A COMPARATIVE STUDY ON HIGH INTENSITY INTERVAL TRAINING (HIIT) VERSUS ANAEROBIC TRAINING FOR INSPIRATORY MUSCLES TO IMPROVE QUALITY OF LIFE INNON SPECIFIED PULMONARY DISEASE PATIENTS

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ABSTRACT

BACKGROUND: A type Pulmonary disease that affects the lungs and other parts of respiratory system. Pulmonary disease may be caused by infection, by smoking tobacco, or by breathing in secondhand tobacco smoke, radon, asbestos, or other forms of air pollution. Pulmonary diseases include asthma, chronic obstructive pulmonary disease (COPD), pulmonary fibrosis, pneumonia, and lung cancer. Also called lung disorder and respiratory disease. The present investigation was planned to find out to compare the effect of high intensity interval training and anaerobic training on improving the inspiratory muscle and quality of life in non specified pulmonary disease patient.

AIMS AND OBJECTIVES: To compare the effectiveness of high intensity interval training versus anaerobic training for inspiratory muscle to improve quality of life in non specified pulmonary disease patient.

METHODOLOGY: 30 patients are non-specified pulmonary disease according to inclusion and exclusion criteria and divide into two groups. Group A. treadmill exercise in High intensity interval training program. Group B. chest mobility exercise in anaerobic training.

RESULT: The data showed that with the use of 12 weeks protocol there was a significance difference ($p < 0.001$) between pre and post test values of 6MWT AND GHQ both group in Male and female patient subjects. The study shows that there was no significance difference between post treatment value of chest mobility exercise.

CONCLUSION: The findings of the study conclude that adding a Anaerobic training like chest mobility exercises did not show any significant difference in inspiratory muscle to improve quality of life when compared with High intensity interval training.

Keywords: Non Specified Pulmonary disease, Chest mobility, Treadmill, Anaerobic training.

INTRODUCTION

Adult respiratory diseases are caused by many factors, including genetic-environmental interaction. Genetic abnormalities can impact early fetal lung development, postnatal lung maturation, as well as adult lung injury and repair. A type of disease that affects the lungs and other parts of respiratory system. Pulmonary disease may be caused by infection, by smoking tobacco, or by breathing in secondhand tobacco smoke, radon, asbestos, or other forms of air pollution. Pulmonary diseases include asthma, chronic obstructive pulmonary disease (COPD), pulmonary fibrosis, pneumonia, and lung cancer. Also called lung disorder and respiratory diseases. In world prevalence of pulmonary disease 65 million people have moderate to severe chronic obstructive pulmonary disease (COPD), from which about 3 million die each year, making it the third leading cause of death worldwide – and the numbers are increasing[2][3]. About 334 million people suffer from asthma [4], which is the most common chronic disease of childhood, affecting 14% of children globally. The prevalence of asthma in children is rising [5].

Both lungs have oblique fissure and the right is further divided by a transverse fissure. The oblique fissure in the left lung separates the superior and the inferior lobe. The oblique and horizontal fissure divides the lungs into superior, middle and inferior lobes. Thus the right lung has three lobes while the left has two. Each lobe is supplied by a lobar bronchus. The lobes are subdivided by bronchopulmonary segments which are supplied by the segmental bronchi. All the respiratory passages from the trachea to the respiratory bronchiole are called the tracheobronchial tree [1][2][3]. The right main bronchus is larger in diameter and more vertical making it directly in line with the trachea than the left main bronchus [2]. Thus swallowed objects that accidentally enter the lower respiratory tract are most likely to become lodged in the right main bronchus [4].Functionally, the lung is divided into a series of bronchopulmonary segments. The bronchopulmonary segments are the largest subdivision of a lobe. They are separated from adjacent segments by connective tissue septa and are also surgically respectable. They are 10 bronchopulmonary segments in the left lung and 8-10 in the left lung [5].

The muscles of respiration are also called the 'breathing pump muscles'; they form a complex arrangement in the form of semi-rigid bellows around the lungs. All muscles that are attached to the human rib cage have the inherent potential to cause a breathing action.

Muscles that helpful in expanding the thoracic cavity are called the inspiratory muscles because they help in inhalation, while those that compress the thoracic cavity are called expiratory muscles and they induce exhalation. These muscles possess exactly the same basic structure as all other skeletal muscles, and they work in concert to expand or compress the thoracic cavity[1][2].Primary Muscles The primary inspiratory muscles are the diaphragm and external intercostals. Relaxed normal expiration is a passive process, happens because of the elastic recoil of the lungs and surface tension. However there are a few muscles that help in forceful expiration and include the internal intercostals, intercostalisintimi, subcostals and the abdominal muscles[3].The muscles of inspiration elevate the ribs and sternum, and the muscles of expiration depress them [4]. Accessory Muscles The accessory inspiratory muscles are the sternocleidomastoid, the scalenus anterior, medius, and posterior, the pectoralis major and minor, the inferior fibres of serratus anterior and latissimus dorsi, the serratus posterior superior may help in inspiration also the iliocostaliscervicis[4][5]. Intercostalmuscles they are three types: External intercostal muscles (the most superficial muscle of intercostal muscles), internal intercostal muscles, and innermost intercostal muscles.External intercostal muscles: Origin: inferior border of rib above and Insertion: superior border of rib below. Nerve supply: all the intercostal muscles are supplied by their respective intercostal nerves.[7]Blood supply: all three muscles receive blood supply from anterior and posterior intercostal arteries, in addition to internal thoracic and musculophrenic arteries; costocervical trunk for internal and innermost intercostal muscles[9]

Anaerobic exercise has been defined by the ACSM as intense physical activity of very short duration, fueled by the energy sources within the contracting muscles and independent of the use of inhaled oxygen as an energy source [14]. Without the use of oxygen, our cells revert to the formation of ATP via glycolysis and fermentation. This process produces significantly less ATP than its aerobic counterpart and leads to the build-up of lactic acid. Exercises typically thought of as anaerobic consist of fast twitch muscles and include sprinting, high-intensity interval training (HIIT), power-lifting, etc. Sustained anaerobic metabolism, in other words, anaerobic exercise, causes a sustained increase in lactate and metabolic acidosis and this transition point is referred to anaerobic threshold (AT)[26]. AT can be directly measured via frequent blood samples

High-intensity exercise can be realistically tolerated by people with sedentary lifestyle, obesity, old age, or cardiac disease only in the form of interval training.

Therefore main purpose of this study to compare on high intensity interval training (hiit) versus anaerobic training for inspiratory muscles to improve quality of life in non-specified pulmonary disease patients.

METHODOLOGY

Comparative study in which with the help of random sampling we have selected 30 patients with diagnosis nonspecific pulmonary disease were selected according to inclusion and exclusion criteria and divide into two groups – Group A: High intensity interval training, Group B: Anaerobic training. Study was conducted in the Opd of Chitrini College of physiotherapy where study duration was12 weeks, 4 Days in week, 25 minute per day.

OUTCOME MEASURES

1. 6-Minute Walk Test
2. General health questionnaire

INCLUSION CRITERIA

a) Age of 35 -50 years.

b) Both Male and female patients.

c) Diagnosed Non specific pulmonary disease.

EXCLUSION CRITERIA

a) Age below 35 and above 50
b) Neurological problems
c) Resent any surgery
d) Ribs fracture
e) Present of lung ulcer
f) Spine fracture
g) Diabetic
h) Any cancer patient
i) Psychiatric disorder
j) Hypertension

PROCEDURE

30 Patients with Non specific subjects were randomly selected based on inclusion and exclusion criteria. Then divided into 2 groups Group A & Group B (15 subjects each group).
Group – A was treated with High intensity interval training

1 - Warm up – 5 minutes (General warm up exercise)
2 - HIIT(On Treadmill) 4 mph for 45 seconds
3 - Repetition- 5 times
4 - Intervals between two repetation-90 seconds
5 - Cool down – 5 minutes (diaphragmatic breathing)

Treadmill test

GROUP B- was treated with Anaerobic training.

1 Warm up – 5 minutes (General warm up exercise)

2 Anaerobic exercise(chest mobility exercise) 2 minutes

3 Repetition- 5 times

4 Intervals between two repetition – 30 seconds

5 Cool down – 5 minutes (diaphragmatic breathing)

Chest mobility exercise

Chest mobility exercises are designed to maintain or improve mobility of the chest wall, trunk and shoulders girdles when it effects ventilation or postural alignment. Chest mobilization exercises are also used to reinforce or emphasize the depth of inspiration or controlled expiration.

Mobiliztion of lateral Side of the Chest

Position of the patient; sitting The patient is asked to bend away from the tight side to lengthen hypomobile structures and expand the chest during inspiration. Then have the patient push the fisted hand into the lateral aspect of the chest, as he bends toward the tight side and breathes out.

Mobilize Lateral Side of the Ches

hest Expansion

Measure the chest with a tape at three levels (axilla, xiphoid, lower costal). Document change in girth after a maximum inspiration and a maximum expiration.

Place both hands on the patient's chest or back as previously described. Note the distance between your thumbs after a maximum inspiration

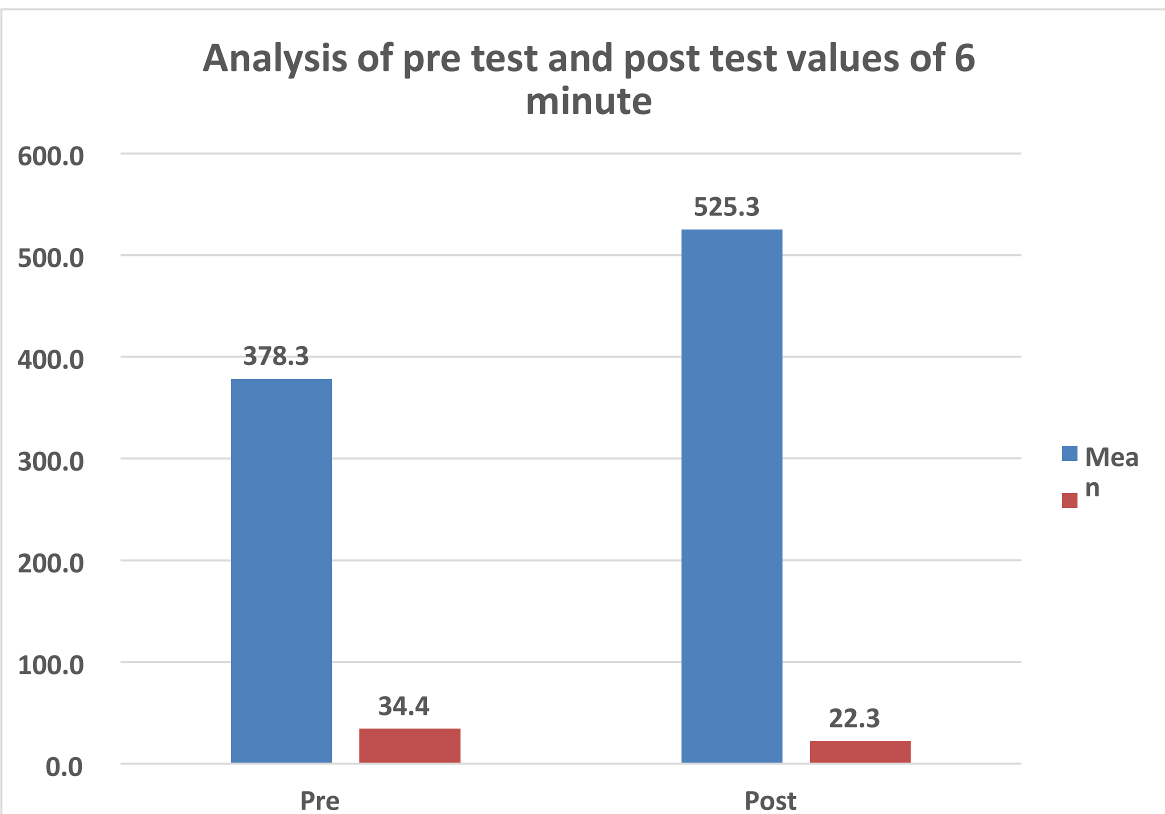
Inch Tape Measurement of Chest Expansion

Mean, Standard deviation, paired ‘t’test and unpaired‘t’ test would be performed for analysis of pre and post data evaluation within and between groups.

TABLE -I

Group A

Group A	Mean	N	SD	Std Error Mean	R	Mean Difference	T	P
Pre Test	378.33	15	34.42	8.89	0.074573	147.00	13.818	<0.001
Post Test	525.33	15	22.32	5.76				



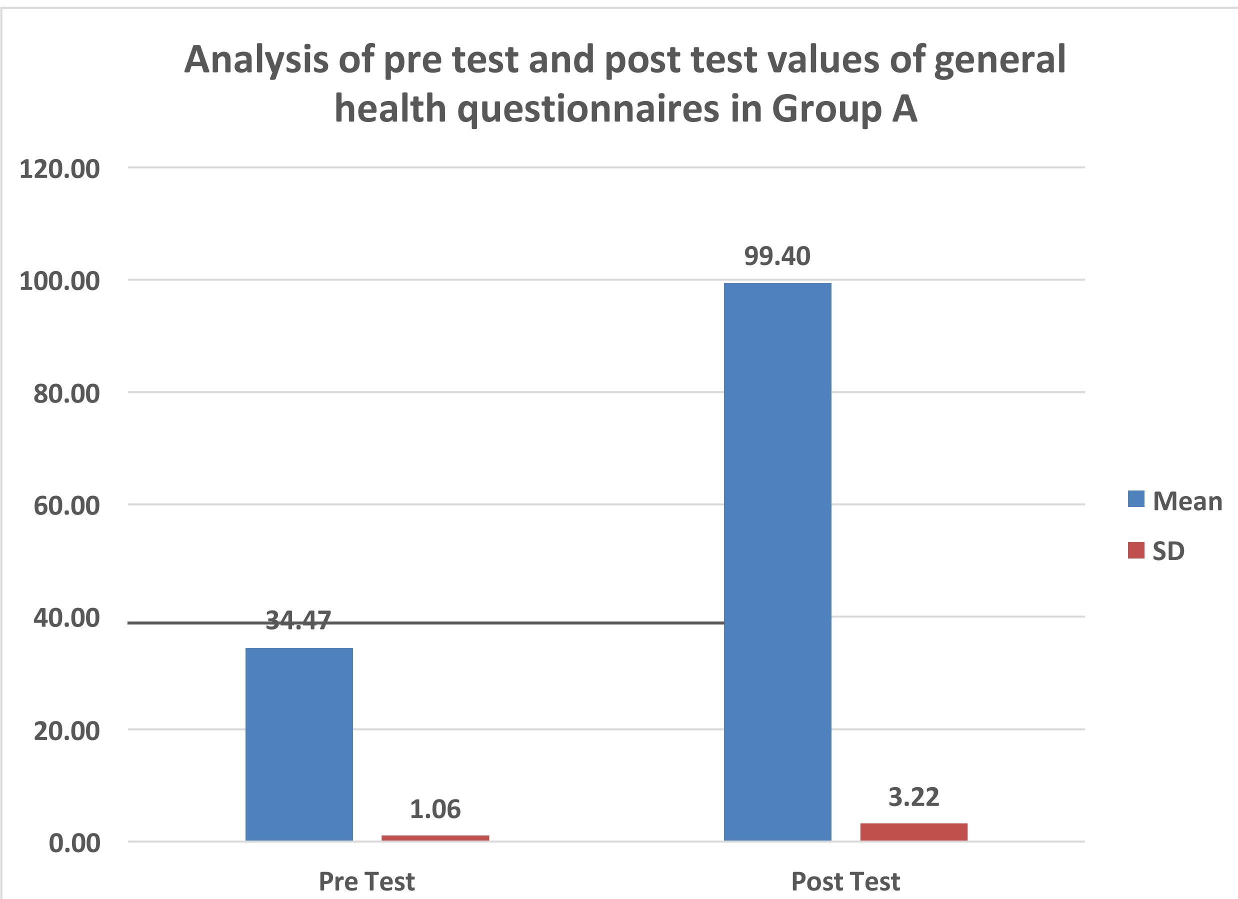
INTERPRETATION:

The above table and graph shows the Analysis of pre and post test values of 6 minute walk test in Group A.

TABLE-II

Group A

	Mean	N	SD	Std Error Mean	R	Mean Difference	T	P
Pre Test	34.47	15	1.06	0.27	0.07324	64.93	74.181	<0.001
Post Test	99.40	15	3.22	0.83				



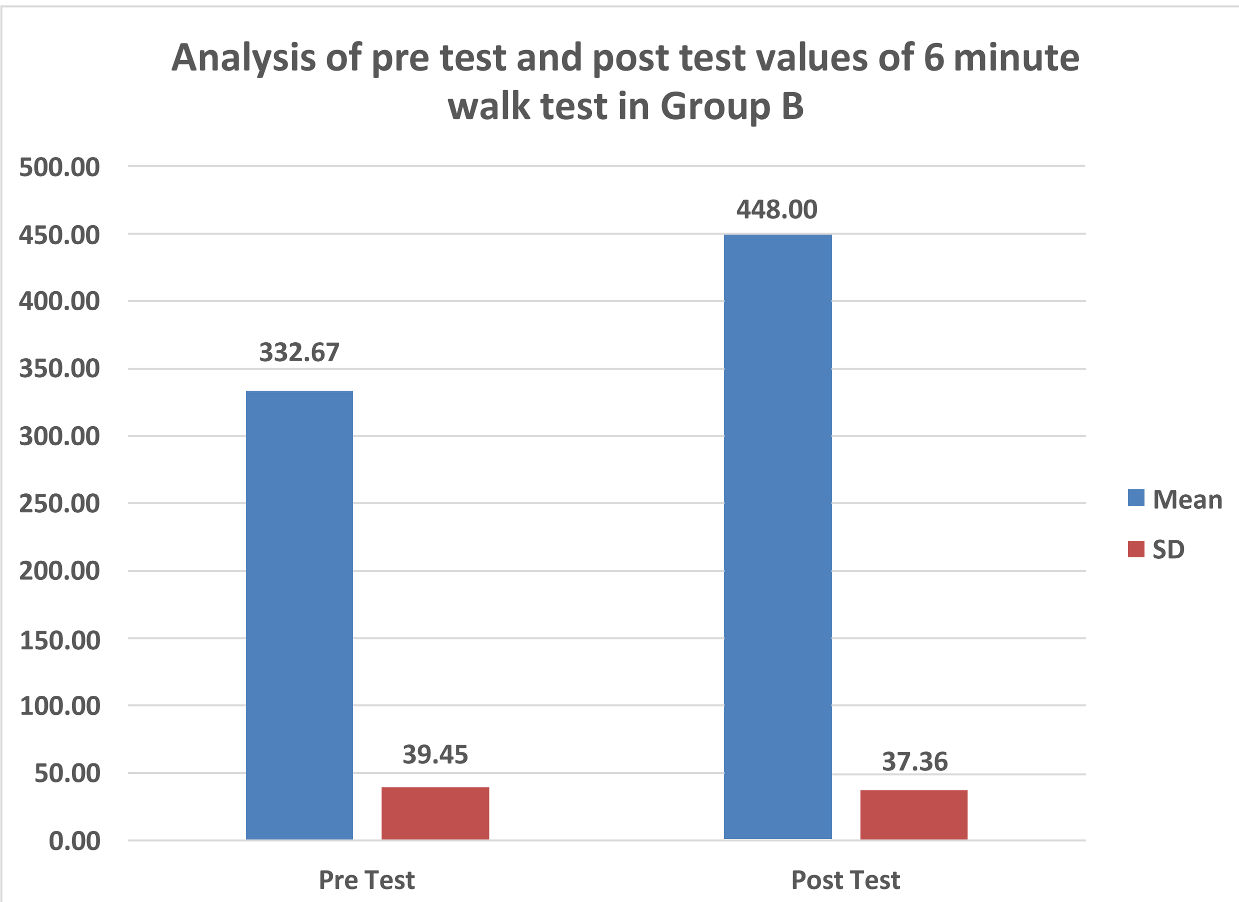
INTERPRETATION :

The above table and graph shows the Analysis of pre test and post test values of general health questionnaires in Group A.

TABLE --III

Group B

	Mean	N	SD	Std Error Mean	R	Mean Difference	T	P
Pre Test	332.67	15	39.45	10.19	0.192276	115.33	8.221	<0.001
Post Test	448.00	15	37.36	9.65				



INTERPRETATION:

The above table and graph shows the Analysis of pre and post test values of 6 minute walk test in Group B.

TABLE - IV

Group B

<table>
<tr><th></th><th>Mean</th><th>N</th><th>SD</th><th>Std Error Mean</th><th>R</th><th>Mean Difference</th><th>T</th><th>P</th></tr>
<tr><td>Pre Test</td><td>69.87</td><td>15</td><td>3.64</td><td>0.94</td><td rowspan="2">0.167005</td><td rowspan="2">32.00</td><td rowspan="2">28.354</td><td rowspan="2"><0.001</td></tr>
<tr><td>Post Test</td><td>101.87</td><td>15</td><td>2.42</td><td>0.62</td></tr>
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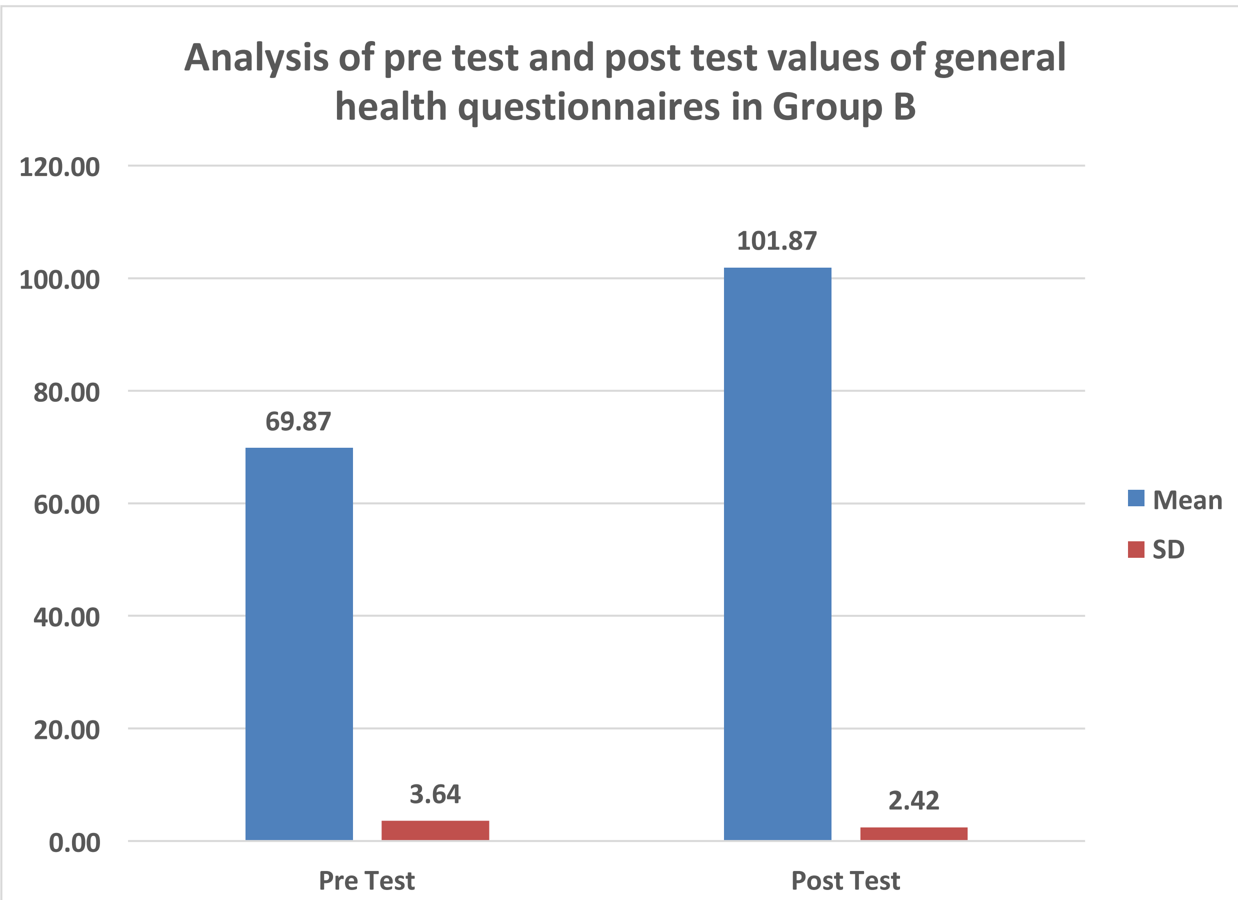


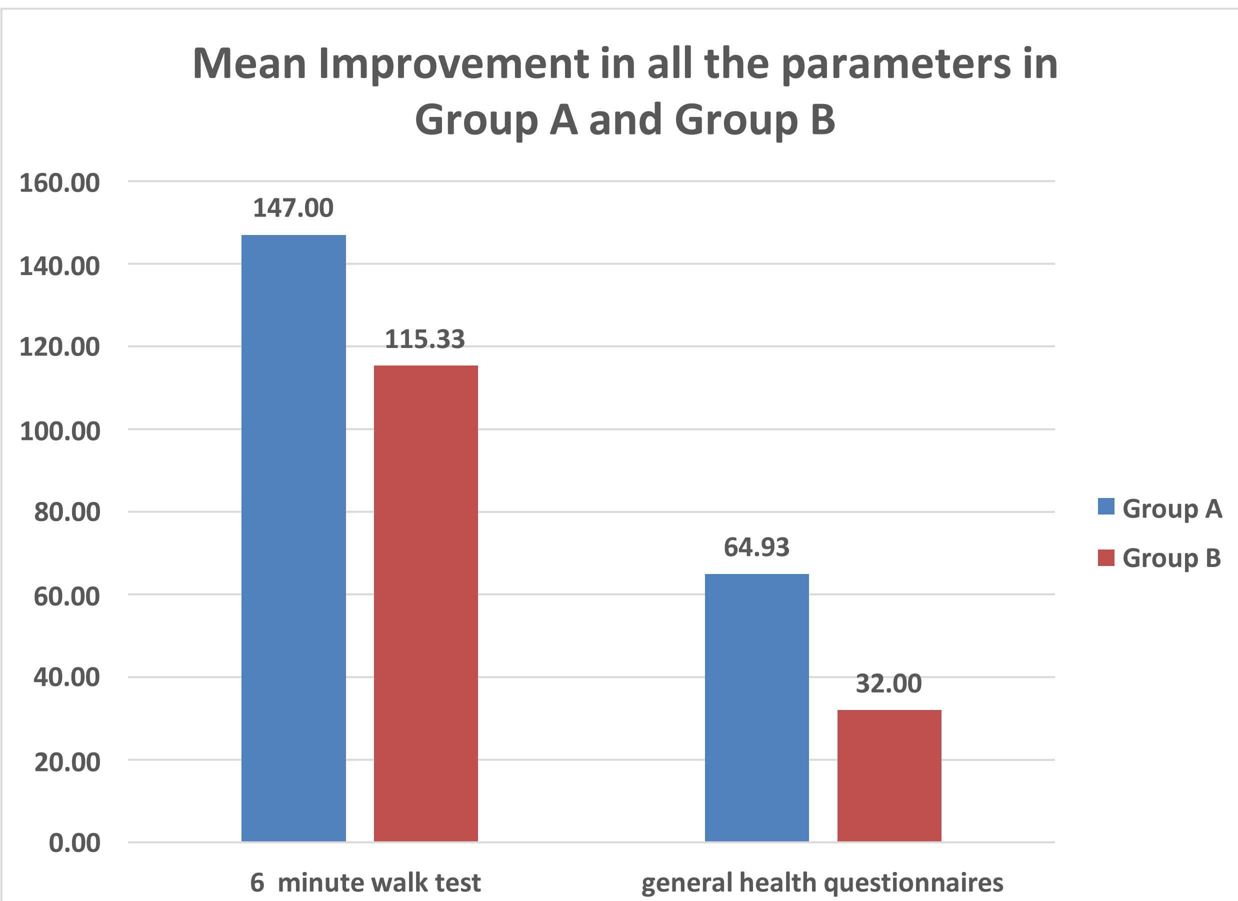
INTERPRETATION :

The above table and graph shows the Analysis of pre test and post test values of general health questionnaires in Group B.

TABLE - V

Mean Improvement in all the parameters in Group A and Group B

	Group	N	Mean		Group	N	Mean
6 minute walk test	A	15	147.00	general health questionnaires	A	15	64.93
	B	15	115.33		B	15	32.00



RESULTS& DISCUSSION

Result: The data showed that with the use of 12 weeks protocol there was a significance difference ($p < 0.001$) between pre and post test values of 6MWT AND GHQ both group in Male and female patient subjects. The study shows that there was no significance difference between post treatment value of chest mobility exercise.

The purpose of the study was to find out the comparative on High intensity interval training and Anaerobic training. The subjects showed improvement in both the groups after the treatment. Analysis of 6MWT and GHQ scores of before and after treatment in group B patients reveal that there was no significant improvement of inspiratory muscle to quality of life when compared to the group A. The patients were assessed after 12 weeks of treatment.

In a study conducted by Ester AlferNorsteboc, Karen Marie Thomas,et.al in the study "High-intensity interval training and pulmonary hemodynamic in COPD with hypoxemia" conclude that High-intensity interval training significantly improved exercise capacity while pulmonary hemodynamic remained unchanged. The improvement may therefore be due to mechanisms other than altered pulmonary artery pressure.

In another study conducted by Chidozie E. Mbad,OladayoJideAdeagbo,Jibril Mohammed, et.al. in the study "Comparative Effects of Six-minute Treadmill Walk and Six-minute Treadmill Walk-talk Test on the Cardiopulmonary Parameters of Healthy Individuals". Concluded that 6MTWT and 6MTWTT, similarly evoke cardiopulmonary changes among apparently healthy young individuals. However, 6MTWTT led to less oxygen consumption and myocardial oxygen demand compared with 6MTWT. This finding may be potentially beneficial for future cardiopulmonary exercise testing using 6MWT.Journal of rehabilitation sciences and research.

2007 Tanaffos showed that the treadmill exercise improve inspiratory muscle strength, dyspnea and health-related quality of life.

2014 Helena Turnip showed that the treadmill exercise improve functional capacity, quality of life in copd patients.

In our study both the group showed statistical significant but while comparing the group A treated treadmill exercise showed significant effect on reducing the scores of our both the outcome measures (6MWT & GHQ) than the group B treated with Chest mobility exercise.

Conclusion

The findings of the study conclude that adding a Anaerobic training like chest mobility exercises did not show significant difference in inspiratory muscle to improve quality of life when compared with High intensity interval training.

Limitations of The Study

1. The study was limited due to shorter duration of treatment.

2. The study was limited due to less number of patients.

3. The study was limited age group.

4. Psychological status was not evaluated.

5. The study was limited due to non-specified pulmonary disease.

Recommendations

It may recommended that treatment Course Could be more than 12 weeks, So that more results would be evaluated.

It may recommended that Study Could be done on different age group.

It may be recommended that different interventions may be chosen in Non Specific Pulmonary Disease patients.

It may recommended that evaluation of patient's condition may be taken in mid of the study duration to evaluate better results.

Different type of professionals may be use in further study

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