VOLUME - 11, ISSUE - 12, DECEMBER - 2022 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Physiotherapy

EFFECTIVENESS OF UNSUPPORTED UPPER LIMB EXERCISE VERSUS LOWER LIMB EXERCISE WITH PURSED-LIP BREATHING AND DIAPHRAGMATIC BREATHING IN PATIENT WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE: A COMPARATIVE STUDY

Barnali Bhattacharjee* Assistant Professor, Banarsidas Chandiwala Institute of Physiotherapy, Kalkaji, New Delhi *Corresponding Author

Mamita Ahmed Former Assistant Professor, Assam Down Town University, Assam,

ABSTRACT

Background: Reduced exercise capacity to perform physical activities is a common manifestation of chronic obstructive pulmonary disease (COPD), with patients presenting exercise limitations when compared with healthy individuals.The purpose of this study is to find out and elaborate the effectiveness of unsupported upper limb and lower limb exercise training , and find out which form of exercise training is more beneficial to improve pulmonary functions in patient with COPD. **Method:** An experimental study has been done on 30 individuals randomised into 2 groups where group A received unsupported upper limb exercises and group B received lower limb training ; with pursed lip and and diaphragmatic breathing being given to both the groups. **Result:** Analysis using paired t test found that there is no significant difference ($p>0.05$) between the unsupported upper limb training versus lower limb training groups **Conclusion:** Though the result showed that there is no significant difference between the two groups but when compared between the two groups,it was seen that lower limb exercise training showed better results than unsupported upper limb training.

KEYWORDS : COPD, Exercise capacity ,PFT , Diaphragmatic Exercise, Purse Lip Breathing Exercise.

INTRODUCTION

The Global Initiative for Chronic Obstructive Lung Disease (GOLD) defined COPD as a disease state characterized by airflow limitation that is not fully reversible. The airflow limitation is usually both progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases.[1]

COPD now ranks as the fourth leading cause of death. It is also a major contributor to job absenteeism and the overall cost of caring for COPD patients has been estimated as high as $40 billion annually with $1.6 billion for long-term oxygen alone.[2]

A variety of pathological changes have been observed in the central airways, peripheral airways and lung parenchyma of patients with chronic obstructive pulmonary disease (COPD). The characteristic changes in the central airways include inflammatory cellular infiltration into the airway wall and mucous gland enlargement. In the peripheral airways, various morphological changes are observed, including mucous plugging, epithelial abnormalities, inflammatory cellular infiltrates, fibrosis and distortion; these changes lead to airway narrowing. Although the major sites of airflow limitation in patients with COPD are most likely the peripheral airways, lesions in both the peripheral airways and the lung parenchyma contribute to chronic airflow limitations.3

Reduced capacity to perform physical exercise is a common manifestation in chronic obstructive pulmonary disease (COPD), with patients presenting limitations in physical activities requiring exertion and lower levels of physical activity when compared with healthy controls.[4]

Frequently, the most severe patients relate major difficulty with activities that involve the upper limbs (UL) compared with lower limbs, particularly when using them without support.[5,6]

Simple arm elevation modifies ventilatory and postural muscle recruitment, therefore, altering the mechanics of the ribcage and abdominal compartments. However, in COPD patients during exercise of UL, these muscles need to sustain the upper girdle and act as accessory respiratory muscles, playing a competitive role .[7]

These muscles, which are usually inactive during inspiration at rest in healthy people, vigorously act during physical effort in COPD patients. Thus, during activities that involve UL, respiration becomes ineffective because the accessory respiratory muscles operate to sustain the shoulder girdle. As a result, the functional overload of the diaphragm associated with thoracoabdominal asynchrony trigger the premature appearance of dyspnoea and fatigue, causing reduction of upper limbs endurance capacity in these patients.[8,9]

The goals of effective COPD management are to prevent disease progression, revels symptoms and improves exercise tolerance, improve health status and prevent and treat complication exacerbation and reduce mortality.

Objective Of The Study

The objective of the study is to find which of the exercise form i.e. unsupported upper limb exercise versus lower limb exercise shows better result with spirometer in patient with COPD.

Need Of The Study:

Many studies have been done to elaborate the effectiveness of unsupported upper limb and lower limb exercises, but there is lack of study to find out which of the two i.e. unsupported upper limb or lower limb is more beneficial in patient with COPD.

And lack of time for exercise in our busy life-style makes it important to study which exercise training is more beneficial to improve pulmonary function in patient with COPD.

The need of the study is therefore to compare the effectiveness of unsupported upper limb verses lower limb exercises with purse lip and diaphragmatic breathing in patient with COPD.

METHODOLOGY

An experimental study was conducted on 30 subjects suffering from COPD with spirometric evidence of Chronic airflow limitation ($FEV1 < 50\%$, $FEV1/FVC < 70\%$) and based on the inclusion criteria for 3 days in 4 weeks.. Prior to the participation, all patients signed the Informed consent, reiterating the basic procedure and intent of the study,as well as warning of any potential risks involved as a result of participation. The ethical clearance was attained. Detailed subjective assessment of the subjects were done preoperatively to rule out any other abnormalities. Both Male and female patients in the age group of 30 to 60 were included in the study.The patients excluded were the ones suffering

from severe orthopaedic or neurological disorders limiting their mobilty, severe pulmonary hypertension,unstable angina or recent MI, cardiac and lung surgical cases, uncooperative patients. The outcome measure used was Spirometer(FEV1, FEV1/FVC)

Procedure:
The subjects were randomly assigned into 2 groups –Group A and Group B.

Group A unsupported upper limb exercise with diaphragmatic breathing and pursed lip breathing. Subjects was asked to do 6 minutes of unsupported upper limb exercise with diaphragmatic and pursed lip breathing (sets of 5 repetitions before and after the exercise), 3days a week, for 4 weeks. Upper extremity exercise as follows Group B Lower limb exercise with diaphragmatic and purse lip breathing.

Exercise Protocol :
Group-A (Unsupported Upper limb exercise) :
This was measured as the patient seated erect in a straight-backed chair with both feet on the floor facing the wall on which a chart was mounted.The chart consisted of eight horizontal coloured strips of paper, the distance between the centres of the strips was 0.15 m. each strip also had a clearly visible stage number. The first level was adjusted to be at the level of patient's knees by altering the position of the chart on the wall. The highest level the patient could reach was recorded. The patient was holding a light weight (0.2kg). The patient started lifting the weight from a neutral position.

Once the patient reached maximum vertical height, the weight was progressively increased by 0.5 kg every minute to a maximum weight of 1 kg. The test was terminated as the patient experienced arm fatigue at the maximum position reached.

Group-B (Lower limb exercise training):
Subjects in Group-B had received lower extremity exercise training for 6 minutes, with diaphragmatic and purse lip breathing (sets of 5 repetitions before and after exercise), 3 days a week, for 4 weeks. Lower limb exercise as follows :

Lower limb training by 6-minute walk test as much as the subject can walk in 6 minute.

Data Analysis:
P value shown in table 1. Paired-T-Test was used within each group to assess whether a significant change from base line had occurred or not. All P values are > 0.05. Data was analyse by using SPSS 20. There were no significant different among the groups at base line from any of the mentioned outcomes.

Table 1: Changes in outcome measures at the end of the study

	Group A			Group B		
	Pre	Post	P value	Pre	Post	P value
PFT (FEV1/FVC)	66.67 ± 3.74	67.68 ± 3.64	0.4598	68.40 ± 1.71	68.93 ± 1.69	0.4005
PFT (FEV1)	46.70 ± 2.14	47.78 ± 1.96	0.1606	47.25 ± 2.50	47.89 ± 2.59	0.4968

DISCUSSION
The aim of the study is to compare the effect of unsupported upper and lower limb exercise training to improve pulmonary function test and find out which one will be more effective.

To compare the effectiveness of UULE and LLE training effect on COPD patients, a group of 30 patients being divided into two groups namely Group A and Group B. In both Group A and Group B, we have 15 (fifteen) subjects each with both Pre and Post analysis values under PFT (FEV1/FVC) and Pre and post analysis value under PFT (FEV1).

The calculated values of ***p*** are >0.05 for both mode of treatments. So we are in a position to say that there is no significant difference between pre and post treatments scores in Group A and Group B.

But on comparing the ***p*** values among the groups, it can be suggested that compared to Group A, Group B has better result in terms of improvement.

CONCLUSION
Based on the statistical analysis performed it is concluded that there in no significant difference between unsupported upper limb exercise and lower limb exercise with purse and diaphragmatic exercise. But on comparing the p values, Group B shows more improvement than Group A. So according to my study, I found lower limb exercises were more effective on COPD patients.

REFERENCES

1. Global Strategy for the Diagnosis, Management and Prevention of COPD, Global Initiative for Chronic Obstructive Lung Disease.
2. Nici L, Donner C, Wouters E, et. al. (2006) studied the effect of unsupported upper extremity exercise training in pulmonary rehabilitation and concluded and strongly recommended the introduction of unsupported upper extremity exercise training of sufficient duration in pulmonary rehabilitation program.
3. Porta R, Vitaca M, Gile LS, et. al. (2005) studied the effect of supported arm training in 15 patients and concluded that significant benefit of supported upper extremity exercise training in the patient who was on mechanical ventilator for at least 15 days.
4 Morris AH , Koski A, Johnson LC (2004) studied the reliability and validity of PFT and concluded that PFT is valuable tool to assess respiratory system and to measure lung volume. It is also used to assess health status before enrolment in physical programs
5. Ziemba AW, Chwalbinska-Moneta J (2003) studied on physiological response to early effect of short term aerobic training and concluded that decrease in the resting and submaximal heart rate and respiratory rate is the earliest effect of increase physical activity.[31]
6. Pendergast DR. (1999) has studied cardio vascular, respiratory and metabolic response to upper body exercise and concluded arm exercise at a given workload is typified by cardiac output and oxygen consumption values slightly higher and heart rate, blood pressure, ventilator and blood lactic acid responses that are significantly higher than those observed during leg exercise
7. Ries AL, Ellia B, Hawkins RW (1998) studied the effect of upper extremity exercise training on minute ventilation and dyspnoea in COPD and concluded that arm elevation and arm exercise require a higher of minute ventilation and produce more dyspnoea than leg exercise for a given energy expenditure
8. Faria EW, Faria IE (1998) studied on cardio respiratory response to exercise of equal relative intensity distributed between upper and lower body and found that cardio respiratory response to upper and lower body exercise do not differ significantly from those to lower body exercise.[34]
9. Aminoff T, Smolander J, Korhonen O, Louhevaara V (1997) has studied that cardio respiratory and subjective response to prolong arm and leg exercise in healthy young and older men. and conclude that during arm cranking there were no significant difference in the 20 physiological responses between the age groups