EFFECTIVENESS OF MYOFUNCTIONAL THERAPY ALONG WITH INSPIRATORY MUSCLE TRAINING VERSUS INSPIRATORY MUSCLE TRAINING ON SEVERITY AND QUALITY OF SLEEP AMONG AN OSA SUBJECTS.

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ABSTRACT

BACKGROUND: Obstructive sleep apnoea (OSA) is a prevalent sleep-related breathing disorder associated with excessive daytime sleepiness, cognitive impairment, and reduced quality of life. OSA is a significant risk factor for road traffic accidents and is strongly linked to obesity, with nearly 60-70% of affected individuals being overweight. While continuous positive airway pressure (CPAP) remains the standard treatment, adherence is often low due to discomfort. Alternative therapeutic approaches, such as oro-facial myofunctional therapy and inspiratory muscle training (IMT), have shown promise in improving OSA symptoms.**OBJECTIVE:**This study aimed to evaluate the combined effect of oro-facial myofunctional therapy and IMT in reducing OSA severity and improving sleep quality in patients with mild to moderate OSA.**SUBJECTS AND METHODS**: A total of 20 participants were randomly assigned into two groups: Group A received myofunctional therapy along with IMT, while Group B underwent conventional physiotherapy with IMT. The intervention was conducted over 12 weeks, with pre- and post-treatment assessments measuring severity and sleep quality using the Apnoea-Hypopnoea Index (AHI) and the Pittsburgh Sleep Quality Index (PSQI).**RESULTS:**Findings suggested a significant improvement in AHI, PSQI, and desaturation index among participants in Group A, indicating that the combined rehabilitative approach effectively enhanced upper airway muscle tone and respiratory function. Despite its limitations, such as the exclusion of individuals with BMI ≥30 kg/m²,**CONCLUSION:** the study highlights the potential role of myofunctional therapy and IMT as adjunct treatments for OSA, offering a non-invasive approach to symptom management and overall sleep quality enhancement.

KEYWORDS: Obstructive Sleep Apnoea (OSA), Sleep-Related Breathing Disorder, Oro-Facial Myofunctional Therapy, Inspiratory Muscle Training (IMT), Sleep Quality, Apnoea-Hypopnoea Index (AHI), Pittsburgh Sleep Quality Index (PSQI),

INTRODUCTION

Obstructive Sleep Apnoea (OSA) is a common and increasingly recognized sleep-related breathing disorder characterized by recurrent episodes of partial or complete airway obstruction during sleep. These episodes lead to intermittent hypoxia, fragmented sleep, and excessive daytime sleepiness, significantly impacting the quality of life. OSA is now considered a global health concern due to its rising prevalence and strong association with cardiovascular, metabolic, and neurological complications.OSA is the most prevalent form of sleep-disordered breathing and affects approximately 2-4% of the population, although this number is believed to be underestimated due to undiagnosed cases. The condition is characterized by repeated episodes of upper airway collapse, leading to either a substantial reduction (hypopnoea) or complete cessation (apnoea) of airflow, despite persistent respiratory effort. These episodes result in frequent awakenings, fluctuations in oxygen levels, and an increased risk of serious health complications such as hypertension, diabetes, stroke, myocardial infarction, and cognitive decline.A strong correlation exists between OSA and obesity, with visceral fat deposition being a key contributing factor. Studies indicate that 60-70% of individuals diagnosed with OSA are overweight or obese. Body Mass Index (BMI) serves as a crucial predictor of OSA, with higher BMI values increasing the risk of developing the condition. Additionally, OSA exhibits a clear sex predilection, being more prevalent in men than women. The exact reason for this male predominance remains unclear, although factors such as hormonal differences and fat distribution patterns are believed to play a role. Postmenopausal women, however, show an increased risk of OSA, suggesting a hormonal influence.OSA is also more common in older adults due to age-related changes in airway muscle tone and structure. Moreover, genetic predisposition plays a role, as individuals with a family history of OSA are at a higher risk of developing the disorder. The typical symptoms include loud snoring, observed apnoeic episodes, excessive daytime sleepiness, morning headaches, difficulty concentrating, irritability, and fatigue. Patients often seek medical attention after being alerted by their bed partners, who witness the apnoeic episodes or are disturbed by loud snoring.Beyond its impact on sleep quality, OSA has significant systemic effects. The condition is linked to an increased risk of hypertension due to repeated episodes of nocturnal hypoxia and sympathetic overactivation. Additionally, untreated OSA can contribute to insulin

resistance, dyslipidemia, and an elevated risk of cardiovascular diseases such as myocardial infarction, arrhythmias, and stroke. The disorder is also associated with neurocognitive impairments, including memory loss, difficulty concentrating, and mood disturbances, further affecting daily functioning and productivity.The diagnosis of OSA is confirmed through sleep studies, with overnight polysomnography (PSG) being the gold standard. This test records various physiological parameters during sleep, including airflow, oxygen levels, respiratory effort, and brain activity, helping to classify OSA severity based on the Apnoea-Hypopnoea Index (AHI). Patients with mild OSA have an AHI between 5 and 15 events per hour, moderate OSA is defined by an AHI between 15 and 30, and severe OSA involves an AHI greater than 30.Treatment for OSA typically includes lifestyle modifications such as weight loss, positional therapy, and avoidance of alcohol and sedatives. Continuous Positive Airway Pressure (CPAP) therapy is the gold standard for moderate to severe cases, providing a continuous flow of air to keep the airway open during sleep. However, patient compliance with CPAP therapy is often poor due to discomfort and inconvenience. Surgical interventions, such as uvulopalatopharyngoplasty (UPPP), mandibular advancement surgery, and nasal surgeries, have been explored, but results remain inconsistent.Given the limitations of conventional treatments, newer rehabilitative approaches such as orofacial myofunctional therapy and inspiratory muscle training (IMT) have gained attention. Myofunctional therapy involves exercises aimed at strengthening the muscles of the tongue, soft palate, and pharynx to improve airway stability and function. IMT focuses on enhancing the strength and endurance of inspiratory muscles, thereby improving respiratory function and reducing airway collapsibility. Studies suggest that these interventions, particularly when combined, can significantly improve sleep quality, reduce AHI, and enhance oxygen saturation levels in patients with mild to moderate OSA.The increasing prevalence of OSA, particularly in urban populations, highlights the need for greater awareness, early diagnosis, and comprehensive management strategies. With a growing body of evidence supporting the role of rehabilitative therapies alongside conventional treatments, a multidisciplinary approach integrating lifestyle changes, respiratory muscle training, and targeted therapies may offer long-term benefits for OSA patients. As the field of sleep medicine continues to evolve, further research into alternative and adjunctive therapies remains crucial for improving patient outcomes and reducing the burden of OSA-related complications.

METHODOLOGY

STUDY DESIGN:This comparative study was conducted in the Department of Cardio-Respiratory Physiotherapy at Ashwin Multispeciality Hospital, Coimbatore, with the objective of evaluating the effects of Myofunctional Therapy combined with Inspiratory Muscle Training versus Conventional Physiotherapy with Inspiratory Muscle Training in patients with Obstructive Sleep Apnoea (OSA). The study population included patients who attended the hospital's outpatient and inpatient departments with complaints of snoring, frequent nighttime awakenings, daytime sleepiness, choking in sleep, breathing difficulties, and obesity.

SUBJECTS: A total of 20 subjects diagnosed with mild to moderate OSA, who either refused or were unsuccessful with CPAP therapy, were selected based on inclusion criteria, which included an age range of 40 to 70 years, BMI below 40, and a neck circumference greater than 17 inches for men and 16 inches for women. Exclusion criteria included patients below 20 years, those with metabolic disorders, cardiac diseases such as myocardial infarction or heart failure, neurological deficits, uncontrolled hypertension or diabetes, chronic obstructive pulmonary disease, carotid vascular disease, and musculoskeletal disabilities. The study was conducted over five months, with each subject undergoing a 50-minute intervention session daily, seven days a week, for 12 weeks. The subjects were randomly divided into two groups of ten using the lot method: Group A received Myofunctional Therapy along with Inspiratory Muscle Training, while Group B received Conventional Physiotherapy along with Inspiratory Muscle Training. Treatment involved the use of various physiotherapy tools, including a couch, pillow, balloon, spoon, straw, brush, neck slimmer, facial jaw exerciser, and inspiratory muscle training devices. The severity of OSA was measured using the Apnoea-Hypopnoea Index (AHI), which quantifies the average number of apnoeas and hypopnoeas per hour of sleep, categorizing OSA as mild (AHI 5–15), moderate (AHI 15–30), or severe (AHI >30). Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), a widely used tool consisting of 24 questions that evaluate various sleep parameters, generating a global score ranging from 0 to 21. Ethical approval was obtained from the PPG College of Physiotherapy and Ashwin Multispeciality Hospital before the study commenced. Pre- and post-intervention assessments of severity and sleep quality were recorded and analyzed to determine the effectiveness of the respective treatment approaches in improving OSA symptoms.

DESCRIPTION OF INTERVENTION:

GROUP A

MYOFUNCTIONAL THERAPY EXERCISE

TREATMENT	REPITATION	DURATION	REST
Tongue slide	10 times	1 minutes	10 sec
Tongue force	10 times	4 minutes	20 sec
Tongue press	10 times	2 minutes	20sec
Tongue stretch	10 times	2 minutes	20 sec
Tongue clench	10 times	2 minutes	20sec
Gum chewing	10 times	2 minutes	20 sec
Finger in cheek	10 times	2 minutes	10 sec
Inflate balloon	10 times	5 minutes	1 min
Nasal breathing	10 times	5 minutes	20 sec
Softpalate exercise	10 times	5 minutes	40 sec
Respirometer	10 times	10 minutes	1 min

GROUP B

IMT(respirometer)

TREATMENT	REPITATION	DURATION	REST
Breathing exercise	10	10 minutes	1 minutes
Active exercise	10	20 minutes	3 minutes
Respirometer	10	10 minutes	2 minutes

STATISTICAL ANALYSIS:

The result was analysed for pre and post test values using paired ‘t’ test favored for alternate hypothesis. The statistical tool used in this study are paired t-test. The paired t-test was used for within group analysis. Pre -test and post-tet values were calculated using paired t test at significant level $p<0.05$ with t-value.

RESULTS

Parameter	**Mean**	**SD**	**Calculated t Value**	**Table t Value**	**P Value**
Quality of Sleep					
Pre-Test	16.30	2.67	11.6208	2.262	P < 0.05 Significant
Post-Test	5.10	1.29			
Severity					
Pre-Test	16.30	5.10	7.7175	2.262	P < 0.05 Significant
Post-Test	8.00	3.30			

The analysis of Group A's quality of sleep reveals a significant difference between pre-test and post-test values. The pre-test mean and standard deviation were 16.20 and 2.66, while the post-test mean and standard deviation were 5.10 and 1.29. With a table t-value of 2.262 and a calculated t-value of 11.2963, the statistical findings indicate a significant improvement in sleep quality after the intervention.

Similarly, the severity analysis also demonstrates a notable difference between pre-test and post-test values. The pre-test mean and standard deviation were 16.30 and 5.10, whereas the post-test values were 8.00 and 3.30. The calculated t-value of 7.7175, compared to the table t-value of 2.262, confirms a statistically significant reduction in severity

Parameter	**Mean**	**SD**	**Calculated t Value**	**Table t Value**	**P Value**
Quality of Sleep (Set 1)					
Pre-Test	15.90	2.33	21.8943	2.262	P < 0.05 Significant
Post-Test	10.20	2.20			
Quality of Sleep (Set 2)					
Pre-Test	16.90	4.63	8.9134	2.262	P < 0.05 Significant
Post-Test	13.70	4.45			

The analysis of Group B's quality of sleep indicates a significant difference between pre-test and post-test values. The pre-test mean and standard deviation were 15.90 and 2.33, while the post-test mean and standard deviation were 10.20 and 2.20. With a table t-value of 2.262 and a calculated t-value of 21.8943, the statistical findings confirm a significant improvement in sleep quality following the intervention. Similarly, the severity analysis also highlights a notable difference between pre-test and post-test values. The pre-test mean and standard deviation were 16.90 and 4.63, whereas the post-test values were 13.70 and 4.45. The calculated t-value of 8.9134, compared to the table t-value of 2.262, establishes a statistically significant reduction in severity.

Parameter	**Group**	**Mean**	**SD**	**Calculated t Value**	**Table t Value**	**P Value**
Pittsburgh Sleep Scale						
Quality of Sleep	Group A	5.10	1.29	6.3258	2.262	P < 0.05 Significant

Parameter	**Group**	**Mean**	**SD**	**Calculated t Value**	**Table t Value**	**P Value**
Quality of Sleep	Group B	10.20	2.20			
Apnea Hypopnea Index						
Quality of Sleep	Group A	8.00	3.30	3.2543	2.262	P < 0.05 Significant
Quality of Sleep	Group B	13.70	4.45			

The analysis of post-test scores between experimental Group A and Group B reveals a significant difference in both the Pittsburgh Sleep Quality Index and the Apnea Hypopnea Index. In the Pittsburgh Sleep Quality Index, the post-test mean and standard deviation for Group A were 5.10 and 1.29, while for Group B, they were 10.20 and 2.20. The calculated t-value of 6.3258 exceeded the table t-value of 2.262, indicating a statistically significant difference between the groups. Consequently, the null hypothesis is rejected, and the alternate hypothesis is accepted. Similarly, in the Apnea Hypopnea Index, the post-test mean and standard deviation for Group A were 8.00 and 3.30, whereas for Group B, they were 13.70 and 4.45. The calculated t-value of 3.2543 was greater than the table t-value of 2.262, confirming a significant difference between the groups. Thus, the statistical findings establish that there is a significant difference in post-test scores between experimental Group A and Group B.

DISCUSSION

Obstructive sleep apnoea (OSA) is a common sleep-related breathing disorder. Over the past few decades, there has been a growing recognition of OSA as a major public health challenge. OSA is associated with excessive daytime sleepiness, cognitive impairment, and reduced quality of life. **L SPICUZZA(2015)et al** conducted study on Obstructive sleep apnoea (OSA) is a multi factorial global disorder. Road traffic accidents (RTA) are a major cause of morbidity and mortality in india.OSA has been identified world over as one of the risk factors in vehicle collisions. The estimated death due to RTA attributable to OSA is largely unknown.One of the biggest risk factors for obstructive sleep apnoea is being overweight or obese. This is because the fat deposits around upper airway interfere with breathing. The 2015

study mentioned above reveals that nearly 60-70% of people suffering from obstructive sleep apnoea are obese.Nightly,use of CPAP ,the standard treatment for OSA results the breathing disturbance further more CPAP and adherence is often low as patients experience it as intrusive and difficult to wear throughout the night. This study ways to decrease CPAP usage in OSA subjects.[22] The episodes of hypopnoea and apnoea during sleep are measured by polysomnography or home sleep testing with apnoea hypopnoea index (AHI) being vital measure of the test.The present study was effect of oro-facial myofunctional therapy combined to inspiratory muscle training in terms of reducing severity and , improving the quality of sleep in patients affected by mild and moderate OSA [23].The papers included in their systematic review evaluated the effects of the oro-facial myofunctional therapy along with inspiratory muscle training for only mild and moderate OSA adults.Moreover, the results suggested a good trend in the improvement of symptoms in patients in the intervention group who underwent the combined rehabilitative treatment (oro-facial myofunctional exercises *plus* inspiratory muscle training). Specifically, the patients reported a significant overall improvement in AHI and Pittsburgh Sleep Quality Index , which suggests an improvement in the indexes attributable to the physiotherapy intervention. Furthermore, a better desaturation index was observed in the intervention group, which could be related to the improvement in both the number of total obstructive apnoeas and the number of hypopnoea Since OSA causes sleep interruption and deterioration of sleep quality, the improvement observed after this novel rehabilitation treatment might be a very important aspect of the rehabilitation goals in these patients.

Further, it was shown that inspiratory muscles were subjected to potentially fatiguing loads during obstructive sleep apnoea with an increase in gastric pressure and inward abdominal movement during the expiratory phases of the apnoea.Thus, rehabilitation could be an adjunct management for OSA, and inspiratory muscle training could help to improve respiratory and cardiovascular fuctionsin OSA subjects.More specially ,since OSA involves the collapse of the upper airways with inspiration during sleep, IMT reducing number of apnoea by improving upper airway muscle tone.However, this study presents some limitations: first, the inclusion of patients with a BMI <30 kg/m might limit the generalizability of the findings, considering that a very large OSA population affect by obesity.In this study, 20 subjects were selected based on selection criteria.They were divided into two groups by using randomized trial by lot method. Group A consisted of 10 subjects and the received myofuncional therapy along with inspiratory muscletraining.Group B consisted of 10 subjects and the received conventional physiotherapy

along with inspiratory muscle training.The study conducted over a period of 12 weeks.The pre-test score and post-test score before and after 12 weeks of treatment for severity and sleep quality the values were recorded.

LIMITATIONS

The study was limits to particular age group.

The study was conducted in short duration.

The study did not include a control group.

The study included mild and moderate group only

SUGGESTIONS:

Similar study can be done on patients with severe caess

Similar study can be done with more number of subjects

The study can be performed for a longer study duration

Further studies can be done with other conventional therapy as a common technique.

Having a control group is desirable.

CONCLUSION

The study concluded that, both the groups showed statistically significant reduced in severity and improvement in quality of sleep among OSA subjects after the application of Myofunctional therapy along with inspiratory muscle training for Group A and inspiratoy muscle training for Group B for a period of 12 weeks. But Group A showed significant improvement when it was compared with Group B.

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