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## Effect of Continues Positive Airway Pressure(C-PAP) Therapy on Patients of Moderate to Severe Obstructive Sleep Apnoea (OSA)

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### Abstract

Sleep apnea is a type of a breathing disorder that takes place during sleep. The objective of this study is to understand the effect of continues positive airway pressure(c-PAP) therapy on patients of moderate to severe obstructive sleep apnoea(OSA). We conducted this study on 50 cases with sleeping difficulties attending opd at Department of T.B. and Respiratory Diseases, SPMC Bikaner. Data on demographic characteristics, sleep, medical history, medication use and habits was obtained with the use of a modified standardized questionnaire and Epworth Sleepiness Scale, before the initiation of overnight polysomnography (PSG). Minimum age of a subject in the study group was 27 and maximum was 68(Mean Age: 49.60). It is obvious that OSA is more prevalent in middle-age. ESS decreases significantly after 1 month of regular c-PAP use amongst the Moderately affected patients of OSA. Amongst the subjects with moderate OSA the Mean $\pm$ -SD BMI was 28.033 $\pm$ -3.14 whereas within those suffering from severe OSA it was 30.012 $\pm$ -3.03. It appears that OSA severity increases with increasing BMI. The prevalence of OSA is more common in males and in post-menopausal females, as it is in pregnant females. Only 1 month of continous and compliant c-PAP therapy was found to be effective in decreasing the Epworth Sleepiness Scale score.

## INTRODUCTION

Sleep apnea is a type of a breathing disorder that takes place during sleep. The breathing may partially or completely stop when an individual is sleeping and it can last for five seconds or more. These pauses in breathing can happen several times within an hour. There are three types of sleep apnea namely obstructive sleep apnea, central sleep apnea and mixed sleep apnea. The most common symptoms of sleep apnea includes snoring when an individual is sleeping, episodes of shortness of breath during sleep, fighting sleepiness during the day or when performing daily activities, at work or while driving, falling asleep easily. Diagnosing of sleep apnea can be performed primarily by the use of Epworth Sleepiness Scale (ESS). ESS is a helping diagnosing tool in sleep apnea and was developed by Dr Murray Johns for assessment of daytime sleepiness. The tool contains of eight questions that tests and assesses how an individual can easily fall asleep when performing some basic daily activities or when relaxing. The scale is measured on a four scale point of zero to three<sup>[1]</sup>.

According to World Health Organization<sup>[2]</sup>, sleep apnea as a condition is not a life threatening situation but the risk factors and complications such as cardiovascular and cerebrovascular diseases are the serious problems associated with sleep apnea. Continuous positive airway pressure (CPAP) is the standard therapy for patients with obstructive sleep apnea/hypopnea syndrome (OSAHS). When used regularly CPAP eliminates obstructive sleep disordered breathing (SDB) events by stabilizing the upper airway. CPAP withdrawal has been reported to cause immediate recurrence of SDB to levels of severity either similar to 3 or slightly less 4 than levels seen at pretreatment. Most published studies have reported that O<sub>2</sub> denaturation on CPAP withdrawal is less severe than pretreatment<sup>[3,4]</sup>. Potential mechanisms suggested for this effect include changes in upper airway anatomy, changes in ventilatory and upper airway control mechanisms and effects of changes in sleep on the above. In two studies 5 subjective (Stanford sleepiness scale [SSS]) and objective measures (multiple sleep latency test [MSLT], psychomotor vigilance test [PVT]) of sleepiness were compared on CPAP withdrawal to pretreatment, but with conflicting results and limited statistical significance for some results.

**Aims and Objectives:** The objective of this study is to understand the effect of continuous positive airway pressure (c-PAP) therapy on patients of moderate to severe obstructive sleep apnoea (OSA).

## MATERIALS AND METHODS

We conducted this study on 50 cases with sleeping difficulties attending opd at Department of T.B. and

Respiratory Diseases, SPMC Bikaner. This institution caters to the medical needs of the people hailing from eastern U.P., Bihar, Jharkhand, Madhya Pradesh, Chhatisgarh. Sample collection was done from amongst those patients who attended the O.P.D. for snoring problem. Patients with sleeping difficulties were motivated to participate in the study. Data on demographic characteristics, sleep, medical history, medication use and habits was obtained with the use of a modified standardized questionnaire and Epworth Sleepiness Scale, before the initiation of overnight polysomnography (PSG). Each patient's height and weight were recorded at the time of polysomnography and used to calculate the body mass index. Sleep history data included a validated measure of daytime sleepiness (Epworth sleepiness scale) and self reported habitual reporting snoring, which was defined as loud snoring occurring "frequently" or "constantly" (most of the interviewers will be attended by the patient spouses or a close relative staying at home). The study group was defined as having an AHI of  $\geq 15$  per hour of sleep. The institutional ethics committee was asked to approve the protocol, informed consent was obtained from the participants. This clinical history form is comprehensive, with the aim of gathering detailed information regarding a patient's sleep patterns, snoring, daytime weariness and any accompanying medical disorders. It also examines personal and family medical histories as well as lifestyle factors like occupation, socioeconomic position, alcohol consumption and smoking behaviors. The Epworth Sleepiness Scale measures the likelihood of nodding off in a variety of scenarios. The form also includes areas for clinical examination findings, vital records, respiratory system assessment and investigations such as blood tests, electrocardiograms, polysomnography and c-PAP titration results. This comprehensive evaluation aids in the diagnosis of disorders such as sleep apnea and other related health difficulties.

**Statistical Analysis:** The statistical analysis was done using statistical software SPSS for windows (Version 16). Chi-square test was used for non-parametric variables. Student's t test was used for comparing two groups and one-way ANOVA test was used for multiple group comparison.  $p < 0.05$  was stated as statistically significant.

**Observation:** In our study we took 50 patients of moderate to severe obstructive sleep apnea (OSA) diagnosed after full night POLYSOMNOGRAPHY (PSG) and then did c-PAP titration study. After c-PAP titration we prescribed c-PAP machine to the patients. Our study intends to study the effect of continuous positive airway pressure (c-PAP) on moderate and severe patients as a whole, therefore the combined results for moderate and severe OSA patients is the main objective of this study.

**Table 1. Distribution of study population according to Age**

Age	Frequency	Percent
21-30	3	6
31-40	6	12
41-50	16	32
51-60	17	34
61-70	8	16
Mean	49.60	27-68 (range)
<b>Sex</b>		
MALE	34	68
FEMALE	16	32

**Table 2. Distribution of study population according to ESS**

ESS	Among Moderate OSA patients	p-value	Among Severe OSA patients	p-value	Combined Results	p-value
ESS initially(ESS_0)	13.71±2.34	<0.034	16.96±1.37	<0.048	15.92±2.85	<0.039
ESS at 1st Month of Follow-Up(ESS_1)	11.54±3.82		14.04±3.88		13.88±4.43	
ESS at 3rd Month of Follow-Up(ESS_3)	9.92±3.26	12.42±3.82	11.22±3.75			
ESS 0 vs 3(p-value)	<0.001	0.001	<0.001			

**Table 3. Distribution of study population according to weight to BMI**

Weight	Among Moderate OSA patients	Among Severe OSA patients	Combined Results
Initial weight(0)	73.75+/-7.67	81.10+/-6.98	77.57±8.14
Weight during 1st month follow-up(1)	73.846+/-7.54	81.227+/- 6.785	77.684±8.006
Weight 0 vs 1(p-value)	0.450	0.201	0.157
Weight during 3rd month follow-up(3)	73.66±7.21	80.74±6.77	77.34±7.78
Weight 0 vs 3(p-value)	0.729	0.184	0.213

Minimum age of a subject in the study group was 27 and maximum was 68(Mean Age: 49.60).It is obvious that OSA is more prevalent in middle-age.

ESS decreases significantly after 1 month of regular c-PAP use amongst the Moderately affected patients of OSA. ESS decreases significantly after 1 month of regular c-PAP use amongst the Severely affected patients of OSA. We can infer that c-PAP therapy causes significant improvement in the Ep worth Sleepiness Scale after 1 month of regular use. Use of c-PAP was strongly associated with improvement in ESS score after 3 months. From this observation it can be concluded that 3 months of effective c-PAP therapy is strongly associated with improvement in Ep worth Sleepiness Scale score hence the increase in quality of life of the patient.

**Weight(kg) and BMI(kg/m<sup>2</sup>):** The maximum weight recorded in this study was 90 kg whereas the lowest was 59 kg(Mean 77.52 kg).The BMI ranged from 20.40 to 35.10(Mean BMI:29.0620).26(52%) subjects included in this study were obese(BMI\_>30),17(34%) were overweight(BMI >25) and 7(14%) were within the normal BMI(18.5-25) range. Amongst the subjects with moderate OSA the Mean+/-SD BMI was 28.033+/-3.14 whereas within those suffering from severe OSA it was 30.012+/-3.03. It appears that OSA severity increases with increasing BMI.

We observed that no significant weight change occurred after 1 month of c-PAP therapy in moderate as well as severe OSA patients. In fact, an increase in mean weight was observed. We observed that no significant weight change occurred after 3 months of c-PAP therapy in moderate as well as severe OSA patients.

## RESULTS AND DISCUSSIONS

Our study was mainly concerned about c-PAP and its role in improving Ep worth Sleepiness Scale Score, and weight in patients of moderate to severe obstructive sleep apnea(OSA).We selected about 50 patients of moderate to severe sleep apnea for this purpose, after fully explained consent and full night polysomnography. After c-PAP titration, subjects were prescribed c-PAP therapy and were monitored for parameters like Ep worth Sleepiness Scale, weight.

We noticed an improvement of Epworth Sleepiness Scale Score(ESS) during the 1st month of follow-up( $p<0.039$ ,Mean: 13.88±4.43 vs 15.92±2.85 initially) which became even more better at 3rd month of follow-up( $p<0.001$ ,Mean: 11.22±3.75 vs 15.12±2.85 initially).It is clear that CPAP therapy is required for a least a portion of each night, as symptoms of daytime sleepiness reappear when CPAP therapy is discontinued for as little as one night<sup>[6]</sup>.

**Weight:** We observed no significant decrease of weight in this study. The mean weight was 77.57±8.14, 77.684±8.006 and 77.34±7.78 initially, at 1st month follow-up and at 3rd month follow-up respectively. p-values at the end of 1st and 3rd month follow-up were 0.157 and 0.213 respectively, which suggests that c-PAP therapy does not improve weight control. Changes in weight are inextricably linked to obstructive sleep apnea (OSA)<sup>[7]</sup>. Weight gain is a risk for both the development and increased severity of OSA<sup>[8]</sup>. It has been estimated that 58% of OSA can be attributable to excess weight<sup>[9]</sup>. There also is evidence that OSA itself contributes to weight gain<sup>[10]</sup>, thus creating an adverse positive. Thus, it is unclear whether treatment of OSA with CPAP results in any changes in weight<sup>[11]</sup>.

## CONCLUSION

Obstructive Sleep Apnea (OSA) is the most common type of sleep apnea. Middle aged people are most commonly afflicted by this disorder. The prevalence of OSA is more common in males and in post-menopausal females, as it is in pregnant females. Only 1 month of continuous and compliant c-PAP therapy was found to be effective in decreasing the Epworth Sleepiness Scale score. This suggests the efficacy of c-PAP treatment in improving the ESS hence the probability of dozing-off during routine work. c-PAP might not be an effective modality in reducing the weight of OSA subjects.

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