



## Cardiovascular Profile of Patients With Obstructive Sleep Apnea

### KEYWORDS

Obstructive sleep apnea, coronary artery disease, Metabolic syndrome, Diabetes Mellitus, Obesity.

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**ABSTRACT** Sleep-disordered breathing is a common condition affecting up to 9% of middle aged women and 24% of middle-aged men (1).

Obstructive sleep apnea (OSA) is increasingly being recognized as an important public health problem in the last two to three decades.

Accumulating data suggests that obstructive sleep apnea is being considered as an independent risk factor for cardio metabolic diseases and leading to increased morbidity and mortality. In an effort to quantify the risk of OSA patients for cardiovascular disease, we decided

to study cardiovascular profile in patients with established OSA.

Ours was a Prospective Observational study.

Our study included 87 subjects, who were diagnosed to have obstructive sleep apnea by overnight Polysomnography. Our study shows that there is strong association between severity of Obstructive sleep apnea & coronary artery disease.

### Objectives of the study-

- To study association between severity of Obstructive sleep apnea and coronary artery disease.
- To study association between severity of Obstructive sleep apnea and various components of metabolic syndrome

**Material and Methods-** Total of 87 subjects, who fulfilled our inclusion and exclusion criteria and were diagnosed to have obstructive sleep apnea by polysomnography were further studied.

- Both males and females were included.
- Age group= 21 years to 65 years old
- Body mass index > 23
- Waist circumference (measured in a horizontal plane midway between the inferior margin of the ribs and superior border of the iliac crest): for males > 90cm and for females > 80cm.
- Patients having symptoms of obstructive sleep apnea and high snore score.

Patients fulfilling above criteria were subjected for overnight polysomnography & those who were diagnosed to have obstructive sleep apnea (i.e. AHI >5, were included in the study), were included in the study.

### Exclusion Criteria-

- Sleep disorders other than OSA.
- Habitual drinker (more than three times per week), history of smoking.
- Underlying lung disease-obstructive, restrictive.
- Past history of Ischemic heart disease.
- Congestive cardiac failure, or evidence of LV dysfunction.
- Patients on steroid treatment, hormone replacement therapy, or with chronic use of drugs such as non-steroidal anti-inflammatory drugs, oral anticoagulants and lipid-lowering drugs.
- History of Cerebrovascular disease, Cardiovascular dis-

ease, Chronic renal failure, Hypothyroidism.

- Pregnant females.

### Data collection technique and tools-

- A detailed history was taken.
- All patients were examined thoroughly.
- Subjects who were willing for further studies and gave written consent, underwent overnight polysomnography. Depending on polysomnography results were divided into mild (AHI 5-15), moderate (AHI 15-30) and severe (AHI >30) [2].

CT Coronary/Conventional Coronary Angiography- Patients who had positive Stress test were subjected for conventional/ CT coronary angiography. Patients who had low probability (i.e. young females, lesser risk factors etc) were subjected for CT coronary angiography while elderly who had risk factors and likely hood of high Ca score were subjected for conventional coronary angiography.

<50% luminal stenosis= not significant

>50% luminal stenosis = significant

**8.5 Data analysis-** We have used chi-square test, Fishers exact test (when cell count is <5) to find association between various parameters with severity of OSA. Statistical test applies at 5% level of significance. P-value <0.05 is considered significant.

### OBSERVATIONS

Our study included 87 subjects, who were diagnosed to have obstructive sleep apnea by overnight Polysomnography.

27.58% were having mild OSA (AHI 5-15), 31.03% had moderate OSA (AHI 16-30), 41.37% had severe OSA (AHI >30) [2].

Total 87 subjects were enrolled in the study. Their age ranged from 21 to 65 years. These subjects were divided

into 9 groups by 5-year age interval and were studied according to the severity of OSA.

Out of 36 subjects with severe OSA, 22 (61.11%) were above the age of 51years, suggesting that as age increased severity of OSA also increased.

The Sleep heart Health Study <sup>(3)</sup> showed that 25% of men and 11% of women in the age group 40 to 98 years old had an AHI ≥ 15.

**1 )Hypertension and OSA severity-**

Hyper-tension	Mild OSA	Moder-ate OSA	Severe OSA	Total	Percent-age (%)	P-value
Yes	12	20	33	65	74.71%	<0.001
No	12	07	03	22	25.28%	
Total	24	27	36	87	100%	

By using Fisher's exact test p-value < 0.05 therefore there is association between occurrence of hypertension and severity of OSA.

This table shows 65/87 subjects where Hypertensive (newly detected + known hypertensive) i.e. 74.71% of study population, while 22/87 were not hypertensive i.e. 25.28%.

But 33/65 hypertensive subjects had severe OSA (AHI >30) i.e. 50.76% and 20/65 hypertensive subjects had moderate OSA (AHI 16-30) i.e. 30.76%, while 12/65 hypertensive subjects had mild OSA.

The above table shows that there is strong association between severity of OSA and hypertension.

**2) Body mass Index and severity of OSA-** 22.98% subjects were overweight, 28.73% Class I obesity, 40.22% had Class II obesity, 8.04% had Class III obesity.

29 patients out of 35 with class II obesity had severe OSA, while all the patients of class III obesity had severe OSA. , suggesting that as BMI increased severity of OSA also increases.

**3) Impaired Glucose tolerance and OSA-**

	Mild OSA	Mod-erate OSA	Severe OSA	Total	Percent-age (%)	P-value
Diabetes Mellitus	03	07	15	25	28.73%	<0.001
Pre-diabetes	04	10	13	27	31.03%	
Non diabetic	17	10	08	35	40.22%	
Total	24	27	36	87	100%	

This table shows that 25/87 subjects were having Diabetes Mellitus i.e. 28.73% of study population, 27/87 were pre-diabetics, i.e. 31.03% of study population and 35/87 were non diabetics i.e. 40.22% .But out of 36 subjects with severe OSA ( AHI >30) 28 were having Diabetes Mellitus or were pre-diabetics, and out of 27 subjects with moderate OSA 20 had either diabetes mellitus or were pre diabetics. Above table shows strong association between impaired glucose tolerance and severity of OSA (by using Chi-square test P-value <0.001)

**4)Dyslipidemia and OSA-  
Total Cholesterol:**

Total Cholesterol	Mild OSA	Moderate OSA	Severe OSA	Total	P-Value
A: >240	02	06	24	32	<0.001
B: 200-239	05	21	12	38	
C: <200	17	00	00	17	
Total	24	27	36	87	

**Conclusion:-** By using Fisher's exact test p-value < 0.05 therefore there is association between total cholesterol level and severity of OSA.

70/87 subjects i.e.80.45% of the study population had de-ranked Total cholesterol levels, while only 17/87 subjects i.e. 19.54% of the study population had normal total cholesterol levels. All subjects having severe OSA had de-ranked total cholesterol levels.

This table shows association between severity of OSA & Total cholesterol levels is statistically significant.

As severity of OSA increased levels of Total Cholesterol,LDL Cholesterol, serum triglyceride increased while HDL Cholesterol levels decreased.

**5)Coronary artery disease and OSA-**

CT Coronary Angiography/ Conventional Angiography	Mild OSA	Moder-ate OSA	Severe OSA	Total	Percent-age (%)	P-value
Normal Angiography	19	14	09	42	48.27%	<0.001
Single ves-sel disease	02	00	00	02	2.29%	
Double ves-sel disease	01	03	02	06	6.89%	
Triple vessel disease	02	06	12	20	22.98%	
Not done	00	02	08	10	11.49%	
Not Willing	00	02	05	07	8.04%	
Total	24	27	36	87	100%	

**Conclusion:-** By using Fisher's exact test p-value < 0.05 therefore there is association between coronary angiography and severity of OSA.

sOut of 87 subjects, based on positivity of stress test and high index of suspicion for coronary artery disease, 77 were advised to undergo Coronary angiography, either CT coronary angiography (in young subjects with low probability of having coronary artery disease) or conventional coronary angiography (in elderly subjects, high probability of coronary artery disease) Out of 77 subjects 07 subjects were not willing to undergo coronary angiography.

Total 70 subjects underwent coronary angiography. Out of 70 patients 42 had normal coronary arteries i.e. 60%, while 28 patients had coronary artery disease i.e. 40%. But 19 out of 24 subjects with mild OSA (AHI 5-15) had normal coronary arteries &14 out of 23 subjects with severe OSA (AHI>30) had either double vessel or triple vessel coronary artery disease, showing strong association between severity of OSA and coronary artery disease.

**Conclusion:**

- Those with severe Obstructive sleep apnea are at increased risk for hypertension, impaired glucose tolerance and dyslipidemia.
- Obstructive sleep apnea is associated with the metabolic syndrome or its core components, partly due to the common feature of obesity.
- There is strong association between severity of Obstructive sleep apnea and development of coronary artery disease.

Our findings highlight the importance of a high index of suspicion for OSA in subjects with metabolic syndrome and coronary artery disease and vice versa.

Efforts to carefully screen for and treat patients with sleep apnea would likely impact on consequent cardiovascular morbidity and mortality.

**Recommendations-**

- 1) High index of suspicion for obstructive sleep apnea is needed in subjects with metabolic syndrome, coronary artery disease and vice versa.
- 2) Currently, most patients are referred for diagnosis only when symptoms are severe enough to affect their quality of life, but early diagnosis and treatment, would likely impact on consequent cardiovascular morbidity and mortality.
- 3) Better understanding of this disease entity at the clinical, molecular and genetic levels is needed as it would help to formulate different treatment strategies in the future.
- 4) Future studies are needed to identify the intermediate mechanisms linking sleep disordered breathing to adverse cardiovascular and metabolic profile.

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