Prevalence of Obstructive Sleep Apnea and It's Association with Depression and Cognitive Dementia: A Systematic Review

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Abstract:

Background: Obstructive sleep apnea (OSA) and depression can be simultaneously present in a patient. The aim of this article is to summarize the prevalence of OSA in different countries across the world and demonstrate the association between OSA and depression along with other cognitive disorders.

Methods: PubMed/ Medline and Goggle Scholar was searched for relevant articles between 2001 and May 2023. Among the selected literature some article were excluded based on the exclusion criteria. The results of the remaining article was studied and summarized to derive a conclusion.

Result: The prevalence of OSA ranges between 3.57% to 26.94% in different countries. The study predicts that a significantly high prevalence of depression is seen in subjects with OSA (21.8%) compare to those without OSA (9.43%). Link between OSA and cognitive dementia has also been identified.

Conclusion: Prevalence of both OSA and depression is high in the community. Primary care physician should be able to detect these early and ensure proper treatment.

Keywords: Obstructive sleep apnea, depression, cognitive dementia

Introduction:

Obstructive sleep apnea (OSA) is the most common type of sleep related breathing disorder. Obstructive sleep apnea syndrome is characterised by repeated episodes of upper airway obstruction during sleep which is associated with intermittent hypoxemia, increased respiratory effort and arousals [1-2]. The most frequent clinical symptom is excessive day-time sleepiness. Inspite of having a large prevalence in the society OSA goes predominantly unnoticed and thus undiagnosed.

Obstructive sleep apnea occurs when the muscle in the back of our throat relaxes too much to allow normal breathing. When the muscle relaxes, the airway becomes narrow or closes as we breathe in, hampering our breathing for 10s or longer. The diagnosis of OSA is based on Apnea-hypopnea index (AHI). AHI can be defined as the number of apneic and hypopneic episodes per hour of sleep. Upto 5 episodes is considered normal and more than 30 episodes is considered as serious OSA.

OSA is associated with pulmonary hypertension, hypercapnia, hypoxemia and daytime sedation. OSA is also known to affect cardiac function especially in obese patients. [3,4] So, predicting the prevalence of OSA is essential. Like OSA depression is highly prevalent in the community. Depression impairs normal functioning and is related to a large number of comorbid conditions and can be considered a substantial public health burden.[5-7].

The relationship between OSA and depression is being increasingly recognised but the mechanism of their association is still not very clear. So there is a much larger need for study and research in this arena.

Aim:
1. To determine the prevalence of OSA.
2. To understand the association between OSA and depression along with cognitive dementia.

Methods:
PubMed/Medline and Google Scholar were searched for articles published from 2001 to May 2023 that reported the prevalence of OSA diagnosed by full polysomnography, instrumental sleep monitoring and questionnaire methods. Database was also searched for articles that linked OSA with depression, dementia and other neurodegenerative disorders. The search terms included obstructive sleep apnea, obstructive sleep apnea syndrome, prevalence, risk factor and the combination of all. Reference list of relevant articles was also checked for publications which may have been left out by electronic search. The selected publications were screened and those not written in English, focused on paediatric patients, performed in patients with comorbidities were excluded. Studies having small sample sizes and those which did not have the outcome to be studied were also excluded.

Pathophysiology:
Obstructive sleep apnea causes sleep fragmentation and intermittent hypoxia. This leads to hypoperfusion, endothelial dysfunction and neuroinflammation. Neuroinflammation results in blood brain barrier dysfunction. Dysfunction of blood brain barrier manifests as mild cognitive impairment which in the long run may lead to dementia. Blood brain barrier dysfunction along with hypoperfusion and endothelial damage may cause vascular depression or resistant depression[8].

Result:
The predisposing factors include obesity, male, late adulthood, hypothyroidism and certain anatomical characteristics of the face such as large neck, large tongue or short lower jaw [9].Currently 22 million Americans suffer from OSA however studies suggest that a large majority of people with moderate to severe OSA remains undiagnosed.

Table 1: Prevalence of OSA in different countries

Country	Author	Study Design	Study Sample	Observation
Iran	Amra et al.[10]	Cross sectional study using Berlin Questionnaire	The study sample consisted of 46.7% male and 53.3% female	Snoring was reported in 29.7% of the study sample.4.9% participants were identified to he at higher risk for OSA

Hong Kong	Ip et al[11].	Cross sectional study using PSG	The study sample consisted of a male population with a average age of 41.2∓6.2 years.	The study demonstrated the prevalence of SDB and OSAS to be 8.8% and 4.1%(AHI≥5) respectively.
Japan	Cui et al[12].	Cross sectional study with the help of pulse oximetry	The total sample size is 1313. 96% of the study population was male.	The prevalence of SDB is 8.5% in the subjects aged between 40-69 years and 4% in the subjects aged between 20-39 years.
Japan	Aasoka et al.[13]	Cross sectional study using home sleep monitoring.	The study recorded that 370 subjects underwent home sleep study	The prevalence of OSA is 3.7%
India	Sharma et al[14].	Cross sectional study using questionnaire and PSG	The study sample consisted of 2150 subjects. 52.8% of the subjects were male. Mean age is 43.9 years.	The study predicted the prevalence of OSA and OSAS in the population to be 13.74% and 3.57% respectively.
India	Reddy et al.[15]	Cross sectional study using questionnaire and PSG	The study sample consisted of 2505 subjects. 50.4% of the subjects were male. Mean age is 41 years.	OSA and OSAS were seen in 26.94% and 12.2% of the subjects respectively.
Korea	Kim et al.[16]	Cross sectional study using home sleep study or PSG.	The study sample consisted of 457 subjects. 67.6% of the subjects were male.	OSA was found in 42% men and 20% female. OSAS was present in 4.5% male and 3.2% female.

A study predicts that a significantly high prevalence of depression is seen in subjects with OSA(21.8%) compare to those without OSA(9.43%)[17]

Table 2: Association of OSA with depression and cognitive dementia

Country	Author	Study population	Neuro degenerative disorder assessment tool	Observation
USA	Peppard[18]	The study sample included 1408 subjects who were randomly selected	Modified Zung Depression Scale	Increase in SRBD category increases the chance of development of depression 1.8 times
Taiwan	Chen[19]	The study sample consisted of 2818 untreated OSA patients and 14090 control subjects from National Health Research Database.	Physician diagnosis	Patients with OSA had 2.18 times increased risk of depression after taking confounders into consideration like monthly income, diabetes, hypertension etc.
USA	Wheaton[20]	The study sample consisted of 9714 individuals of the community	PHQ-9	Among women with physician diagnosed OSA prevalence of depressive is 5 times higher (OR=5.2,CI 95%,2.7-9.9)
Canada	Smith[21]	The study sample includes records of 773 patients with OSA and controls from general population	Physician diagnosis	Apnea patients are at a higher risk of depression (OR=1.4,95% CI,1.0-1.9)
USA	Sharafkhaneh[22]	The study is based on the review of all VHA outpatient clinic files.	ICD-9-CM	Depressive disorder (OR=2.71, 95%CI, 2.62-2.81), dementia (OR=1.50, 95%CI, 1.34-1.67) are more prevalent in the OSA group.

USA	Torelli[23]	The study cohort consists of thirty individuals. Sixteen subjects have OSA and the remaining fourteen make the control group.	Voxel based morphometry	Short and long term memory deficits were associated with OSA.

Conclusion:

Depression and OSA have a severe impact on health. OSA is considered as the risk factor for depression and neurodegenerative disorders. But most of the time OSA remains undiagnosed and thus unmanaged. So early diagnosis and screening of OSA by primary physicians will enable them to safeguard the patients from the future incidence of depression, cognitive dementia and neurodegenerative disorders.OSA can be easily treated with positive airway pressure treatment and this would suppress and rather reverse the adverse effects of various neurodegenerative disorders.

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