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To Study the Incidences of Anxiety and Depression in Patients Diagnosed with Obstructive Sleep Apnea (OSA) and Population Without Obstructive Sleep Apnea

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Abstract

Background: *Obstructive sleep apnea syndrome (OSAS) is a very common condition, characterized by repeated obstruction in upper airway while asleep. Cardinal symptoms include breathing pauses followed by loud snorting and sometimes or frequently arousal or awakening and resulting excessive daytime somnolensce, morning headache, sleep disruption ,psychological symptoms of irritability, mood disturbance, and cognitive impairment.Though, the association of sleep apnea with affective mood disorders is not completely understood, a Meta-Analysis study found the prevalence of depressive and anxious symptoms in OSA patients was 35% and 32%, respectively.*

Methods: *This is a Prospective study done in patients with OSA and non OSA population who visited in a tertiary care facility in South India. Clinical history, OSA screening, overnight polysomnography and psychological assessment were obtained from the patients. Categorical variables were expressed using frequency and percentage. Numerical variables were represented using mean and standard deviation. To test the statistical significance of the difference in mean/median value of age/BMI between groups, independent sample t test and Mann Whiney U test was applied respectively. To test the statistical significance in the proportion of categorical variables with group Chi Square test was applied. To test the statistical significance of the changes in proportion of severity of OSA, depression and anxiety after 3 months of CPAP therapy, Mc Nemar's Chi Square test was applied. A p value of <0.05 was considered to be statistically significant.*

Results: *A total of 216 patients were enrolled in the study of which 108 were diagnosed with OSA as study group and another 108 non OSA population as control group: The mean age of the study participants was 53.50±12.899 years while that of controls is 55.81±14.314 years67.6 % among study were having mild anxiety while 89.8% of control,26.9% of study group has moderate while 10.2% of control group has moderate anxiety,5.6% in study group had severe anxiety while none was there in control group , of 31 individuals with moderate OSA ,71% were mild,25.8% moderate and 3.2% severe anxiety.*

39 individuals with severe OSA were having mild anxiety in 41%, moderate in 46.2% and severe in 12.8% of individuals and of 38 individuals with mild OSA ,68.4% individual were normal,28.9% were having mild depression and 2.6% moderate. None of them had severe depression. Of 31 individuals with moderate OSA ,25.8% were normal,54.8% were having mild depression,19.4% moderate and none with severe depression,39 patients with severe OSA was having mild depression in35.9%, moderate in 46.2% and 7.7% were with severe depression.10.3% individual with severe OSA were normal respectively and the incidence was found to be statistically significant, with p value<0.005.

Conclusions: *This study supported the hypothesis that incidence of anxiety and depression is higher among patients with OSA than those without OSA.*

Introduction

An obstructive sleep apnea (OSA) is a common sleep disordered breathing , and potentially a life-threatening condition , characterized by breathing pauses during sleep and repeats in a cycle throughout the sleep resulting from partial or complete obstruction in upper airway. These episodes results in sleep fragmentation ,frequent arousal and awakening, nocturnal hypoxemia, and hypercapnia. Important risk factors includes male sex, age, obesity, alcohol, narcotic drugs and anatomic variation. The condition manifests as apneas or hypoapneas during sleep, with consequent arousal/awakening and excessive daytime sleepiness (EDS). OSA can potentially cause serious physiological consequences including cardiovascular diseases, cerebrovascular accidents, transient ischemic attacks, arrhythmias in heart, raised systemic and pulmonary artery pressures, and psychological symptoms including depression, impaired cognition, irritability, anxiety .The symptoms of OSA frequently overlaps with symptoms associated with those of mood disorders. These psychological conditions are a health challenges worldwide, contributing to human misery. The relationship is bidirectional and complex with varying potential of affecting life. Pathophysiological mechanisms including sleep fragmentation and arousal, hypoxia, oxidative stress, inflammation and neurotransmitter imbalance. While continuous positive airway pressure (CPAP), the most widely used and first line and an effective therapy for OSA, improves the symptoms such as day time somnolence, the effects specifically on affective mood disorders are yet to be found.

Materials and Methods

Selection and Description of Participants

Since no study could be located in existing literature on the correlation between incidence of anxiety and depression on the result of proportion of moderate anxiety in OSA patients (18%) and non OSA patients (33.3%) observed from the results of the pilot study conducted in 11 OSA and 6 Non OSA patients and with 80% power and 95% confidence, the minimum sample size comes to 112 in each group, totaling to 224. The study was conducted among 108 patients diagnosed OSA by polysomnography, aged 18 years or more, attending to the department of Pulmonology with symptoms suggestive of OSA. Those patients who opted to go ahead with the polysomnography and subsequent requirement of CPAP treatment based upon AHI and symptomatology were taken as the experimental group (n=108) and those without any symptoms suggestive of OSA were designated as control group (n=108).To assess the psychiatric status, the participants were asked to fill the Beck depression inventory (BDI-II) and Beck anxiety inventory (BAI) which are a self-report questionnaire consisting of 21 multiple-choice questions regarding depression and anxiety symptoms. They were asked to fill the questionnaire and graded to mild, moderate and severe according to scores at the time of diagnosis and again after 3 months of CPAP therapy.

- Inclusion criteria- All patients newly diagnosed with OSA by PSG,age more than 18 years and willing to give consent.
- Exclusion criteria: Age less than 18 years ,with any contraindications for CPAP,already on antidepressants or anti anxiety medications and not willing to give consent.

Technical information

Primary: To study the incidence of anxiety and depression in patients diagnosed with OSA compared to non OSA at a tertiary care center.

Secondary: To study the association of anxiety and depression with BMI and with severity of OSA and CPAP therapy on anxiety and depression.

The study was commenced after receiving an authorization certificate from both the scientific and ethical committee of Amrita Institute of Medical Sciences and Research Centre, Kochi. Informed consent was taken from all patients. All subjects were interviewed using a semi-structured questionnaire to collect their demographic details and clinical history related to duration symptoms. All subjects who were screened by

STOPBANG questionnaire were subjected to overnight sleep studies using Polysomnography to record the events of apnea, hypopnea.

The Apnoea–Hypopnea Index (AHI) is the number of apnea and Hypopnea events per hour of sleep,used to indicate the severity of sleep apnea. AHI values for adults are categorized as,normal: AHI<5,mild sleep apnea: 5≤AHI<15,moderate sleep apnea: 15≤AHI<30,severe sleep apnea: AHI≥30.

Statistics

Statstical analysis was performed using IBM SPSS version 20.0.Categorical variables were expressed using frequency and percentage.Numerical variables were represented using mean and standard deviation.To test the statistical significance of the difference in mean/median value of age/BMI between groups,independent sample t test and Mann Whiney U test was applied respectively.To test the statistical significance in the proportion of categorical variables with group Chi Square test was applied.To test the statistical significance of the changes in proportion of severity of OSA,depression and anxiety after 3 months of CPAP therapy,Mc Nemar's Chi Square test was applied.A p value of <0.05 was considered to be statistically significant.

Results

The mean age of the study participants was 53.50±12.899 while that of controls is 55.81±14.314.

Percent of males in the study group comprise 75.9 % as compared to controls with 57.4 %, and those of females is 24.1 % in the study group compared to 42.6 % in controls ,and the distribution was found to be stastically significant.

The present study showed incidence of anxiety amongst males with OSA, mild in 79.2 %,moderate in 16.7 % and 4.2 % were severe while that in females with OSA 77.8% were mild and 22.2% moderate with no severe anxiety. Incidence of depression in males with OSA is mild in 34.7 % ,moderate in 14.6 % ,severe in 2.1 % severe ,and rest 48.6 % ,while that in females with OSA 30.6% were with mild depression and 19.4% were having moderate and the rest of the 50 % being normal.

On comparison of incidence of Anxiety and Depression between study and control group, 67.6 % among study were having mild anxiety while 89.8% of control,26.9% of study group has moderate while 10.2%

of control group has moderate anxiety,5.6% in study group had severe anxiety while none was there in control group , of 31 individuals with moderate OSA ,71% were mild,25.8% moderate and 3.2% severe anxiety.39 individuals with severe OSA were having mild anxiety in 41%,moderate in 46.2% and severe in 12.8% of individuals and of 38 individuals with mild OSA ,68.4% individual were normal,28.9% were having mild depression and 2.6% moderate. None of them had severe depression. Of 31 individuals with moderate OSA ,25.8% were normal,54.8% were having mild depression,19.4% moderate and none with severe depression,39 patients with severe OSA was having mild depression in35.9%,moderate in 46.2% and 7.7% were with severe depression.10.3% individual with severe OSA were normal respectively and the incidence was found to be statistically significant ,with p value<0.005. shown in figure 2.

Of 38 individuals with mild OSA ,92.1% were having mild anxiety and 7.9% moderate. None of them had severe anxiety., further Of 38 individuals with mild OSA ,68.4% individual were normal,28.9% were having mild depression and 2.6% moderate. None of them had severe depression. Of 31 individuals with moderate OSA ,25.8% were normal,54.8% were having mild depression,19.4% moderate and none with severe depression.39 patients with severe OSA was having mild depression in35.9%, moderate in 46.2% and 7.7% with severe depression.10.3% individual with severe OSA were normal. It was found to be statistically significant ,with p value<0.005.

In both Anxiety and Depression, BMI in patients with OSA has got higher values as the severity increases, though the increase is very minimal and statistically association was not found to be significant.

In the study group percent of individuals with mild OSA is 35.2 %, moderate is 28.7% and severe 36.1% which after 3 months of treatment on CPAP which improved to , normal in 87.1% of individuals , moderate in 9.7% ,and severe 3.2% .

100% of individual with mild anxiety before treatment remained same.83.3% with moderate anxiety improved to mild category,8.3% remained moderate, and another 8.3% worsened to severe category, while those with severe OSA 66.7% became mild,33.3% improved to moderate and no patients with severe anxiety. 88.9% individuals who were not depressed remained the same, while 11.1% developed mild depression.80% of individuals with mild depression improved to normal while 20% remained mildly depressed.54.5% individuals with moderate depression improved to normal,36.4% improved to mild category while 9.1% worsened to severe depression. All the patients who were severely depressed became normal.

Gender			Group		p Value
			Cases	Controls	
			n= 108(%)	n= 108(%)	
	Male		82 (75.9)	62 (57.4)	
					0.004
	female		26 (24.1)	46(42.6)	

Table-1 Comparison of gender between the groups

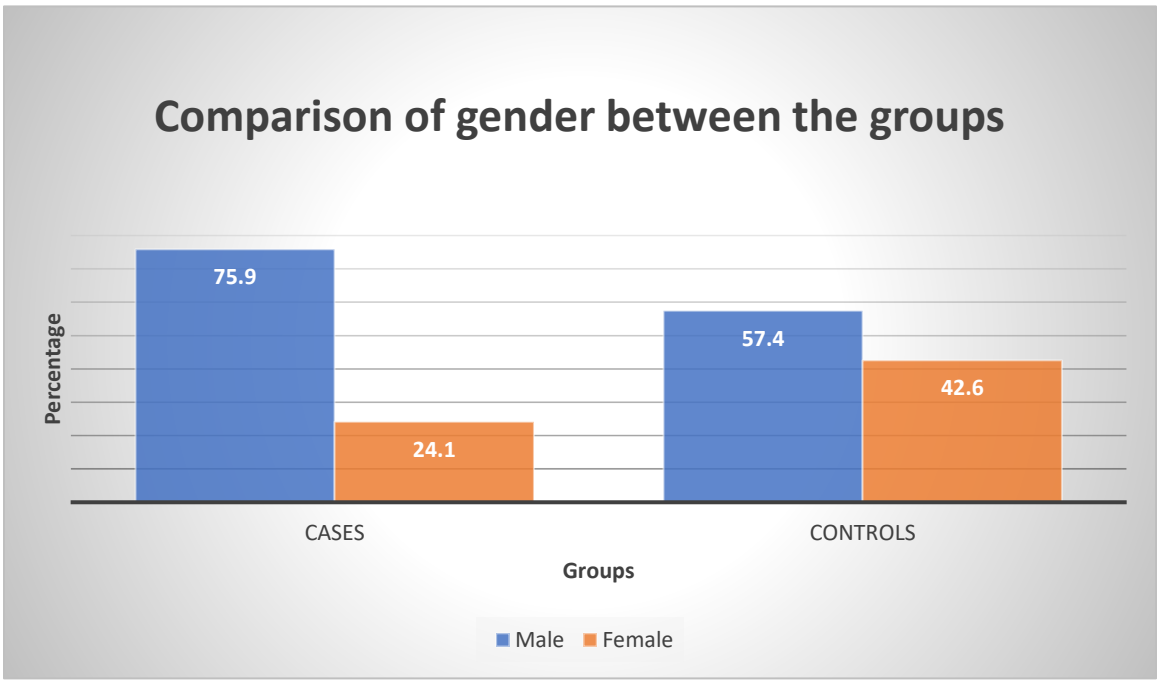

Figure-1

Severity of Anxiety (BAI)	Groups		p Value
	OSA patients n =108 (%)	Control n =108 (%)	<0.001
Mild	73 (67.6)	97 (89.8)	
Moderate	29 (26.9)	11 (10.2)	
Severe	6 (5.6)	0 (0)	

Table 02 Comparison of Anxiety between the groups

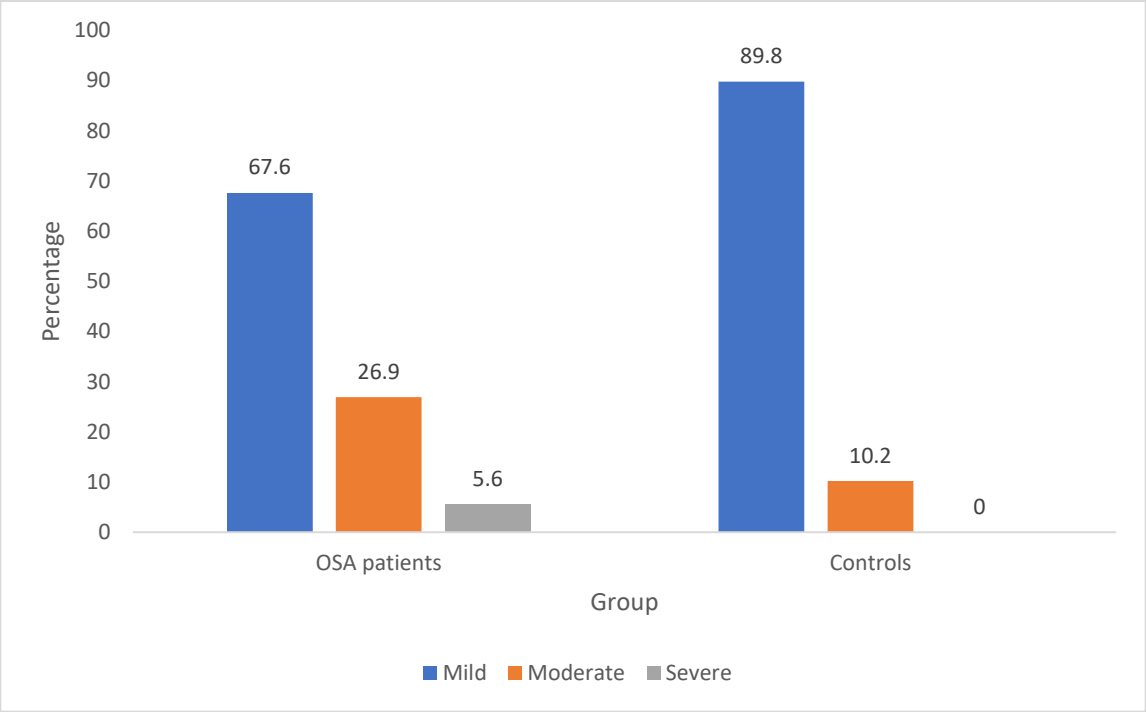

Figure-2 Comparison of Anxiety between the groups

Severity of Depression (BDI)	Groups		p Value
	OSA patients n (%)	Control n (%)	<0.001
Normal	38 (35.2)	68 (63)	
Mild	42 (38.9)	30 (27.8)	
Moderate	25 (23.1)	10 (9.3)	
Severe	3 (2.8)	0 (0)	

Table 03 Comparison of Depression in between the groups

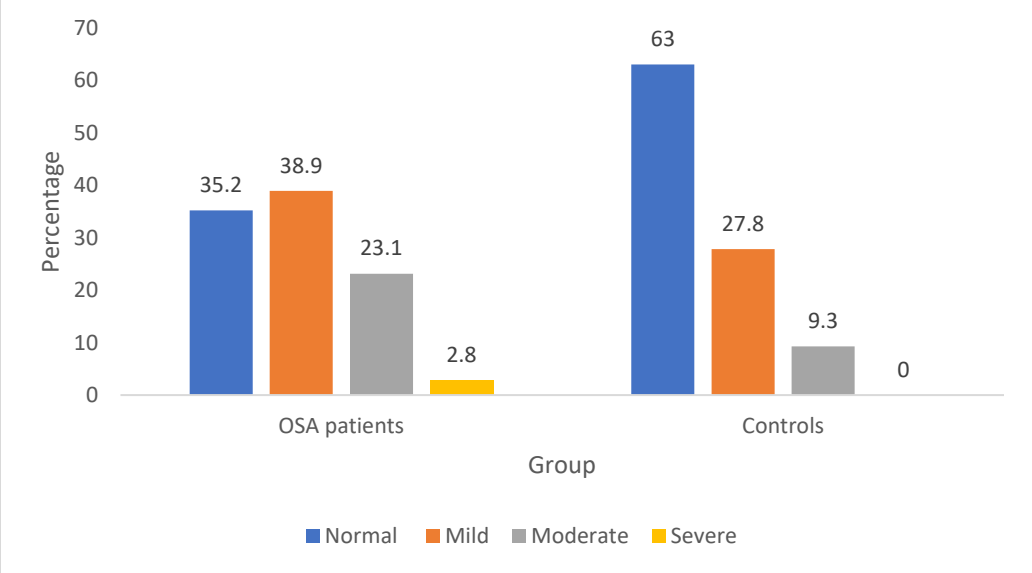

Figure 03 Comparison of Depression between the groups

Severity of Anxiety	n = 31	Percentage (%)
Normal	28	90.3
Mild	2	6.5
Moderate	1	3.2

Table-4 Anxiety distribution after three months on CPAP therapy

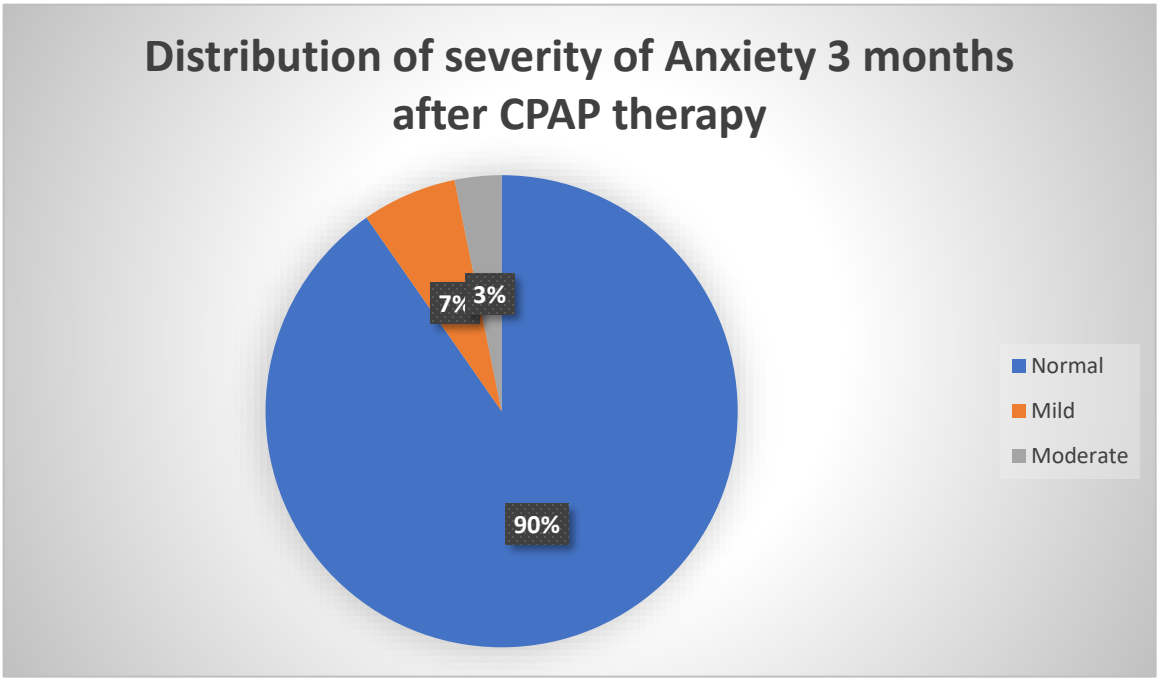

Figure-4

Severity of Depression	n = 31	Percentage (%)
Normal	23	74.2
Mild	7	22.6
Severe	1	3.2

Table-5 Distribution of depression after 3 months of CPAP therapy

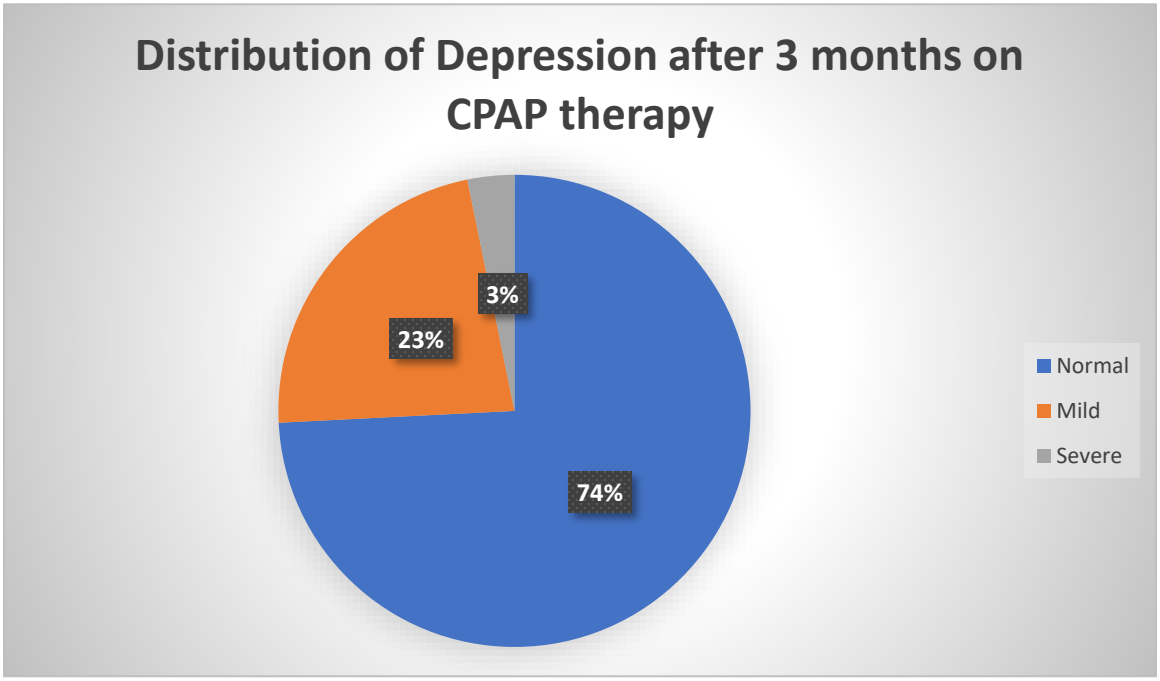

Figure 5

Discussion

Age and sleep apnoea: The mean age of the study participants was 53.50±12.899 while that of controls is 55.81±14.314. There was larger representation from the elderly age group (>50 years) in the study population.

Gender differences in sleep apnoea: Percent of males in the study group comprise 75.9 % as compared to controls with 57.4 %,and those of females is 24.1 % in the study group compared to 42.6 % in controls ,and the distribution was found to be stastically significant. Valencia-Flores et al., in their study on sex differences in sleep architecture in OSA observed and commented that women had higher quantum of slow wave sleep, sleep latencies being longer and lesser night awakenings than male.

The lower proportion of OSA among the female participants could be attributed to the lower reporting of subjective symptoms like snoring, daytime sleepiness, choking episodes by the females than being detected by the objective measurements like sleep studies and neck circumference BMI, etc.

The STOPBANG questionnaire scores a positive score for male gender as well as scores for subjectively reported components including snoring which may be a source of underdiagnosis in females.

Anxiety, Depression and sleep apnea: The present study showed incidence of anxiety amongst males with OSA ,mild in 79.2 %,moderate in 16.7 % and 4.2 % were severe while that in females with OSA 77.8% were mild and 22.2% moderate with no severe anxiety. Incidence of depression in males with OSA is mild in 34.7 % ,moderate in 14.6 % ,severe in 2.1 % severe ,and rest 48.6 % ,while that in females with OSA 30.6% were with mild depression and 19.4% were having moderate and the rest of the 50 % being normal.

On comparison of incidence of Anxiety and Depression between study and control group, 67.6 % among study were having mild anxiety while 89.8% of control,26.9% of study group has moderate while 10.2% of control group has moderate anxiety,5.6% in study group had severe anxiety while none was there in control group. Of 38 individuals with mild OSA ,92.1% were having mild anxiety and 7.9% moderate,none of them had severe anxiety ,of 31 individuals with moderate OSA ,71% were mild,25.8% moderate and 3.2% severe anxiety.39 individuals with severe OSA were having mild anxiety in 41%,moderate in 46.2% and severe in 12.8% of individuals .

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The high incidence of affective mood disorders in patients with OSA could be explained by a number of possible mechanisms. The two main factors suspected to be responsible for depressive symptoms in OSAS are frequent sleep fragmentations followed by arousals and intermittent desaturations during sleep. Sleep fragmentation is the primary cause of EDS in OSA patients and is considered to be the cause for symptoms in the mood disorder. Metabolic disturbances in brain resulting from repeated nocturnal desaturation and resulting hypoxia in OSA had previously been observed in functional MRI deficits, white matter hyperintensities (WMH) is thought to be connected to affective mood disorders . Functional MRI deficits shows autonomic and ventilatory problems in regions with injury to brain structures, which dictates that the processing of neurons in the injured structures can be altered by these damages.

CPAP Intervention and changes in Anxiety and depression:

100% of individual with mild anxiety before treatment remained same.83.3% with moderate anxiety improved to mild category,8.3% remained moderate, and another 8.3% worsened to severe category, while those with severe OSA 66.7% became mild,33.3% improved to moderate and no patients with severe anxiety. 88.9% individuals who were not depressed remained the same, while 11.1% developed mild depression.80% of individuals with mild depression improved to normal while 20% remained mildly depressed.54.5% individuals with moderate depression improved to normal,36.4% improved to mild category while 9.1% worsened to severe depression. All the patients who were severely depressed became normal.

Several studies have shown improvement in symptomatology of mood disorders. One such study by Platon et al. and Schwartz and Karatinos has shown a remarkable improvement in the affective mood disorder (depression) of severe OSA with around eleven to fourteen months on therapy with CPAP. The greatest benefit was gained by most severe OSA (AHIs ≥ 40) . Five other observational studies has reported that psychological complaints of OSA has been improved CPAP when used over three months. Dostálová et al. found that the benefits gained by CPAP is more likely through an improvement in AHI during sleep,

which results in an improvement in diurnal somnolence and intermittent desaturation and a decline in affective mood symptomatology.

Association of BMI with anxiety and depression:

In both Anxiety and Depression, BMI in patients with OSA has got higher values as the severity increases, though the increase is very minimal and statistically association was not found to be significant.

Conclusion

The study showed a higher incidences of affective mood disorders in OSA patients than in general population . Some of the symptoms with these psychological conditions overlaps with those of OSA ,and thus identification of these patients and prompt treatment is warranted as these psychological conditions may affect the compliance to treatment.CPAP therapy showed a significant improvement in symptoms after 3 months of treatment. Hence early screening and treatment of obstructive sleep apnoea and identification and prompt treatment of anxiety and depression is recommended. BMI does not affect the incidences of anxiety and depression significantly.

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