blood pressure and hypertension. Nature Reviews Cardiology. 2021 Nov;18(11):785-802.
2. Mills KT, Stefanescu A, He J. The global epidemiology of hypertension. Nature Reviews Nephrology. 2020 Apr;16(4):223-37.
3. Kario K, Hoshide S, Mogi M. Uncontrolled hypertension: the greatest challenge and perspectives in Asia. Hypertension Research. 2022 Dec;45(12):1847-9.
4. Carey RM, Moran AE, Whelton PK. Treatment of hypertension: a review. Jama. 2022 Nov 8;328(18):1849-61.
5. Flack JM, Buhnerkempe MG, Moore KT. Resistant hypertension: disease burden and emerging treatment options. Current Hypertension Reports. 2024 May;26(5):183-99.
6. Ahmed AM, Nur SM, Xiaochen Y. Association between obstructive sleep apnea and resistant hypertension: systematic review and meta-analysis. Frontiers in Medicine. 2023 Jun 2;10:1200952.
7. Jehan S, Zizi F, Pandi-Perumal SR, McFarlane SI, Jean-Louis G, Myers AK. Obstructive sleep apnea, hypertension, resistant hypertension and cardiovascular disease. Sleep medicine and disorders: international journal. 2020 Nov 23;4(3):67.
8. Brown J, Yazdi F, Jodari-Karimi M, Owen JG, Reisin E. Obstructive sleep apnea and hypertension: updates to a critical relationship. Current hypertension reports. 2022 Jun;24(6):173-84.
9. Lavie L. Obstructive sleep apnoea syndrome–an oxidative stress disorder. Sleep medicine reviews. 2003 Feb 1;7(1):35-51.

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(3), 2721-2726 | ISSN:2251-6727

10. Pimenta E, Stowasser M, Gordon RD, Harding SM, Batlouni M, Zhang B, Oparil S, Calhoun DA. Increased dietary sodium is related to severity of obstructive sleep apnea in patients with resistant hypertension and hyperaldosteronism. Chest. 2013 Apr 1;143(4):978-83.

11. Gottlieb DJ, Punjabi NM. Diagnosis and management of obstructive sleep apnea: a review. Jama. 2020 Apr 14;323(14):1389-400.

12. Chen J, Bundy JD, Hamm LL, Hsu CY, Lash J, Miller III ER, Thomas G, Cohen DL, Weir MR, Raj DS, Chen HY. Inflammation and apparent treatment-resistant hypertension in patients with chronic kidney disease: the results from the CRIC study. Hypertension. 2019 Apr;73(4):785-93.

13. Labarca G, Schmidt A, Dreyse J, Jorquera J, Enos D, Torres G, Barbe F. Efficacy of continuous positive airway pressure (CPAP) in patients with obstructive sleep apnea (OSA) and resistant hypertension (RH): Systematic review and meta-analysis. Sleep medicine reviews. 2021 Aug 1;58:101446.

14. Pivetta B, Chen L, Nagappa M, Saripella A, Waseem R, Englesakis M, Chung F. Use and performance of the STOP-Bang questionnaire for obstructive sleep apnea screening across geographic regions: a systematic review and meta-analysis. JAMA network open. 2021 Mar 1;4(3):e211009-.

15. Brant LC, Passaglia LG, Pinto-Filho MM, de Castilho FM, Ribeiro AL, Nascimento BR. The burden of resistant hypertension across the world. Current Hypertension Reports. 2022 Mar;24(3):55-66.

16. Hla KM, Young TB, Bidwell T, Palta M, Skatrud JB, Dempsey J. Sleep apnea and hypertension: a population-based study. Annals of internal medicine. 1994 Mar 1;120(5):382-8.

17. Duarte RL, Fonseca LB, Magalhães-da-Silveira FJ, Silveira EA, Rabahi MF. Validation of the STOP-Bang questionnaire as a means of screening for obstructive sleep apnea in adults in Brazil. Jornal brasileiro de Pneumologia. 2017;43(06):456-63.

18. Muxfeldt ES, Margallo VS, Guimarães GM, Salles GF. Prevalence and associated factors of obstructive sleep apnea in patients with resistant hypertension. American journal of hypertension. 2014 Aug 1;27(8):1069-78.

19. Worsnop CJ, Naughton MT, Barter CE, Morgan TO, Anderson AI, Pierce RJ. The prevalence of obstructive sleep apnea in hypertensives. American journal of respiratory and critical care medicine. 1998 Jan 1;157(1):111-5.

20. Mohsenin V, Yaggi HK, Shah N, Dziura J. The effect of gender on the prevalence of hypertension in obstructive sleep apnea. Sleep medicine. 2009 Aug 1;10(7):759-62.

21. Hedner J, Bengtsson-Boström K, Peker Y, Grote L, Råstam L, Lindblad U. Hypertension prevalence in obstructive sleep apnoea and sex: a population-based case–control study. European Respiratory Journal. 2006 Mar 1;27(3):564-70.

22. Foster GD, Sanders MH, Millman R, Zammit G, Borradaile KE, Newman AB, Wadden TA, Kelley D, Wing RR, Pi Sunyer FX, Darcey V. Obstructive sleep apnea among obese patients with type 2 diabetes. Diabetes care. 2009 Jun 1;32(6):1017-9.

23. Al-Jewair TS, Nazir MA, Al-Masoud NN, Alqahtani ND. Prevalence and risks of habitual snoring and obstructive sleep apnea symptoms in adult dental patients. Saudi medical journal. 2016 Feb;37(2):183.