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# Effectiveness of Application of a Soft Cervical Collar on Symptoms and Quality of Sleep among the Patients with Obstructive Sleep Apnoea at Selected Community Areas in Puducherry

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**ABSTRACT**

The study aimed to evaluate the effectiveness of the Application of a Soft Cervical Collar on Symptoms and Quality of Sleep among the patients with Obstructive Sleep Apnoea in selected Community areas through Puducherry through a Quantitative study and assess their association with epidemiologic factors. 60 participants were selected according to the inclusion and exclusion criteria by simple random sampling technique (lottery method). A Pre-Experimental research design was used for the study. Data was collected using STOP-BANG and PSQI among the patients with Obstructive Sleep Apnoea at selected Community areas in Puducherry. Data analysis was done using descriptive statistics and inferential statistics. The calculated Repeated Measures ANOVA F = 42.837 for the effectiveness of Application of a Soft Cervical Collar on symptoms of Obstructive Sleep Apnoea was found to be statistically significant $p<0.001$ Level. The calculated Repeated Measures ANOVA F = 79.425 for the effectiveness of Application of a Soft Cervical Collar on quality of sleep among Obstructive Sleep Apnoea patients was found to be statistically significant at $p<0.001$ Level. The calculated Karl Pearson's Correlation value of r = 0.582 between the symptoms of Obstructive Sleep Apnoea and quality of sleep among Obstructive Sleep Apnoea patients shows a positive correlation which was found to be statistically significant at $p<0.001$ Level. Hence, the researcher concluded that the Application of a Soft Cervical Collar was found to be effective in reducing the Obstructive Sleep Apnoea symptoms and the Sleep Disturbances thereby improving the Quality of sleep.

## INTRODUCTION

On average, we spend about 30% of our whole lives asleep. All humans will acknowledge the fact that they need to sleep; on the other side, they start to think of excess/deficient sleep as an illness that needs a cure. Sleep is an internal subjective phenomenon and a highly complex mechanism arising from an interaction between multiple brain chambers, neurotransmitter pathways, and hormones, each of which is exclusive to the process in the generation of sleep. This complex nature makes sleep very vulnerable to even minute disruptions. Small changes in any brain function can have a very big effect on sleep mechanisms and a disrupted sleep cycle leads to many other health problems. The disrupted sleep cycle is closely linked to an increased susceptibility to a broad range of disorders in humans, ranging from poor vigilance and memory to reduced mental, physical reaction times, reduced motivation, depression, insomnia, metabolic abnormalities, obesity, immune impairment, an even greater risk of cancer due to continuous irritability (Russell Foster. October 2012) **[1].**

Sleep-disordered breathing (SDB) is a broad term used to describe a varied number of breathing disorders that occur during sleep including; Obstructive Sleep Apnoea (OSA), Central Sleep Apnoea (CSA), Nocturnal hypoventilation and Cheyne–Stokes respiration (CSR). According to the recent data; approximately 42 million American Adults have SDB, 1 in 5 adults have mild Obstructive Sleep Apnoea, 1 in 15 have moderate to severe Obstructive Sleep Apnoea, 9% of middle-aged women and 25% of middle-aged men suffer from Obstructive Sleep Apnoea. Even though the prevalence is similar to that of Asthma (20 million) and Diabetes (23.6 million) of the whole US population, 75% of severe SDB cases remain undiagnosed till date everywhere. It involves mainly three mechanisms; Apnoea: a cessation of airflow for 10 or more seconds, Hypopnea: a decrease in airflow lasting 10 or more seconds with a 30% oxygen reduction in airflow and with at least a 4% oxygen desaturation from the baseline assessment, Flow limitation: it is the narrowing of the upper airway and an indication of impending upper airway closure. Breathing stops for a period of time until the brain registers the lack of breathing or a drop in the saturation levels and stimulates a wake-up mechanism. Conservative treatment includes weight loss and alcohol cut down for the present generation. Active treatment presently contains nasal (CPAP) Continuous Positive Airway Pressure, oral appliances like mouth guards or surgical correction of upper airway compromise. Daytime sleepiness may distinguish simple

snorers from people with Sleep Apnoea in a simpler manner (Lindberg E. Carter N. Gislason T. Janson C. Dec 2001) **[5]**.

Obstructive Sleep Apnoea is known to be a *secret killer*. Among the total Adult population of 18 million, 5% of the population are affected where 4% of middle-aged men, 2% of women and 85% of sports players (neck exercises) suffer from Obstructive Sleep Apnoea. Obstructive Sleep Apnoea restricts air space causing an obstruction as severe as 30-40 times per hour that lead to decreased oxygen saturation below 7% to our body. This deprives our body cells of its oxygen requirement and hence no rejuvenation can occur in the brain. It wakes us up to breath and saturation returns, sleep resumes and again it repeats. These cycles of events lead to getting up of the person from sleep several times gasping for air (Ramar K. et al. July 2015) **[17]**. The prevalence of Obstructive Sleep Apnoea, with its associated mortality and morbidity factors, has led to the view that Obstructive Sleep Apnoea may be as big a public health hazard as smoking and hence requires immediate attention **[16]**.

Moderate and severe Obstructive Sleep Apnoea is hugely related to cardiovascular diseases, diabetes, occupational and road-traffic accidents due to excess fatigue and daytime sleepiness. Treatment of OSA is usually by CPAP and sometimes mandibular advancement device (MAD). Their treatment effectiveness is hindered by limited amenability with long term treatment. Knowledge about various mechanical barriers has elicited interest in the detection of a new treatment method that may inhibit the collapse of airways during sleep. The researchers believe that stabilization of the neck by a Soft Cervical Collar during sleep aids in sustaining airway patency. This would eventually imply improved oxygen saturation in the blood and a reduction of daytime fatigue and sleepiness (Florim Delijaj. November 2018) **[9].**

The study was conducted with the objectives of identifying the Pretest Level of Symptoms and Quality of Sleep, to Evaluate the Effectiveness of the Application of a Soft Cervical Collar on Symptoms and Quality of Sleep, to Correlate Post Test Level of Symptoms with Quality of Sleep, to Associate Post Test Level of Symptoms and Quality of Sleep with their selected Demographic Variables among the patients with Obstructive Sleep Apnoea.

Obstructive Sleep Apnoea patients, diagnosed with their condition are finding it difficult to afford expensive equipment costs for survival. Many opportunist firms have begun to exploit

people by offering this equipment for rent on basis of a higher monthly interest rate. A study conducted with alternating treatment modality will be much beneficial for the common public and patients with Obstructive Sleep Apnoea.

## MATERIALS AND METHODS

A quantitative research approach and Pre-experimental research design were selected for this study. A total number of 60 samples who fulfilled the inclusion criteria were selected from community areas in Puducherry by using a simple random sampling technique by lottery method. The study was conducted for 4 weeks. Assessment of Pretest and Post Test (Post Test 1, Post Test 2, Post Test 3; each consequent $7^{th}$ day of the intervention) Level of Symptoms and Quality of Sleep was done by STOP-BANG questionnaire and PSQI. The participants who were included in the study were Adult Obstructive Sleep Apnoea patients with AHI level of 15-30, BMI less than 35, age group between 20-70years, participants who are willing to participate, and Participants who can understand Tamil or English. The participants who were excluded from the study were adult Obstructive Sleep Apnoea patients: with ongoing or planned pregnancy, having neck injuries and chronic diseases, under-treatment of Psychological conditions and drug abuse, not able to wear a cervical collar for any other reasons.

## RESULTS AND DISCUSSION:

## RESULTS

The study results showed that the calculated Repeated Measures ANOVA F = 42.837 for the effectiveness of Application of a Soft Cervical Collar on symptoms of Obstructive Sleep Apnoea was found to be statistically significant at $p<0.001$Level.

**Table No. 1: Effectiveness of Pretest and Post Tests Level of Symptoms among patients with Obstructive Sleep Apnoea**

| Symptoms | Mean | S.D | Repeated Measures ANOVA "F" Value |
|---|---|---|---|
| **Pretest** | 4.62 | 1.25 | **F = 42.837**<br>**p = 0.0001, S*****|
| **Post Test 1** | 4.43 | 1.24 | |
| **Post Test 2** | 4.00 | 1.09 | |
| **Post Test 3** | 3.89 | 1.02 | |

*****p<0.001, S – Significant**

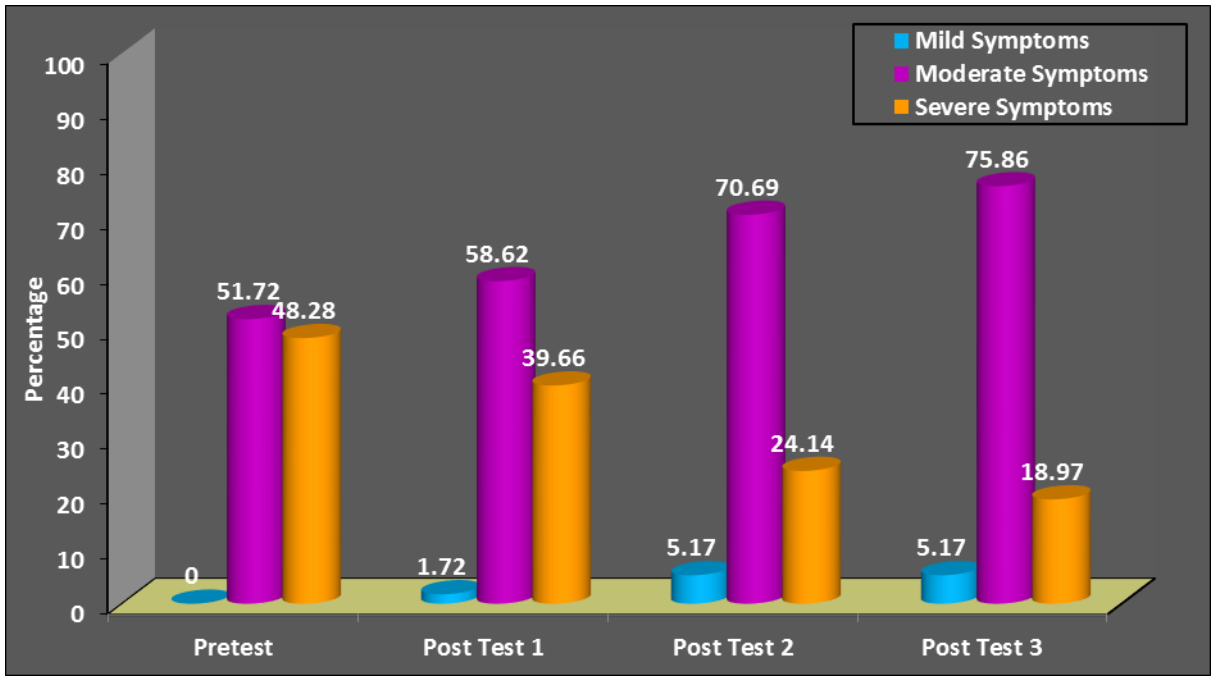


**Fig.1. Percentage distribution of Pretest and Post Test Level of Symptoms among patients with Obstructive Sleep Apnoea**

Table no 1 shows that the calculated Repeated Measures ANOVA F = 42.837 was found to be statistically significant at p<0.001 Level. The mean Level of Obstructive Sleep Apnoea in the Pretest was 4.62±1.25, Post Test 1 was 4.43±1.24, Post Test 2 was 4.00±1.09, and Post Test 3 was 3.89±1.02. This infers that a significant difference in the Symptoms between Pretest and

Post Test 1, Post Test 2, and Post Test 3 was identified. This indicates that Symptoms had reduced considerably.

**Table No. 2: Effectiveness of Pretest and Post Tests Level of Quality of Sleep among patients with Obstructive Sleep Apnoea.**

| Quality Of Sleep | Mean | S.D | Repeated Measures ANOVA "F" Value |
|---|---|---|---|
| **Pretest** | 9.10 | 3.17 | **F = 79.425**<br>**p = 0.0001, S*****|
| **Post Test 1** | 8.34 | 2.86 | |
| **Post Test 2** | 7.50 | 2.56 | |
| **Post Test 3** | 7.19 | 2.57 | |

***p<0.001, S – Significant

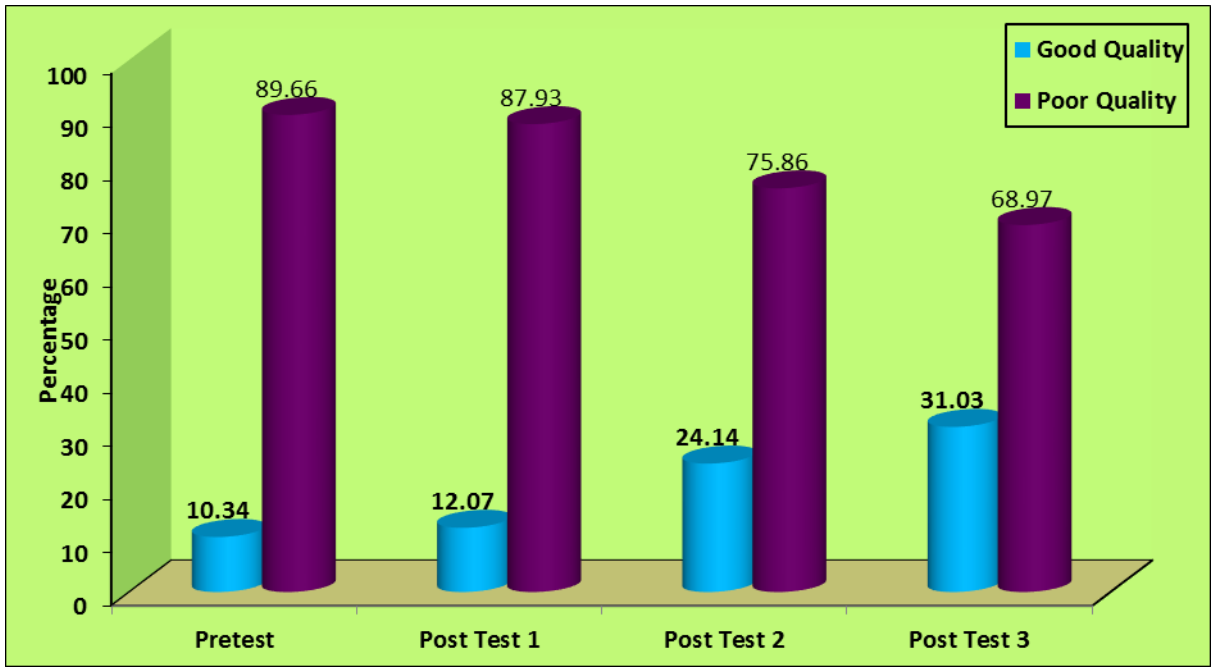


**Fig.2. Percentage distribution of Pretest and Post Test Level of Quality of Sleep among patients with Obstructive Sleep Apnoea**

Table 2 shows that the mean Level of Quality of Sleep in the Pretest was 9.10±3.17, Post Test 1 was 8.34±2.86, Post Test 2 was 7.50±2.56, and Post Test 3 was 7.19±2.57. The calculated Repeated Measures ANOVA F = 79.425 was found to be statistically significant at p<0.001

Level. This infers that a significant difference in the Quality of Sleep between Pretest and Post Test 1, Post Test 2, and Post Test 3 was identified. This indicates that Quality of Sleep had improved considerably.

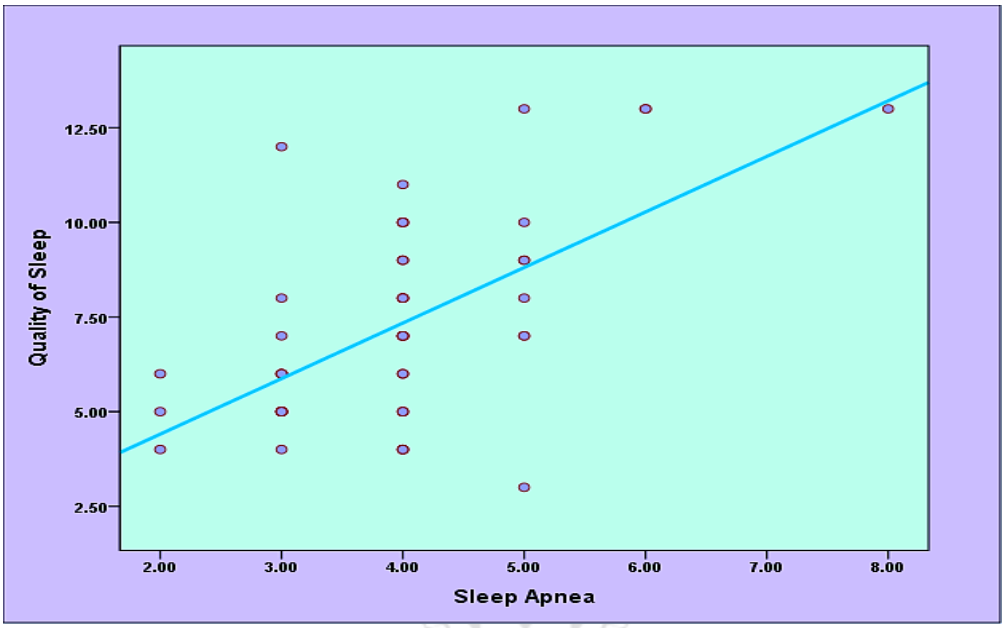


**Fig. 3. Scatter Dot diagram showing the Correlation between Post Test Level of Symptoms and Quality of Sleep among patients with Obstructive Sleep Apnoea**

Fig.3. depicts that the mean value of Post Test 3 Level of Symptoms was 3.89±1.02 and the mean value of Quality of Sleep was 7.19±2.57. The calculated Karl Pearson's Correlation value of r = 0.582 shows a positive correlation which was found to be statistically significant at p<0.001 Level. This infers that when the Symptoms of Obstructive Sleep Apnoea decreases, the Sleep disturbances also decreases which in turn improves the Quality of Sleep.

## DISCUSSIONS

The Application of a Soft Cervical Collar was identified to be effective in reducing the Obstructive Sleep Apnoea Symptoms and as the calculated Repeated Measures ANOVA F = 42.837 was found to be statistically significant at p<0.001 Level. The calculated paired 't' test value of t = 7.927 between Pretest and Post Test was found to be statistically significant at p<0.001 Level.

Arnaud Prigent, Leo Grassion, Stephanie Guesdon, Jesus Gonzalez-Bermejo (2017) conducted a study where the course of respiratory parameters with the various treatments showed a reduction of the median Apnoea -hypopnea index (AHI) from 68 events/h at diagnosis to 21 events/h with PEP and face mask (*P* = .043) and 0.8 events/h with PEP and a cervical collar (*P* = .043), Furthermore the reduction of median PEP from 13 to 10.5 cm H2O. After the study, all patients continued to use the cervical collar at 12 months **[10]**.

Florim Delijaj, Gustaf Levin, Eva Lindberg and Eugen Wang (2016) conducted a study illustrating that AHI was reduced to 30.4 ±] 23.2 through MAD monotherapy, and to 14.9 ± 10.2 through CC/MAD combination therapy. The study showed a significant reduction in AHI scores in patients with severe OSAS through the use of the CC/MAD combination therapy as compared to the MAD monotherapy **[9]**. This result is supported by the study of Hiyama S, Ono T, Ishiwata Y, Kuroda T. (2001) stating that the amount of jaw opening was significantly decreased by the wearing of the cervical headgear (P <.05). These results suggest that cervical headgear significantly reduced the sagittal dimension of the upper airway during sleep, although there was no significant anteroposterior displacement of the mandible **[3]**.

The Application of a Soft Cervical Collar on the Quality of Sleep was identified to be effective in improving the Quality of Sleep as the calculated Repeated Measures ANOVA F = 79.425 was found to be statistically significant at p<0.001 Level. The calculated paired 't' test value of t = 10.371 between Pretest and Post Test was found to be statistically significant at p<0.001 Level.

Chan ASL, Sutherland K, Schwab RJ, et al. (2010) conducted a study where the study results suggest that MAS increased the volume of the upper airway, predominantly by increasing the volume of the velopharynx, and this increased volume is associated with changes in the surrounding bony and soft tissue structures**[11]**. Barthlen GM, Rose EC, Stats R, Jonas IE (2002) conducted a study stating that the treatment with the soft monobloc mandibular advancement device is a therapeutic solution with long term and stable effects (48 months) for patients suffering from mild or moderate obstructive sleep Apnoea **[18]**.

The calculated Karl Pearson's Correlation value of r = 0.582 shows a positive correlation which was found to be statistically significant at p<0.001 Level. The mean Level of Post Test Level of Obstructive Sleep Apnoea was 3.89±1.02 and the mean score of Quality of Sleep was 7.19±2.57.

This infers that when the Symptoms of Obstructive Sleep Apnoea decrease Sleep disturbances decreases which in turn increases the Quality of Sleep.

The only limitation of the study is that among the 60 patients taken, there was a dropout of 2 patients due to migratory reasons. A similar study can be replicated in larger samples for broader generalization and framed health promotion in Community. Further follow-up could be done with the help of polysomnographic parameters to obtain objective findings of effectiveness. A randomized control study can be done to assess the presence of depression among patients with obstructive sleep Apnoea. Similar studies can be replicated in different age groups, different states of India, different professionals like nurses, police, etc. This study can be conducted in a hospital setting. A comparative study can be done between the patients on conventional treatment and patients using the cervical collar, between the rural and urban areas.

## CONCLUSION

The above study results show that the Application of a Soft Cervical Collar was found to lower the symptoms of Obstructive Sleep Apnoea which in turn decreases the sleep disturbances which in turn increase the Quality of Sleep among Obstructive Sleep Apnoea patients. This alternative modality can be beneficial to many a number of persons with Obstructive Sleep Apnoea who are not able to afford the luxurious modalities of its treatment. This gives relief from the symptoms of the conditions, is easy to use, non-invasive and improves the quality of sleep.

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