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The Evaluation of Diastolic Hypertension in Sleep Overlap Syndrome

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ABSTRACT

Introduction: The overlap syndrome, consisting of obstructive sleep apnea hypopnea syndrome (OSAHS) and chronic obstructive pulmonary disease (COPD) is a major problem in COPD patients. OSHAS corresponds to the likelihood of systemic hypertension. The present study was aimed to evaluate the association between apnea-hypopnea index and diastolic blood pressure (DBP) in overlap patients.

Materials and Methods: We conducted a cross-sectional study involving overnight polysomnography after measurement of resting diastolic blood pressure (DBP) in patients with overlap syndrome in Sleep Laboratory of Imam Reza Hospital, Mashhad, Iran from November 2010 to July 2012. Participants were divided into four subgroups regarding to their Apnea-Hypopnea Index (AHI) (AHI <5, AHI: 5-15, AHI: 15-30 and AHI >30). Descriptive statistics included age, body mass index (BMI), OSA, Apnea-Hypopnea Index (AHI), DBP, and neck circumference.

Results: Sixty participants ranged between from 46 to 82 years old were entered into this study. There was statistically significant difference in mean DBP among different AHI subgroups (80±0.50, 95±0.60, and 105±0.65, respectively) (P<0.001). Additionally, there was statistically significant correlation between AHI and DBP (r= 0.60, P=0.01).

Conclusion: According to the findings of our study, DBP is an important cardiovascular concern in COPD patients with OSAHS and has a direct correlation with AHI.

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Introduction

Nowadays, obstructive sleep apnea syndrome (OSAS) is considered as one of the most common breathing disorders. OSAS is presented with intermittent partial to complete airway collapse and obstruction leading to frequent episodes of apnea and hypopnea and the breathing pauses that can cause acute adverse effects (1-3). A major acute adverse effect of OSAS is fluctuations in blood pressure and heart rate (2). OSA and chronic obstructive pulmonary disease (COPD) are common diseases that local previous studies clearly indicated them (4-5). The prevalence of OSAS is about 5% to 15% (6) while the prevalence of COPD is most commonly reported between 6-10% (7) and approximately 29 to 31 percent of adults in the United States have hypertension (8). Furthermore, 10 to 15 % of individuals with COPD, concurrently have sleep apnea (overlap syndrome) (4). In addition, OSA is correlated with adverse outcomes on health and quality of life due to increased risk for poor neurocognitive performance and organ system dysfunction (cardiovascular events)(9, 10). Many studies have reported that systemic hypertension is more common among individuals who have OSA than among those who do not, even after

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adjustment for confounding variables (11-13). These studies have found that the severity of OSA corresponds to the likelihood of systemic hypertension. In one study, the post-apneic mean arterial blood pressure [(1/3 x systolic blood pressure] + [2/3 x diastolic blood pressure]) increased to 105 mmHg from a baseline of 95 mmHg (14). Isolated diastolic hypertension is considered to be present when the blood pressure is <140/≥90 mmHg (15).

Nieto and colleagues (12) showed that mean systolic and diastolic blood pressure and the prevalence of hypertension increased significantly with increasing sleep-disordered breathing.

To our knowledge, there is no published study on the association of obstructive sleep apnea hypopnea syndrome with the diastolic blood pressure in COPD patients. Therefore, this study aimed to determine the associated conditions between apnea-hypopnea index in COPD patients and diastolic blood pressure.

Materials and Methods

We conducted a cross-sectional study involving overnight polysomnography (PSG) after measurement of BP from November 2010 to July 2012 in Sleep laboratory of Imam Reza Hospital, Mashhad, Iran. All COPD patients who had history of snoring, apnea or excessive day-time sleepiness were enrolled into this study. All patients with pneumonia, ischemic heart disease, lung cancer, heart failure, diabetes mellitus, systolic hypertension, and positive history for sedatives were excluded. Demographic information including weight, height, body mass index (BMI), and neck circumference were measured for all participants. COPD was recognized by spirometric classification, using guidelines of global initiative for obstructive lung disease (GOLD) (16). All participants were underwent an overnight PSG test using 'Somnomedics 2008 system. OSA and desaturation (minimum of oxygen saturation) were recorded. Apnea-Hypopnea index was measured in all patients. The AHI is consisted of summation of all apneas and hypopneas in one hour. We categorized our patients in to four categories based on the AHI: AHI <5, AHI: 5-15, AHI: 15-30, and AHI >30. Written informed consents were initially obtained from all patients and the study protocol was approved by the Ethics Committee of Mashhad University of Medical Sciences.

Table 1. Characteristics of the studied participants

	Minimum	Maximum	Mean±SD
Age	46.00	82.00	61.01±7.78
BMI	22.50	46.40	31.98±5.89
AHI	.30	69.80	17.70±17.53
OSA	2.00	324.00	70.73±72.59
Desaturation	56.00	88.00	75.70±8.61
DBP	70.00	110.00	90.00±9.87
Neck circumference	32.00	50.50	40.17±4.64

Body mass index (BMI), Obstructive sleep apnea (OSA), Apnea-Hypopnea Index (AHI), Diastolic blood pressure (DBP)

Statistical analysis

The data were analyzed using SPSS 11 for windows (SPSS Inc., Chicago, IL, USA). All data were checked for normality by Kolmogorov–Smirnov test (K–S test). P-value less than 0.05 considered significant. Numerical data including age, BMI, AHI, OSA, desaturation, neck circumference and diastolic blood pressure are expressed as mean ± SD. ANOVA test was used for comparing the mean among different subgroups. Pearson's test was used for evaluating the correlation between variables.

Results

The characteristics of patients are shown in Table 1. There were a total of 70 participants, but 10 subjects were excluded due to their poor-quality spirometric test records. The age of the patients was ranged between 46 to 82 years old. Twenty-two patients (36.7 %) were female and 38 patients (63.3 %) were male. The average of BMI, AHI, DBP was 31.9843±5.8912 kg/m, 17.7067±17.53717, and 90.0000±9.87206 mmHg respectively. In our study, there was statistically significant differences in mean DBP among different AHI subgroups (80±0.50, 95±0.60, and 105±0.65, respectively) (P<0.001). The correlation of AHI and DBP is presented in Figure 1. As, this figure indicated, higher AHI was correlated with higher DBP (r=0.60, P=0.01). There was no significant correlation between DBP and neck circumference (r=0.20, P=0.63).

There was no difference between men and women regarding the correlation of AHI and DBP (P=0.70)

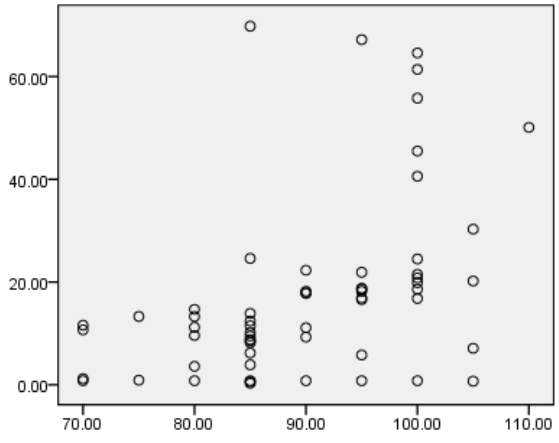

Figure 1. Correlation between apnea hypopnea index (AHI) and diastolic blood pressure (DBP)

Discussion

In this cross-sectional study, we aimed to evaluate the correlation of DBP with AHI index in patients with overlap syndrome (combination of COPD and OSAHS). We found statistically significant direct correlation between DBP and AHI. Also, the mean DBP was significantly different among AHI subgroups.

Overlap syndrome, consisting of COPD and OSAHS, is an important condition in COPD patients. Severe ventilatory complications like nocturnal oxygen desaturation, hypercapnic respiratory failure, and pulmonary hypertension are more prevalent in overlap syndrome comparing to the COPD alone (17). It is well accepted that COPD and OSAHS are systemic inflammatory conditions and both of them are considered as independent risk factors for cardiovascular diseases (17). Different cardiovascular events can occur in overlap syndrome (9). Systemic hypertension is an important and preventable risk factor in overlap syndrome.

In the present study, we found a statistically significant correlation between AHI and DBP. Our finding was compatible with the study of Li and colleagues (18) that found positive correlation between AHI and diastolic and systolic blood pressure in 1149 middle aged patients who were suspected to have OSAHS and underwent PSG. Additionally, we found a statistically significant difference in mean DBP among AHI subgroups. Furthermore, Guillot and colleagues (19) showed that an AHI ≥30 per hour was independently associated with incident hypertension after 3 years.

Lee and colleagues (20) aimed to find the sex effects and the role of poor sleep quality on systolic BP (SBP) and DBP in OSAS patients. They revealed that in male subjects, apnea-hypopnea index (AHI) was related with high DBP. We did not find difference regarding the correlation of AHI with mean DBP between men and women.

Our study had some limitations: Firstly, if we could expand the sample size, the conclusion of the results would be more accurate. Secondly, if we could consider a control group like COPD or OSAHS alone, the comparing of the results would be more interesting.

Conclusion

According to significantly increased amount of AHI and diastolic blood pressure, this study suggests that systemic factors may contribute to the pathophysiology of sleep disease breathing in COPD patients and findings of the current study might be useful base for further studies considering this issue in more detail.

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Conflict of interest

The authors declare no conflicts of interest.

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