"THE EFFECT OF MANUAL DIAPHRAGMATIC RELEASE TECHNIQUES IN THE IMPROVEMENT OF DIAPHRAGMATIC MOBILITY AND EXERCISE CAPACITY IN SUBJECTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE".

-A COMPARATIVE STUDY

A Dissertation Submitted in partial fulfilment

Of the requirements for the degree of

MASTER OF PHYSIOTHERAPY DEGREE

WITH SPECIALIZATION IN

ADVANCED PHYSIOTHERAPY IN CARDIO RESPIRATORY

Submitted by

(Reg. No: 271530082)

Submitted To

THE TAMILNADU DR.M.G.R.MEDICAL UNIVERSITY

CHENNAI

NANDHA COLLEGE OF PHYSIOTHERAPY

ERODE – 638052

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NANDHA COLLEGE OF PHYSIOTHERAPY

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Under the guidance of

Prof.R.Saravanakumar M.P.T, (Cardio.,)

A Dissertation Submitted to

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Dissertation evaluated on**.....**

Internal Examiner External Examiner

CERTIFICATE BY THE HEAD OF THE INSTITUTION

Prof. V.MANIVANNAN, M.P.T, (Ortho)
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This is certify that the dissertation entitled **" THE EFFECT OF MANUAL DIAPHRAGMATIC RELEASE TECHNIQUES IN THE IMPROVEMENT OF DIAPHRAGMATIC MOBILITY AND EXERCISE CAPACITY IN SUBJECTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE -A COMPARATIVE STUDY"** Is a bonafide complied work, carried out by **REGISTER NUMBER:271530082.** Nandha College of physiotherapy Erode-638052.in partial fulfilment for the award of degree in Master of Physiotherapy as per the doctrines of requirements for the degree of **THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY, Chennai-32.** This work was guided and supervised by **Prof.R. Saravankumar M.P.T, (Cardio)**

I wish him a great success in his dissertation work.

Place : Erode Principal Signature

Date :

CERTIFICATE BY THE GUIDE

Prof. R. SARAVANAKUMAR, M.P.T, (Cardio)
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This is to certify the dissertation entitled **"THE EFFECT OF MANUAL DIAPHRAGMATIC RELEASE TECHNIQUES IN THE IMPROVEMENT OF DIAPHRAGMATIC MOBILITY AND EXERCISE CAPACITY IN SUBJECTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE -A COMPARATIVE STUDY"** is a bonafide complied work, carried out by **Reg.No. 271530082 Nandha College of physiotherapy Erode-638052**. in partial fulfilment for the award of degree in Master of Physiotherapy as per the doctrines of requirements for the degree of **THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY Chennai-32.**

This work was done under my personal guidance.

Place : Erode Guide Signature

Date :

DECLARATION

I hereby and present my project work entitled **"THE EFFECT OF MANUAL DIAPHRAGMATIC RELEASE TECHNIQUES IN THE IMPROVEMENT OF DIAPHRAGMATIC MOBILITY AND EXERCISE CAPACITY IN SUBJECTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE – A COMPARATIVE STUDY".** is outcome of original research work was undertaken and carried out by me under the guidance of **Prof.R.SARAVANAKUMAR, M.P.T,(cardio).**

To the best of my knowledge this dissertation has not been formed in any other basic for the award of any other degree, diploma, associateship, fellowship, preciously from any other medical university.

Reg.No.271530082

ACKNOWLEDGEMENT

ACKNOWLEDGEMENT

It is first honourable duty to **"THANK THE ALMIGHTY GOD**" without whose guidance & blessing which showered on me to complete the project.

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I am very happy to express my heartfelt thanks to the **My Husband** giving me strength and wisdom in successfully completing this project work in an efficient manner.

I thank my beloved **My parents, brother & My Family Members** who encouraged me in all means to complete this project.

At last and most extreme gratitude to my **Beloved Friends** for their valuable co-operation to complete this project.

My hearty thanks to private Hospital physiotherapists who gave me an to do My Project work in their hospitals.

PREFACE

It was immense pleasure for me to present this project work on **"THE EFFECT OF MANUAL DIAPHRAGMATIC RELEASE TECHNIQUES IN THE IMPROVEMENT OF DIAPHRAGMATIC MOBILITY AND EXERCISE CAPACITY IN SUBJECTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE- A COMPARATIVE STUDY"** because this opportunity made me learn a lot about this condition.

I have done this work with my best level by referring many cardio respiratory books, journals and websites. I have assessed and given treatment to subject to improve their condition. I believe this project work will prove to be very useful for the physiotherapists to give a better knowledge while assessing and treating COPD subjects.

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INTRODUCTION

INTRODUCTION

COPD is a common condition that mainly affects middle-aged or older adults who smoke. Many people don't realise they have it. The breathing problems tend to get gradually worse over time and can limit your normal activities, although treatment can help keep the condition under control. Chronic obstructive pulmonary disease (COPD) is a common problem in the elderly. The disease is characterised by intermittent worsening of symptoms and these episodes are called acute exacerbations. The best estimate, based on several lines of evidence, is that approximately half of all exacerbations are caused by bacteria. These lines of evidence include studies of lower respiratory tract bacteriology during exacerbations, correlation of airways' inflammation with results of sputum cultures during exacerbations, analysis of immune responses to bacterial pathogens, and the observation in randomised, prospective, placebo-controlled trials that antibacterial therapy is of benefit. (Timothy F. Murphy)

Chronic obstructive pulmonary disease (C.O.P.D) is the 5^{th} cause of mortality and morbidity in the world and represents an economic and social burden. Chronic obstructive pulmonary disease is a chronic pulmonary disorder affecting 10% - 15% individuals over age of 45 years. World health organization **(W.H.O)** estimates, Chronic obstructive pulmonary disease as a simple cause of death, mainly affecting the middle aged and elderly people. Some of the risk factors for Chronic obstructive pulmonary disease include smoking, occupational exposures, air pollution, hyper responsiveness of airways , and certain genetic variations.

By 2020 Chronic obstructive pulmonary disease, is expected to rise to 3^{rd} position as a cause of death and to 5^{th} position as a cause of loss of disability adjusted life years (DALYS), as per the baseline projections made in global burden of disease study

According to the **American Thoracic Society (ATS), Chronic obstructive pulmonary disease** "a disease that is characterized by the presence of limitation to flow of air due to chronic bronchitis or emphysema. The obstruction to airflow is generally incremental, may be accompanied by hyper reactivity of airways, and may be partially reversible."

Reduction in normal flexibility of muscle leads to alteration in the length-tension relationship, which in turn prevents the muscle from producing maximum tension, leading to muscle weakness and shortening. Changes in length, reduce excursions of thorax, thereby worsening the features of disease.

Hyperinflation of lung reduces ability to carry out activities initially to a greater stress levels and then later reducing the ability at varying levels. Remodell ing of inspiratory muscles consequently leads to reduction in their excursion . The adaptive changes that takes place in chest wall and the surrounding muscles affects breathing in Chronic obstructive pulmonary disease Subject.

Chronic obstructive pulmonary disease is a major cause of death and disability in the United States. The most important risk factor for COPD is cigarette smoking. Thus, COPD is largely a preventable condition. Other risk factors may include air pollution, childhood infections, heredity, advanced age, airway hyper responsiveness, and occupational exposures. Some risk factors, including male sex and socioeconomic status, may gain their influence through associations with cigarette smoking or living conditions. More attention to primary, secondary, and tertiary prevention of COPD is required

Improvements in expansion of thorax brings marked changes in tension generating capacity of muscles of respiration and reduces the stimulus for control of respiration , thereby reducing breathlessness.

Whilst breathlessness is the main symptomatic feature of COPD, cervico-thoracic pain has also been reported in this patient population, perhaps as a consequence of musculoskeletal changes. Recent work by reported that prevalence of pain (predominantly in the neck, shoulders and chest), a common feature of musculoskeletal conditions, was significantly higher in Subjects with COPD (45%) compared to the general population (34%). This is unsurprising given the observed use of accessory muscles in COPD to overcome breathlessness (Lohne et al., 2010; Bentsen et al., 2011). Interestingly, many of these subjects reported using TENS/acupuncture to assist in pain management as opposed to general physiotherapy, such as manual therapy (MT).

Its most striking feature is expiratory airflow limitation (i.e., the ability to performa complete exhalation is impaired, causing air trapping and lung hyperinflation). The hyperinflation causes the diaphragm muscle fibres, which usually lie vertically in the zone of apposition, to become more transversely oriented. This makes the diaphragm's contraction less effective at raising and expanding the lower rib cage, and may even lead to a decrease in the transverse diameter of the lower rib cage during inspiration. The diaphragm then undergoes a reduction in the number of sarcomeres to restore its pressure-generating capacity; however, as a consequence, diaphragmatic mobility is reduced. The reduction of diaphragmatic motion is a major risk factor for increased mortality in people with COPD.

There are a number of published studies describing the use of manual diaphragmatic release techniques for the management of COPD, predominantly from the osteopathic and chiropractic literature (Howell et al., 1975) Advocates of manual diaphragmatic release propose that techniques, aimed at increasing thoracic mobility, may work to reduce the work of breathing through enhanced oxygen transport and lymphatic return. Supportive evidence from research in healthy subjects where a myofascial release technique affected heart rate variability confirming an association between manual diaphragmatic release and

the autonomic nervous system propose that manual diaphragmatic release promotes autonomic activity causing associated vasodilatation, smooth muscle relaxation and increased blood flow, leading to improved range of motion, decrease in pain perception and/or change in tissue. These findings have yet to be replicated in a COPD Subject population, although it would seem reasonable to consider manual diaphragmatic release as an adjunctive therapeutic approach to increase thoracic mobility, reduce the work of breathing and manage pain.

1.1 OPERATIONAL DEFINITION

CHTRONIC OBSTRUCTIVE PULMONARY DISEASE

Chronic obstructive pulmonary disease is a lung disease characterized by chronic obstruction of lung airflow that interferes with normal breathing and is not fully reversible.

MANUAL DIAPHRAGMATIC RELEASE TECHNIQUES

It is an intervention intended to directly stretch the diaphragmatic muscle fibres. A common goal is increase the mobility of the thoracic structure involved in respiratory mechanics.

SIX MINUTES WALK TEST

A 6-minute walk test is generally done at the start of a pulmonary rehabilitation program or to evaluate a exercise capacity and endurance. The test measures the distance a patient can walk quickly on a flat, hard surface in 6 minutes and reflects their ability to perform daily physical activities.

1.2 NEED FOR STUDY

Chronic obstructive pulmonary disease (COPD), a chronic progressive disease which leads to considerable loss of quality of life and early mortality, is expected to become the fourth leading cause of death by 2020. The high costs (social and financial) associated with managing this disease (NHS costs estimated as £800 million per year in the UK) are set to rise further given longer life expectancy and acknowledgement that many cases go undiagnosed. Outside of pharmaceutical therapy, pulmonary rehabilitation, a multimodal management approach comprising of education, physical exercise, and psychological support has been shown to be effective in improving Subjects' quality of life. The contribution of each element to the overall effectiveness of the programme on COPD however remains unclear. Physical exercise, a key feature of such programmes primarily aims to develop physiological capacity through exercises such as stair climbing, walking etc.

Some authors suggest that therapeutic interventions, targeting musculoskeletal structures in the thoracic region, such as manual therapy could afford additional therapeutic benefit in COPD management. Very rarely articles support manual diaphragmatic release techniques.

In this study focus the manual diaphragmatic releases techniques to improve diaphragmatic mobility and exercise capacity in people with chronic obstructive pulmonary disease.

1.3 AIM OF THE STUDY

The aim of this study is to find the effect of Manual Diaphragmatic Release techniques and conventional diaphragmatic strengthening exercises improves Diaphragmatic Mobility and exercise capacity in subjects with Chronic obstructive pulmonary disease.

1.4 OBJECTIVE OF THE STUDY:

- To find out the effect of Manual Diaphragmatic Release techniques improves Diaphragmatic Mobility and exercise capacity in subjects with chronic obstructive pulmonary disease.
- To find out the effect of conventional diaphragmatic strengthening exercises improves Diaphragmatic Mobility and exercise capacity in subjects with chronic obstructive pulmonary disease.
- To compare the effect of Manual Diaphragmatic Release techniques and conventional diaphragmatic strengthening exercises improves Diaphragmatic Mobility and exercise capacity in subjects with chronic obstructive pulmonary disease.

1.5 KEY WORDS

- Chronic obstructive pulmonary disease.
- Manual Diaphragmatic Release techniques.
- Conventional Diaphragm Strengthening.
- Diaphragmatic Mobility.
- Exercise Capacity.

1.6 HYPOTHESIS

1.6.1 NULL HYPOTHESIS:

- There is no significant difference in the improvement of Exercise capacity and Diaphragmatic mobility between Manual Diaphragmatic Release techniques and conventional diaphragmatic strengthening exercises in subjects with chronic obstructive pulmonary disease.

1.6.2 ALTERNATE HYPOTHESIS

- There is significant difference in the improvement of Exercise capacity and Diaphragmatic mobility between Manual Diaphragmatic Release techniques and conventional diaphragmatic strengthening exercises in subjects with chronic obstructive pulmonary disease.

Chapter-II

REVIEW OF LITERATURE

II. REVIEW OF LITERATURE

Julie A. Ekstrum et al (2009), stated that,

Adults participating in a 6-week stretching and respiratory exercise program demonstrated improved chest wall excursion and function.

Mangueira NM, et.al,(2009), concluded that,

The chronic symptoms of chronic obstructive pulmonary disease are major factors responsible for altering relationship between health and quality of life

Katrina, Renita, et al (2008), concluded that,

Combination of diaphragmatic strengthening exercises and other breathing exercises has positive effects on chest mobility and respiratory muscle strength in Chronic obstructive pulmonary disease Subjects."

Derenne JP, Macklem et al (2007),**has stated that**,

Hyperinflation of lung results in severe shortening of respiratory muscles.

Gold staging system for chronic obstructive pulmonary disease (2006),

Categorized Moderate chronic obstructive pulmonary disease as with Fev1/Fvc ratio of less than 70%, with a predicted Fev1 of less than 80%.

Linda Nicci ,et.al,(2006), has stated that,Pulmonary rehabilitation includes intervention strategies that are integrated into lifelong management of Subjects with chronic respiratory disease.

American physiological society (2006),

Diaphragmatic exercise improves breathing capacity by increasing Chest wall expansion and forced expiratory lung volume, trunk mobility, improves chest wall function and relieves dyspnea.

Douradovz et al (2006), stated that,

The clinical profile and the overall health status of the of chronic obstructive disease Subject are affected by changes in the entire system. Therefore the treatment should focus on the each and every aspects of the disease.

Denna swart out, Corbeil R.N, et al, (2006), stated that,

Physical exercise serves to improve respiratory efficiency, promote expansion of lungs & chest, strengthen respiratory muscles and help the Subject to breathe more comfortably and to get more oxygen into the body**.**

Elaine Paulin et al,(2003) stated that

Breathing Exercises aimed to increasing the mobility of chest wall, improve thoracic mobility, and exercise capacity, reduce breathlessness and symptoms of depression in Subjects with chronic obstructive pulmonary disease.

Lieber R.L(2002), stated that,

Alteration in the length of the muscle fiber in later stages leads to compensation in number of sarcomeres . These changes in length of muscle in turn have an impact on the force producing capacity of the muscles , thereby reducing the working ability of musculature.

Belman. MJ et.al, (1996) concluded that,

Mechanical disadvantage in inspiratory muscles, as a result of abnormal mechanics, contributes to symptoms of dyspnea.

Lacasse .Y, Guyatt G.H, et al, (1997), stated that,

Manual techniques is likely to improve functional exercise capacity and health related quality of life.

Ries AL, Kaplan RM, et.al,(1995),concluded that,

Conventional Diaphragmatic breathing exercises significantly improves exercise performance and symptoms in Subjects with Chronic obstructive pulmonary disease under moderate or severe category.

Cynthia.S,Cane, et.al, (1995), stated that,

Chronic obstructive pulmonary disease is a common disease in adults and its prevalence is increasing in older age groups.

Gossman MR, Sahrmann S.A (1982),statedthat,

When a muscle loses its normal flexibility, there is alteration in length - tension relationship. This change reduces the ability of muscle to produce maximum tension, thereby leading to muscle weakness and reduction in excursion.

WilliamsP.E, Goldspink.G,(1978),stated that,

Immobilization leads to changes in the proteins of contractile elements and in metabolism of the mitochondria, decreases the sarcomere number and increases the thickening of tissue leading to muscle shortening and reduction in joint mobility.

Zahra Mohamed Hassan et al, 2012

It significantly increase PEFR. Manual therapy will improve Subject's function level and the capacity for independent living by decreasing the severity of COPD symptoms and recurrence of COPD attacks.

Taciano Rocha et al, (2015)

The Manual Diaphragm Release Technique improves diaphragmatic mobility, exercise capacity and inspiratory capacity in people with chronic obstructive pulmonary disease. This technique could be considered in the management of people with chronic obstructive pulmonary disease.

Helga Souza, Daniela Cunha Brandao 2015

The Manual Diaphragm Release Technique improves diaphragmatic mobility, exercise capacity and inspiratory capacity in people with chronic obstructive pulmonary disease.

Chapter-III

MATERIALS& METHODOLOGY

III.MATERIALS &METHODOLOGY

- **MATERIALS**

- ✓ Ultrasonography machine
- ✓ Treatment gel
- ✓ Inch tape
- ✓ Marker
- ✓ Stopwatch
- ✓ Measuring/trundle wheel to measure distance covered
- ✓ Pulse oximeter for measuring heart rate and SpO2
- ✓ Two small cones to mark the turnaround points
- ✓ A chair that can be easily moved along the walking course
- ✓ Worksheets on a clipboard
- ✓ A source of oxygen
- ✓ Sphygmomanometer

METHODOLOGY

3.1 STUDY DESIGN:

Study was an experimental two group pre-test and post-test study design**.**

3.2 STUDY SETTING:

Study was conducted in department of pulmonology, Sutha Multispecialty Hospitals, Erode**.**

Government Head Quarters Hospital- Erode

3.3 STUDY DURATION:

Study was conducted for a period of three month

3.4 SUBJECTS:

All adult Subjects attending the pulmonology department of Sutha Multispecialty Hospitals, Erode were assessed and selected for the study. A total of 30 Subjects with Chronic obstructive pulmonary disease were selected by random sampling method and were divided into 2 groups namely Group-A and Group-B respectively.

Group-A subjects were involved in Manual Diaphragmatic Release technique and Group-B Subjects performed conventional diaphragmatic strengthening exercises.

3.5 CRITERIA FOR SELECTION:

INCLUSIVE CRITERIA

- Subjects with Chronic obstructive pulmonary disease.
- Both sexes were included.
- Age group between 45-50 years.
- Subjects who were willing to participate.
- Subjects who have quit smoking.
- Subjects Ex smokers
- Forced expiratory volume in one second (FEV1) < 80% predicted and FEV1 <_ 0.7 of forced vital capacity (FVC)

EXCLUSIVE CRITERIA:

- Subjects with severe Chronic obstructive pulmonary disease.
- Subjects with associated respiratory complications.
- Subjects with cardiac, orthopedic and neurological problems.
- Subjects had a history of thoracic surgery
- Individuals on prolonged corticosteroids.
- Unwilling to Participate

3.6 VARIABLES:

DEPENDENT VARIABLE:

- ✓ Diaphragmatic Mobility
- ✓ Exercise capacity

INDEPENDENT VARIABLE:

- ✓ Manual Diaphragmatic Release technique
- ✓ Conventional diaphragmatic strengthening exercises.

3.7 PARAMETERS:

- ✓ Ultrasonography
- ✓ Six minutes walk test

3.8 PROCEDURE:

Subjects with chronic obstructive pulmonary disease were taken for the study. Both the groups were explained about the procedure that has to be done and consent was obtained from them. Pre-test Diaphragmatic Mobility and Exercise capacity were measured and the data's were recorded.

GROUP-A:

They were subjected to Manual Diaphragmatic Release techniques.

Subject Position: Supine Lying

Therapist position: Walk standing, standing on head end position

Procedure: The therapist made manual contact (pisiform, hypothenar region and the last three fingers) with the underside of the costal cartilages of the seventh to tenth ribs. During the subject inspiration, the therapist pulled gently in a cephalad (superior) direction accompanying the elevation movement of the ribs. During exhalation, the therapist deepened contact toward the inner costal margin. On subsequent breaths, the therapist sought to gain traction and smoothly deepen the contact. The manoeuvre was performed in two sets of 10 deep breaths, with a 1-minute interval between them.

GROUP-B:

They were subjected to conventional Diaphragmatic strengthening Exercises

Subject position: Sitting

Therapist Position: beside the subjects

Procedure: The therapist made manual contact (pisiform, hypothenar region and the last three fingers) with the underside of the costal cartilages of the seventh to tenth ribs. During inspiration therapist give a hand pressure against inspiration. This techniques performed in 3 sets of 15 repetition, with 2 minutes interval between them.

3.9 STATISTICAL TOOLS

Paired and unpaired ‘t’ test:

Paired ‘t’ test was used to compare the pre-test and post-test value of the same group.

Formula: Paired t-test

$$S = \sqrt{\frac{\sum d^2 - \frac{(\sum d)^2}{n}}{n-1}}$$

$$t = \frac{\bar{d}\sqrt{n}}{s}$$

Where,

d = difference between the pre-test Vs post-test

$\bar{d}$ = mean difference

n = total number of subjects

s = standard deviation

The unpaired t-test was used to compare the post-test values of between Group I and Group II.

Formula: Unpaired t-test

$$S = \sqrt{\frac{\sum\left(X_1 - \overline{X_2}\right)^2 + \sum\left(X_2 - \overline{X_2}\right)^2}{n_1 + n_2 - 2}}$$

$$t = \frac{\overline{X_1} - \overline{X_2}}{S} \sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$

Where,

$\overline{x_1}$ = Mean of Group A

$\overline{x_2}$ = Mean of Group B

$\sum$ = sum of the value

n_1 = number of subjects in Group A

n_1 = number of subjects in Group B

S = standard deviation

Chapter-IV

DATA PRESENTATION AND STATISTICAL ANALYSIS

IV. DATA PRESENTATION AND STATISTICAL ANALYSIS

TABLE-I

PAIRED 't' TEST

PRE TEST AND POST TEST VALUES OF GROUP A

GROUP A – MANUAL DIAPHRAGMTIC RELEASE TECHNIQUES

SIX MINUTES WALK TEST

The comparative mean values, mean differences, standard deviation and Paired 't' test values of Group A who were treated with Manual Diaphragmatic Release Techniques

.S.NO	GROUP A	MEAN	MEAN DEVIATION	STANDARD DEVIATION	't' VALUE
1.	Pre test	479	70.6	12.20	18.47
2.	Post test	549.6		9.75	

The table I shows analysis of Six Minutes walk test on paired 't' test. The test value for Group A was 18.47 at 0.05 % level of significance, which was greater than the tabulated 't' value 2.145. The result shows that there was marked difference between pre test and post test values.

GRAPH-I

GRAPHICAL REPRESENTATION OF PRE TEST AND POST TEST VALUES OF GROUP A (MANUAL DIAPHRAGMTIC RELEASE TECHNIQUES)

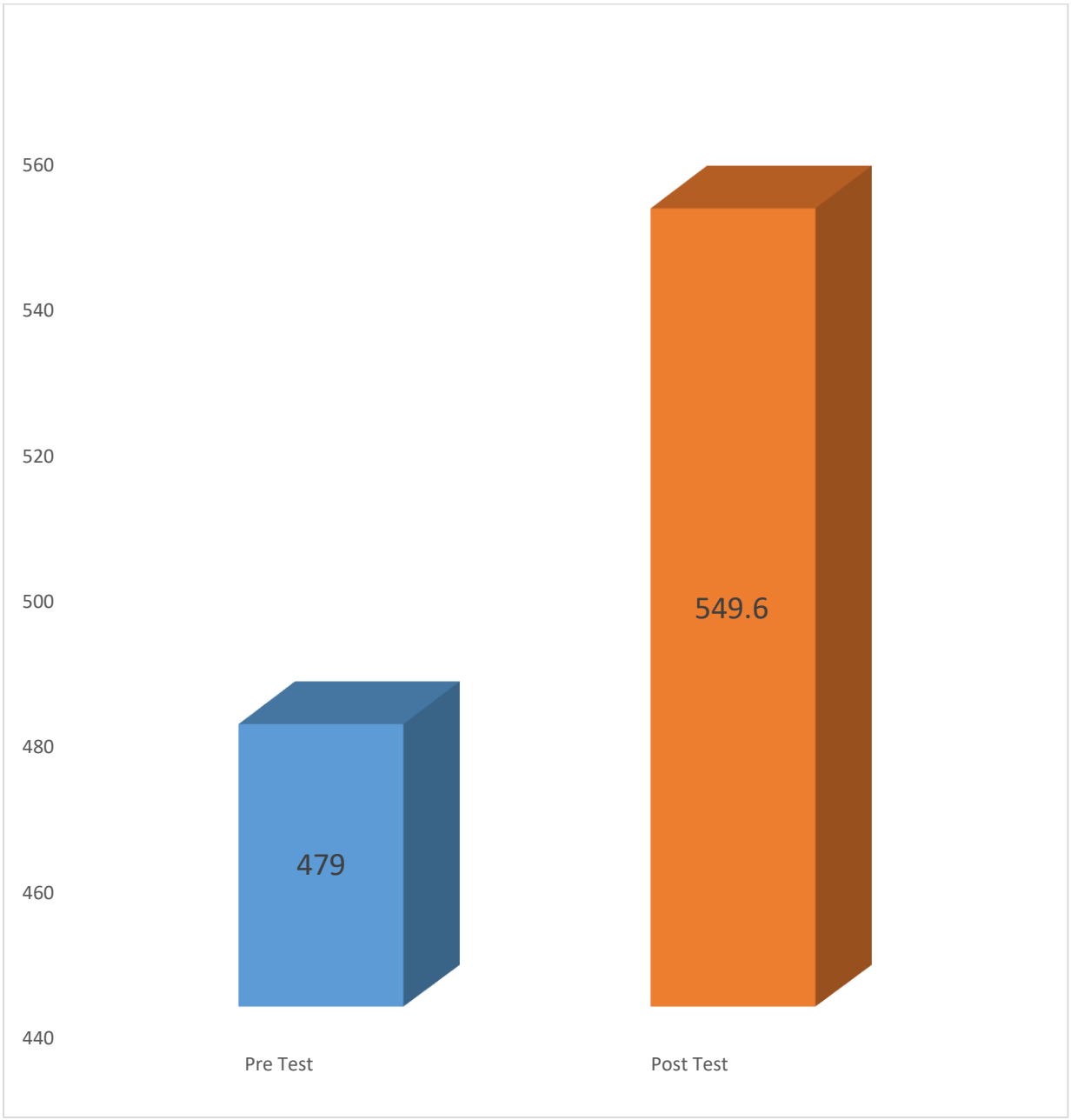


TABLE-II

PAIRED 't' TEST

PRE TEST AND POST TEST VALUES OF GROUP B

GROUP B – CONVENTIONAL DIAPHRAGMATIC STRENGTHENING EXERCISES

SIX MINUTES WALK TEST

The comparative mean values, mean differences, standard deviation and Paired 't' test values of Group B who were treated with Conventional Diaphragmatic Strengthening Exercises

S.NO	GROUP B	MEAN	MEAN DEVIATION	STANDARD DEVIATION	't' VALUE
1.	Pre test	476.47	29.2	12.76	14.42
2.	Post test	505.67		9.62	

The table II shows analysis of Six Minutes walk test on paired 't' test. The test value for Group B was 14.42 at 0.05 % level of significance, which was greater than the tabulated 't' value 2.145. The result shows that there was marked difference between pre test and post test values.

GRAPH-II

GRAPHICAL REPRESENTATION OF PRE TEST AND POST TEST VALUES OF GROUP B (CONVENTIONAL DIAPHRAGMATIC STRENGTHENING EXERCISES)

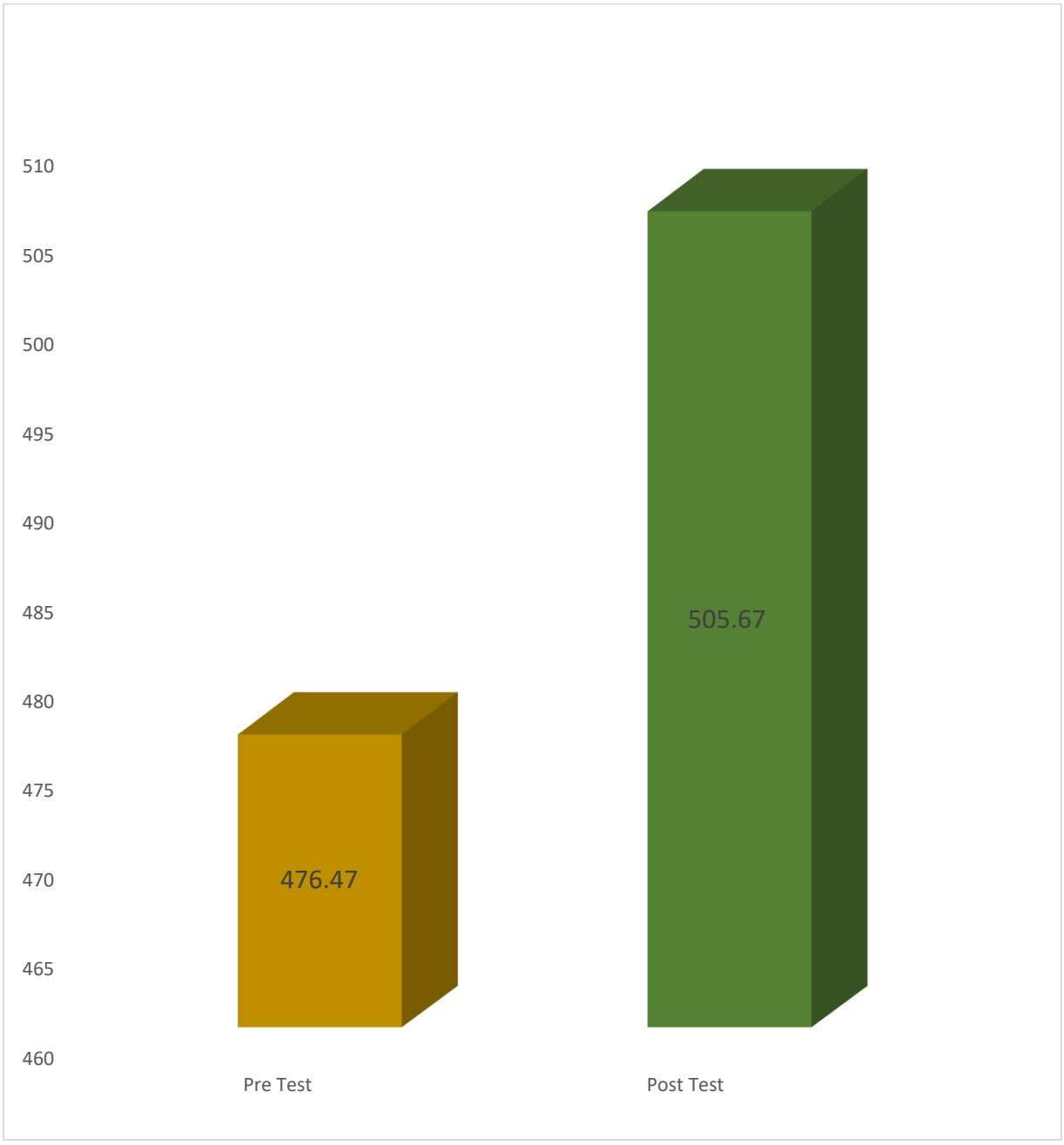


TABLE-III

UNPAIRED‘t’ TEST

COMPARISON BETWEEN THE PRE TEST VALUES OF GROUP A AND B

SIX MINUTES WALK TEST

The comparative mean values, mean differences, standard deviation and Unpaired‘t’ test values of Group A and Group B.

S.NO	GROUPS	MEAN	MEAN DEVIATION	STANDARD DEVIATION	‘t’ VALUE
1.	Group A	479	2.53	12.20	0.555
2.	Group B	476.47		12.76	

The table III shows analysis of Six Minutes walk test on paired ‘t’ test. The pre test value for Group A Group B was 0.555 at 0.05 % level of significance, which was greater than the tabulated ‘t’ value 2.145. The result shows that there was no marked difference between pre test and post test values.

GRAPH-III

GRAPHICL REPRESENTATION OF PRE TEST VALUES FOR GROUP A AND GROUP B

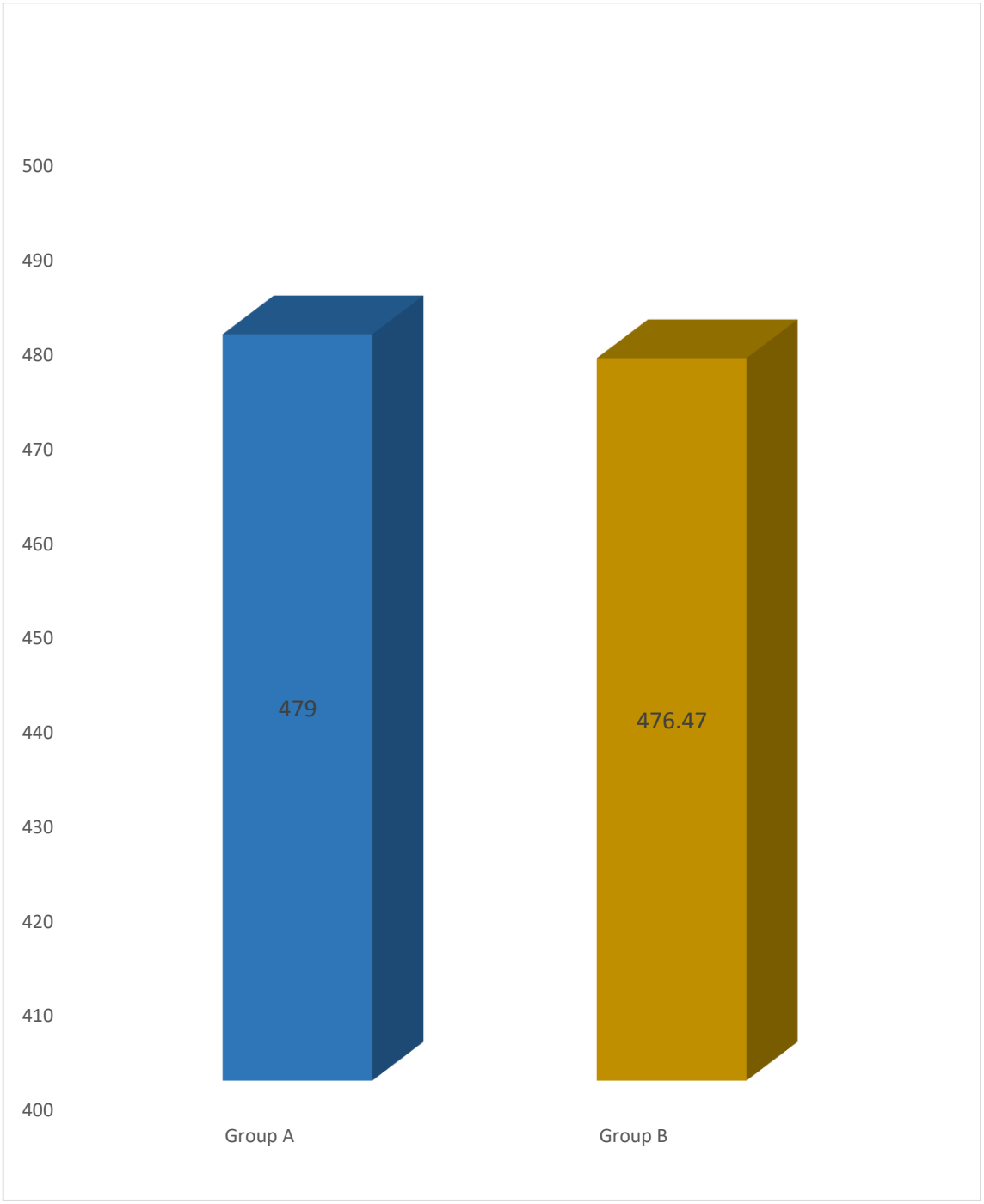


TABLE-IV

UNPAIRED ‘t’ TEST

COMPARISON BETWEEN THE POST TEST VALUES OF GROUP A AND B

SIX MINUTES WALK TEST

The comparative mean values, mean differences, standard deviation and Unpaired ‘t’ test values of Group A and Group B.

S.NO	GROUPS	MEAN	MEAN DEVIATION	STANDARD DEVIATION	‘t’ VALUE
1.	Group A	549.6	12.75	9.75	12.42
2.	Group B	505.67		9.62	

The table IV shows analysis of Six minutes walk test on paired ‘t’ test. The post test value for Group A and Group B was 12.42 at 0.05 % level of significance, which was greater than the tabulated ‘t’ value 2.145. The result shows that there was marked difference between pre test and post test values.

GRAPH-IV

GRAPHICL REPRESENTATION OF POST TEST VALUES FOR GROUP A AND GROUP B

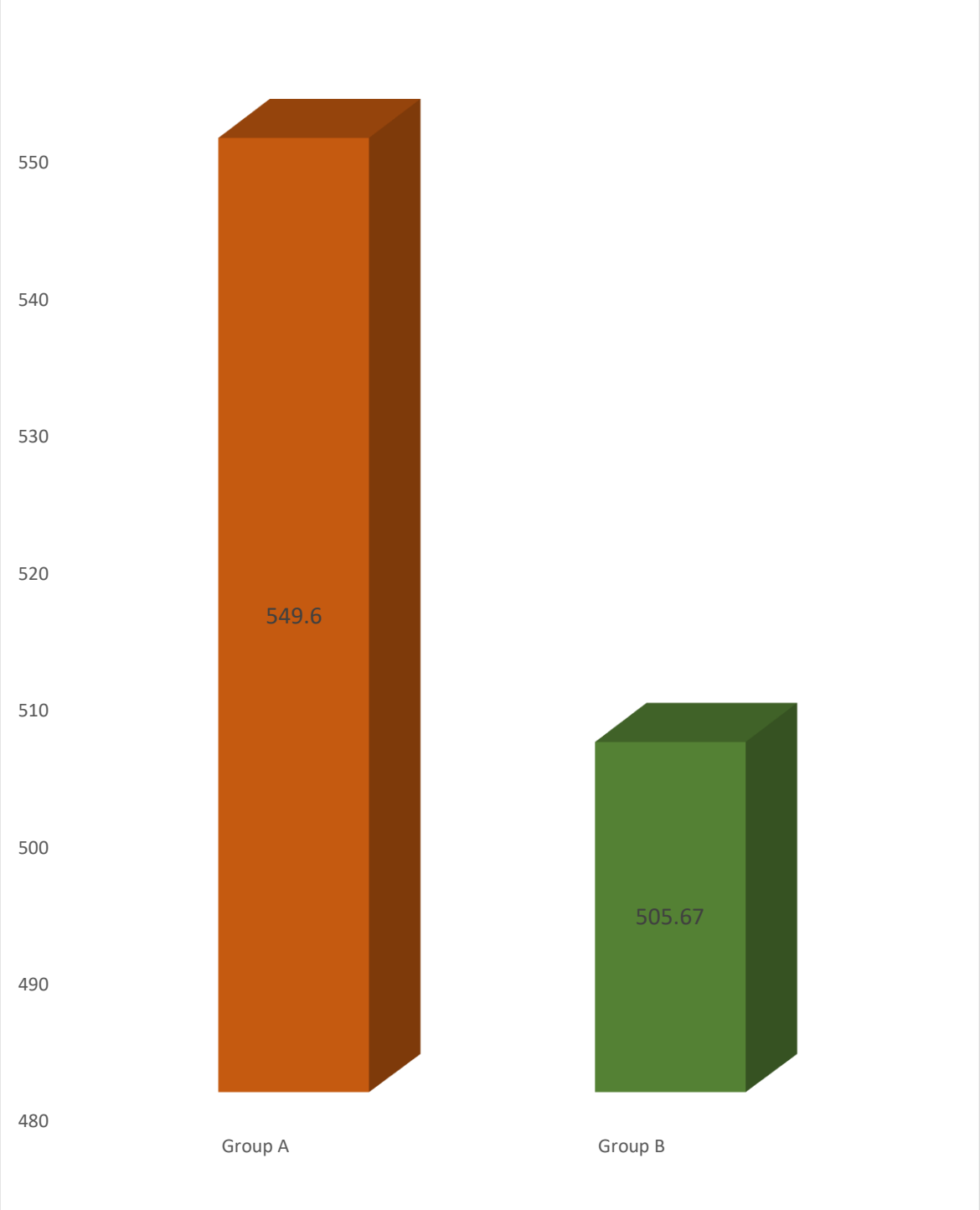


TABLE-V

PAIRED 't' TEST

PRE TEST AND POST TEST VALUES OF GROUP A

GROUP A – MANUAL DIAPHRAGMATIC RELEASE TECHNIQUES

ULTRA SONOGRAPHY

The comparative mean values, mean differences, standard deviation and Paired 't' test values of Group A who were treated with Manual Diaphragmatic Release Techniques.

S.NO	GROUP A	MEAN (mm)	MEAN DEVIATION	STANDARD DEVIATION	't' VALUE
1.	Pre test	5.33	2.1	1.05	30.2
2.	Post test	17		1.20	

The table V shows analysis of Ultra sonography on paired 't' test. The test value for Group A was 30.2 at 0.05 % level of significance, which was greater than the tabulated 't' value 2.145. The result shows that there was marked difference between pre test and post test values.

GRAPH-V

GRAPHICAL REPRESENTATION OF PRE TEST AND POST TEST VALUES OF GROUP A (MANUAL DIAPHRAGMATIC RELEASE TECHNIQUES)

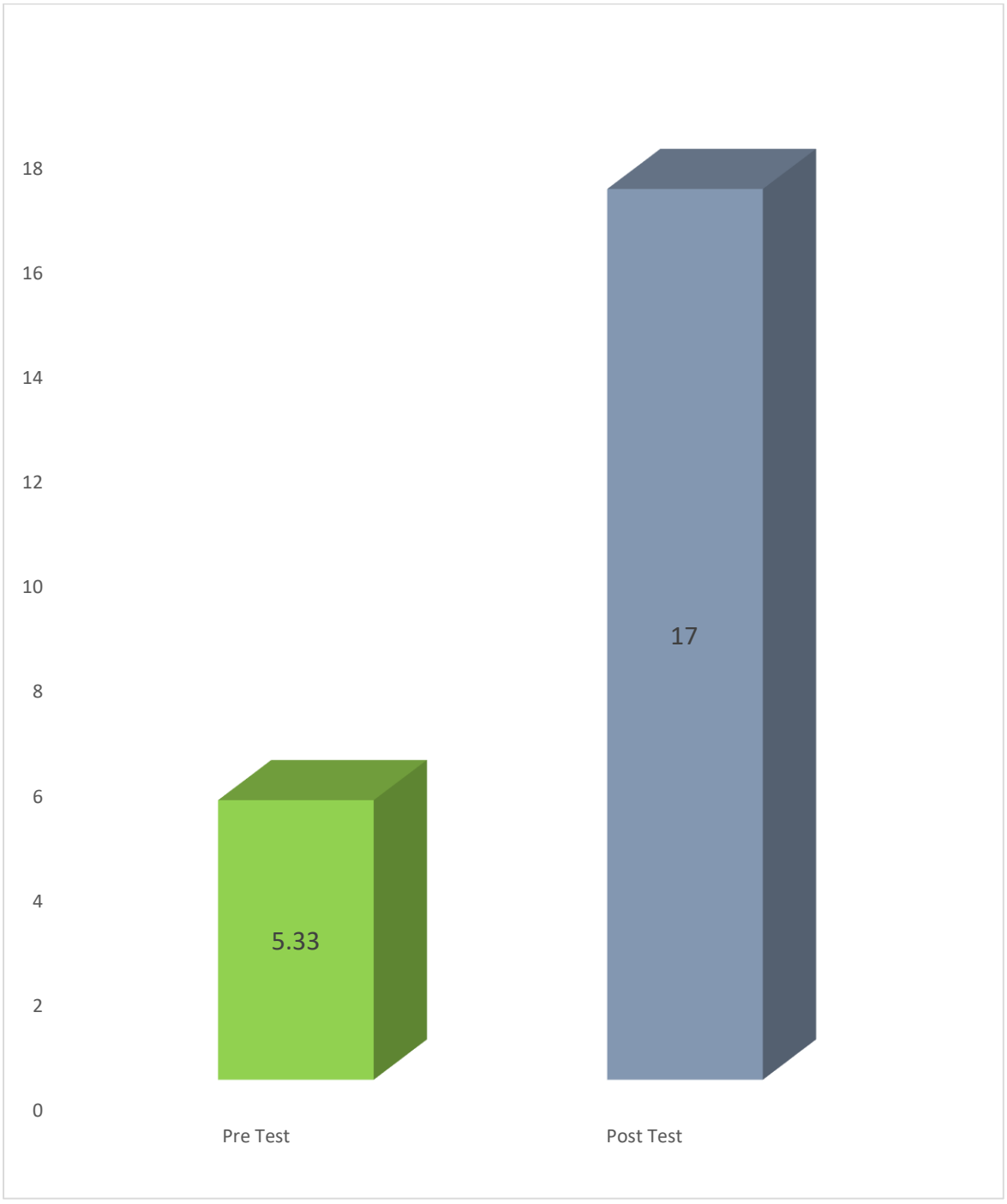


TABLE-VI

PAIRED 't' TEST

PRE TEST AND POST TEST VALUES OF GROUP B

GROUP B – CONVENTIONAL DIAPHRAGMATIC STRENGTHENING EXERCISES

ULTRA SONO GRAPHY

The comparative mean values, mean differences, standard deviation and Paired 't' test values of Group B who were treated with Conventional Diaphragmatic Strengthening Exercises

S.NO	GROUP B	MEAN	MEAN DEVIATION	STANDARD DEVIATION	't' VALUE
1.	Pre test	5.27	4	1.03	11.83
2.	Post test	9.27		1.10	

The table VI shows analysis of Ultra sono graphy on paired 't' test. The test value for Group A was 11.83 at 0.05 % level of significance, which was greater than the tabulated 't' value 2.145. The result shows that there was marked difference between pre test and post test values.

GRAPH-VI

GRAPHICAL REPRESENTATION OF PRE TEST AND POST TEST VALUES OF GROUP A (CONVENTIONAL DIAPHRAGMATIC STRENGTHENING EXERCISES)

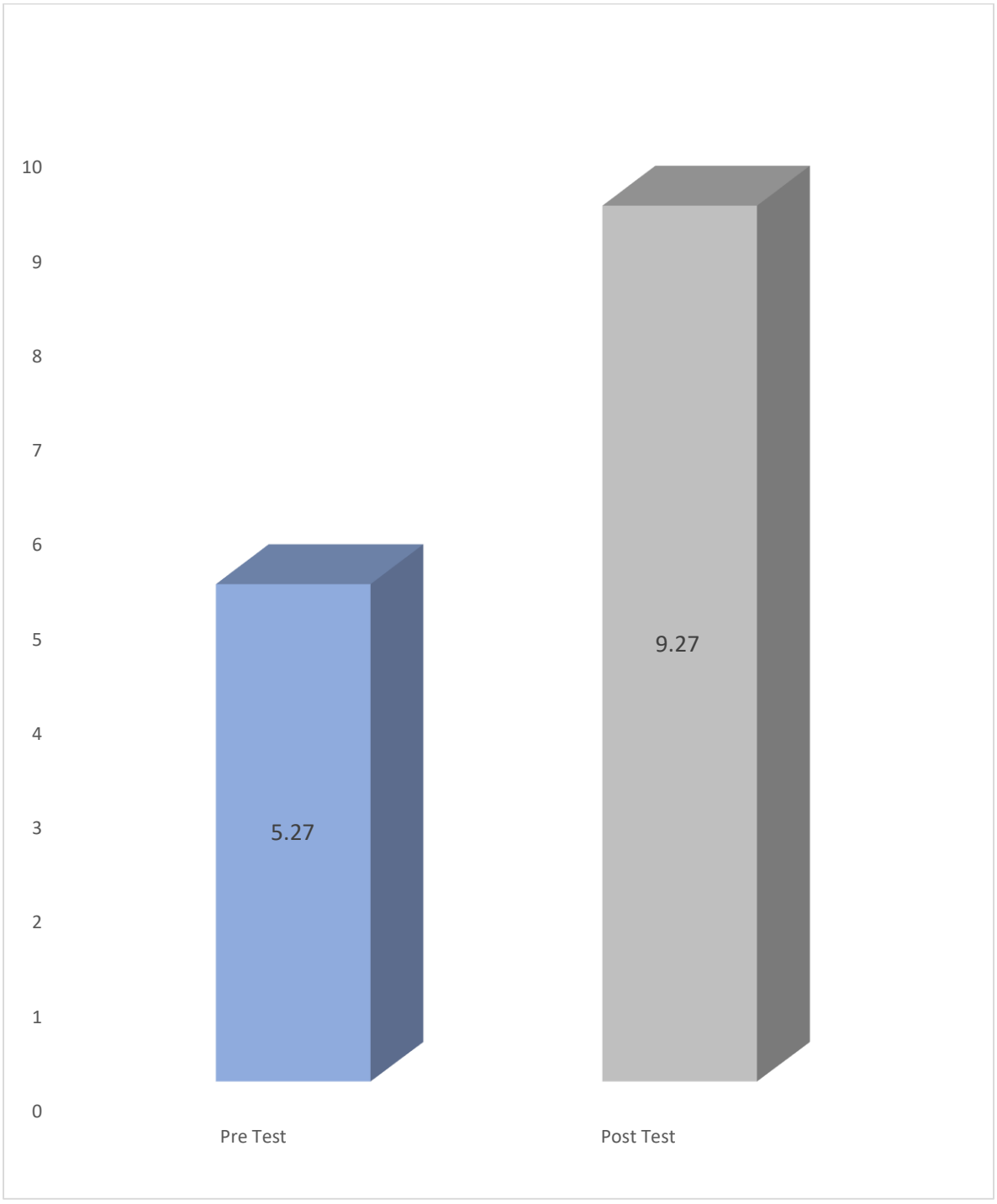


TABLE-VII

UNPAIRED‘t’ TEST

COMPARISON BETWEEN THE PRE TEST VALUES OF GROUP A AND B

ULTRA SONO GRAPHY

The comparative mean values, mean differences, standard deviation and Unpaired‘t’ test values of Group A and Group B.

S.NO	GROUPS	MEAN	MEAN DEVIATION	STANDARD DEVIATION	‘t’ VALUE
1.	Group A	5.33	0.06	1.05	0.175
2.	Group B	5.27		1.03	

The table VII shows analysis of Ultrasono graphy on paired ‘t’ test. The pre test value for Group A and Group B was 0.175 at 0.05 % level of significance, which was greater than the tabulated ‘t’ value 2.145. The result shows that there was no marked difference between pre test and post test values.

GRAPH-VII

GRAPHICL REPRESENTATION OF PRE TEST VALUES FOR GROUP A AND GROUP B

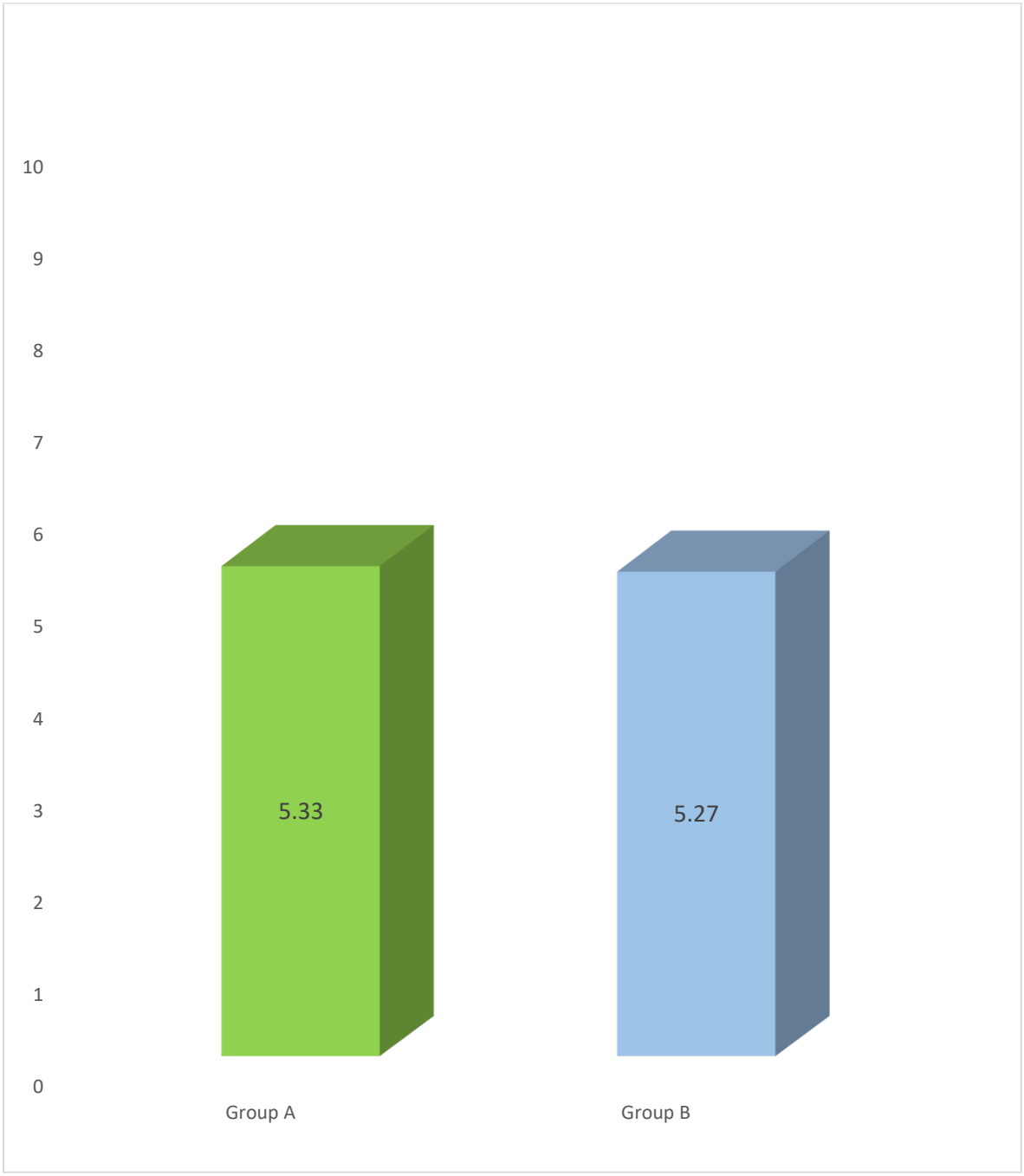


TABLE-VIII

UNPAIRED ‘t’ TEST

COMPARISON BETWEEN THE POST TEST VALUES OF GROUP A AND B

ULTRA SONO GRAPHY

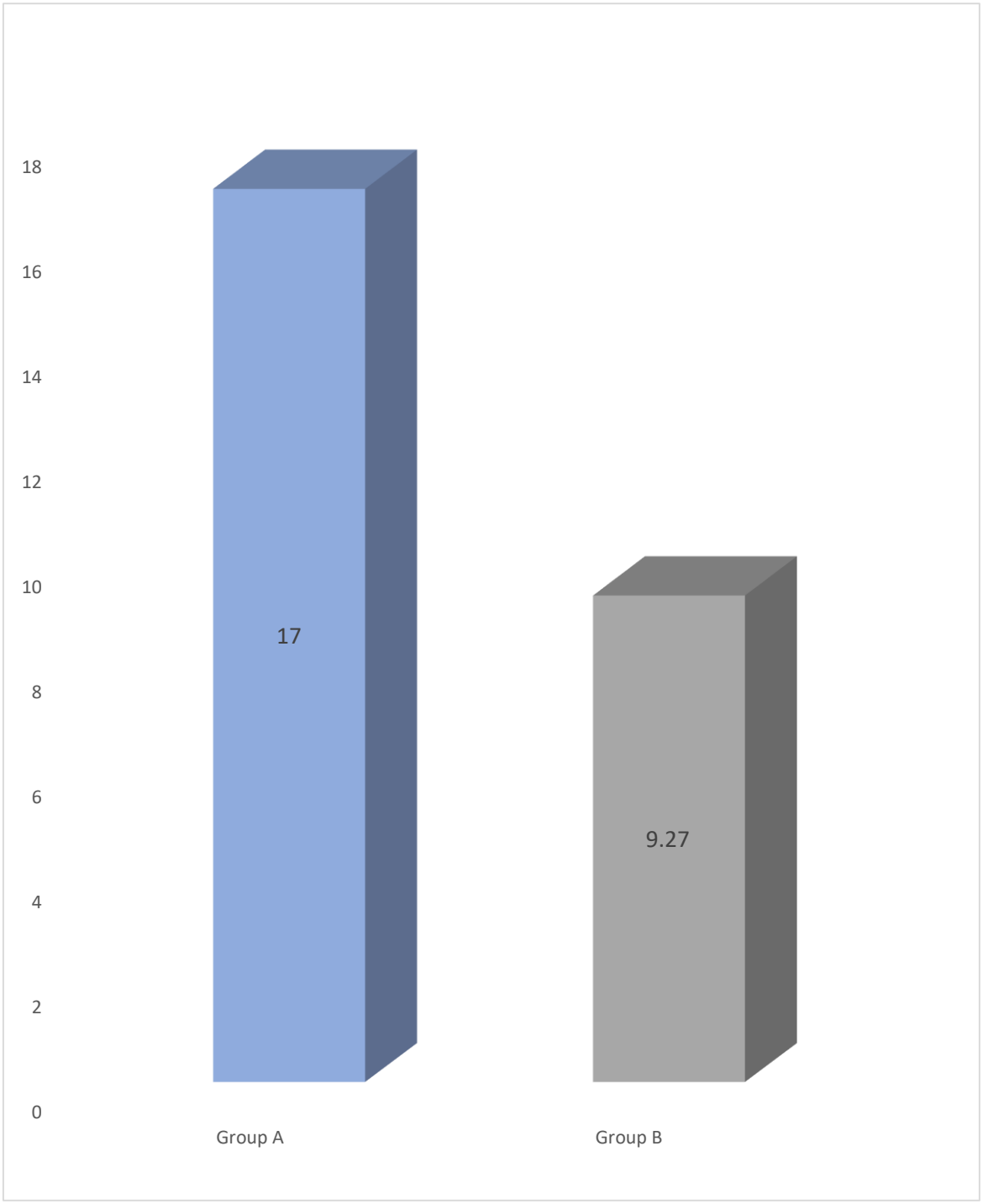
The comparative mean values, mean differences, standard deviation and Unpaired ‘t’ test values of Group A and Group.

S.NO	GROUPS	MEAN	MEAN DEVIATION	STANDARD DEVIATION	‘t’ VALUE
1.	Group A	17	2.65	1.20	18.44
2.	Group B	9.27		1.10	

The table VIII shows analysis of Ultrasono graphy on paired ‘t’ test. The post test value for Group A and Group B was 18.44 at 0.05 % level of significance, which was greater than the tabulated ‘t’ value 2.145. The result shows that there was marked difference between pre test and post test values.

GRAPH-VIII

GRAPHICL REPRESENTATION OF POST TEST VALUES FOR GROUP A AND GROUP B



Chapter- V

RESULTS & DISCUSSION

V RESULTS AND DISCUSSION

5.1 RESULTS

The Paired 't' test analyses for the pre test and post test variable for the Six Minutes walk test for measuring exercise capacity in COPD which is shown in table I and II. Both the groups show a significant difference between the pre test and post test values. The 't' value for the Group A is 18.47, the 't' value for the Group B is 14.42.

The unpaired't' test analyses for the Post test variables for Both groups for the Six Minutes walk test for measuring exercise capacity in COPD shown in the table IV. There was a significant difference shown between the Groups. Group A subjects show superior to Group B. The 't' value for the post test variables for both groups is 12.42.

The Paired 't' test analyses for the pre test and post test variable for the Diaphragmatic Mobility measured by Ultrasonography is shown in table V and VI. Both the groups show a significant difference between the pre test and post test values. The 't' value for the Group A is 30.2, the 't' value for the Group B is 11.83.

The unpaired't' test analyses for the Post test variables for Both groups Diaphragmatic Mobility measured by Ultrasonography is shown in table VIII. There was a significant difference shown between the Groups. Group A subjects show superior to Group B The 't' value for the post test variables for both groups is 18.44.

5.2 DISCUSSION

This study was aimed to determine the effectiveness of Manual Diaphragmatic Release techniques and conventional Diaphragmatic strengthening exercises on the diaphragmatic mobility and Exercises capacity in subjects with chronic obstructive pulmonary disease. The study's functional parameters were Six Minutes Walk test and Ultrasono Graphy.

A total of 30 subjects with chronic obstructive pulmonary disease, who fulfilled the selection criteria were randomly selected and divided into two groups containing 15 in each. Group –A received Manual Diaphragmatic Release techniques and Group-B received conventional Diaphragmatic strengthening exercises. Results obtained from statistical interpretation between Group A & B at 5% level of significance showed that there is a significant difference in the improvement of Diaphragmatic mobility and Exercise Capacity in subjects with chronic obstructive pulmonary disease.

Chronic obstructive pulmonary disease (COPD) is a syndrome of progressive airflow limitation caused by chronic inflammation of the airways and lung parenchyma. Conventional management of COPD includes smoking cessation, pharmacologic therapy, long-term oxygen therapy, and pulmonary rehabilitation. Bronchitis and emphysema have been shown to decrease compliance of the chest wall. Likewise, with advancing age, chest wall compliance decreases, the force-generating capacity of the diaphragm diminishes, residual volume (RV) increases, and forced vital capacity (FVC) lessens. Therefore, the chest wall and related structures are potential targets for therapeutic intervention. For example, respiratory muscle stretch gymnastics stretching exercises designed to improve chest wall compliance have been reported to improve chest wall mobility, improve vital capacity, and decrease dyspnoea.

Elaine Paulin et.al, (2003) stated that, exercises aimed to increasing mobility of chest wall, improve thoracic mobility and exercise capacity reduce breathlessness and symptoms of depression in Subjects with chronic obstructive pulmonary disease .

Further**,** Durmus .D, Alavli. G, et al, (2009), stated that, global postural re-education method resulted in greater improvements than the conventional exercise program in specific pulmonary function parameters like forced vital capacity, forced volume in 1sec and peak expiratory flow parameters.

Given this beneficial effect on diaphragmatic mobility, it can be hypothesised that the manual action on the underside of the last four costal cartilages allows the traction of the lower rib cage in a cranial direction and that the manual compression of the tissues in the area of insertion of the anterior costal diaphragm fibres lengthens the diaphragm in its insertional zone. At the moment, this is only a speculative hypothesis, not supported by direct measurements. This hypothesis, however, could be tested in future studies, again by ultrasound, placing a larger probe at the midaxillary line in order to perform a quantitative evaluation of the diaphragm's zone of apposition, as previously suggested Souchard PE (2001) , stated that**,** "Global postural re-education method uses active muscle stretching postures in which the stretching is made possible by the patient's participation in isometric contractions in the increasingly eccentric positions of the shortened muscles."

According to Aliverti and colleagues, in healthy people, accurate continuous measurements of abdominal volume variations allow estimation of instantaneous diaphragm displacement during quiet breathing, accounting for 89% of the variability of diaphragm displacement in the zone of apposition, whereas rib cage displacement accounts for less than 1%. More recently, Priori and colleagues showed similar results in people with COPD, where change in Vab accounted on average for 76% of diaphragmatic displacement in the zone of apposition during quiet breathing in the seated position. This might be because in the previous

studies it was possible to record both measurements simultaneously, with diaphragmatic motion being assessed by placing the ultrasound probe on the lateral rib cage, thus allowing visibility of the markers. In the present study, diaphragmatic motion was assessed by placing the ultrasound probe on the anterior subcostal abdominal surface. It was therefore not possible to achieve simultaneous measurements and this probably led to the lower regression coefficient. Nevertheless, the significant effects of the intervention on diaphragmatic motion were corroborated by two independent methods of evaluation.

From the above, this study gives a strong data support ,that subjects chronic obstructive pulmonary disease can improve their Exercises capacity and Diaphragmatic mobility using Manual Diaphragmatic release techniques.

LIMITATIONS AND RECOMMENDATIONS

5.3 LIMITATION OF THE STUDY

- The study was done for a short duration, long-term study need for further explorations.
- Intra rater and Inter rater reliability is not tested.
- No standard protocol of treatment was used for this study.
- Long term effect of exercises was not found.
- Certain factors like climate conditions, nutrition, time of testing, psychological factors, regular activities of daily living could not be controlled during the testing period.
- Only COPD are focused in this study.

5.4 FUTURE RECOMMENDATIONS

- ✓ Other Pulmonary conditions can be considered in future.
- ✓ Study recommends comparison of various manual techniques in treatment of COPD.
- ✓ Similar study can be done for COPD.
- ✓ Other aged subjects are also included for this similar study.

Chapter- VI

SUMMARY & CONCLUSION

VI SUMMARY AND CONCLUSION

The purpose of the study is to compare the effect of manual Diaphragmatic release techniques and Conventional Diaphragmatic strengthening exercises. 30 subjects with COPD were selected for the study and divided into two equal groups. The subjects were selected using simple random sampling method. All the subjects selected were divided into two equal groups, 15 subjects in each. Group A subjects underwent of manual Diaphragmatic release techniques where as Group B subjects underwent Conventional Diaphragmatic strengthening exercises. The study was done for duration of 3 months, treatment was applied for thrice weekly, a clear exercise schedule was given to every individual participants.

Outcome measured used in the study are Diaphragmatic Mobility and Exercise capacity. The tools used are Six Minutes Walk test and Ultrasonography. The pre test of the outcome was measured before the initiation of the therapy, and the post test outcomes were measured after 3 months. The student ‘t’ test was used to find out the significant difference in the improvements of the treatment.

Based on the statistical analysis the subjects in Group A shown a marked improvement in Diaphragmatic Mobility and Exercise capacity when compared with the subjects in Group B.

Conclusion:

1. There is a significant improvement in Diaphragmatic mobility on both the groups.
2. There is a significant improvement in Exercise capacity both the groups.
3. When compared with Group B (Control group), the Group A shows a marked improvement on Diaphragmatic mobility.
4. When compared with Group B (Control group), the Group A shows a marked improvement on Exercise Capacity.

So this study concludes that the Manual Diaphragmatic release techniques shows superior improvement in diaphragmatic mobility and exercise capacity in subjects with COPD.

Chapter- VII

BIBLIOGRAPHY

BIBLIOGRAPHY

1. GOLD. Global Initiative for Chronic Obstructive Lung Disease [homepage on the Internet]. 2011. Available from: www.goldcopd.org. Accessed December 26, 2012.
2. Yamaguti W, Paulin E, Shibao S, Chammas M, Salge JM, Ribeiro M, et al. Air trapping: the major factor limiting diaphragm mobility in chronic obstructive pulmonary disease patients. Respirology. 2008;13:138–144.
3. Aliverti A, Quaranta M, Chakrabarti B, Albuquerque LP, Calverley PM. Paradoxical movement of the lower ribcage at rest and during exercise in COPD patients. Eur Respir J. 2009;33:49–60.
4. Yamaguti WPdS. Paulin E, Salge JM, Chammas MC, Cukier A, de Carvalho CRFD. Disfunc¸a˜o diafragma´ tica e mortalidade em pacientes portadores de DPOC. J Bras Pneumol. 2009;35:1174–1181.
5. Ito K, Barnes PJ. COPD as a disease of accelerated lung aging. Chest. 2009;135:173–180.
6. Hochhegger B, De Meireles GP, Irion K, Zanetti G, Garcia E, Moreira J, et al. The chest and aging: radiological findings. J Bras Pneumol. 2012;38:656–665.
7. Soyuer F, S¸ enol V. Functional outcome and depression in the elderly with or without fatigue. Arch Gerontol Geriatr. 2010;53:e164–e167.
8. Chaitow L, Bradley D, Gilbert C. Multidisciplinary approaches to breathing pattern disorders. 1st ed. London: Churchill Livingstone; 2002:142.
9. DiGiovanna E, Schiowitz S, Dowling D. In: Somers D, ed. In: An Osteopathic Approach to Diagnosis and Treatment. 3rd ed. Philadelphia: Lippincott Williams & Wilkins; 2005:404.
10. Ricard F, Salle´ J-L. Tratado de Osteopatia. 3rd ed. Madrid, Spain: Panamericana; 2009:135.

11. de Coster M, Pollaris A. Osteopatı´a Visceal. 2nd ed. Madrid, Spain: Paidotribo; 2005:38.
12. American Thoracic Society/European Respiratory Society. ATS/ERS Statement on Respiratory Muscle Testing. Am J Respir Crit Care Med. 2002;166:518–624.
13. Pereira C, Sato T, Rodrigues S. New reference values for forced spirometry in white adults in Brazil. J Bras Pneumol. 2007;33:397–406.
14. Licciardone JC, Russo DP. Blinding protocols, treatment credibility, and expectancy: methodologic issues in clinical trials of osteopathic manipulative treatment. J Am Osteopath Assoc. 2006;106:457–463.
15. Testa A, Soldati G, Giannuzzi R, Berardi S, Portale G, Silveri N. Ultrasound m-mode assessment of diaphragmatic kinetics by anterior transverse scanning in healthy subjects. Ultrasound Med Biol. 2011;37:44–52.
16. American Thoracic Society. ATS Statement: Guidelines for the Six-Minute Walk Test. Am J Respir Crit Care Med. 2002;166:111–117.
17. Severino FG, Resqueti VR, Bruno SS, Azevedo IG, Vieira RHG, Fregonezi GAF. Comparac¸a˜o entre o manovacuoˆmetro nacional e o importado para medida da pressa˜o inspirato´ ria nasal. Rev Bras Fisioter. 2010;14:426–431.
18. Aliverti A, Pedotti A. Opto-electronic plethysmography. Monaldi Arch Chest Dis. 2003;59:12–16.
19. Cala SJ, Kenyon CM, Ferrigno G, Carnevali P, Aliverti A, Pedotti A, et al. Chest wall and lung volume estimation by optical reflectance motion analysis. J Appl Physiol. 1996;81:2680–2689.
20. Heneghan NR, Adab P, Balanos GM, Jordan RE. Manual therapy for chronic obstructive airways disease: A systematic review of current evidence. Man Ther. 2012;17:507–518.

21. Aliverti A, Ghidoli G, Dellaca RL, Pedotti A, Macklem PT. Chest wall kinematic determinants of diaphragm length by optoelectronic plethysmography and ultrasonography. J Appl Physiol. 2003;94:621–630.
22. Priori R, Aliverti A, Albuquerque A, Quaranta M, Albert P, Calverley PMA. The effect of posture on asynchronous chest wall movement in COPD. J Appl Physiol. 2013;114:1066–1075.
23. Wilkens H, Weingard B, Lo Mauro A, Schena E, Pedotti A, Sybrecht GW, et al. Breathing pattern and chest wall volumes during exercise in patients with cystic fibrosis, pulmonary fibrosis and COPD before and after lung transplantation. Thorax. 2010;65:808–814.
24. Similowski T, Yan S, Gauthier AP, Macklem PT, Bellemare F. Contractile properties of human diaphragm during chronic hyperinflation. N Engl J Med. 1991;325: 917–923.
25. Clanton TL, Levine S. Respiratory muscle fiber remodeling in chronic hyperinflation: dysfunction or adaptation? J Appl Physiol. 2009;107:324–335.
26. De Troyer A. Effect of hyperinflation on the diaphragm. Eur Respir J. 1997;10: 708–713.
27. O'Donnell DE, Laveneziana P. Physiology and consequences of lung hyperinflation in COPD. Eur Respir Rev. 2006;15:61–67.
28. McNamara RJ, Elkins MR, Ferreira ML, Spencer LM, Herbert RD. Smallest worthwhile effect of land-based and water-based pulmonary rehabilitation for COPD. Eur Respir J Open Res. 2015;1:1–8.

APPENDICES

APPENDICES

APPENDIX -1

CARDIOPULMONARY ASSESSMENT

Name :

Age :

Sex :

Occupation :

Height : Date of Admission :

Weight : Date of assessment :

Chief complaints :

HISTORY

Present medical history :

Past medical history :

Family history :

Social History :

Personal History :

Associated problem :

Vital signs:

Heart rate :

Blood Pressure :

Respiratory rate :

Temperature :

OBJECTIVE ASSESSMENT

On observation

Built :

Color :

Chest shape :

Symmetry :

Breathing pattern :

Chest movement :

Intercostals retraction :

Periphery/extremities :

Clubbing :

Cyanosis :

Respiratory distress :

Type of respiration :

Usage of assessor muscles :

Vocal fremitus :

On Palpation:

Tracheal deviation :

Chest expansion :

- ✓ Axilla
- ✓ Nipple level
- ✓ Xiphoid

Tenderness :

Oedema :

On Examination

On Auscultation

Heard sounds :

Lung sounds :

Abnormal breath sound :

Wheeze Rails

Rhonchi Crepitus

INVESTIGATION:

X-Ray :

E.C.G :

Echocardiogram :

ABG Analysis :

Blood test :

Exercise tolerance :

DIAGNOSIS:

APPENDIX-II

DATA

SIX MINUTES WALK TEST

GROUP A- MANUAL DIAPHRAGMATIC RELEASE TECHNIQUES

S.NO	PRE TEST	POST TEST
1	468	543
2	484	566
3	477	555
4	486	568
5	471	562
6	486	549
7	492	543
8	469	536
9	468	542
10	495	553
11	453	546
12	498	537
13	487	545
14	476	548
15	475	551

SIX MINUTES WALK TEST

GROUP B-CONVENTIONAL DIAPHRAGMATIC STRENGTHENING EXERCISES

S.NO	PRE TEST	POST TEST
1	471	501
2	461	506
3	466	498
4	452	495
5	490	502
6	486	512
7	475	506
8	485	510
9	470	492
10	496	523
11	485	518
12	477	507
13	468	496
14	495	521
15	470	498

DIAPHRAGMATIC MOBILITY

GROUP A- MANUAL DIAPHRAGMATIC RELEASE TECHNIQUES

S.NO	PRE TEST (mm)	POST TEST (mm)
1	4	18
2	5	19
3	6	18
4	4	17
5	4	17
6	6	17
7	6	18
8	7	18
9	5	16
10	4	15
11	5	17
12	6	18
13	7	16
14	5	16
15	6	15

DIAPHRAGMATIC MOBILITY

GROUP B-CONVENTIONAL DIAPHRAGMATIC STRENGTHENING EXERCISES

S.NO	PRE TEST (mm)	POST TEST (mm)
1	5	10
2	7	9
3	5	11
4	6	9
5	4	9
6	4	8
7	4	7
8	6	8
9	7	9
10	5	9
11	6	10
12	5	10
13	5	10
14	6	11
15	4	9

APPENDIX III

SIX MINUTES WALK TEST

A 6-minute walk test is generally done at the start of a pulmonary rehabilitation program or to evaluate a exercise capacity and endurance. The test measures the distance a patient can walk quickly on a flat, hard surface in 6 minutes and reflects their ability to perform daily physical activities.

Determining the physical capability of an individual with COPD, chronic obstructive pulmonary disorder, is an important aspect of planning the appropriate clinical treatment.

Because many people, especially those who are elderly, are unable to perform the standard treadmill-based exercise test used to evaluate exercise capacity, the 6-minute walk test was developed as a valid alternative.

- **Indications of 6-Minute Walk Test**

One of the most significant reasons to conduct a 6-minute walk test is for measuring the response to medical intervention in a patient with moderate to severe heart or lung disease.

Clinicians also use a 6-minute walk test:

- As a one-time measurement of functional status.
- To provide information about a patient's ability to perform activities of daily living.
- To evaluate the response of bodily systems to exercise including the heart, lungs, blood and circulation.

- **Contraindication of six minutes walk test**

- Unstable angina during the month prior to the test.
- Heart attack the month prior to the test.

- Resting heart rate of > 120 beats per minute.
- Systolic blood pressure of > 188 mm Hg.
- Diastolic blood pressure of > 100 mm Hg.

- **Preparing for the six minutes walk test**

- Dress in comfortable clothing.
- Wear comfortable shoes, preferably designed for walking.
- Use walking aids if you normally need them, such as a cane or walker.

- Eat a light meal before early morning or afternoon tests.
- Avoid vigorous exercise within 2 hours prior to the test

- **Reason for the stopping six minutes walk test**

- Chest pain
- Intolerable dyspnea
- Leg cramps
- Staggering
- Excessive sweating
- If you become pale or ashen in appearance

- **Tips for the six minutes walk test**

- You will be permitted to slow down, stop and rest as needed.
- You may lean against the wall when resting but should remain standing.
- If you do stop to rest, keep in mind the timer will not stop when you do and you should start up again when you are ready.

- Your technician will be watching you carefully, periodically reporting how many minutes have elapsed.
- Advise your technician of any concerns, both prior to and during the test.

➢ **Result**

Most 6-minute walk tests will be done twice -- once before and once following therapeutic intervention to determine if the patient has experienced significant improvement in functional status.

One of the goals of medical intervention for COPD is for the patient to be able to walk further during the second test. One study reported that COPD patients who underwent exercise and diaphragmatic strength training could actually walk 50 meters (20 percent) more during their second test. While the 6-minute walk test is a useful tool for measuring functional capacity of many patients, the test should not be performed at home in the absence of proper medical supervision.

APPENDIX IV

CONSENT FORM

This is to certify that I _____ freely and voluntarily agree to participate in the study **"EFFECT OF MANUAL DIAPHRAGMATIC RELEASE TECHNIQUES IN THE IMPROVEMENT OF DIAPHRAGMATIC MOBILITY AND EXERCISE CAPACITY IN SUBJECTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE".**

I have been explained about the procedures and the risks that would occur during the study.

Participant:

Witness:

Date:

I have explained and defined the procedure to which the subject has consented to participate.

Researcher:

Date

APPENDIX V

ABSTRACT

Background & purpose

The purpose of the study was to assess the effectiveness of Manual Diaphragmatic Release Technique in COPD subjects.

Matrials and methods

A total of 30 COPD subjects were randomly assigned to either a group A(Manual Diaphragmatic Release Technique) N=15 or in a group B (Diaphragmatic strengthening Exercise) N= 15.Both group (Age 45-50 years). The Study was conducted for a period of three month.outcome measure were evaluated at pre and post intervention by using the six minutes walk test and ultrasonograghy.

Results

After intervention significant effects were observed group A on six minutes walk test and ultrasonography pre test and post test score was obtained.

Conclusion

There is a significant improvement of exercises capacity and diaphragmatic mobility, so it indicates that manual diaphragmatic release technique is effective in COPD subjects.

Key words

- Chronic obstructive pulmonary disease.
- Manual Diaphragmatic Release techniques, Conventional Diaphragm Strengthening.
- Diaphragmatic Mobility, Exercise Capacity.