Effect of CPAP on depressive symptoms in OSA

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Abstract  Background: Obstructive sleep apnea syndrome (OSAS) is a common disease, affecting about 2–4% of the adult population. Some of the symptoms of OSAS resemble symptoms associated with anxiety and depressive conditions in untreated OSAS, rates of depression are elevated compared with general populations, studies of (CPAP) treatment in OSAS have shown an improvement in symptoms of depression.

Aim: To assess depression in patients with obstructive sleep apnea syndrome (OSAS), and the effect of CPAP on it.

Patients and methods: This study comprised 30 cases who underwent full history taking, general and local examinations, assessment of daytime sleepiness by Epworth scale, overnight polysomnography using (Embla S 4000, Iceland) and assessment of depression before and 2 month after treatment with CPAP by The Hamilton Depression Rating Scale (HDRS), The Structured Clinical Interview for DSM-IV (SCID) and BECK scale for depression.

Results: The mean age of patients was 55 years. Sixteen patients had HDRS scores above the cut-off point of the scale of ten (indicating some sort of depression). After that patients were subjected to SCID. Ten patients (33.3%) fulfilled the clinical diagnosis of a major depressive disorder according to DSM-IV and after CPAP treatment for two months resulted in significant improvements of depressive symptoms in both BDI and HRSD scores. The BDI score decreased from 18.6 ± 9.2 to 9.4 ± 10.1, while the HRSD score decreased from 14.1 ± 8.5 to 7.9 ± 7.2 (both p < 0.01).

Conclusion: OSA is associated with depression which improved after CPAP treatment.

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Some of the symptoms of OSAS resemble symptoms associated with anxiety and depressive conditions. However, clinicians may have problems in differentiating psychiatric disease from symptoms related to organic disease [3]. Early studies found an increased likelihood of depression in sleepy patients [8,9]. Later, several studies have investigated the association of OSAS with depression and anxiety; however, the relationship is still poorly understood.

In untreated OSAS, rates of depression are elevated compared with general populations [9,10], although not necessarily at a pathological level [9]. In contrast, some other studies have been unable to confirm this association between OSAS and anxiety or depression [11]. Some studies of continuous positive airway pressure (CPAP) treatment in OSAS have shown an improvement in symptoms of depression [8,12,13].

Aim of the work

To assess depression in patients with obstructive sleep apnea syndrome (OSAS), and the effect of CPAP on it.

Patients and methods

This study was done on 30 patients who attended the chest department, minoufia university hospitals, and a written consent was obtained from each patient participating in the study. All the patients underwent the following:

1- Full history taking.
2- Physical examination (general and local).
3- Assessment of daytime sleepiness.

The Epworth Sleepiness Scale (ESS) was used for assessing daytime sleepiness. This is a commonly used self-administered scale with eight items about how easily the respondent would fall asleep in different situations. The items are scored on a 0–3 scale, which are added to give an overall score of 0–24. Higher scores indicate more sleepiness. ESS score 2–10 is considered 'normal' and more than 10 indicative of pathological sleepiness [14].

4-Complete overnight polysomnography using (Embla S 4000, Iceland) in the sleep laboratory, Minoufia University Hospital overnight (8 h sleep) using EMBLA S 4000 system, which records the following: Sleep stages by EEG, EOG and EMG, Oxygen saturation, Snoring, Flattening index, Body position, Nasal ventilation, Respiratory effort and Apnea Hypopnoea index.

5-Assessment of depression before and 2 month after treatment with CPAP by:

1-The Hamilton Depression Rating Scale (HDRS) is an inventory employed to detect and identify the intensity or severity of the signs and symptoms of depression; 17 questions are divided into two categories. The first category consists of nine questions scored on a five-point scale; the second category consists of eight questions rated on a three-point scale. A total score is computed reflecting the degree of symptom severity. A score >7 indicates impairment [15]. HAM-D Scoring Instructions (Cut-Off Scores)

0–7 Normal.
8–13 Mild depression.
14–18 Moderate depression.
>18 Severe depression.

NB: A total HAM-D score of 7 or less after treatment is for most raters a typical indicator of remission. A decrease of 50% or more from baseline during the course of the treatment is considered an indicator of clinical response, or in other words, a clinically significant change.

2-Beck Depression Inventory (BDI), is a self-reported 21-item Beck Depression Inventory (BDI). We used a cut off of >9 to classify BDI measures as high, a threshold lower than the typical 14 but a more sensitive level [16].

3-The Structured Clinical Interview for DSM-IV (SCID) is a semistructured interview used to establish the major Axis I diagnoses in DSM-IV. It is administered by a clinician and includes an introductory overview followed by nine modules, seven of which represent the major Axis I diagnostic classes. Only the section on mood disorders was used and it is more accurate than scales [17]. The following patients were excluded:

1- Patients with previous psychiatric disorders.
2- Patients were on antidepressant treatment.
3- Patients with chronic diseases (respiratory, renal, hepatic, cardiac, and neurological disorders).

Data were analyzed using SPSS (v 15.0). Means with standard deviations or percentages were used to describe the sample. Group differences were assessed with unpaired t-tests and the changes after treatment were assessed with paired t-tests. A P value < 0.05 was considered to indicate statistical significance.

Results

This study included 30 patients, 18 males and 12 females, aged 18–72 years with mean 55 years with SD 17.6, 5 patients had mild OSA, 15 patients had moderate OSA and 10 patients had severe OSA (Table 1). Sixteen patients had HDRS scores above the cut-off point of the scale of ten (indicating some sort of depression), 10 patients (33.33%) had mild depressive symptoms, while 4 patients had moderate symptoms (13.33%), and 2 patients (6.67%) had severe symptoms (Table 2). It is important to note that the levels of depressive symptoms obtained from the Hamilton scale are not necessarily always equate with a formal categorical diagnosis of major depressive disorder. Females had higher scores than males.

| Table 1 | Demographic data and classification of OSA. |
|---------|------------------------------------------|
| Parameters | Number | % |
| SEX: | | |
| Female | 12 | 40.0 |
| Male | 18 | 60.0 |
| AHI: | | |
| Mild OSA (5–15/h) | 5 | 16.7 |
| Moderate (15–30/h) | 15 | 50.0 |
| Sever (>30/h) | 10 | 33.3 |
| Parameters | Mean | SD | Range |
| Age in years | 55 | 17.6 | (18–72) |
After that patients were subjected to SCID. Ten patients (33.3%) fulfilled the clinical diagnosis of a major depressive disorder according to DSM-IV, six patients with mild depressive episodes and four patients with moderate depressive episodes. There was no statistically significant difference between males and females on either parameter (HDRS and SCID).

Five of the ten patients diagnosed with a depressive episode by the SCID before to using the CPAP, no longer met the diagnostic criteria needed for the diagnosis of a depressive episode after the use of CPAP. While only 4 patients met the diagnosis of a mild depressive episode (3 patients with moderate depression changed to mild depression after CPAP and one patient from 6 patients with mild depression before CPAP remains the same).

Only one patient from 4 patients with moderate before CPAP remains with moderate depression (Tables 3 and 4).

### Table 2: Assessment of patients by HDRS and SCID (first examination).

|                      | Males (N = 18) | Females (N = 12) | Total (N = 30) |
|----------------------|---------------|-----------------|--------------|
| HDRS                 |               |                 |              |
| Normal               | 9 (50%)       | 5 (41.66%)      | 14 (46.67%)  |
| Mild                 | 6 (33.33%)    | 4 (33.33%)      | 10 (33.33%)  |
| Moderate             | 2 (11.11%)    | 2 (16.66%)      | 4 (13.33%)   |
| Severe               | 1 (5.55%)     | 1 (8.33%)       | 2 (6.67%)    |
| SCID                 |               |                 |              |
| No disorder          | 13 (72.22%)   | 7 (58.33%)      | 20 (66.66%)  |
| Mild depression      | 3 (16.67%)    | 3 (25%)         | 6 (20%)      |
| Mod depression       | 2 (11.11%)    | 2 (16.66%)      | 4 (13.33%)   |

N.B: Mild depression = major depressive episode, mild; mod depression = major depressive episode, moderate; HDRS: Hamilton Depression Rating Scale; SCID: Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition.

### Table 3: Comparison between depressed patients on HDRS before and after CPAP treatment.

|                      | Number | HDRS at baseline Mean ± SD | HDRS at follow-up Mean ± SD | Differences | T   | P   |
|----------------------|--------|-----------------|-----------------|-----------|-----|-----|
| Normal               | 14     | 4.7 ± 2.9       | 1.6 ± 1.2       | 4.8       | 0.00|     |
| Mild                 | 10     | 10.7 ± 0.7      | 6.9 ± 1.8       | 11.2      | 0.00|     |
| Moderate             | 4      | 14.9 ± 0.9      | 10.8 ± 0.8      | 5.2       | 0.03|     |
| Severe               | 2      | 34.8 ± 3.7      | 27.1 ± 3.1      | 2.9       | 0.045|    |
| Total                | 16     | 14.1 ± 8.8      | 7.9 ± 7.2       | 8.1       | 0.001|    |

There was a statistically significant decrease in the HDRS in all groups (mild, moderate and severe depression) when patients with OSA used the CPAP for 2 months.

### Table 4: Comparison between depressed patients on SCID before and after CPAP treatment.

| SCID                  | SCID before CPAP | SCID after CPAP |
|-----------------------|------------------|-----------------|
| No disorder           | 20 (66.66%)      | 25 (83.33%)     |
| Mild depression       | 6 (20%)          | 4 (13.33%)      |
| Mod depression        | 4 (13.33%)       | 1 (13.33%)      |

Fig. 1 shows a comparison of the total scores of BDI and HRSD between pre-CPAP and post-CPAP treatment in MDD patients with OSA (n = 30).

CPAP treatment for two months resulted in significant improvements of depressive symptoms in both BDI and HRSD scores. The BDI score decreased from 18.6 ± 9.2 to 9.4 ± 10.1, while the HRSD score decreased from 14.1 ± 8.5 to 7.9 ± 7.2 (both P < 0.01) (Tables 3, 4 and Fig. 1).

### Discussion

In this study, it was aimed to determine the rate of depressive symptoms associated with OSA. More than half of the studied samples (53.3%) had depressive symptoms as measured by HDRS; six of these patients (20%) had clinically significant moderate to severe symptoms. This high prevalence is in line
with findings reported in some studies in which OSA was highly associated with depression [11]. Females showed a higher rate of depression although this difference was not statistically significant; females had statistically higher scores than males on the HDRS, and this finding has been reported in previous studies [17,18].

When using the SCID to establish a DSM-IV diagnosis, the total number of individuals with a clinical diagnosis of depressive disorder was ten (33.33%), and there was no statistically significant difference between females and males in the rate of occurrence of depressive disorders using this method.

We can conclude that the prevalence of depression in the same sample varied according to the tool used, with a high prevalence when measured with the HDRS, a tool used mainly to measure the severity of depressive symptoms rather than to generate a diagnosis. This finding can explain some of the differences in the rate of depression in individuals with OSA found across different studies [19,20].

At follow-up, marked improvement of depression was found after the use of CPAP, as reflected by statistically significant improvement on the HDRS. In addition, only five patients of those diagnosed with the SCID as having a depressive disorder still met the DSM-IV diagnostic criteria for a depressive episode after CPAP treatment. These patients might require specific antidepressant treatment whereas the other five patients would not require additional treatment apart from CPAP. Most studies showed improvement of depressive symptoms with the use of the CPAP [21,22], and this finding is replicated in the current study, but some studies [23,24] found no improvement in depression after CPAP use. In the first study [24], only individuals with severe OSA were included and the second study included a limited number of patients [25].

The difference in results might also be due to differences in the tool used and cut-off points taken and this is clear in the current study. When HDRS was used as the tool to assess depression severity the improvement after CPAP use was very obvious but, when SCID was used, improvement was less obvious.

The BDI includes questions on symptoms that overlap typical OSA characteristics, such as sleepiness and fatigue, loss of libido, and impaired concentration. This overlap does not alter the depressive symptoms themselves but confounds interpretation of the source of the mood disturbances; we cannot disentangle the extent to which individuals with depressed mood experience a disorder independent of OSA. The DSM-IV criteria for organic rule-out of a primary mood disorder, i.e., diagnosis of a mood disorder that is secondary to a physical medical illness [26] do not clarify whether depressed mood in OSA should be considered secondary to the physical disorder [27].

Limitations of the current study include larger number of subjects than 30 would need to be studied to verify that the findings generalize to a larger population. Additional limitations relate to the lack of objective measures of symptoms.

Also this study showed that depression is associated with severe and moderate OSA as all patients with severe OSA had depressive symptoms and some had moderate OSA and this is coinciding with Carmen and Ruth [28]. Also philips et al. did not find any significant depressive symptoms in elderly patients with mild OSA as this study [11].

**Conclusion**

OSA is associated with depressive symptoms especially severe and moderate OSA and these symptoms improve in most cases with CPAP treatment.

**Conflict of interest**

None to declared.

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