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COMPARISON BETWEEN THE EFFECT OF UPPER LIMB AND LOWER LIMB AEROBIC EXERCISE TRAINING ON FUNCTIONAL CAPACITY IN PATIENT WITH STABLE MODERATE COPD.

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ABSTRACT

Background: Chronic Obstructive Pulmonary Disease (COPD) is a common, preventable and treatable disease that is characterized by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities usually caused by significant exposure to noxious particles or gases. Chronic inflammation leads to structural changes, narrowing of the small airways and destruction of the lung parenchyma that leads to the loss of alveolar attachments to the small airways and decreases lung elastic recoil . Most common respiratory symptoms include dyspnea, cough and/or sputum production.

Purpose: To study and compare the effect of upper limb and lower limb aerobic exercise training of functional capacity in stable moderate COPD patient.

Sampling Methods: The comparative study consist of sixty participants with stable moderate COPD. simple random sampling using chit method a people with odd number were placed in Group A and with even numbers were placed in Group B. So Group A include thirty individuals and Group B include thirty individuals.

Results: The results of the study showed that there was a significant statistical reduction in the Borg RPE scale rating in both the groups but reduction was seen more in Group B with lower limb aerobic exercise training.

On comparison of 6MWD study showed that there was significant statistical improvement seen in both groups. But Group B with lower limb aerobic exercise training showed more statistical improvement than Group A with upper limb training.

Conclusion: After comparing the result ,we can conclude that there was significant statistical improvement seen in both the groups of stable moderate COPD patient ,but patient trained with lower limb training showed better statistical improvement than patient exercising with upper limb traning.

KEYWORDS : stable moderate copd, functionalcapacity, subamaximal aerobic exercise intensity.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a preventable and treatable disease with some significant extrapulmonary effects that may contribute to the severity in individual patients.[1]

Its pulmonary component is characterized by airflow limitation that is not fully reversible. The airflow limitation is usually progressive and associated with an abnormal inflammatory response of the lung to noxious particles or gases.[1]COPD will usually worsen with time, especially if untreated. [1]

The majority of people suffering from COPD have chronic bronchitis, although emphysema is often a more problematic disease and results in greater decrease in quality of life .[1]

In the United States, the overall prevalence of COPD in adult white populations is 4 to 6% in men and 1 to 3% in women in the age group 55 to 74 years, COPD ranked third in men and fourth in women as a cause of death. [2]

COPD is an enormous cause of disability among affected individuals. The WHO estimates that COPD causes 4.7 million deaths annually, making the condition the fifth leading cause of global mortality. [3]

A study published by World Bank /WHO reported COPD is likely to rise from being 12th most burdensome disease in 1990 to 5th in 2020. [4]

In the Indian scenario the prevalence rates of COPD in males are reported as 2.12% to 9.4% and that for females is 1.33% to 4.9% in the studies from north India while the prevalence rates of COPD from South India for males is 1.4% to 4.08% and that for females is 2.55% to 2.7%. The Medians are 5% for male and 2.7% for females. India constitutes nearly 25-30 % of patient with COPD. [4]

For patient with COPD degradation in lung function is progressive, leading to premature disability & death .As the lung function decreases ,the ability to engage in activities of daily living decreases & thus the quality of life is impaired. [5]

In patient with COPD upper limb muscles act as accessory muscles of respiration. During unsupported arm exercises the participation of the accessory muscles in ventilation decreases & there is shift of respiration work to diaphragm. [5]

It's has been seen that upper limb exercise training for patient with COPD increases upper limb work capacity improves endurance & decreases oxygen consumption at given work load. [5]

The effectiveness of lower limb exercise training for patient with COPD has also been well documented with consistency & clinically significant improvement in exercise capacity and quality of life. [5]

PROBLEM STATEMENT –

Is there any difference between the effect of upper limb and lower limb aerobic exercise training in improving functional capacity in patients with stable moderate COPD.

OBJECTIVE –

To study the effect of upper limb aerobic exercise training on functional capacity of patient with stable moderate COPD by using outcome measures 6MWD and BORG RPE SCALE RATING.

To study the effect of lower limb aerobic exercise training on functional capacity of patient with stable moderate COPD by using outcome measures 6 MWD and BORG RPE SCALE RATING.

To compare the effect upper limb and lower limb aerobic exercise training on functional capacity of patient with stable moderate COPD by using outcome measures 6 MWD and BORG RPE SCALE RATING.

METHODOLOGY

Study design - Experimental .
Sample method –Simple random sampling .
Sample size - 60 patient .
Study area – In and around PCMC area.
Study duration - 6 months.

INCLUSION CRITERIA

All patient with moderate COPD based on GOLDS criteria .
[GOLD 2 moderate:FEV1`/FVC< 0.70, FEV1 -50 to 80 %] Age 40-65 years old.
Both Male & female .
Co-operative patient.

EXCLUSION CRITERIA.

Patient with any musculoskeletal or neurological conditions.

with any associative heart disease .

Inability to communicate because of language barrier, hearing or cognitive impairment .

PROCEDURE

Ethical approval was taken from ethical committee. subject were chosen on the basis of inclusion and exclusion criteria . patient consent was taken .Out of 60 patient 2 groups of 30 patient each were randomly made.

Intensity of exercise was set based upon target heart rate which was set between 40%-75% of HR which was correlated with 14 -15 on RPE scale rating. [6,7,8.]

All the patient were told to perform PFT test prior to the training .

Group A was given upper limb exercise protocol which started with warm up for 10 mins which include active mobility exercise of upper limb .Warm up was then followed by arm ergometer. Exercise protocol was set based upon intensity and duration. End of protocol include cool down exercise which include lower limb stretches, low intensity active movement for 10 mins.

After the completion of the protocol 6MWT and Borg RPE was again taken of each patient for further comparison of data.

Group B was given lower limb exercise protocol which started with warm up for 10 mins which include active mobility exercise of lower limb like active lower limb movements ,spot marching . Warm up was then followed by walking. Exercise protocol was set based upon intensity and duration. For group B exercise protocol was started with warm up, it was then followed by aerobic exercise using walking.

End of protocol include cool down exercise which include lower limb stretches, low intensity active movement for 10 mins.

BOTH THE GROUPS WERE GIVEN 6 WEEKS PROTOCOL BASEDUPON INTENSITY AND DURATION AS SHOWN BELOW :

Week 1 - intensity was kept as tolerated by patient, which falls between 14-15 RPE on, duration 10 mins.

Week 2 - intensity was kept as tolerated by patient, which falls between 14-15 on RPE, duration 20 mins.

Week 3 - intensity was kept as tolerated by patient, which falls between 14-15 on RPE, duration 30 mins.

Week 4 intensity was increased as tolerated by patient, which falls between 14-15 on RPE, duration 30 mins.

Week 5 intensity was increased as tolerated by patient, which falls between 14-15 on RPE,

Week 6 intensity was increased as tolerated by patient, which falls between 14-15 on RPE, duration 30 mins.

On the completion of the protocol 6MWT and Borg RPE was again taken of each patient for further comparison of data.

EXERCISE STOPPED IF - - DIZZINESS.

- CRAMPS.
- SHORTNESS OF BREATH.
- PAIN IN CHEST.

DATAANALYSIS

Data was than analysed by using paired "t" test and unpaired "t" test.Data within same group was analysed by using paired -t test and in between group a and group b unpaired - t test was used. Data was analysed using Instat app.

RESULT

TABLE AND GRAPB BELOW SHOWS DATA ANALYSIS OF BORG RPESCALE OF BOTH THE GROUPS

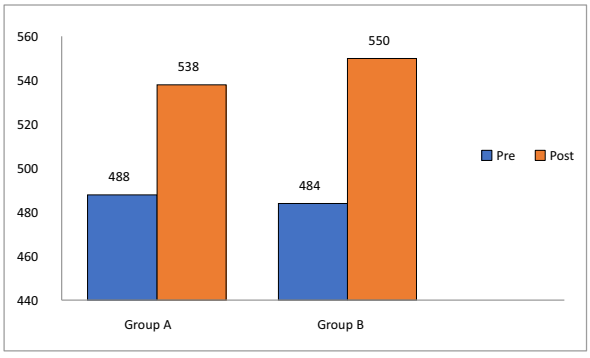
As shown in table below , when compared the BORG RPE scale, post training [mean 11.53] to pre training [mean 14.5] in stable moderate COPD patient, significant statistical difference [p<0.0001] was found in group A.

when BORG RPE scale was compared, post training [mean 9.26] to pre training [mean 12.6] in stable moderate COPD patient, significant statistical difference [p<0.0001] was found in group B.

When in between group comparison was done for BORG RPE SCALE, mean difference of group A [3.00] and group B [mean 3.33], as shown in table, the significant statistical difference found was [p<0.0001] when compared in between groups.

Table 1:

Outcome Measure	Groups	Training	Mean	SD	Paired "t" test	Significance p value	Mean difference	Unpaired "t" value	Significance P value
BORG RPE SCALE	Group A	Pre	±14.5	.87	5.326	P<0.0001	3.00	5.790	P<0.0001
		Post	±11.53	± 1.47					
	Group B	Pre	±12.6	±1.42	16.69	P<0.0001	3.33		
		Post	±9.26	.5					



Graph 1:

TABLE AND GRAPH BELOW SHOWS DATA ANALYSIS OF 6 MWD OF BOTH THE GROUPS.

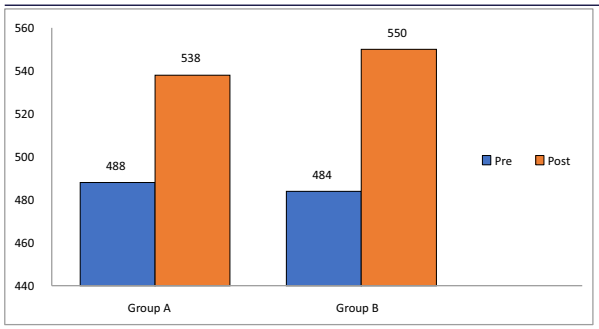
As shown in table below, when compared the distance covered in 6-Min walked test, post training [mean 538] to pre training [mean 488] in moderately stable COPD patients, significant statistical difference [0.0002] was found in Group A.

when distance covered in 6 min walked compared, post training [mean 550] to pre training [mean 484] in moderately stable COPD patients, significant statistically difference was found [p<0.0001] was found in Group B.

When in between group comparison was done for 6 min walk distance mean difference in Group A [MEAN -15.000] and Group B [MEAN 66.000], was shown in table , there was significant difference found was [p<0.0001] .

Table 2:

Outcome Measure	Groups	Training	Mean	SD	Paired "t " test	Significance P value	Mean difference	Unpaired "t" test	Significance "P" value.
6 MWD	Group A	Pre	+ 488	± 36.0	4.34	0.0002	-15.000	8.69	<0.0001
		Post	± 538	± 49.15					
	Group B	Pre	+ 484	± 36.7	15.83	< 0.0001	-66.000		
		Post	+ 550	± 32.8					



Graph No 2 -

DISCUSSION

The present study was carried out to compare the effect of upper limb and lower limb aerobic exercise training on functional capacity in patient with stable moderate COPD.

The self-paced 6MWT was used as it measures and assesses patient's submaximal level of functional capacity and allows patient to stop and rest during the test. [9]

Most activities of daily living are performed at Submaximal levels of exertion, the 6MWD may better reflect the functional exercise level for daily physical activities (ATS statement: 2002).[9]

On comparing the 6-min walk distance of both the groups, group A with upper limb exercise training, showed post training6-MWD (mean 538) to pre training 6-MWD (mean 488), and group B with lower limb exercise training, post training 6-MWD(Mean 550) to pre training 6-MWD (mean 484), showed significant statistical improvement. However, the improvement is more significant statistically , in group B lower limb exercise training.

Some subjects in both the groups were allowed to take rest in between the treatment if they required and it was found that there was improvement in distance covered, even with interval training as referred to continuous training, despite of the rest pause.

COPD patients have an increased physiologic dead space and breath more to achieve the same level of alveolar ventilation. [10,11] The patients compensate for flow difficulties by increasing breathing frequency and decreasing tidal volume compared to normal subjects. So, during exercise, inspiratory movements are assisted by accessory inspiratory muscles. [10,11] Airway narrowing will thus cause increase of air trapping in bronchioles and alveoli, and thus will result in increased of physiological dead space. [10,11] The obstruction hinders normal gas exchange, and reduces exercise performance by increasing the energy cost of breathing. [10,11] Improved exercise tolerance may show changes in breathing pattern, specifically, increased tidal volume and reduced respiratory rate. [10,11].

On comparing RPE scale ratings of both Group A and Group B there was slight improvement in both cases but Group B showed more significant improvement. This improvement in perceived exertion can be due to the psychological benefit of exercise, which included increased motivation, desensitization to dyspnea and loss of fear of exercise. [12,13.]

Pulmonary disease results in dyspnea/shortness of breath on exertion. As a result of this patient limits their work, physical activity which even contributes to deconditioning effect. [14,15] Exercise has been shown to be an effective intervention to break this vicious cycle and prevent disability and functional impairments. [14,15] Poor exercise tolerance in COPD patients do not always link closely to limitation in pulmonary ventilation and gas exchange in exercise. [14,15] Rather, peripheral skeletal muscle performance deteriorates in COPD due to, decreased muscle mass and strength and reduced skeletal muscle oxidative capacity from a marked decrease in type I and increases in type IIb muscle fibers proportions and reduced mitochondrial enzyme activities. Loss of peripheral function possibly results from detraining with sedentary lifestyle. [16,17,18]

Aerobic exercise causes increase in the collaterization of peripheral capillaries so as to increase blood supply to working muscle and also increase in nitric oxide production in blood vessels, also increase of oxidative enzyme in working muscles, and is also associated with shift from type ll to type l muscle fibers. [16,17,18]

CONCLUSION

After comparing the result, we can conclude that there was significant statistical improvement seen in both the groups of stable moderate COPD patient, but patient trained with lower limb aerobic exercise training showed better statistical improvement than patient exercising with upper limb aerobic exercise training.

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