



## QUESTIONNAIRE BASED PREDICTION OF OBSTRUCTIVE SLEEP APNEA IN CARDIOVASCULAR DISEASES

### Cardiology

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### ABSTRACT

**BACKGROUND:** Obstructive sleep apnea (OSA) has been implicated in the pathogenesis of a variety of Cardiovascular Diseases Most often, OSA syndromes are under-diagnosed and undertreated. This study was conducted to predict sleep apnea in patients with cardiovascular diseases.

**METHODS:** In this prospective, questionnaire based clinical study; OSA was assessed using the Epworth sleepiness scale and Mallampatti score. Nicotine dependence was assessed using the Fagerstrom scale.

**RESULTS:** 90 participants were enrolled in the study. 7.7% of the participants had high, and 46.6% had moderate nicotine dependence. The co-morbidities widely prevalent were hypertension (36.7%), type II diabetes mellitus (24.4%), and COPD (2%). Overall prevalence of some degree of OSA was 57.8%. 30% of the study subjects had grade 4 sleep apnea.

**CONCLUSION:** Simple screening tools could be employed at primary health centers to identify patients with cardiovascular diseases that require a detailed sleep study.

### KEYWORDS

Obstructive sleep apnea, Nicotine dependence, Epworth sleepiness scale, Mallampatti score, Fagerstrom Scale

### INTRODUCTION

Obstructive Sleep Apnea (OSA) is an independent risk factor for hypertension, and vice versa. OSA has also been implicated in the pathogenesis of coronary artery disease, stroke, and atrial fibrillation.<sup>1,2</sup> The prevalence of OSA has been found to be 40 to 60% in patients with cardiovascular diseases. OSA syndrome manifests with excessive sleepiness at daytime, or a history of chronic fatigue. Several studies conducted over the last few years indicated that effective treatment of OSA improves morbidity, and survival of patients with cardiovascular diseases. However, most of the times, OSA syndrome is under-diagnosed and undertreated.<sup>3,4</sup>

The gold standard for diagnosis of OSA is nocturnal laboratory-based polysomnography (PSG). PSG is time-consuming, labor-intensive, and costly. The Epworth Sleep Scale (ESS) provides a rapid, validated method of screening and is useful in both clinical practice and research settings.<sup>5</sup> Another simple test that is often performed to predict OSA is the Mallampatti score. Such prediction using the ESS and Mallampatti score may be a useful guidance to indicate the requirement of PSG.<sup>6,7</sup> Previous studies indicated a strong association between smoking and OSA. Thus screening for OSA in smokers with cardiovascular diseases could improve treatment decisions, improve morbidity and mortality, and save health care costs.<sup>8,9,10</sup> With this background, this study was conducted to predict sleep apnea in patients with cardiovascular diseases.

### MATERIALS AND METHODS

A prospective, questionnaire based clinical study was undertaken. The study population consisted of patients attending the outpatient clinic in the department of cardiology at Vydehi Institute of Medical Sciences & Research Centre, Bangalore. The study was conducted over a period of 6 months from July to December 2017. Ethical clearance was obtained from the Institutional ethics committee. Patients diagnosed with cardiovascular diseases, with history of cigarette smoking and those willing to provide informed consent were included in the study. Patients who were suffering from congenital heart diseases, those seriously ill and not willing to participate were excluded.

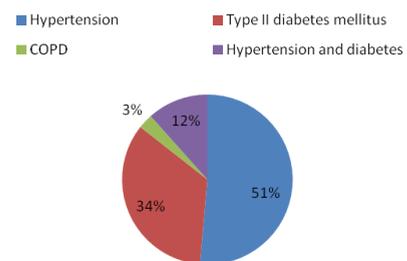
Data was recorded in a case report form. OSA was assessed using the ESS<sup>11</sup> and Mallampatti Score.<sup>12</sup> Nicotine dependence was assessed using the Fagerstrom scale for nicotine dependence.<sup>13</sup> Additionally, the

duration of the cardiovascular disease, presence of co-morbidities, alcohol dependence and social factors leading to substance dependence were ascertained. Data was analyzed using descriptive statistics. SPSS version 21 was used for the analysis. Fisher's exact test was used to determine the correlation between the factors. A 'p' value of <0.001 was considered to be statistically significant.

### RESULTS

**Demographic details:** A total of 90 participants were included in the study. All the participants were males. 37.7% participants were aged above 60 years, 54.40% between 40 to 60 years, and 7.7% were less than 40 years. The co-morbidities widely prevalent among the participants were hypertension (36.7%), type II diabetes mellitus (24.4%), and COPD (2%). About 8.3% of the study participants were both hypertensive and diabetic. The results are shown in Fig 1.

Figure 1: Presence of comorbidities



**Screening for OSA by ESS:** The overall prevalence of some degree of OSA with a score of more than 8 was 57.8%. Out of this, the prediction was that 34.40% of the participants had average amount of daytime sleepiness, 21.10% might need medical attention, and 2.2% were excessively sleepy mandating medical attention. Remaining 42.20% were unlikely to be abnormally sleepy.

**Mallampatti Score as an independent predictor of OSA:** 30% of the study participants belonged to grade 4 with soft palate not visualized at all. This indicates that they have a high risk for sleep-disordered breathing. Also, 36.60% belonged to grade 3, 24.40% grade 2 respectively. 8.8% of the participants had normal anatomy of the oropharynx.

**Fagerstrom test for nicotine dependence:** The participants smoked an average of 14 cigarettes over an average of 30.4 years, resulting in a mean Pack Years of 426. 7.7% of the participants had high dependence, 46.6% of the participants had moderate dependence, 28.9% had low to moderate dependence, and 16.8% of the participants had low dependence.

**Association between Mallampatti score and Epworth score:** Statistically significant association was found between Mallampatti Score and ESS (Fisher's exact test ( $P < 0.001$ )). Out of all the participants who had a Mallampatti Score of 4 (30%), 48.1% were found to be excessively sleepy and 7.4% mandated medical intervention due to excessive sleepiness; while all participants with a Grade 1 Mallampatti score (8.8%), were found unlikely to be abnormally sleepy. The results are shown in Tab 1.

**Table 1: Association between Mallampatti score and Epworth score**

Mallampatti Score	Epworth Score, n (%)				Total
	0-7	8-9	10-15	16-24	
1	8 (100)	0 (0)	0 (0)	0 (0)	8 (100)
2	17 (77.3)	3 (13.6)	2 (9.1)	0 (0)	22 (100)
3	7 (21.2)	22 (66.7)	4 (12.1)	0 (0)	33 (100)
4	6 (22.2)	6 (22.2)	13 (48.1)	2 (7.4)	27 (100)
Total	38 (42.2)	31 (34.4)	19 (21.1)	2 (2.2)	90 (100)

Note: According to Fisher's Exact Test  $P < 0.001$ ,  $n = 90$

**Mallampatti score I:** Complete visualization of soft palate II: Complete visualization of uvula III: Visualization of only the base of uvula IV: Soft palate is not visible at all  
**Epworth score 0-7:** Unlikely that patient is abnormally sleepy, 8-9: Patient has an average amount of daytime sleepiness 10-15: Patient may be excessively sleepy depending on the situation. Patient may want to consider seeking medical treatment 16-24: Patient is excessively sleepy and should consider seeking medical attention.

**Association between Fagerstrom scale and Epworth Score:** Statistically significant association was found (Fisher's exact test;  $P = 0.002$ ). Out of all the participants who had high nicotine dependence (7.7%), 57.1% were predicted to have excessive sleepiness, while out of the participants with low nicotine dependence (16.6%), 80% were unlikely to be abnormally sleepy. The results are shown in Tab 2.

**Table 2: Association between Fagerstrom scale and Epworth score**

Fagerstrom Scale	Epworth Score, n (%)				Total n (%)
	0-7	8-9	10-15	16-24	
1-2	12 (80)	2 (13.3)	1 (6.7)	0 (0)	15 (100)
3-4	15 (57.7)	7 (26.9)	4 (15.4)	0 (0)	26 (100)
5-7	10 (23.8)	20 (47.6)	10 (23.8)	2 (4.8)	42 (100)
>8	1 (14.3)	2 (28.6)	4 (57.1)	0 (0)	7 (100)
Total	38 (42.2)	31 (34.4)	19 (21.1)	2 (2.2)	90 (100)

Note: According to Fisher's Exact Test  $P = 0.002$ ;  $n = 90$

**Fagerstrom scale 1-2:** Low dependence, 3-4: Low to moderate dependence 5-7: Moderate dependence >8: High dependence  
**Epworth score 0-7:** Unlikely that patient is abnormally sleepy, 8-9: Patient has an average amount of daytime sleepiness 10-15: Patient may be excessively sleepy depending on the situation. Patient may want to consider seeking medical treatment 16-24: Patient is excessively sleepy and should consider seeking medical attention

## DISCUSSION

This study was conducted to evaluate the prevalence and predictors of sleep apnea in patients with cardiovascular diseases. In this study, 68.8% of the participants were aged above 50 years. Screening for OSA by ESS showed that the overall prevalence of some degree of OSA was 57.8%. It coincides with previous studies.<sup>14,15</sup>

The patients in this study had co-morbidities like hypertension, type II diabetes mellitus, and COPD. Previous studies support the fact that hypertension and OSA frequently co-exist.<sup>16</sup> Several large-scale, cross-sectional, and epidemiological studies have estimated that as many as 15% to 30% of patients with OSA have type II diabetes mellitus. They have also pointed out that as the severity of OSA increases, so does the likelihood and worse glycemic control in patients with T2DM. Previous studies also pointed out that OSA and COPD coexist in about 1% of the adult general population.<sup>17,18</sup>

In this study, Mallampatti score was used as an independent predictor of OSA. It was found that 30% of the study subjects belonged to grade 4 with soft palate not visualized at all. Hence, they were having a high risk for sleep-disordered breathing. This score is a simple, non-invasive, easy to learn, and quick test that requires no special equipment. The scoring could also be used to prioritize patients for PSA.<sup>7</sup> In this study, this fact is well proven as statistically significant association was found between Mallampatti Score and Epworth Score.

As smoking is an independent risk factor for both cardiovascular diseases and OSA, an attempt was taken to use the Fagerstrom scale to find out nicotine dependence in the study participants.<sup>19</sup> Out of all the participants who had high nicotine dependence, 57.1% were predicted to have excessive sleepiness. It is thus, very important to screen for OSA in patients on nicotine dependence.

The limitations of our study include a wide age range, absence of confirmatory sleep studies and failure to account for confounding factors like BMI.

## CONCLUSION

This study showed a high prevalence of OSA in patients with cardiovascular diseases by simple screening tools. These tools are less time consuming and cost effective. These could be employed at primary health centers, so that patients that require a detailed sleep study could be identified and directed to higher centers for further management. The study also showed a high prevalence of nicotine dependence in the study subjects. This mandates attention to smoking de-addiction measures in these patients along with lifestyle modification and management of co-morbidities. Thus, for the effective management of cardiovascular diseases, a multidimensional approach is imperative.

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