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RESISTANT HYPERTENSION IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA

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Abstract

Obstructive sleep apnea (OSA) is a sleep disorder characterised as complete or partial upper airflow cessation during sleep. Although it has been widely accepted that OSA is a risk factor for the development of hypertension, the studies focusing on this topic revealed inconsistent results. We aimed to clarify the association between OSA and resistant hypertension among the population of Calicut district in the state of Kerala. The study was conducted using the STOPBANG questionnaire. All individuals included were between the ages of 35-65 and had previously documented resistant hypertension. The responses from 49 people that fit the inclusion criteria have been analysed. 16/49 of the participants were placed in scores of 0-2, 15/49 were placed in scores of 3-4 and 18/49 were placed in the scores of 5-8. Based on our study, we can conclude that OSA is related to an increased risk of resistant hypertension among the population studied.

Introduction

Worldwide, hypertension is the leading preventable cause of mortality. Hypertension is the most frequent medical condition in the United States, impacting 75 million adults. Treatment-resistant hypertension, defined as an elevated blood pressure despite the use of three antihypertensive drugs from different drug classes (including a long-acting calcium channel blocker, a renin-angiotensin system blocker, and a diuretic) or a controlled blood pressure with four or more medications, affects 10.3% of adults worldwide and 19.7% of adolescents[3,4,15,24]. All types of treatment-resistant hypertension harm target organs such as the brain, kidneys and heart, resulting in myocardial infarction, stroke, chronic kidney disease, and heart failure.

According to data from 1950 to 2014, India's total prevalence of hypertension is 29.8% (95 percent CI 26-7-33.0) [1]. A meta-analysis of prior Indian prevalence studies reveals a considerable rise in hypertension prevalence from 3% to 4.5 percent in the 1960s to 11%–15.5 percent in the mid-1990s [20]. Hypertension prevalence studies in urban and rural populations from the mid-1990s to the present reveal an upward trend, with a bigger increase in urban (33.8%) than rural (27.6%) populations [1,5]. Nonetheless, people in urban India have better blood pressure control (20.2 percent) than those in rural India (10.7 percent) [1]. The data on resistant hypertension in India are lacking, as compared to the statistics available of hypertension in the general population.

Despite the fact that pharmacologic control is the cornerstone of hypertension therapy, lifestyle changes are just as important. Obesity, which underpins many occurrences of hypertension and influences its treatment, is immediately addressed by health behaviours that promote weight loss, such as physical activity and hypocaloric diets. Other lifestyle behaviours such as sodium restriction, smoking cessation, moderate alcohol consumption, and treatment of obstructive sleep apnea (OSA) are also recommended as blood pressure control techniques [5,11].

Sleep is essential for mental and physical well-being, and when it is disrupted, it poses a serious public health risk [2,10]. Sleep disturbances, with the exception of OSA, have received minimal attention in resistant hypertension. All treatment-resistant individuals with hypertension should be evaluated for apnea and, if necessary, OSA therapy (e.g., continuous positive airway pressure (CPAP)) should be started [16,25]. Treating OSA may have a wide range of benefits since it can enhance sleep quality and duration, which can have an impact on other lifestyle goals including food and medical advice. The current study focuses on new findings since that time and concludes with recommendations for future research [8,9,21].

The goal of this study was to summarize the current state of knowledge combined with additional data about the link between OSA and treatment-resistant hypertension. The current study focuses on new evidence that has emerged since that time, and it concludes with recommendations for further research.

Methods

In this cross sectional study we gathered information trying to understand the relationship between obstructive sleep apnea and resistant hypertension among the general population of Calicut

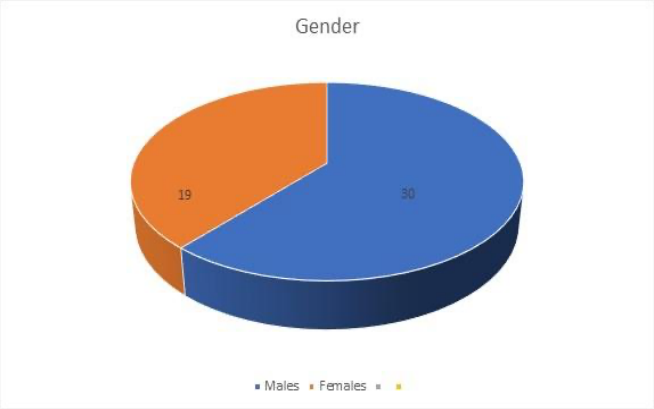
district in Kerala, India. We selected adults between the age of 35-65 to be included in our study. All individuals selected for our study had previously documented resistant hypertension being treated at the Calicut Medical College. Resistant hypertension is defined as a blood pressure that remains above goal despite concurrent use of three antihypertensive agents of different classes taken at maximally tolerated doses, one of which should be a diuretic.

All 49 participants answered self-administered standardized questionnaires about their current lifestyle, and health condition.

The studied screening tool was the STOP-BANG questionnaire which includes four questions related to snoring, tiredness, observed apnea, and high blood pressure. Two or more yes answers to STOP questions indicates high OSA risk. The BANG adds four more questions to the STOP section. The BANG questions assess the OSA risk based on BMI > 35 kg/m2, age > 50 years, (neck circumference > 41 cm for females and neck circumference > 43 for males) and male gender. Three or more yes answers to STOP-BANG questions indicate high OSA risk. In this study, all individuals had one point each for having high blood pressure and the rest of the score was calculated based on individual responses.

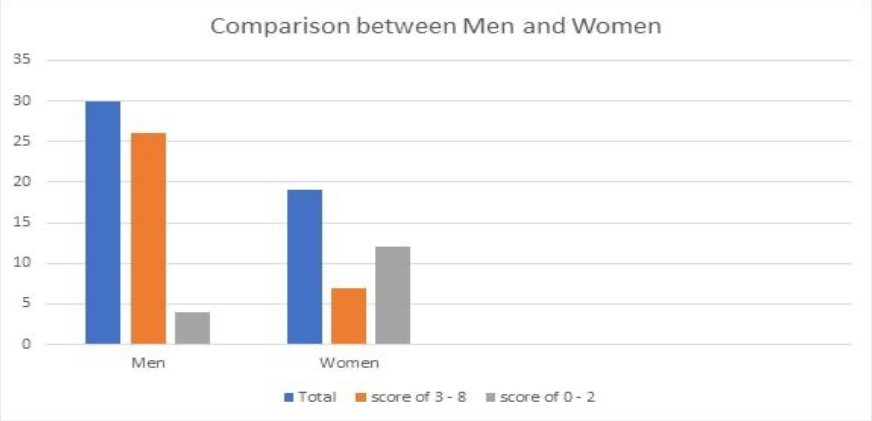
Results

49 participants had come forward and answered the STOP BANG questionnaire which was circulated online. The STOP BANG questionnaire is arranged into scores of 0-2, 3-4 and 5-8. According to the responses acquired from the participants 16 of them were placed in 0-2, 15 were placed in 3-4 and 18 of the participants were placed in the category 5-8. The participants that fall in between the scores of 0-2 were considered to be low risk. Those that fall in between the scores of 3-4 were considered to be in the intermediate zone whereas those that fall in the 5-8 category are said to be a highrisk individual. In our study, those participants that fall in the groups between 3-4, and 5-8 (33 participants) can be considered to have a correlation between resistant hypertension and obstructive sleep apnea.

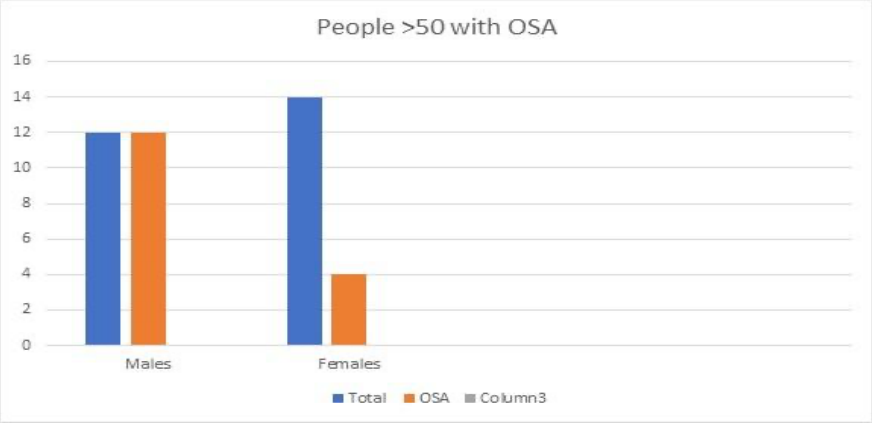


Among 30 males, 26 have a definitive link between resistant hypertension and OSA, and among 19 females 7 of them had a definitive link (based on the scoring criteria).

According to the result, it can be derived that OSA is potentially one of the many causes of resistant hypertension and is more common among men than in women.



According to the data there were 26 participants over the age of 50, in which 16 of them were found to be suffering from Obstructive Sleep Apnea. Of the 16 participants 12 of them were males and 4 were females.



All 16 of the individuals who had a BMI of >35, had a definitive link between resistant hypertension and OSA.

Out of the 33 participants that were linked between resistant hypertension and OSA, 15 individuals (10-males, 5-females) were found to have a large neck circumference, this provides additional support in drawing a link between OSA and resistant hypertension.

As per all of the data that was put together, it can be concluded that patients who suffer from resistant hypertension can have multiple etiologies to their illness. From the feedback obtained through the questionnaire we can draw a relationship between resistant hypertension with other factors such as BMI, male gender and those with a large neck circumference.

Discussion

The data we collected gave rise to several relevant findings. First, there was a significant link between sleep apnea in patients with hypertension, representing nearly all male subjects, and a moderate association in females. Secondly, there was a complete association of all obese patients with OSA. The increased prevalence of OSA among individuals with resistant HTN is likely due to a variety of factors. For starters, both resistant HTN and OSA may have risk factors in common. Obese people constituted nearly one-third of all subjects. Obesity is a well-known risk factor for OSA and is a typical feature of people with resistant hypertension [17]. The research failed to reveal a statistically significant link between neck circumference and resistant hypertension, although a modest association can be made. This can be attributed to the low sample size of 49 subjects.

OSA is known to be linked to high blood pressure [14,22]. The probable processes driving the connections, however, have yet to be fully understood. Several possible explanations may aid in our understanding of the link between OSA and hypertension. OSA generates oxidative stress and intermittent hypoxia, similar to hypoxia/reperfusion damage, resulting in vascular endothelial dysfunction [12]. Meanwhile, blood pressure increase is caused by excessive sympathetic vasoconstrictor output along with decreased nitric oxide bioavailability [18,19]. Furthermore, episodes of OSA increase sympathetic activity, which affects the chemoreflex and can lead to hypertension [6,7]. Individuals with sleep-disordered breathing have higher sympathetic nerve activity, as measured by 24-hour urinary catecholamine excretion, according to clinical observations [26]. Untreated OSA may also diminish pharmaceutical effectiveness due to pharmacokinetic or chronotherapeutic effects, potentially establishing a resistance pathway to antihypertensive medicines [13,23].

This study has certain limitations such as the sample size. We have a relatively small sample size with only 49 patients. The patients were enrolled in the study on the basis of themselves identifying as patients with resistant hypertension however, measuring of blood pressure on different occasions in a clinical setting was not performed. In our study, we found out that 33 individuals had moderate to severe OSA depending on the score from the STOP-BANG questionnaire. However, the gold standard for diagnosis of OSA still remains overnight polysomnography (PSG) owing to the low specificity of sleep questionnaires. The questionnaires also lacked the causative factor for their resistant hypertension, with this additional information, more insight would have been revealed about the several risk factors linked with resistant hypertension.

Overall, our study was able to demonstrate a statistically significant relation between OSA and resistant hypertension along with relevant factors such as gender, age, neck circumference, and obesity. Several of the shortcomings could have been overcome with a larger sample size, specific and precise diagnostic criteria, and a modified comprehensive questionnaire. Further studies must explore the link between the treatment of resistant hypertension and obstructive sleep apnea.

Conclusion

The STOP-BANG questionnaire was sent out to the population of Calicut district in Kerala. The majority of the participants were males (30) and the remaining 19 were females. The strongest correlation between OSA and treatment resistant hypertension was seen in the male population with 26 of the 30 participants and 7 of the 19 female participants. Therefore, in conclusion this study draws a positive relationship between OSA and treatment resistant hypertension among males in the population of Calicut district, Kerala.

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