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Research report

The high prevalence of obstructive sleep apnea among patients with bipolar disorders

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ABSTRACT

Introduction: Sleep plays an important role in maintaining stability in bipolar disorders, and sleep disturbances can trigger mood episodes. Obstructive sleep apnea (OSA) is a common sleep disorder, yet the co-occurrence with bipolar disorder has not been methodically studied. Methods: This is a chart review of 482 consecutively seen patients with a bipolar disorder who underwent routine screening for OSA using a self-report sleep apnea questionnaire. Positive screens were referred for a sleep study. Results: A positive screen was found in 214 (44.4%) patients. Sleep studies were obtained on 114 patients, and 101, were diagnosed with OSA: point prevalence 21%. Discussion: The 21% prevalence fails to consider the false negative rate of the questionnaire, or the exclusion of patients who screened positive but failed to get a sleep study. Taking these into consideration it is estimated that the true prevalence of OSA in this study may be as high as 47.5%. The co-occurrence of OSA and bipolar disorders is markedly higher than previously thought. Of note, OSA may play a role in refractory bipolar, disorders, and carries significant mortality and morbidity that overlap, with the mortality and morbidity found with bipolar disorders. Limitations: This was a retrospective study based on a self-report questionnaire. Polysomnographic confirmation was performed in only a subgroup of subjects. Conclusions: The data suggest that unrecognized OSA may play a major role in the mortality and morbidity of bipolar disorders. All patients diagnosed with a bipolar disorder should be screened with an OSA questionnaire.

1. Introduction

Obstructive sleep apnea (OSA) is a common sleep disorder characterized by airflow cessation associated with night time arousals, fragmented sleep, and oxygen desaturation. Symptoms of OSA may include daytime sleepiness, insomnia, morning headaches, fatigue, irritability, memory problems, snoring, depression and cognitive problems. OSA is associated with a multitude of health problems, a diminished quality of life and if left untreated can shorten life by 20 years (Chung, 2011). Sleep disturbances occur frequently in the context of both mania and depression, and represent diagnostic criteria items in the DSM-IV. At the same time, exogenous causes of sleep disturbance, such as jet lag and shift work, can destabilize a euthymic patient with a bipolar disorder (Wehr et al., 1987). Full syndromal sleep disorders, such as OSA, have been associated with psychiatric complications, particularly depression and anxiety, but a link to bipolar disorders has not been well established (Schroder and O'Hara, 2005; Ohayon, 2003). Bipolar disorders and OSA are both associated with a high risk of mortality from accidents, high cardiovascular morbidity and mortality, and neural structural changes (Marshall et al., 2008; Young et al., 1993; Ohayon, 2003; Sharafkhaneh et al., 2005; Angst et al., 2002; Van Winkel et al., 2008; Konarski et al., 2008).

Prior research indicates low prevalence rates of OSA among patients with a bipolar disorder. In a general population study, OSA was found to affect 2% of women and 4% of men in the United States (Young et al., 1993). Similarly, a review of the Veterans Health Administration database of four million veterans found the prevalence of sleep apnea in patients with bipolar disorders to be 3.3% (Joo et al., 2010). The rate of comorbid bipolar disorders in patients with sleep apnea in this same database was 4.65% (Schroder and O'Hara, 2005) Beyond the Veterans Health Administration data there has been no systematic study of the prevalence of OSA in bipolar disorders.

Plante and Winkelman in their 2008 American Journal of Psychiatry article, *Sleep Disturbances in Bipolar Disorder: Therapeutic Implications*, discussed the critical nature of sleep for bipolar disorders and raised the possibility that obstructive sleep apnea may destabilize bipolar disorders (Plante and Winkelman, 2008).

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They called for the routine screening for sleep apnea in all patients with bipolar disorders.

Because of the bi-directional interaction between sleep disturbance and mood instability, an elevated rate of OSA among bipolar patients would be clinically important. A high prevalence of OSA could impact the health of patients with one of the bipolar disorders. The objective of this study was to identify the prevalence of OSA in a mood disorders specialty clinic where every new patient was systematically screened for sleep disorders using a standardized assessment instrument. The health consequences of unrecognized OSA and the possible link between OSA and bipolar disorders morbidity and mortality are discussed below.

2. Methods

The medical charts of 482 consecutive patients with bipolar I, II, or NOS treated at The Depression & Bipolar Clinic of Colorado between October 1, 2005 and December 31, 2008 were examined. The following information was extracted from the chart: diagnosis, gender, age at the time of the evaluation (Table 1), height, weight, sleep apnea screen score, and the results of polysomnography, if performed (Table 2). BMI was calculated using the patient's height and weight. The Depression & Bipolar Clinic of Colorado is a private clinic that accepts patients age 16 and older.

The OSA screening questionnaire (Table 3) used was originally found on the American Sleep Apnea Association web site, http://www.sleepapnea.org (questionnaire no longer available). The OSA screen was given as part of a routine 36 page general mental health self-report questionnaire filled out by patients prior to the first appointment. The OSA screen contains 9 Yes/No questions (Table 3). The scores range from 0 to 9. Three or more positive responses is considered a positive screen. Patients who screened positive were referred for a sleep study. A diagnosis of OSA was made by a clinical sleep lab for polysomnography, using the standard American Academy of Sleep Medicine criteria of an apnea hypopnea index of at least 15 or at least 5 with daytime hypersomnolence (Epstein et al., 2009).

Statistics were analyzed using Statistical Package for the Social Sciences, Windows version 14.0 and Microsoft Excel. Continuous clinical and demographic variables independent-samples *t* test were calculated to compare subjects who had a positive sleep study with those who had a negative sleep study, and those who had a positive screen to those who had a negative screen. Chi-square statistics were used to analyze categorical variables. Logistic regression was conducted to evaluate body mass index as a predictor of a positive OSA screen and a positive sleep study.

The Poudre Valley Health System Institutional Review Board gave approval for this research prior to the initiation of any research activities.

Table 1
Sample description. SD=Standard deviation, BMI=Body mass index kg/m^2.

	Men	Women
n	193	289
Mean age	43.53, SD 15.10	45.37, SD 14.17
BMI	26.90, SD 4.98	26.58, SD 5.85
Diagnosis		
Bipolar I	23 (11.9%)	35 (12.1%)
Bipolar II	118 (61.1%)	183 (63.3%)
Bipolar NOS	52 (26.9%)	71 (24.6)

Table 2
Results of sleep apnea screening and polysomnography in men and women.

	N	(%) Of population	(%) Of positive screens	(%) Of sleep studies
Total population	482			
Positive screens	214	44.4		
Sleep studies	114	23.7	53.3	
OSA diagnosis	101	21.0	47.2	88.6
Men	193			
Positive screens	88	45.6		
Sleep studies	59	30.0	67.0	
OSA diagnosis	53	27.5	60.2	89.8
Women	289			
Positive screens	126	43.6		
Sleep studies	55	18.3	43.7	
OSA diagnosis	48	16.6	38.1	87.3

3. Results

A total of 482 consecutive charts were included in the review. All had completed the screening questionnaire. Demographics are described in Table 3. A positive OSA screen was documented in 44.4% ($n=214$) of the charts. Only 53.3% of patients with a positive screen went on to receive a sleep study ($n=114$). Of those who received a sleep study ($n=114$) 88.6% were diagnosed with OSA. OSA was diagnosed in 21% ($n=101$) of patients suffering from a bipolar disorder. There were no significant differences between men and women in the study with regard to age, body mass index (BMI), and diagnostic distribution (Table 1).

The average BMI of patients in this study was 26.7 kg/m^2, standard deviation (SD)=5.51. This value is modestly higher than the 25.0 kg/m^2 threshold for overweight. Obese individuals made up 25.5% of the sample. Individuals who were obese or overweight made up 59.3% of the sample (Table 4).

Subjects with a positive sleep apnea screen had a significantly higher mean BMI (29.32 kg/m^2) than those with a negative screen (24.6 kg/m^2, $p<0.01$), and were older (47.4 years vs. 42.4 years, $p<0.01$). Patients who were given a diagnosis of OSA had a significantly higher mean BMI (30.4 kg/m^2) than those with a negative OSA screen (24.6 kg/m^2, $p=0.012$). The mean BMI for patients who screened positive by questionnaire but failed to obtain a sleep study was 28.8 kg/m. This was not statistically different than the BMI of patients given the diagnosis of OSA, SD=6.01. The average questionnaire screen score for those who had a sleep study was higher than those who screened positive, but did not have a sleep study (5.16 vs. 4.41, $p=0.01$).

Logistic regression identified BMI as a predictor of a positive OSA screen ($p<0.001$) and a positive sleep study ($p=0.015$). Table 4 contains the rates of positive screens and positive sleep studies by BMI category. Differences in neither bipolar subtype nor gender were associated with outcomes of the sleep apnea screen or sleep study. Patients with a positive sleep study were significantly more likely to endorse questions 1, 3 and 4 (Table 3) of the 9 item screening instrument compared to patients with a negative screen.

4. Discussion

To the best of our knowledge this is the first study of a bipolar population that involves systematic screening for sleep apnea in patients with bipolar disorders. The point prevalence of OSA in this study was at minimum 21%. This is markedly higher than the previous rate of 3.3% from the Veterans Health Administration database that only checked for the diagnosis but did not involve any systematic screening.