

Assessment of Obstructive Sleep Apnea among Adult Hypertensive Patients on Follow Up at Jimma Medical Center

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Abstract

Introduction: Obstructive Sleep Apnea (OSA) is a sleep disorder in which air flow narrows or almost ceases. The pathophysiology of OSA-related health problems is most significantly associated intermittent hypoxia, which causes damage to cell functions. Determinants of the OSA were not identified in our study geographical area.

Objective: The aim of this study was to assess obstructive sleep apnea among adult hypertensive patients on follows up at Jimma Medical center (JMC) 2020.

Methodology: An institution-based descriptive cross-sectional study design was carried out at the JMC Clinic for Chronic Follow-up Care. All hypertensive patients who attended the JMC's Chronic Follow-up Clinic were our baseline populations, while those who gave their consent and met our inclusion criteria during the study period were enrolled as study participants. The data were cleaned and entered the computer using Epidata version 3.1 and exported to the Statistical Package for Social Sciences (SPSS) version 20.0 for analysis. Frequency, percentage and mean were calculated for descriptive statistics.

Result: A total of 291 adult hypertension patients with follow-up care at the JMC were included in the study, comprising 155 (53.3%) men and 136 (46.7%) women. The age of the participants ranged from 28 to 74years, and the mean age was 51 years. Of the 291 hypertensive patients screened for OSA using the STOP Bang questionnaire, 187 (64.3%) were classified as high risk for OSA.

Conclusion: The present study shows that the prevalence of OSA is considerably high, with remarkable fluctuations and increases in age and gender. Men are most affected by OSA compared to women.

Keywords: Obstructive Sleep Apnea; Prevalence; Hypertension; Ethiopia

Abbreviations

OSA: Obstructive Sleep Apnea; HTN: Hypertension; JUMC: Jimma University Medical Center; ETB: Ethiopia Birr; SBQ: STOP-Bang questionnaire

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Introduction

Obstructive sleep apnea (OSA) is characterized by repeated episodes of partial or complete blockage of the upper airway during sleep; It is a serious condition because it may lead to increased risk of poor neurocognitive performance and adverse outcomes due to recurrent excitation and overnight hypoxemia from months to years [1,2]. OSA is accepted as one of the major challenging sleep disorders that affects adults of all ages. Hypopnea or apnea leads to transient hypoxemia and hypercapnia [3].

Persistent high blood pressure (BP) above ($\geq 140/90$ mmHg), in spite of life-style modification and management with three antihypertensive medications in addition to a diuretic, defines OSA [4]. OSA is the intermittent apnea or lowering of airflow at some stage in sleep and is classified as mild, moderate, or excessive; primarily based totally at the quantity of those flow-confined respiratory occasions consistent with an hour. The apnea-hypopnea index (AHI) is classified as mild (AHI 5 - < 15), moderate (AHI 15 - < 30), and excessive (AHI ≥ 30) [5]. A research conducted among population display the affiliation of massive OSA among resistant HTN [6,7]. Among suffers from resistant HTN for long period of time, the severity of OSA is extremely high, ranging from 70% to 83% [8,9]. In patients with severe sleep disorder, there are a lot of factors that result in the patho-physiological manifestation of OSA-induced increased blood pressure [10], Similarly, OSA-induced hypoxemia causes systemic inflammation and oxidative stress, which necessarily increases peripheral arterial resistance and increases in blood pressure [11,12]. Peripheral arterial resistance begins with periodic hypoxemia, frequent waking, and impulsive sleep deprivation, thereby promoting increases in blood pressure [13]. OSA is even more common in hypertensive patients, with around 30% of hypertensive patients suffering from OSA from the previous study [14]. In relation to antihypertensive treatment, 38% of untreated hypertensive subjects and 38% of treated subjects had an apnea-hypopnea rate greater than five compared to only 4% of the normotensive subjects apnea in hypertensive adult [15].

Materials and Methods

Study area and period

The study was carried out at the JMC Chronic Follow-up Clinic in the Jimma town, which is 335 km southwest of Addis Ababa, and it is the largest referral hospital in southwest Ethiopia. The hospital provides a variety of specialized services one of which is chronic follow-up care for hypertension patients in addition to diabetes mellitus, chronic heart failure, and other chronic diseases care. The study was carried out from September 1 to October 1, 2020.

Study design and population: A descriptive cross-sectional study design was carried out in the hospital. All hypertensive patients who attended the chronic clinic at the JMC were from our populations of origin, while the study was conducted on the sampled hypertensive patients.

Sample size determination

The sample size was estimated by a single population proportion formula with finite population correction. The following parameters have been considered: 50% prevalence, 95% confidence interval, 5% margin of error. By considering the above assumptions, the calculated sample size was 384. Since the expected general population of hypertensive patients on follow-up in the chronic clinic was 875, which is less than 10,000, we use correction formula and then 10% for non-respondents rate was added. The final sample size was calculated to be 291.

Inclusion and exclusion criteria

All adult or elderly hypertensive patients who wished to participate and gave their consent were included. Pregnant women, asthmatics, chronic obstructive pulmonary diseases, critical illnesses and psychiatric disorders were excluded.

Data collection tool and procedures

The structured questionnaire was developed after reviewing various literatures and it contains socio-demographic characteristics, behavioral characteristics and the STOP BANG (SBQ) questionnaire for OSA screening.

SBQ was first instrumented in 2008. It is a brief, clear, reliable, and easy to retrieve. It consists of four components including snoring, fatigue, observed apnea and high blood pressure represented in STOP and BMI, age, girth of the neck, gender Bang represented in Bang. For each question, if the answer was “yes” its score was taken as 1, if it was “no” it was scored as 0. The overall total of rate value varied from 0 to 8. According to the ratings for detecting OSA risk, we classified OSA risk as mild, moderate or severe. Answering to more than three items was taken as a high OSA risk and answering to less than three items yes was taken as a low OSA risk [16,17]. Body weight was measured with a digital scale with an accuracy of 0.1 kg, while body height was measured with a portable stadiometer with an accuracy of 0.1 cm. The subjects were barefooted and worn light underwear during measurement. The BMI was easily calculated by dividing the person’s weight (kg) and to square of height (m²). The neck circumference was measured with inextensible plastic tape in an upright position and at the cricothyroid level.

Data analysis

After collection, all data checked, wiped clean and entered into Epi-Data 3.1 and exported to the Statistical bundle for Social Science (SPSS) 20. Frequency and percent had been computed for descriptive statistics.

Data quality assurance

Measurement had been taken to guarantee high-satisfactory of participants. Data collectors had been skilled with the aid of training by the main investigator for 2 day on the goals of the study, interviewing techniques, on chart evaluation procedures and instruments. The pre-test had been conducted at Shene Gebe hospital (on 5% of the sample size) on the hypertensive patients on follow-up and, then important adjustments had been done. The questionnaire was checked for consistency and completeness before data entry.

Result

Socio demographic characteristics of the study participant

A total of 291 adult hypertensive patients on follow up at JMC were included in the study, out of which 155 (53.3%) were males and 136 (46.7%) were females. The age of the participants ranged from 28 - 74 years and the mean age was 51. The result also showed that most of the participants (62.5%) live in the rural areas while others (37.5%) live in the urban setting (As shown in the table 1).

	Variables	Frequency	Percent
Age	<=28	1	.3
	29 - 38	17	5.8
	39 - 48	88	30.2
	49 - 58	151	51.9
	59 - 68	28	9.6
	> 68	6	2.1
Sex	Male	155	53.3
	Female	136	46.7

Address	Rural	183	62.5
	Urban	108	37.5
	Others	9	3.1
Religion	Muslim	194	66.7
	Orthodox	75	25.8
	Protestant	18	6.2
	Others†	4	1.4
Marital status	Married	287	98.6
	Divorced	4	1.4
Educational status	Illiterate	30	10.3
	Read and write	107	36.8
	Primary school	91	31
	Secondary school	34	11.7
	Diploma and higher	29	10
Occupation	Unemployed	20	6.9
	Farmer	103	35.4
	Employed	47	16.2
	Government employee	29	10
	Merchant	82	28.2
	Daily labor	10	3.4
Family history of HTN	Yes	29	10
	No	262	90

Table 1: Socio demographic characteristics of hypertensive patients in chronic clinic follow up at JMC Jimma town, Oromia Ethiopia, 2020.

†: Catholic, Wakefata.

Behavioral and habitual characteristics of the study participant

Table 2 presents the behavioral and habitual characteristics of the hypertensive patients. Of the 291 study patients, 186 (63.9%) were non-khat chewers and 105 (36.1%) were khat chewers. Similarly, the study reported one hundred and five (36.1%) participants with hypertensive disease having consumed alcohol compared to two hundred and sixty seven participants (91.8%) who haven't consumed alcohol. Smoking was not prevalent (6.9%) compared to non-smokers of participants (93.9%) with hypertensive disease.

Variables		Frequency	Percent
Khat chewing	Yes	105	36.1
	No	186	63.9
Alcohol drinking	Yes	24	8.2
	No	267	91.8
Smoking	Yes	20	6.9
	No	271	93.9

Table 2: Behavioral and habitual data on hypertensive patients in chronic clinic follow up at JMC Jimma town, Oromia Ethiopia, 2020.

STOP-BANG scores of the study participant

Table 3 shows that participants with hypertensive disease displayed lower STOP-BANG scores like snoring louder (3.8%) compared to those without snoring loudly (96.2%). They were more likely not to be tired during the day (97.3). Around half of the participants 132 (45.3%) were treated of high blood pressure and 47 (16.1%) were observed stop breathing during sleep. The study reported that the majority (98.3%) of the study participants showed Body Mass Index below thirty five (BMI < 35) compared to 1.7% of participants with BMI above 35. In the similar study of STOP-BANG scores, more than half of hypertensive patients (57.7%) were aged above 50 years, compared to 42.3% of patients < 50 years. Under STOP-BANG scores, by using 40 cm as corresponding best cut-offs for determining neck circumferences in *hypertension patients, only 0.7% showed above the cut point compared to the majority (99.3%) of the study patients below the indicated cut point if neck circumferences (As indicated in table 3).*

		Frequency	Percent
Snoring louder	Yes	11	3.8
	No	280	96.2
Tired during the day	Yes	8	2.7
	No	183	97.3
Stop Breathing/Choking	Yes	47	16.1
	No	244	83.9
Treated for High Blood Pressure	Yes	132	45.3
	No	159	54.7
BMI > 35	Yes	5	1.7
	No	186	98.3
Age > 50	Yes	168	57.7
	No	123	42.3
Neck circumferences > 40 cm	Yes	2	.7
	No	289	99.3
Male gender	Yes	155	53.3
	No	136	46.7

Table 3: STOP-BANG scores of hypertensive patients in chronic clinic follow up at JMC Jimma town, Oromia Ethiopia, 2020.

Prevalence of obstructive sleep apnea

Of the 291 hypertensive patients screened for OSA by the STOP-Bang questionnaire, 187(64.3%) were classified as high risk of OSA. Around two third (64.3%) of participants had STOP-Bang score 1 and above from this. Among this, 1.8% of participants had score 5 and above (As indicated in figure 1).

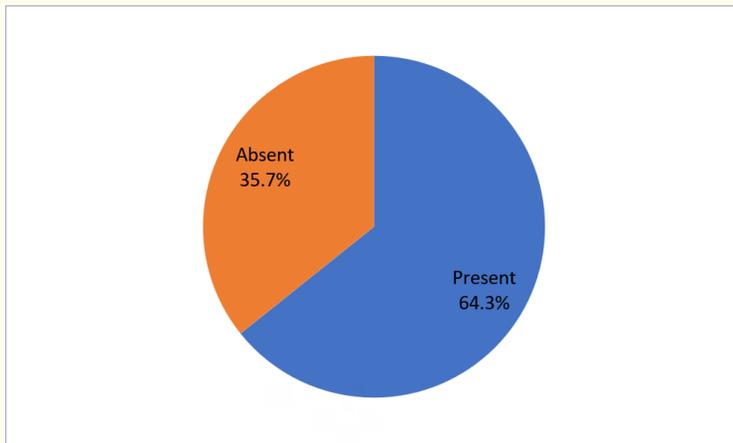


Figure 1: Prevalence of OSA risk among hypertensive patients on chronic clinic follow up at JMC Jimma town, Oromia Ethiopia, 2020.

OSA risk of the study participant

From the 187 high risk for OSA, 5 (1.8%) scored severe OSA, 55(18.9%) scored as 'Moderate, whereas 127 (43.6%) scored as "low" with OSA (as indicated in figure 2).

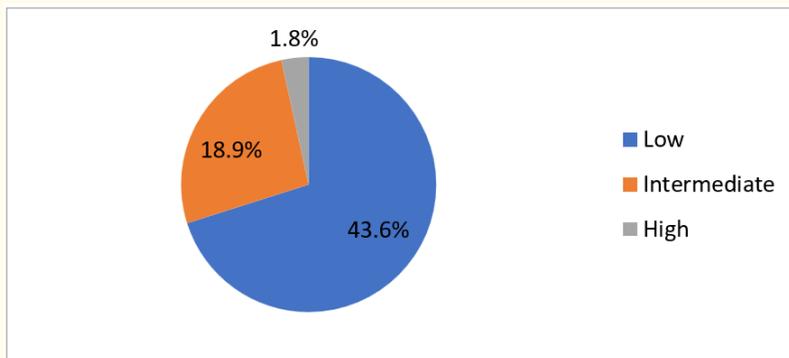


Figure 2: Severity of OSA among hypertensive patients on chronic clinic follow up at JMC Jimma town, Oromia Ethiopia, 2020.

Discussion

OSA prevalence is high and rising in all countries. Its global prevalence continues to increase in developed countries and appears highly related to vulnerability towards obesity [2]. Despite the significant prevalence of OSA across all developed and developing nations, it has

been positively ascertained to affect 24% to 26% of men and 17% to 28% of women between 30 and 70 years of age [7,8]. In this study, prevalence of obstructive sleep apnea among hypertensive patients was 64.3%. Similarly, according to one study done in Texas obstructive sleep apnea was estimated between 30 and 70% among hypertensive patients [18].

The current study prevalence was lower than that from a study done in Spain (83.5%) [19] and Brazil (71%) [20]. The difference could be due to variation in study design and sample size. The current study was higher than study done in Canada (23.6%) [21] and Australia [22]. The difference could be due to variation in study design and sample size as well as time of study. In this study prevalence of severity obstructive sleep apnea among hypertensive patients was 43.6%, 18.9% and 1.8% in subjects with mild, moderate and severe OSA, in line with a study conducted in Poland [23] lower than studies conducted in Israel [24] and Canada [21]. Repetitive OSA-induced hypoxemia and hypercapnia elicit reflex changes in both sympathetic and parasympathetic systems [25]. These autonomic derangements, with consequent increases in catecholamine levels, persist even into the daytime, and could contribute to the development of HTN [26]. Severe OSA may cause endothelial dysfunction, which is primarily driven by OSA-associated intermittent hypoxia. Observational data indicate that excess aldosterone could play a role in the relation between the severity of OSA and in resistant HTN [27-29]. Increased sympathetic activity in patients with OSA linked to increased chemo reflex drive is also thought to be one of the contributory causes for HTN [30].

Limitations of the Study

Screening by the STOP BANG questioner alone is not sufficient for making a diagnosis due to its high sensitivity and low specificity. People with mild to moderate sleep apnea did not correlate with elevated blood pressure within 24 hours. The actual drug compliance could not be determined due to a deficiency of drug dose data.

Conclusion

From the current study, the prevalence of OSA is significantly excessive with substantial variation in age and gender. Males are prevalently as compared to females.

Conflict of Interest

The authors declare no conflict of interest.

Authors' Contributions

Bekalu Getachew and Tesema Etefa designed the study, collected, analyzed and interpreted the data. Solomon Tesfaye, Urge Gerema, and Mengistu Ayele prepared the manuscript for publication. Tesema Etefa, Urge Gerema, and Mengistu Ayele conceived the study. Niguse Hamba, Diriba Dereje and Bekalu Getachew reviewed result and the draft of the manuscript.

Ethical Statement

Ethical approval was taken from Research Ethical Committee of Jimma University with IRB/012/2020. Written, informed consent was obtained from all participants by the local language before interview. Data was kept confidential. The rights to withdraw from the study were respected.

Informed Consent

Informed consent was obtained from all the participants included in the study.

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