

Original Article

Sleep-disordered Breathing in Uncontrolled Blood Pressure: Our Experience

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ABSTRACT

Introduction: Sleep-disordered breathing is one of the greatest health problems. It comprises of obstructive sleep apnea, central sleep apnea, periodic breathing, and upper airway resistance syndrome. There are several studies reporting association of uncontrolled blood pressure with individuals having sleep disordered breathing. Data regarding this were sparse in developing countries. Therefore this study was performed to find out the sleep-disordered breathing among uncontrolled hypertensive patients.

Materials and Methods: Study was performed from January, 2014 to January, 2017 in sleep center in Kathmandu, Nepal. Patient with uncontrolled BP were included. Uncontrolled BP was defined as blood pressure >130/80 mmHg not on intensive antihypertensive regimen and resistant elevated BP was defined as blood pressure >130/80 mmHg despite intensive antihypertensive regimen. These patients were subjected for polysomnography.

Results: Three hundred patients were selected out of which 250 patients with uncontrolled blood pressure were included. They were subjected for overnight polysomnography. Among them, 70 patients (28%) were found to have mild obstructive sleep apnea, 20 patients had moderate obstructive sleep apnea (8%) & 15 had severe obstructive sleep apnea (6%).

Conclusions: This study concludes that those individuals having uncontrolled blood pressure has obstructive sleep apnea and these individuals have to undergo polysomnography.

Keywords: Apnea; Obstructive sleep apnea; Hypertension; Polysomnography

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INTRODUCTION

Sleep-disordered breathing (SDB) comprises obstructive sleep apnea (OSA), central sleep apnea & upper airway resistance syndrome. OSA is characterized by reduction in upper airway muscle tone resulting in repetitive complete (apnea) or partial (hypopnea) upper airway closure. OSA results in increased sympathetic nervous system activation, changes in baroreceptor function, increased oxidative stress, and endothelial dysfunction which can increase blood pressure.¹

Elevations in blood pressure (BP) often progresses to hypertension (HTN). In the Framingham Heart Study, high-normal BP was associated with an approximately two-fold increase risk of cardiovascular disease (CVD).^{2,3} Several studies which have focused the relationship of OSA and resistant HTN.^{4,6} It is unclear whether OSA severity level confers increased risk for elevated BP in our setting. Therefore this study was done to know the severity of sleep disordered breathing in patient with uncontrolled blood pressure.

Table 1 Characteristics of patients with uncontrolled hypertension n=250

Blood pressure,median (IQR)		Diabetes mellitus	35 (14%)
Systolic BP (mm of Hg)	135 (131,141.2)	Smoking history	46 (18.4%)
Diastolic BPBP(mm of Hg)	78.3 (74.5, 83.5)	ACE inhibitors or ARB	40 (16%)
Age (years) mean ± SD	62.5± 5.9	Beta Blockers	20 (8%)
Male : Female	140 (56%): 110 (44%)	Calcium Channel Blockers	50 (20%)
Body mass Index(kg/m2)	33.5±5.9 (mean± SD)	Diuretics	15 (6%)
≥30	65 (24%)	Alpha Blockers	2 (0.8%)

ACE: Angiotensin Converting Enzyme; ARB: Angiotensin II Receptor Blockers

Table 2: Obstructive sleep apnea in uncontrolled hypertensive patients (n=250)

	Number of patients (%)	P-Value
Mild OSA (AHI 5-15/hr)	70 (28%)	0.12
Moderate OSA (AHI 15-30/hr)	20 (8%)	0.018
Severe OSA (AHI >30/hr)	15 (6%)	0.02

Table 3: Logistic regression of Severe OSA with uncontrolled blood pressurepatients (n=250)

Factor	OR(95%; CI)	P Value
Severe OSA	2.05 (1.69-8.83)	0.02
Age	1.03 (0.97-1.10)	0.38
Male	0.97 (0.4-2.35)	0.95
Body Mass Index	1.06 (1.00-1.16)	0.04
Diabetes	2.65 (1.53-9.45)	0.005
Smoking	1.82 (0.73-4.61)	0.03

MATERIALS AND METHODS

This is a hospital-based cross-sectional study from January, 2014 to January, 2017 done in Swacon International Hospital and Sleep Care Center, Kathmandu, Nepal. Permission was obtained from ethical committee. Patients referred from different centers in Kathmandu who had uncontrolled hypertension were included and those with congestive cardiac failure (ejection fraction <30%) and acute coronary syndromes were excluded.

Out of the total, 250 patients with uncontrolled hypertension were included. Subjects were recruited using Epworth Sleepiness Scale (ESS) questionnaire. All the patients were evaluated by cardiologist and ophthalmologist. Elevated BP was defined a systolic Blood Pressure (SBP) \geq 130 mmHg or Diastolic Blood Pressure (DBP) \geq 80mmHg. Uncontrolled elevated BP was defined as SBP \geq 130mmHg or DBP \geq 80mmHg without use of an intensive antihypertensive regimen IAR (\geq 3 antihypertensive with 1 being a diuretic). Controlled BP was defined as SBP < 130 mmHg or DBP < 80mmHg. Demographic data including age, sex, Body Mass Index (BMI), history of diabetes, smoking history, and medication for hypertension were collected in structured Performa after informed consent. Subjects who met inclusion criteria underwent overnight level IV polysomnographic test using ALICE 5 done in sleep lab after written consent. Polysomnography reporting was done by certified sleep physician.

Statistical Analysis

Analysis was performed using a statistical software package (SPSS 22 for windows). Nominal variables were compared using Chi-square test or Fisher's exact test. Step wise multivariate logistic regression was performed with potential candidate variables as covariates. All the statistical tests performed were two tailed; $p < 0.05$ was considered statistically significant.

RESULTS

A total of 250 patients with uncontrolled BP were included. Among them, 140 were males and 110 were females. Mean age of patient was 62.5 \pm 5.9 years. Among the studied population, sixty five (24%) patients had BMI \geq 30 and 35 patients (14%) were

diabetics. (Table 1) All the patients were subjected for overnight polysomnography. Among them 105 had OSA - 70 (28%) patients had mild OSA, 20 (8%) patients had moderate OSA, and 15 (6%) patients had severe OSA. (Table 2) On logistic regression analysis, not adjusted for age, sex, BMI, nor smoking, severe OSA was associated with uncontrolled hypertension (OR 2.05, 95% CI 1.69-8.83) $P = 0.02$ (Table 3)

DISCUSSION

The main finding of this study was that SDB is more prevalent in hypertensive men. The results confirm the findings of previous smaller studies in which hypertensive and non-hypertensive subjects have been compared for the prevalence of SDB.^{4,5,7,8} Fletcher and coworkers compared 46 hypertensive men taken off medication with 34 age and weight matched normotensive control subjects. An Apnea-Hypopnea Index (AHI) > 10 was found in 30% of the hypertensive subjects and in 9% of the controls.⁹ In the Sleep Heart Health Study, a prospective population-based cohort, study patients with AHI > 15 had three times the odds of having hypertension at baseline compared to controls. After adjusting for demographics and anthropometric variables, odds ratio (OR) for hypertension for those with AHI ≥ 30 was 1.37 (95% confidence interval (CI), 1.03–1.83).² Heart Biomarker Evaluation in Apnea Treatment (HeartBEAT) study, a 4-site randomized controlled trial, found 3-fold higher odds of resistant elevated BP (OR 2.75, 95% CI 1.23-6.14, $p = 0.01$) in the severe OSA group in the model adjusted for age, sex, race, BMI, smoking, diabetes mellitus, and CVD.¹⁰

Limitation of this study is that the BP was measured only once in outpatient visit in most of the participants. Twenty four hour ambulatory BP monitoring may help to provide prognostic value.

Cardiovascular disease status was not considered as confounding factors. Dosage of medications and compliance with medication were not included in the analysis.

CONCLUSIONS

Sleep-disordered breathing is more prevalent in men with uncontrolled hypertension. AHI is independent predictors of uncontrolled hypertension irrespective of confounders. The results indicate that uncontrolled hypertensive patients are more prone to have sleep apnea. Therefore polysomnography is recommended to rule out SDB in uncontrolled hypertensive patient

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