

Prevalence and predictors of hypertension in Saudi patients with obstructive sleep apnea

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Hypertension (HTN) is a common health problem in Saudi population with a prevalence of 26.1% in middle-aged population.¹ On the other hand, obstructive sleep apnea (OSA) is a common sleep related breathing disorder characterized by a temporary cessation of airflow during sleep for 10 seconds or more despite continuing effort. A prevalence rate of 24% was reported in the middle-aged men and 9% in women.² In primary care setting, 3 out of 10 middle aged Saudi men and 4 out of 10 middle-aged Saudi women are at risk for OSA.^{3,4} The prevalence of HTN among OSA patients in developed countries has been reported to range from 26-59%.^{5,6} Most previous studies that explored HTN in OSA patients had focused on men. Additionally, no previous study has addressed this issue in Arabs. Therefore, we conducted this study to measure the prevalence of HTN among Saudi patients of both genders with laboratory confirmed OSA and determine the predictors of HTN in OSA patients.

Medical records of all Saudi patients (≥ 18 years) diagnosed with OSA based on type I attended all-night polysomnography in the University of Sleep Disorders Center at King Khalid University Hospital, King Saud University, Riyadh, Kingdom of Saudi Arabia between March 2003 to October 2007 were reviewed retrospectively. Full polysomnography (PSG) montage was used including 4 electroencephalographic (EEG) placements (C_1-A_4 , C_2-A_3 , O_1-A_4 , and O_2-A_3), and assessment of muscle tone and leg movements by chin and leg electromyography (EMG), eye movements by electrooculography (EOG), heart rate by electrocardiography (EKG), and oxygen saturation (SaO_2) by finger pulse oximetry. Chest and abdominal wall movements were measured using thoracic and abdominal belts. Airflow was monitored with a thermistor and a nasal prong pressure sensor. Sleep

position was documented with a position sensor and snoring assessed by recording with a microphone. Polysomnography analysis was performed using Alice® 4 and 5 diagnostic equipment (Respironics, Inc, Murrysville, Pennsylvania, United States). Page-by-page analysis and scoring of electronic raw data were performed manually. Obstructive apneas and hypopneas were scored manually in accordance with the American Academy of Sleep Medicine Criteria (AASM 2007).⁷ Obstructive sleep apnea was diagnosed according to the International Classification of Sleep Disorders (ICSD 2005).⁸ Hypertension was defined as definite HTN if the patient met the following conditions: 1) a previous diagnosis of HTN, 2) treatment with antihypertensive medications.⁵ As per the sleep disorders center protocol, blood pressure of patients is measured 3 times: (i) when first assessed by the specialists in the clinic; (ii) at bedtime in the sleep disorders center; and (iii) on awakening. Those with high blood pressure were reassessed for the possibility of HTN.

The study was approved by the Ethics Committee of the University. Data were expressed as mean \pm SD. Comparisons were made using t-test. If normality test failed, Mann-Whitney test was used. To define predictors of HTN, a univariate logistic regression analysis was developed. Variables that were significant in the univariate analysis were entered into a multivariate logistic regression analysis model to define the independent variables that influence the presence of HTN in OSA patients. Statistical significance was set at a p-value ≤ 0.05 . The standard statistical software (SPSS Version 16.0; SPSS Inc. Chicago, IL) was used for analysis.

Six hundred and six patients with OSA with a mean age of 46.1 ± 14.9 years (range 18-85 years), (388 or [64%] males) were included. The prevalence of HTN varies with the severity of OSA. Hypertension was present in 249 (41.1%) (56.9% females and 32.2% males). The prevalence of HTN varies with the severity of OSA; 12% in mild OSA, 19.7% in moderate OSA and 68.3% in severe OSA. These findings entail association not cause-effect. The comparison between

Table 1 - Demographic and polysomnographic features of obstructive sleep apnea (OSA) patients with and without hypertension (HTN).

Demographic	OSA patients with HTN	OSA patients without HTN	P-value
Age (year)	53.6 \pm 12.2	40.9 \pm 14.5	<0.001
Body Mass Index (kg/m ²)	39.0 \pm 9.6	34.66 \pm 9.6	<0.001
Epworth sleepiness scale	10.0 \pm 6.1	9.3 \pm 5.8	Not significant
Apnea hypopnea index (events/hour)	58.6 \pm 37.8	43.8 \pm 35.6	<0.001
Desaturation index (events/hour)	38.4 \pm 30.4	27.1 \pm 28.7	<0.001
Lowest O ₂ saturation	78.7 \pm 12.5	82.6 \pm 12.0	<0.001
Arousal index (events/hour)	60.3 \pm 35.3	49.2 \pm 31.7	<0.001

OSA patients with and without HTN are summarized in Table 1. Age, AHI index and body mass index (BMI), desaturation index, and arousal index were significantly higher in OSA patients with HTN. Among OSA patients with HTN, women were older (57.0 ± 11.1 years versus 50.1 ± 12.4 year, $p < 0.001$) and had a higher BMI (42.5 ± 9.2 kg/m² versus 35.6 ± 8.7 kg/m², $p < 0.001$) compared to men. There were no significant differences in polysomnographic parameters between men and women with HTN. Univariate regression analysis showed that BMI (>35) (odds ration [OR] 2.6; $p < 0.001$), male gender (OR 2.8; $p < 0.001$) and AHI (>30 /hours) (OR 2.0; $p < 0.001$) were predictors of HTN in OSA. Multivariate regression analysis revealed that BMI (>35) (OR 1.8; $p = 0.009$, CI: 1.7-2.4) was an independent predictor of HTN in OSA patients.

This study revealed a high prevalence of HTN in Saudi OSA patients particularly among women. Possible explanations of this high prevalence among women include older age and higher BMI. A recently published paper showed that Saudi women referred to the sleep disorders center with OSA are older and have higher BMI compared to men.⁹ Several studies demonstrated a causal-effect relationship between OSA and HTN.¹⁰ A number of mechanisms have been proposed to explain this relationship. Among these are endothelial dysfunction, oxidative stress, systemic inflammation, repetitive hypoxemia, increased sympathetic activation, release of vasoactive factors, and metabolic dysregulation. Moreover, treatment of OSA with continuous positive airway pressure has been shown to lower blood pressure at nighttime and daytime in HTN patients with OSA.¹⁰

Physicians with different medical specialties should keep in mind the strong association between OSA and HTN when dealing with HTN and OSA patients to avoid unnecessary delays in the diagnosis and management.

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Related topics

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