Relationships between body mass index and depressive symptoms in patients with obstructive sleep apnea: A study from Northern part of India, Kashmir

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ABSTRACT

Background: Obstructive sleep apnea (OSA) often results in a wide range of psychological symptoms. The relationship of depressive disorders and depressive symptoms with body mass index (BMI) and severity of sleep apnea were the subject of numerous studies; results, however, were inconclusive in the majority of studies. Keeping this in view, we studied the correlates of depressive symptoms in patients with OSA. Relationships between BMI and depressive symptoms in patients with OSA. Methods: We performed polysomnography (PSG) studies of patients that were referred from various subspecialty clinics from July 2011 to August 2013. Ninety-five women and 87 men (total 182) diagnosed with OSA were reviewed for the presence of depressive symptoms and degree of sleepiness using the Epworth Sleepiness Scale (ESS) scores Hamilton Depression Rating Scale (HAM-D). Moreover, Mini-International Neuropsychiatric Interview Scale was applied at the time of PSG. This was followed by application of standard methods of statistical analysis. Results: Our sample included 27 (42.6%) men and 20 (57.4%) women, with a mean age of 58.60 ± 14.75 years. Women (61.6 ± 10.0) had a mean age significantly more (*P = 0.011) than that of men (54.0 ± 13.0). BMI has a statistical significant correlation with apnea–hypopnea index (correlation is significant at the 0.05 level [two-tailed]), ESS (correlation is significant at the 0.05 level [two-tailed]), and HAM-D (correlation is significant at the 0.01 level [two-tailed]). Conclusion: Depressive symptoms are more common and more severe in women with OSA than in men. There is definite relationship between BMI and depressive symptoms in patients with OSA. There is no causal relationship between OSA and depressive symptoms in the population studied.

Keywords: Body mass index, depression, obstructive sleep apnea

Obstructive sleep apnea (OSA) is a common sleep disruption syndrome that is due to a respiratory problem engendered by sleep itself. The common symptoms of OSA include daytime sleepiness, fatigue, irritability, and disturbed sleep and memory problems. The prevalence of OSA is estimated to be 3%–7.5% in men and 2%–3% in women. OSA often results in wide range of psychiatric disorders, in particular depression and anxiety. There have been few robust studies reporting that depression and depressive symptoms are correlated with OSA. Although small number of studies have found no association between the two common disorder. Researchers have reported that depression is more common in women with OSA than in men with OSA. Recent researches have shown that both depression and OSA have common underlying mechanisms. The repetitive upper airway obstruction causes frequent episodes of reduced or
no airflow during sleep. The result is sleep fragmentation, and hypoxemia may incite depressive symptoms. It is also postulated that depression may be simply outcome of depressed mood which may be due to any chronic medical conditions. Although the underlying mechanism how sleep apnea is linked to depressed mood, patients with comorbid OSA have impaired neurocognitive functioning and impaired quality of life. Obesity is frequent the major risk factor for the development of patients with OSA. The incidence of OSA in the obese population is very high and ranges from 40% to 93%. A prospective study (4-year follow-up) conducted in 690 inhabitants of Wisconsin reported that a 10% increase in weight was related to a 6-fold greater risk of OSA. There is increased prevalence of depression among obese individuals suffering from OSA, although OSA can be confounding factor in the study. Patients with obesity predispose to the development OSA by causing a narrowing of the pharynx. This exacerbates the hypoxemia of OSA by reducing functional residual capacity, thus creating areas of ventilation/perfusion mismatch. Many individuals with OSA have central obesity and other features of this metabolic syndrome. These metabolic conditions may be long-term complications and may account for the cardiovascular morbidity and mortality associated with OSA. Researchers have shown that apnea severity was only related to the somatic dimension of depression, while obesity was related to the cognitive aspect. The study also revealed that individuals with greater apnea severity tended to be both more obese and more depressed. The high prevalence of OSA and depression in the general population emphasizes the need for a clear insight of the relationship between the two conditions. The relationship of depressive disorders and depressive symptoms with body mass index (BMI) and severity of sleep apnea were the subject of numerous studies; results, however, were inconclusive in majority of studies. We hypothesized that active symptoms of depression would be more severe and more prevalent in women than in men with OSA. Keeping this in view, we studied the correlates of depressive symptoms in patients with OSA.

METHODS

A retrospective study of data from 182 consecutive patients with ages ranging from 22 to 90 referred to our sleep laboratory from various subspecialty clinics from July 2011 to August 2013 for an evaluation of OSA. We performed polysomnography (PSG) studies of patients that were referred and had been subjected to an overnight PSG. This cross-sectional study was carried out at the modern hospital Srinagar. Modern hospital is a private hospital located in Rajbagh that provides the full spectrum of primary care and specialty services through its own salaried professional staff. Patients from all parts of the state Jammu and Kashmir are referred to hospital, as the standard polysomnographic studies with accredited laboratory are only available here in the hospital. The enrolled population in modern hospital is comparable to the surrounding community with respect to race. The records of 182 patients referred for PSG between July 2011 and August 2013 were examined and were excluded.

Exclusion criteria

1. Patients on nocturnal oxygen supplementation
2. Unstable cardiopulmonary, neurological, or psychiatric disease
3. Upper airway surgery
4. Using positive airway pressure therapy or oral appliances
5. Patients using psychotropic drugs or diagnosed as having mental illness, including depression.

All participants gave written informed consent before PSG. All patients underwent overnight PSG for the assessment of sleep-disordered breathing by means of a computer-based system. Demographic data, general medical history, clinical information from the initial visit for sleep-related complaints, as well as PSG results for cases were recorded. Height, weight, and neck circumference were measured in all patients. Obesity was diagnosed in patients with BMI exceeding 30 kg/m², and overweight condition was diagnosed if BMI >25 and <30 kg/m². An overnight laboratory PSG was then performed to diagnose the presence and severity of OSA. PSG recordings were started based on the individual’s usual domestic sleeping habits, and each patient was recorded for a minimum of 7 h.

Polysomnographic recordings included: recordings of airflow by the nasal pressure transducer and oronasal thermocouples, chest and abdominal wall motion by piece electrodes, oxygen saturation by pulse oximeter, electrocardiogram, six electroencephalogram channels, bilateral electro-oculograms, chin and tibialis electromyogram. The data were analyzed on a visual basis by an experienced investigator. Recordings were scored visually in 30 s in nonrapid eye movement (REM) sleep Stages 1–4 sleep and in REM sleep according to standard criteria. Similarly, respiratory events and microarousals were scored according to established criteria. Daytime sleepiness was measured by the Epworth Sleepiness Scale (ESS). A score of >9 points was considered as excessive daytime sleepiness. We defined the OSAS as a combination of apnea–hypopnea index (AHI) >5 and an ESS Score >9.

We defined the OSAS as a combination of apnea–hypopnea index (AHI) >5 and and ESS Score >9. Psychiatric diagnosis was done by using Mini-International
Neuropsychiatric Interview (MINI plus scale). This was followed by application of Hamilton Depression Rating Scale (HAM-D) in patients suffering from referred for PSG.

**Ethical issues**

The study was performed in accordance with the Declaration of Helsinki and was approved by a local ethics committee.

**Statistical analysis**

Normality of data in each group was tested with Kolmogorov–Smirnov test. Data were shown (mean) as standard deviation for continuous variables, and number of cases was used for categorical variables. Differences between the groups were analyzed by Kruskal–Wallis or Chi-square as appropriate. Correlational analyses were calculated according to Pearson’s correlation.

**RESULTS**

Our sample included 27 (42.6%) men and 20 (57.4%) women, with a mean age of 58.60 ± 14.75 years. Women (61.6 ± 10.0) had a mean age significantly more (P = 0.011) than that of men (54.0 ± 13.0). PSG showed that both men and women had a comparably moderate degree of OSA. The mean HAM-D score was highly significantly more in women (P = 0.000) than in men [Table 1].

Out of 182 patients, 47 were suffering from depression as diagnosed by MINI plus scale and HAM-D scale. Eight patients were excluded from the study, as they were already taking medications. The unvaried numerical analysis shows that AHI has correlation with ESS but has a no statistical significant correlation with HAM-D, as shown in Table 2.

Age has significant correlation with AHI (correlation is significant at the 0.01 level [two-tailed]) and ESS (correlation is significant at the 0.05 level [two-tailed] but has no statistical significant correlation with HAM-D).

BMI has a statistical significant correlation with AHI (correlation is significant at the 0.05 level [two-tailed]), ESS (correlation is significant at the 0.05 level [two-tailed]), and HAM-D (correlation is significant at the 0.01 level [two-tailed]), as shown in Table 2.

**DISCUSSION**

OSA is a common breathing disorder associated with considerable morbidity. Obstructive sleep apnea being recognized and diagnosed with increasing frequency has become an increasingly important part of respiratory practice. OSA is well-known risk factor for plethora of cardiovascular and metabolic disorders which is serious morbidity in psychiatric patients. To the best of our knowledge, this is the first attempt to explore the relationships between BMI and depressive symptoms in patients with OSA in Kashmiri population. Our sample included 27 (42.6%) men and 20 (57.4%) women, with a mean age of 58.60 ± 14.75 years. Women (61.6 ± 10.0) had a mean age significantly more than that of men (54.0 ± 13.0). OSA is found in all age groups, but its prevalence increases with age.

Another important finding of study was the age has significant correlation with AHI and ESS. The finding is in accordance with study where 30%–60% of patients fulfill the criterion of an AHI >5, over 55 years of age. Women with OSA were more likely to report depressive symptoms and reported a more severe level of depressive symptoms than did men with OSA. Researchers have reported that history of depression is more common in women with OSA than in men with OSA. PSG showed that both men and women had a comparably moderate degree of OSA. Our findings suggest that depressive symptoms in OSA are more severe than men, and depressive symptoms deserve special consideration in women with OSA.
The current literature about the correlation between OSA and depression is ambiguous. As per our study, AHI has no correlation with HAM-D. The observation can be explained by fact complex and multifactorial causation of the depression. The study is in accordance with study, who found no association between the depressive symptoms and OSA severity. Several studies also observed no association between the depressive symptoms and OSA severity.

The finding of a positive relationship between BMI scores and the HAM-D was surprising and unexpected. As per few researchers, we found that high AHI scores were associated with high BMIs. Further, BMI has a significant correlation with AHI and ESS. The findings are in accordance with reports who found that apnea severity was only related to the somatic dimension of depression, while obesity was related to the cognitive aspect. The study also revealed that individuals with greater apnea severity tended to be both more obese and more depressed.

The most common metabolic abnormality seen with sleep apnea is obesity. BMI is a very good predictor of AHI >10, with high sensitivity (95.5%) but low specificity (46.2%). Obesity is one of the preventable potential mediators in the association between obstructive sleep apnea and depression. There is increased rate of depression among obese individuals, although sleep apnea may have been confounding variable. Many researchers have links between mood and sleep in individuals with sleep apnea disappear after controlling for covariates such as age, weight, and hypertension.

Several limitations of our research should be mentioned. The present findings should be interpreted taking into consideration some limitations of the study, particularly the retrospective design. First, the number of individuals was limited. The cross-sectional design renders the interpretation of associations questionable. Patients were recruited from those who visited the sleep laboratory, which compromises the generalizability of our findings. Future studies on OSA patients with depression are needed to provide more knowledge of the complex relationship between OSA and depression.

CONCLUSION

Depressive symptoms are more common and more severe in women with OSA than in men. There is a definite relationship between BMI and depressive symptoms in patients with OSA. There is no causal relationship between OSA and depressive symptoms in the population studied.

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Conflicts of interest
There are no conflicts of interest.

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