

# Prevalence of Obstructive Sleep Apnea among Patients with Cardiovascular Diseases

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## Abstract

**Background:** Obstructive sleep apnea (OSA) is the most common sleep disorder that interrupts respiration during sleep. It is associated with increasing cardiovascular disease risk.

**Aim:** To screen for OSA among cardiovascular disease patients.

**Methods:** This is a cross-sectional study that was carried out in Makkah city and 451 patients were recruited. Data of this study was collected using a questionnaire which includes sociodemographic data and STOP-Bang test that consists of 8 questions, and net results of STOP-Bang test scoring was divided into OSA-low risk, OSA-intermediate risk and OSA-high risk.

**Results:** The majority of studied patients were males 315(69.8%), Saudis 370(82%), married 353(78.3%), diabetic 291(64.5%), and their age between 40 to 59 years. 81.4% of the studied patients have OSA-high risk, 9.3% have OSA-intermediate risk while 9.3% have OSA-low risk. The relationship between OSA risk scores and patients' characteristics shows a statistical significance ( $p < 0.05$ ) in all patients' characteristics except using medications for chronic diseases ( $p 0.228$ ).

**Conclusion:** OSA is highly prevalent among cardiovascular disease patients. Physicians' awareness regarding screening, diagnosis, and treatment of OSA is essential to prevent cardiovascular disease risks.

**Keywords:** Obstructive Sleep Apnea, Cardiovascular disease

## Introduction

OSA is characterized by recurrent attack of apnea and hypo-apnea during sleep, resulting from either partial or complete oropharyngeal obstruction, which leads to cessation or decreased airflow for more than 10 seconds, associated with decrease in oxygen saturation or awakening from sleep (1).

OSA affects approximately 17% of the adult population (2), but studies showed that it is a highly unrecognized and undiagnosed pattern (3).

It is characterized by snoring and unrefreshed sleep despite sleeping 7 to 9 hours (4). It is also highly associated in patients with different cardiovascular disease ranges from 30% hypertension to 60% arrhythmia including Atrial Fibrillation, heart failure (HF) and coronary artery diseases (CAD) (5).

In regard to OSA attacks, there is impaired diastolic function and atrial and aortic enlargement due to an increased cardiac load (6).

Sleep apnea and cardiovascular diseases share several risk factors which can be categorized into non modifiable risk factors such as male gender, old age, race and craniofacial or oropharyngeal anatomic abnormalities while the modifiable factors include obesity (7), hypertension, hyperlipidemia, glucose intolerance, alcohol and smoking (8).

## Methodology

This is a cross-sectional study that was carried out between 1/3/2020 to 1/6/2020 in Makkah cardiac centers at Al-Noor hospital, King Faisal hospital, King Abdul-Aziz hospital and King Abdullah medical city and UQU medical center.

The patients were recruited using systematic random sampling technique.

The calculated sample size is 369 based on the prevalence of OSA ranges from 30% hypertension to 60% arrhythmia including Atrial Fibrillation, heart failure (HF) and coronary artery diseases (CAD) (5). We selected the higher value of 60% to have sufficient power of study. The total population of Makkah is 2 million. Confidence intervals were taken at 95% and with a 5% margin of error. We added 20% more to the number to accommodate those who refused to participate in the study, hence the total sample size was 451.

All patients above age of 18-years-old, with cardiovascular diseases were included while patients who are known to have other sleep disorders and psychiatric patients were excluded.

Data of this study were collected using a questionnaire which included three sections:

The first section included social demographic data.

The second section was related to the disease: diagnosis, duration, medications, symptoms control, follow up, other sleep disorders and cardiovascular risk factors (diabetes mellitus, dyslipidemia, BMI, physical activity and family history of cardiovascular disease).

The third section was the STOP-Bang test (9) which included 8 questions, one point for each YES answer, and 0 for NO answer. SCORING depends on::

OSA - Low Risk : Yes to 0 - 2 questions

OSA - Intermediate Risk : Yes to 3 - 4 questions

OSA - High Risk : Yes to 5 - 8 questions

or Yes to 2 or more of 4 STOP questions + male gender  
or Yes to 2 or more of 4 STOP questions + BMI >35kg/m<sup>2</sup>  
or Yes to 2 or more of 4 STOP questions + neck circumference 17 inches / 43cm in male or 16 inches / 41cm in female

SPSS software, version 20 was used for performing all statistical analyses. Chi-squared test was used for categorical values.

Ethical approval was obtained from UQU ethical committee, as well as oral consent being taken from all participants.

## Results

The socio-demographic characteristics of the 451 patients who were recruited to this study are shown in Table 1. The majority of them were males 315(69.8%), Saudis 370(82%), married 353(78.3%), diabetic 291(64.5%), and their age was between 40 to 59 years.

Regarding Score's results of OSA screening, 367(81.4%) of the studied patients have a OSA-high risk, 42(9.3%) have OSA-intermediate risk, while 42(9.3%) have OSA-low risk (Table 2).

The high probability of having OSA among different cardiovascular diseases is shown in Table 4 while Table 5 studied the relationship between OSA - risk scores and patients' characteristics which shows statistical significance ( $p < 0.05$ ) in all patient's characteristics except using medications for chronic diseases ( $p 0.228$ ).

Table 1: Description of studied patients

Gender	Male	315(69.8%)
	Female	136(30.2%)
Nationality	Saudi	370(82%)
	Non Saudi	81(18%)
Marital status	Married	353(78.3%)
	Single	41(9.1%)
	Divorced or widow	57(12.6%)
Occupation	Working	270(59.9%)
	Retired	98(21.7%)
	Jobless	83(18.4%)
On medications	Yes	404(89.6%)
	No	47(10.4%)
Diabetic	Yes	291(64.5%)
	No	160(35.5%)
Diagnosed with Dyslipidemia	Yes	362(80.3%)
	No	89(19.7%)
Family history of OSA	Yes	258(57.2%)
	No	193(42.8%)
Age	18 to 39 years	62(13.7%)
	40 to 59 years	227(50.3%)
	≥ 60 years	162(35.9%)
BMI	≥30 kg/m <sup>2</sup>	394(87.4%)
	<30 kg/m <sup>2</sup>	57(12.6%)

Table 2: Risk Score of OSA among studied patients

	No (%)
Riskscore	
OSA - High Risk	367(81.4%)
OSA - Intermediate Risk	42(9.3%)
OSA - Low Risk	42(9.3%)

Table 3: Responses to eight questions of STOP-Bang test

Snoring / Do you Snore loudly?	Yes	362(80.3%)
	No	89(19.7%)
Tired / Do you often feel Tired, Fatigued, or Sleepy during the daytime?	Yes	361(80%)
	No	90(20%)
Observed / Has anyone Observed you Stop Breathing or Choking/Gasping during your sleep?	Yes	276(61.2%)
	No	175(38.8%)
Pressure / Do you have or are being treated for High Blood Pressure?	Yes	421(100.0%)
	No	30(100.0%)
Body Mass Index more than 35 kg/m <sup>2</sup> ?	Yes	295(65.4%)
	No	156(34.6%)
Age older than 50?	Yes	320(71%)
	No	131(29%)
Neck circumference (greater than 40 cm = 15.75 inches)?	Yes	317(70.3%)
	No	134(29.7%)
Gender / are you Male?	Yes	315(69.8%)
	No	136(30.2%)

Table 4: OSA risk among different cardiovascular diseases

	Score		
	OSA-High Risk	OSA-Intermediate risk	OSA-Low risk
Hypertension	350(83.1%)	35(8.3%)	36(8.6%)
Heart failure	118(94.4%)	4(3.2%)	3(2.4%)
Ischemic heart disease	132(91.7%)	11(7.6%)	1(0.7%)
Atrial fibrillation	88(93.6%)	4(4.3%)	2(2.1%)
Other arrhythmias	150(89.3%)	12(7.1%)	6(3.6%)
Stroke	91(94.8%)	2(2.1%)	3(3.1%)
Pulmonary hypertension	67(94.4%)	1(1.4%)	3(4.2%)
Peripheral arterial diseases	76 (98.7%)	0 (0.0%)	1(1.3%)

Table 5: Distribution of OSA risk scores according to parents' characteristics

		Score			P
		OSA - High Risk	OSA - Intermediate Risk	OSA - Low Risk	
On medications	Yes	333(82.4%)	36(8.9%)	35(8.7%)	0.228
	No	34(72.3%)	6(12.8%)	7(14.9%)	
Diabetes mellitus	Yes	264(90.7%)	18(6.2%)	9(3.1%)	0.000
	No	103(64.4%)	24(15.0%)	33(20.6%)	
Dyslipidemia	Yes	306(84.5%)	30(8.3%)	26(7.2%)	0.001
	No	61(68.5%)	12(13.5%)	16(18.0%)	
Family history	Yes	227(88.0%)	18(7.0%)	13(5.0%)	0.000
	No	140(72.5%)	24(12.4%)	29(15.0%)	
Gender	Male	262(83.2%)	31(9.8%)	22(7%)	0.033
	Female	105(77.2%)	11(8.1%)	20(14.7%)	
Marital status	Married	279(79%)	41(11.6%)	33(9.3%)	0.029
	Single	38(92.7%)	0(0.0%)	3(7.3%)	
	Divorced or widow	50(87.7%)	1(1.8%)	6(10.5%)	
Job	Working	207(76.7%)	34(12.6%)	29(10.7%)	0.001
	Retired	92(93.9%)	4(4.1%)	2(2.0%)	
	Jobless	68(81.9%)	4(4.8%)	11(13.3%)	
Age	18 to 39 years	48(77.4%)	3(4.8%)	11(17.7%)	0.001
	40 to 59 years	173(76.2%)	28(12.3%)	26(11.5%)	
	≥ 60 years	146(90.1%)	11(6.8%)	5(3.1%)	
BMI	≥30 kg/m <sup>2</sup>	347(88.1%)	27(6.9%)	20(5.1%)	0.001
	<30 kg/m <sup>2</sup>	20(35.1%)	15(36.3%)	22(38.6%)	



## Discussion

OSA is widespread and mostly underdiagnosed. It affects approximately 17% of the adult population (10). Statistics from the Multi-Ethnic Study of Atherosclerosis found that undiagnosed moderate to severe OSA is 84% to 93% in 2015(11). Studies from the United States found that 82% of males and 93% of females with OSA are undiagnosed (12).

Generally, males are at higher risk for OSA than females (13,14). In the present study 83.2% of males have OSA-high risk in comparison with 77.2% of the female patients. Research in Switzerland showed that 50% of males and 23% of females had OSA (15).

Additionally, other studies reported that 24% of males and 9% of females have OSA (16). Another Cohort study found that 10% of males and 3% of females between 30 and 49 years had OSA, while 17% of men and 9% of women between 50 and 70 years had OSA (17).

The present study reported that the risk of OSA increases with age and 90.1% of patients older than 60 have a higher risk for OSA. In another study of men over sixty-five years old, the prevalence of OSA was 23% in men below seventy two years and 30% in men over eighty (18).

OSA is highly prevalent in obese patients and increased weight is one of the major risk factors of OSA progression. The prevalence of OSA in obese individuals is approximately twice that of non-obese persons (19). In our study it was found that 88.1% of obese patients have OSA- high risk score.

OSA is more prevalent in individuals with cardiovascular disease particularly persons with underlying ischemic heart disease and in individuals with cardiovascular risk factors such as DM, hypertension, and HF (20). The prevalence of OSA in patients with CVD ranges from 30% (hypertension) to 60% (stroke, arrhythmia, end-stage renal disease) (21).

In our study we found that 91.7% of ischemic heart disease patients, 93.6% of patients with atrial fibrillation, 98.3% of patients with other arrhythmias, 94.8% of Stroke, 94.4% Pulmonary hypertension and 98.7% of patients with Peripheral arterial diseases have a high risk for OSA.

A study done by Javaheri S et al. reported that 83% of hypertensive patients have mild OSA while 30% of them had moderate to severe OSA; 55% of patients with HF had mild OSA while 12% of them had moderate to severe OSA; 50% of patients with arrhythmias had mild OSA and 20% of them had moderate to severe OSA. Patients with stroke ranged from 75% to 57%, and patients with ischemic heart disease ranged from 65% of them with mild OSA to 38% of them with moderate to severe OSA (22). Hypertension is one of the diseases included in metabolic syndrome. OSA is one of the most common conditions associated with resistant hypertension and numerous studies document increased risk and prevalence of hypertension in such persons with OSA (23). The prevalence of

OSA increases in patients with hypertension (30–80%), and it could reach 64% to 83% in patients with resistant hypertension (24).

OSA is 30% more common in individuals who had ischemic stroke as reported by The Sleep Heart Health Study (25) which is in agreement with our study.

### Arrhythmias.

OSA is more common among patients with arrhythmias such as AF, non-sustained ventricular tachycardia, and complex ventricular ectopy (26).

Several studies reported a high prevalence of OSA in patients with an acute stroke or TIA; it was 95% in one study (27).

OSA was an independent predictor of IHD. In some studies, the prevalence of OSA in patients with ACS was 40% to 50% (28) which coincides with the results of the present study.

The prevalence of OSA among patients with systolic dysfunction is 11% to 37% and it is 50% of patients with HF with preserved systolic function (29). In parallel with our study many studies found that up to 37% of patients with HF have OSA (30).

A systematic review and meta-analysis showed that prevalence of OSA in diabetic patients was reported to be 54.50% which is in agreement with our study which reported that 90.7% of diabetic patients have a high-risk score for OSA (31).

## Conclusion

OSA is highly prevalent among cardiovascular disease patients. Accordingly; screening, early diagnosis, health education, prevention and treatment are essential.

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