Faculty of Medicine

University of Dhaka

EFFECTIVENESS OF DIAPHRAGMATIC MANIPULATION ALONG WITH CONVENTIONAL PHYSIOTHERAPY FOR PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD).

By

Md. Rofiqul Islam

Master of Science in Physiotherapy

Session: 2013-2014

Registration No: 8515

Roll No: 204

Department of Physiotherapy

Bangladesh Health Professions Institute (BHPI)

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Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science in Physiotherapy

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Supervisor's Statement

As supervisor of Md. Rofiqul Islam's M.Sc. in Physiotherapy Program Thesis work, I certify that I consider his thesis **"Effectiveness of Diaphragmatic Manipulation along with Conventional Physiotherapy for Patients with Chronic Obstructive Pulmonary Disease (COPD)"** to be suitable for examination.

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We the undersigned certify that we have carefully read and recommended to the Faculty of Medicine, University of Dhaka, for acceptance of this thesis entitled, **“Effectiveness of diaphragmatic manipulation along with conventional physiotherapy for patients with COPD”** submitted by Md. Rofiqul Islam, for the partial fulfillment of the requirements for the degree of Master of Science in Physiotherapy.

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Declaration Form

- This work has not previously been accepted in substance for any degree and is not concurrently submitted in candidate for any degree
- This dissertation is being submitted in partial fulfillment of the requirements for the degree of M.Sc. in Physiotherapy.
- This dissertation is the result of my own independent work/investigation, except where otherwise stated. Other sources are acknowledged by giving explicit references. A Bibliography is appended.
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List of Abbreviations

BMRC	:	Bangladesh Medical & Research Council
BP	:	Blood Pressure
CNS	:	Central Nervous System
COPD	:	Chronic Obstructive Pulmonary Disease
FEV	:	Force Expiratory volume
FEV1	:	Force Expiratory volume 1st Second
FVC	:	Force Vital Capacity
GOLD	:	Global initiative for chronic Obstructive Lung Disease
HR	:	Heart Rate
HSC	:	Higher School Certificate
HVLA	:	High Velocity Low Amplitude
IC	:	Inter Costal
MEP	:	Maximal Expiratory Pressure
MIP	:	Maximal Inspiratory Pressure
NIDCH	:	National Institute of Disease of the Chest & Hospital
OM	:	Orgasmic Meditation
PFT	:	Pulmonary Function Test
PNF	:	Proprioceptive Neuromuscular Facilitation
RCT	:	Randomized Control Trail
SD	:	Standard Deviation
SPSS	:	Statistical Package for the Social Science
SSC	:	Secondary School Certificate
WHO	:	World Health Organization

Abstract

Introduction: COPD means chronic obstructive pulmonary diseases. Many manual procedures have long been involved in the management of chronic obstructive pulmonary disease (COPD). Few literatures evaluated the COPD responses to individual or multiple manipulative techniques, so effects are unclear and poorly understood. ***Objective:*** To determine the effectiveness of diaphragmatic manipulation along with conventional physiotherapy on respiratory parameters for patients with chronic obstructive pulmonary disease. ***Methodology:*** 30 participants (age range: 40 to 70 years) from National Institute of Diseases of Chest and Hospital (NIDCH) from Mohakhali, Dhaka with chronic obstructive pulmonary diseases (COPD) were included in the study. Diaphragmatic manipulation was applied to experimental group. The conventional treatment was given for 6 sessions/two week including 3 repetitions in one session in 3 session a day of no less than 30 minutes duration for consecutive 2 weeks. Experimental research design measured by using mean, standard daviation, paired t test, independent –t test were taken. ***Result:*** Significant difference between Pre and Post values of all components of respiratory assessment questionnaires showing the effectiveness of diaphragmatic manipulation in reducing pulse rate and improving pulse rate and oxygen saturation rate in 6 minute walk test. Moreover within group comparison in experimental and control group it was found that all the respiratory parameters were significant through diaphragmatic manipulation along with conventional physiotherapy and conventional physiotherapy but only oxygen saturation rate in control group it was not significant. ***Conclusion:*** Diaphragmatic manipulation along with conventional physiotherapy yields statistically as well as clinically significant improvements in both pulse rate and six minute walk test in patient with COPD between the ages of 40 and 70 years.

Key words: Diaphragmatic manipulation, Chronic Obstructive Pulmonary Disease

CHAPTER:I	INTRODUCTION

1.1 Background

Chronic obstructive pulmonary disease (COPD) is one of several chronic diseases that are becoming increasingly problematic worldwide. Their increasing burden and monetary cost are a particular risk to low- and middle-income countries and if trends continue unabated, chronic diseases have the potential to overwhelm health systems and state economies where several high-level international organizations have expressed their concern about the impact of chronic diseases on health systems (Bordoni, et al.,2016). COPD is associated with considerable morbidity and mortality proportion, it is the fifth leading cause of death in the world; with its mortality rate is expected to increase more than 30% during the next 10 years (WHO, 2010). The Global Initiative for Chronic Obstructive Lung Disease (GOLD) defined Chronic Obstructive Pulmonary Disease (COPD) as airflow limitation that tends to not be fully reversible and which is usually both progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases (Pauwels, et al., 2012). Chronic obstructive pulmonary disease (COPD) is a lung disease characterized by chronic obstruction of lung airflow that interferes with normal breathing and is not fully reversible (Abdelaal, et al., 2015). COPD is characterized by a gradual worsening of lung functions and health status (Shankar, 2008). Pulmonary, cardiovascular as well as skeletal muscles dysfunctions are the main underlying elements in limiting exercise capacity of COPD patients (Mohamed and Mousa, 2012). It is predicted that the burden of COPD will be even more apparent in the coming decades, due to the continuous exposure to risk factors as well as the increase in life-expectancy (Lopez-Campos, et al., 2014). It is expected that COPD will move from the sixth to the fourth cause of mortality and morbidity in the world (Chapmann, et al., 2009). Moreover, this illness accounts for significant health-care costs worldwide prevailing both in developed and in developing countries (Lopez-Campos, et al., 2014). The diaphragm is recognized as the primary muscle of respiration that plays an important role in breathing and physiological regulation. It is formed by a centraltrefoil-shaped tendon that blends superiorly with the fibrous pericardium (Boussuges, et al., 2009). So in order to reduce the rate of mortality it is necessary to make the muscle active in case of COPD patients. Chronic obstructive pulmonary disease (COPD) is a lung disease characterized by chronic obstruction of lung airflow that interferes with normal breathing and is not fully reversible. The more familiar terms 'chronic bronchitis' and 'emphysema' are no longer used, but are now included within the COPD diagnosis. COPD is not simply a "smoker's cough" but an under-diagnosed, life-threatening lung disease (WHO, 2015). According to Courtney (2009), dysfunctional breathing is "when the person is unable to breath efficiently or when breathing is inappropriate, unhelpful or inefficient in responding to environmental conditions and the changing needs of the individual". Chronic obstructive pulmonary disease (COPD) is a common treatable disorder with progressive, partially reversible airflow limitation (Boussuges, et al., 2009). Diaphragm is the main muscle for inspiration and there are mainly two types of intercostal muscle - internal Intercostal muscles and external Intercostal muscles; These muscles work in unison when inspiration-expiration process occurs. This muscle of respiration may undergo atrophy in physical inactivity. This may affect chest wall mobility and Chest expansion and reduce lung compliance (Kenneth and Saladin, 2009). Individuals who may have respiratory dysfunction but do not display respiratory distress are of less interest to the medical profession and This is reflected in health care research where respiratory disease studies are common but the effects of dysfunctional breathing remain poorly understood; This is understandable given that respiratory diseases such as asthma and chronic obstructive pulmonary disease (COPD) are associated with high morbidity whereas dysfunctional breathing is not. In asthma and COPD, to maintain the lung functions of ventilation and gas exchange, breathing patterns may change from abdominal breathing to upper chest breathing (Courtney, 2009). Neuro-physiological facilitation of respiration is a proprioceptive and tactile stimuli that alter the depth and rate of breathing. Intercostal stretching is an effective PNF technique helps in improving breathing pattern and respiratory muscle activity and The IC stretch enhances the chest wall elevation and increase chest expansion and diaphragm excursion to improve intra-thoracic lung volume which contributes to improvement in flow rate percentage; otherwise, Intercostal (IC) muscles are diverse and widely spread throughout the rib cage and These muscles are morphologically and functionally skeletal muscles, and it helps in upward and outward movement of the ribs which results in increase in antero-posterior diameter of the thoracic cavity (Troyer, et al., 2005). The IC muscles help both in inspiration and forced expiration. Even though these muscles engage in respiration, their activities are fewer during active contraction among normal healthy adults (Han, et al, 2010). COPD is associated with considerable morbidity and mortality proportion, it is the fifth leading cause of death in the world; with its mortality rate is expected to increase more than 30% during the next 10 years (Troyer, et al., 2005). Diaphragm is the main muscle for inspiration and There are mainly two type of intercostals muscle - internal Intercostal muscles and external Intercostal muscles; These muscles work in unison when inspiration-expiration process occurs and this muscle of respiration may undergo atrophy in physical inactivity. This may affect chest wall mobility and chest expansion and reduce lung compliance (kenneth and Saladin, 2009). Neuro physiological facilitation of respiration is a proprioceptive and tactile stimuli that alter the depth and rate of breathing. Intercostal stretching is an effective PNF technique helps in improving breathing pattern and respiratory muscle activity; The inter costal stretch enhances the chest wall elevation and increase chest expansion and diaphragm excursion to improve intrathoracic lung volume which contributes to improvement in flowrate percentage; Anterior basal lift is another respiratory PNF technique which helps in improving respiratory muscle activity and thereby improves intra-thoracic lung volume which contributes to improvement in flow rate percentage (Troyer, et al., 2005). Respiratory drive is regulated by information from sensory receptors within the airway, lungs and respiratory muscles as well as central and peripheral chemo receptors. The respiratory muscles contraction and relaxation are under control of GTO which is sensitive to muscle stretch (active or passive) due to this there is a firing discharge of muscle spindle, which give this message to CNS via Alpha and Gamma motor neurons which directly responsible for initiating muscle contraction. IC Stretch increases alpha motor neuron activity, causing the muscle fibers to contract and thus resist the stretching. Gamma motor neurons, which innervate intrafusal muscle fibers of muscle spindles regulate how sensitive the stretch reflex is and Application of a stretch to the chest wall just prior to inspiration, increases the gamma motor neuron discharge and alpha motor neuron activity is enhanced (Courtney, 2009). A quantitative analysis of respiratory muscle mechanics was reported by Ratnovsky and Elad (2005). Their study showed that the diaphragm muscle generates forces the same as those generated by other inspiratory muscles, but performs 60-80% of the total inspiratory work even at low efforts, unlike other respiratory muscles. In case of COPD it has been mostly found that due to noxious stimuli or gases the airflow limitation become progressive and associated with an abnormal inflammatory response of the lungs (McIvor, et al., 2011). In case of COPD the chronic airflow limitation is caused by a mixture of small airways disease (e.g. obstructive bronchiolitis) and parenchymal destruction (emphysema) (GOLD, 2017). Usually the COPD is thought to be a combination of emphysema and chronic bronchitis (McIvor, et al., 2011). Chronic obstructive pulmonary disease (COPD) is the group of lung conditions that leads to breathlessness. Emphysema – damage to the air sacs in the lungs, chronic bronchitis – long-term inflammation of the airways and asthma- Asthma is a chronic disease involving the airways in the lungs. These airways, or bronchial tubes, allow air to come in and out of the lungs (Halbert, et al., 2006). COPD (Chronic obstructive pulmonary disease) is the leading cause of morbidity and mortality. It's the fourth leading cause of death in world, and going to be the third leading cause of death around worldwide in the year of 2020 (WHO, 2016). Worldwide, the burden of COPD is projected to increase with advancing decades due to continued exposure to risk factors those were associated with COPD and aging of the population (Mathers and Loncars, 2006). Approximately 10%–20% of the global populations older than 40 years (an estimated 80 million) were suffering for COPD (Bhandari and Sharma, 2012).

Now COPD is a global burden in the world. It increases death and disability. The main cause of COPD is unknown but the main risk factor is smoking. The symptoms of COPD are breathing problems tend to get gradually worse over time and can limit individuals normal activities, although treatment can help keep the condition under control. Lung function declines with age, COPD prevalence estimates are highly dependent upon the age range and distribution of subjects included (Halbert, et al., 2006). Accurate prevalence evidence is important for several reasons, including documentation of COPD's impact on disability, quality of life and costs, and for helping to inform public health planning (Halbert, et al., 2006). COPD burden is born by 11 Asian countries and Asian Pacific Society of Respiratory Diseases 6.2% of the global. In Nepal, COPD accounts for 43% of the non-communicable disease burden, and 2.56% of hospitalizations. Tobacco smoking is the primary cause of COPD, indoor air pollution from biomass and/or traditional fuels is predictable to be associated with 0.4 million deaths from acute symptoms of COPD (Bhandari and Sharma, 2012). Global prevalence of COPD was estimated to be 11.7% among individual's with ≥30 years of age (Adeloye, et al., 2015). In Bangladesh the prevalence of COPD is 13.5% and more occurring aged 40 years or older. Illiteracy, smoking and biomass fuel burning are modifiable determinants of COPD. And also found higher among rural than urban residents and in males than females (Alam, et al., 2015). Tobacco smoking is thought to be the main risk factor for developing COPD but other environmental exposures including biomass fuel exposure and air pollution may also contribute in developing COPD. In addition to exposures, sometimes host factors may predispose subjects to develop COPD. The host factors may include genetic abnormalities, abnormal lung development and accelerated aging (GOLD, 2017). Globally, it has been revealed that most commonly encountered risk factor for COPD is tobacco smoking. Other types of tobacco including pipe, cigar, water pipe and marijuana are also risk factors for COPD. Outdoor, occupational, and indoor air pollution – the latter resulting from the burning of biomass fuels – are other major risk factors for COPD. Nonsmokers may also develop COPD. COPD is the result of a complex interplay of long-term cumulative exposure to noxious gases and particles, combined with a variety of host factors including genetics, airway hyper-responsiveness and poor lung growth during childhood (Lange, et al., 2015). Often, the prevalence of COPD is directly related to the prevalence of tobacco smoking, although in many countries outdoor, occupational and indoor air pollution resulting from the burning of wood and other biomass fuels are major COPD risk factors (Eisnar, et al., 2010). Risk factors such as a history of smoking that leads to the presence of clinical symptoms such as cough, sputum, or dyspnea on exertion, or middle aged or older people who have, COPD must always be assumed (Guidelines for the Diagnosis and Treatment of COPD, 2004).

1.2 Rationale

Chronic obstructive pulmonary disease (COPD) is one of the most commonly occurring respiratory disorder around the globe that causes physical, mental and functional limitation in our day to day life. Considering the variety of proposed therapeutic and the limited evidence for its clinical efficacy, it is often difficult to make light of the actual treatment approach. To develop evidence based study to strengthen physiotherapy practice as well as the betterment of the patients. As a student of M.Sc. in Physiotherapy and being a researcher, my interest is to work in this area and to establish an evidence based physiotherapy treatment technique for patients with COPD. COPD is a common respiratory disorder and its relationship with physical therapy is well established. Diaphragmatic manipulation has been successfully used by respiratory physiotherapists in management of reducing breathlessness and improving pulmonary function in many developed and developing countries. But in our country few physiotherapists have known this effective technique. But for evidence based physiotherapy, there is absolutely needed some guideline in which COPD patients will get proper treatment. It has been suggested that diaphragmatic manipulation can be used to treat diseases like chronic bronchitis type of COPD however there is a lack of evidence. Some research articles have been published about physiotherapy interventions of respiratory diseases but there’s no well-developed research on this area in our country. On the other hand this study will be helpful for professions and professionals of physiotherapy & with this connection with other professionals will have a chance to gather their knowledge from this study.

1.3 Research Question

Is diaphragmatic manipulation effective on pulmonary function in chronic obstructive pulmonary disease patients?

1.4 Study Objectives

1.4.1 General Objective

To evaluate the effectiveness of diaphragmatic manipulation on pulmonary function in chronic obstructive pulmonary disease patients.

1.4.2 Specific Objective

1. To find out socio demographic factors for patient with COPD.
2. To assess the respiratory rate of the participants.
3. To assess the pulse rate of the participants.
4. To identify respiratory rate, pulse rate after 6 minute walk performance of participants with COPD.

1.5 Hypothesis: Diaphragmatic manipulation along with conventional physiotherapy is effective for patients with chronic obstructive pulmonary disease (COPD).

1.6 Null-hypothesis: Diaphragmatic manipulation along with conventional physiotherapy is no more effective for patients with chronic obstructive pulmonary disease (COPD).

1.7 List of Variables

Independent Variables

Diaphragmatic Manipulation

Conventional Physiotherapy

Dependent Variables

Respiratory rate

Heart Rate

Oxygen saturation rate

Heart rate after 6 minute walk test

Oxygen saturation rate after 6 minute walk test

1.8 Operational Definition

COPD (Chronic Obstructive Pulmonary Disease): COPD is a lung disease characterized by chronic obstruction of lung airflow that interferes with normal breathing and is not fully reversible.

Diaphragm: A dome-shaped, muscular partition separating the thorax from the abdomen in mammals. It plays a major role in breathing, as its contraction increases the volume of the thorax and so inflates the lungs.

Manipulation: The act, process, or an instance of manipulating especially a body part by manual examination and treatment.

Pulmonary Disease: Pulmonary disease is characterized by chronic typically irreversible airway obstruction resulting in a slowed rate of exhalation.

Pulmonary Function: Pulmonary function means Lung function, defined as the exchange of oxygen and carbon dioxide between the blood and the air within the lungs.

Pulmonary function test: A test that is designed to measure how well the lungs are working. Abbreviated PFT. PFTs gauge how the lungs are expanding and contracting (when a person inhales and exhales) and measure the efficiency of the exchange of oxygen and carbon dioxide between the blood and the air within the lungs.

Chronic obstructive pulmonary disease (COPD) is now the fourth leading cause of death globally, and the World Health Organization (WHO) has predicted that it will become the third most common cause of death in the world by 2030 (WHO, 2010). In developed countries, current information estimates a prevalence of 8 % to 10 % among adults 40 years of age and older, whereas in developing countries, prevalence varies significantly among countries and is difficult to quote (Diaz-Guzman and Mannino, 2014). It is estimated that more than 210 million people have the disease worldwide. Concerning a large number of subjects, COPD generates important health and social costs. However, although COPD is one of the most common chronic diseases and has a high health and social impact, it is still poorly recognized among the general public and also clinicians. Consequently, there is a major and urgent need to better understand this complex disease (Bousquet, et al., 2010). About 115,000 people are diagnosed with COPD each year – equivalent to a new diagnosis every 5 minutes. In the five years up to 2008, incidence rates went down from 212 to 185 per 100,000 (Vestbo, et al., 2014). Chronic obstructive pulmonary disease (COPD) is a progressive life threatening lung disease that causes breathlessness (initially with exertion) and predisposes to exacerbations and serious illness. Globally, it is estimated that about 3 million deaths were caused by the disease in 2015 (that is, 5% of all deaths globally in that year). More than 90% of COPD deaths occur in low and middle income countries. The primary cause of COPD is exposure to tobacco smoke (either active smoking or secondhand smoke). Other risk factors include exposure to indoor and outdoor air pollution and occupational dusts and fumes. Some cases of COPD are due to long-term asthma. COPD is likely to increase in coming years due to higher smoking prevalence and aging populations in many countries. Many cases of COPD are preventable by avoidance or early cessation of smoking (DiGiovanna, et al., 2005). A recent review by Courtney (2009) discusses the function of breathing and the role it plays in the physiological regulation of oxygen, carbon dioxide and pH. Courtney (2009) also discusses how impairment of the functions of breathing affects people's quality of life, challenging homeostasis and compromising health. A study has been conducted investigating the interrelationship of respiratory function in healthy individuals (Engel & Vemulpad, 2007). However, the majority of studies involve symptomatic individuals with pathologies such as COPD (Yamaguti, et al., 2008). Engel & Vemulpad (2007) described the diaphragm as a musculotendinous dome that separates the thoracic and abdominal cavities. It contains perforations (hiatus, foramina and arches), permitting passage of the aorta, inferior vena cava, oesophagus, nerves, psoas and quadratus lumborum muscles. Anatomical attachments of the diaphragm include: the xiphoid process of the sternum, lower six ribs, first three lumbar vertebrae, the central tendon and myofascial connections with the psoas and quadratus lumborum muscles. Innervation of the diaphragm is from the phrenic nerve originating from cervical spine segments C3-4-5 (Yamaguti, et al., 2008). The diaphragm is the „primary muscle of respiration‟ and is responsible for producing pressure gradients between the thoracic and abdominal cavities important for efficient respiratory and circulatory functions (DiGiovanna, et al., 2005). The normal phasic respiratory action of this large dome shaped muscle is to descend and flatten during inhalation whilst lifting and widening the lower six ribs, resulting in a slight anterior motion of the abdomen (Courtney, 2009). Normal tidal breathing at rest is accomplished almost entirely by downward and upward movement of the diaphragm to lengthen and shorten the vertical diameter of the chest cavity (Ratnovsky & Elad, 2005). Additional expansion and contraction of the lungs is achieved by elevation and depression of the ribs to further increase and decrease the diameter of the chest cavity. Diaphragm movement is often described as a ''pump-like'' action. It is assisted by upper rib movement, referred to as „pump handle‟ , and lower rib movement, referred to as „bucket handle‟ (Greenman, 2003). The ''pump-like'' action is thought to become impaired in the presence of diseases such as COPD and asthma (Troyer, et al., 2005). A study by Yamaguti, et al. (2008) investigated 54 COPD subjects and 20 healthy subjects. Diaphragm mobility was measured using ultrasound to measure the craniocaudal displacement of the left branch of the portal vein and found that individuals with COPD have less diaphragm mobility than healthy subjects. Their results lead to the conclusion that diaphragm mobility was inversely and weakly correlated with pulmonary hyperinflation. Both Yamaguti, et al. (2008) investigated diaphragm mobility and pulmonary hyperinflation in healthy subjects and subjects with COPD, the results of both studies may have been affected by internal and external validity. For example, both studies evaluated a small number of subjects, affecting power and possibly generalizability. While impairment of diaphragm function has been well documented in symptomatic patients such as those with asthma or COPD, there may be changes in normal breathing mechanics in apparently healthy individuals which are related to musculoskeletal changes that result in altered diaphragm and rib movement. For example, with a dysfunctional diaphragm, the abdominal muscles may alter their pattern of respiratory activity causing other respiratory muscles to change their function and often become overloaded (Courtney, 2009).

According to Bartley and Clifton-Smith (2006), upper chest breathing can expend up to 30% of body energy, as this type of breathing uses accessory muscles of respiration such as sternocleidomastoid and the scaleni. The authors consider that in comparison, diaphragmatic breathing requires less than five percent of body energy and they therefore consider this to be an optimal breathing pattern. Contraction of the abdominal diaphragm can also produce changes in the thoracic and abdominal cavities affecting pressure gradients and lymphatic flow (Courtney, 2009). Increasing the compliance of the diaphragm may enhance diaphragm movement and improve lymphatic flow. Bartley and Clifton-Smith (2006), described how pressure gradients created by the movement of the diaphragm can influence lymphatic flow dynamics and affect gastrointestinal and cardiovascular systems. The influence of lymphatic flow, created by the diaphragm, is based on early research recognizing that lymph flow is influenced by myofascial compression and is consistent with the basic osteopathic concepts relating to homeostasis and the interrelationship of body systems (Wallace, et al., 2006). Several studies have investigated the effects of biomechanical diaphragm function and physiological changes in body systems. Verges, et al., (2008) investigated the effects of ''diaphragmatic breathing'' on blood pressure (BP) and heart rate (HR) in a single case study where BP and HR recordings were recorded over a three week period. The authors compared normal breathing with diaphragmatic breathing and reported that diaphragmatic breathing was associated with a statistically significant reduction in systolic and diastolic BP ($P<0.001$) but no change in HR. If poor diaphragm mechanics are prolonged, psychological effects such as hyperarousal, anxiety, and panic disorder may be observed (Han, et al., 2010).

In individuals with asthma and COPD, breathing patterns are different in comparison to asymptomatic individuals. The changes in breathing patterns are adjustments to maintain the lung functions of ventilation and gas exchange. Bartleyand Clifton-Smith (2006), assert that dysfunctional breathing contributes to structural musculoskeletal changes and poor posture, which may lead to further impairment of ventilation and respiration than that of dysfunctional breathing alone. It has been stated by Verses, et al. (2008) that poor biomechanics, such as dysfunction of the thoracic spine or ribs can cause flattening of the diaphragm reducing volume displacement and pressure gradients. In conditions such as asthma and COPD the diaphragm becomes shorter (flattened), reducing its curvature, power and efficiency (Courtney, 2009). Dysfunction of the diaphragm can create poor breathing patterns, which in turn alters normal respiratory pressure dynamics and can have detrimental effects on the function of the cardiovascular and lymphatic systems (Courtney, 2009). One technique used to assist in release of diaphragm hypertonicity is high velocity/low amplitude (HVLA) thrust to the thoracolumbar vertebra. A thrust technique is a method of specific joint mobilization which is indicated for the treatment of joint restriction (Kappler & Jones, 2007). Manual medicine practitioners, including osteopaths, commonly consider that the anatomical attachments of the diaphragm relating to musculoskeletal structures, such as the left and right crura attachments to the upper two or three lumbar vertebrae respectively and their intervertebral discs, play a role in diaphragm movement (Hruby, 2015). Hruby (2015) stated that application of osteopathic manipulation, such as HVLA, to anatomical areas relating to the diaphragm "can often restore or partially rehabilitate altered diaphragmatic function". However, there appears to be a lack of objective evidence about the role that HVLA might play in changing diaphragm function. Another OM technique designed to relax the resting state of the abdominal diaphragm is referred to as "doming of the diaphragm" (DiGiovanna, et al., 2005). Within osteopathic literature there are claims that "increased tone"4of the diaphragm, tends to flatten the shape of the diaphragm, resulting in less efficient respiration and a decrease in pressure gradients required for optimal functioning of body systems (Giovanna, et al., 2005). Doming of the diaphragm is used to

Osteopaths believe that such doming techniques may indirectly engage the inferior surface of the diaphragm and increase its excursion during expiration (Wallace, et al., 2006). These claims have not been adequately investigated and therefore remain as ahypothesis rather than a demonstrated fact. The theoretical basis for osteopaths treating the diaphragm is well documented (DiGiovanna, et al., 2005). Hruby (2015) improving breathing mechanics, venous blood flow and lymphatic flow. Bartley and Clifton-Smith (2006) showed pressure gradient differentials were created by the thoracic diaphragm which influenced lymph flow when OM treatment was applied to the diaphragm. Bartley and Clifton-Smith (2006) describe how facilitation of lymphatic flow in the bronchial tree is important, and may be enhanced through application of OM treatment. They also state that OM treatment to myofascial lymphatic support structures reduces congestion in the airways of patients with asthma. However, there has been minimal empirical investigation into whether OM techniques actually have an effect on the diaphragm. A randomized control trial by Engel and Vemulpad (2007) explored the effect of combining "chiropractic manual therapy" with exercise on respiratory function in normal individuals. The chiropractic „manual therapy‟ consisted of soft tissue therapy and nonspecific high-velocity low amplitude (HVLA) manipulation applied to the lower cervical, upper and middle thoracic spines, and associated ribs. Although it is unclear whether Engel and Vemulpad (2007) conducted a treatment or technique investigation, one could reasonably assume that a technique study was conducted, as participants were healthy and asymptomatic. Furthermore, the „manual therapy‟ described by the authors is very similar to the description of techniques documented by Hartman (2001). Engel and Vemulpad (2007) study reported that participants who A randomized control trial by Engel and Vemulpad (2007) explored the effect of combining "chiropractic manual therapy” with exercise on respiratory function in normal individuals. The chiropractic „manual therapy‟ consisted of soft tissue therapy and nonspecific high-velocity low amplitude (HVLA) manipulation applied to the lower cervical, upper and middle thoracic spines, and associated ribs. Although it is unclear whether Engel and Vemulpad (2007) conducted a treatment or technique, investigation, one could reasonably assume that a technique study was conducted, as participants were healthy and asymptomatic. Furthermore, the „manual therapy‟ described by the authors is very similar to the description of techniques documented by (Hruby, 2015). Engel and Vemulpad (2007) study reported that participants who received chiropractic manual therapy showed a significant increase in forced vital capacity (FVC) ($P<.001$) and forced expiratory volume in the first second (FEV1) ($P=.001$) in respiratory function compared to the control group which reported no change in FVC or FEV. Engel and Vemulpad (2007) concluded that manual therapy appeared to increase the respiratory function in normal individuals, although they acknowledge that generalizability was limited by the small sample size ($n=20$). Bartley and Clifton-Smith (2006) discussed how manipulative techniques aimed at increasing the motion of the thoracic cage, mobilizing the ribs and the thoracic spine, enhancing arterial supply and lymphatic return have been recommended for patients with a variety of obstructive airways diseases such as COPD. Further, a recent study by Noll, et al. (2008) investigated the immediate effects of osteopathic manipulative treatment in elderly patients with COPD. The Findings from the study by Noll et al., (2008) supported their primary hypothesis that a single multitechnique OM treatment session produces measurable changes in pulmonary function. In addition to the quantitative results reported by Noll, et al. (2008), a follow-up telephone survey was conducted to collect subjective feedback. Noll et al. (2008) stated that “Most subjects in both study groups reported their health benefited from receiving OM treatment and reported subjective improvement in their breathing", which implies there may have been a strong non-specific effect associated with the treatment protocol employed. The authors attributed the positive health benefits seen in both groups to a possible placebo effect, and acknowledged that the sham and OM treatment protocols were similar, i.e. touch to same anatomical regions for same duration of time. The results from Noll, et al. (2008) did not conclusively support their hypothesis, and indeed may have somewhat refuted it, as the authors concluded that an overall worsening of some spirometry measures occurred – probably due to „air trapping‟ . The authors speculated that this finding was possibly due to one particular technique that may have promoted a sudden rush of air into the lungs which cannot be fully exhaled by a COPD patient. One explanation for the „worsening‟ of pulmonary function in the group may be the mismatch of the standardized techniques employed to specific patient diagnostic findings. This explanation is similar to the views expressed in the commentary by Hruby (2015) in that treatment should be guided by the patient's condition and response to treatment. A similar investigation into restrictive airway diseases and OM treatment by Guiney et al., (2005) focused on the effects of OM treatment on pediatric patients with asthma. The results of this investigation showed a mean (±SD) increase of 4.8% (±10) in peak expiratory flow rates (PEFs) for patients in the OM treatment group compared to a mean increase of 1.4% (±11.1) in PEFs for patients in the control group. Although the authors claimed that the "design of a randomized controlled trial increases the validity of the study significantly", the omission of blinding of physicians responsible for measuring and recording patients PEFs may have influenced outcome measures. In a previous asthma study by Zannoti, et al. (2012) the authors also reported notable improvements (25% to 70%) in patient PEFs following the use of OM treatment and attributed this positive effect to mechanical improvements in chest wall motion. However, a pre-test-post-test cross over study by Matera, et al. (2012) investigating the effects of four OM techniques, applied in sequential order, on patients with chronic asthma found no statistically significant difference between the OM procedure and the sham procedure. The authors partially attribute this outcome to the fact that OM treatment was not individualized to treat each patient's "pattern of strain" – which is common practice when used in clinical settings. The study by Matera, et al. (2012) is another example of some of the difficulties around investigating osteopathic manipulative therapy using standardized protocol. Instead of matching techniques to patient condition, as described by Rabe (2011), a set protocol of techniques was employed and all subjects were treated for exhalation restrictions of the lower ribs which may have required a different OM technique. Osteopathic manipulative treatment studies are guided by the patient's condition and response to treatment, which then determine the techniques used. The pre-test post-test study by Matera, et al. (2012) was a pilot study and only recruited ten subjects. Although the authors report their findings as "not statistically significant" it is likely that given the small sample size (n=10) the study was not adequately powered to detect small to moderate treatment effects. The observed effect size for the main outcome measure (PEF) was 0.4. Assuming an alpha = 0.05 and desired power =0.8, the necessary sample size would be 100 subjects per group. The observed power in Matera, et al. (2012) study was 0.14 which is clearly insufficient to be able to draw definitive conclusions.

Diaphragmatic manipulation:

There are many manual procedures which are used for COPD. Few literatures assessed the COPD responses to individual or multiple manipulative techniques and variety of manual techniques were introduced to improve pulmonary function (PF). These techniques are targeting neuronal, lymphatic and musculoskeletal components of pulmonary system. Functional outcomes of COPD patients may be limited by pulmonary, musculoskeletal constraints and low functional capacity. Diaphragmatic or costal manipulation procedures produced significant benefits on both pulmonary function and functional capacity in patients with moderate COPD (Ashraf, et al., 2015). Patient position is in supine lying, therapist do 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: the therapist pulled gently in a cephalad 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.

Dose: 2 sets of 10 deep breaths, with a 1-2 minutes interval between them (Ashraf, et al., 2015).

Ashraf, et al., (2015) conducted a randomized controlled trial from May 2013 to August 2014 in Egypt with the aim to explore ventilatory functions (VF) and functional capacity (FC) responses to diaphragmatic or costal manipulation or both in COPD patients. Subjects with age ranged from 45-65 years having moderate COPD

(50 % <"FEV1"<80% ,FEV1/FVC <70% and partially reversible airway obstruction) with no clinical evidence of obvious exercise limiting cardiovascular or neuromuscular diseases and not involved in previous rehabilitation program at least 4 months were the inclusion criteria of that study. To conduct the study 195 male participants had met the criteria for inclusion and were randomly assigned into diaphragmatic manipulation group (group-A; n= 46), rib raising group (group-B; n= 53), diaphragmatic manipulation and rib rising (group-C; n= 50) and control group (group-D; n= 46). The interventions were provided to the subjects twice a week and continued for 12 weeks. The lung function parameters were evaluated at the beginning and at end of 12 weeks after completion of interventions. The parameters include forced vital capacity (FVC), forced expiratory volume in one second (FEV1) and functional capacity (FC) by 6 minute walk test. After analyzing the data within-group comparison showed that there were significant increase in FVC, FEV1 and 6 minute's walk test in group A, B, C ($P<0.05$) but decrease in group D. In between group analysis it has been found that statistically significant difference found more in favor of group C those who were treated with a combination of diaphragmatic manipulation and rid raising and no statistical significant difference is found in group A and B. in a study it has been found that the effectiveness of manipulation technique may be enhanced by combination of other treatment techniques where one treatment works synergistically to another (Kucher and Kuchera, 1995). This study has large sample size with multi-factorial design which revealed the strength of the study. But this has some limitations including that only male genders were appointed for conducting the study, only a local area of Egypt has been covered which will not represent the whole population. Rocha, et al., (2013) had conducted a research to find out the effectiveness of diaphragm release manual technique on the mobility of

diaphragm, chest wall kinetics and functional exercise capacity on patient with COPD. A double blinded RCT on 19 COPD patients were concluded to carry out the study. Participants were randomly allocated in two groups. Intervention group received diaphragmatic release manual technique and Control group with a sham protocol (light touch). Diaphragm displacement was observed by ultrasonography, evaluation of chest wall kinematics measured by Optoelectronic Plethysmography and Functional exercise capacity by six minutes' walk distance (6MWT). Pulmonary plethysmographs are commonly used to measure the functional residual capacity (FRC) of the lungs. The procedure is Patient is in a room. Breathe in using a mouth piece, expiration as possible 3-4 times. In result intervention group had a significant increase ($p<0.05$) in maximal inspiratory (MIP) and maximal expiratory pressure (MEP) compared to control group. At the within group analysis there is significant improvement were observed in inspiratory capacity ($p<0.01$) and distance walked during the 6 minute walk test ($p<0.001$) in intervention group. There were no changes in the chest wall volume and mobility between the groups. So it can be stated that manual diaphragm release technique improves respiratory muscle functionality and functional exercise capacity in COPD patients. In a study of Noll, et al., (2008) it has been found that there is positive noticeable effect on lung function and symptomatic improvement is found with manipulative techniques. A RCT with 20 patients of COPD in ex-smoker and aged > 60 years had carried out by Rocha, et al., (2015). The treatment group received diaphragmatic release manual technique where the controlled group received a sham protocol (light touch). The dose was 2 set in 10 deep breaths and 1 min interval. Diaphragmatic mobility was analyzed by using ultrasonography. Functional exercise capacity by 6-minute walk test. Maximal respiratory pressures and abdominal and chest wall kinematics measured by optoelectronic plethysmography. Outcomes were measured before and after the first and sixth treatments. After analyzing the treatment the manual diaphragm release technique was found to be improved diaphragmatic mobility, exercise capacity and inspiratory capacity in people with chronic obstructive pulmonary disease. In a small study sequential manipulation for four weeks was evaluated where it has been found that there is significant improvement in increasing residual volume in patient with COPD (Noll, et al., 2009).

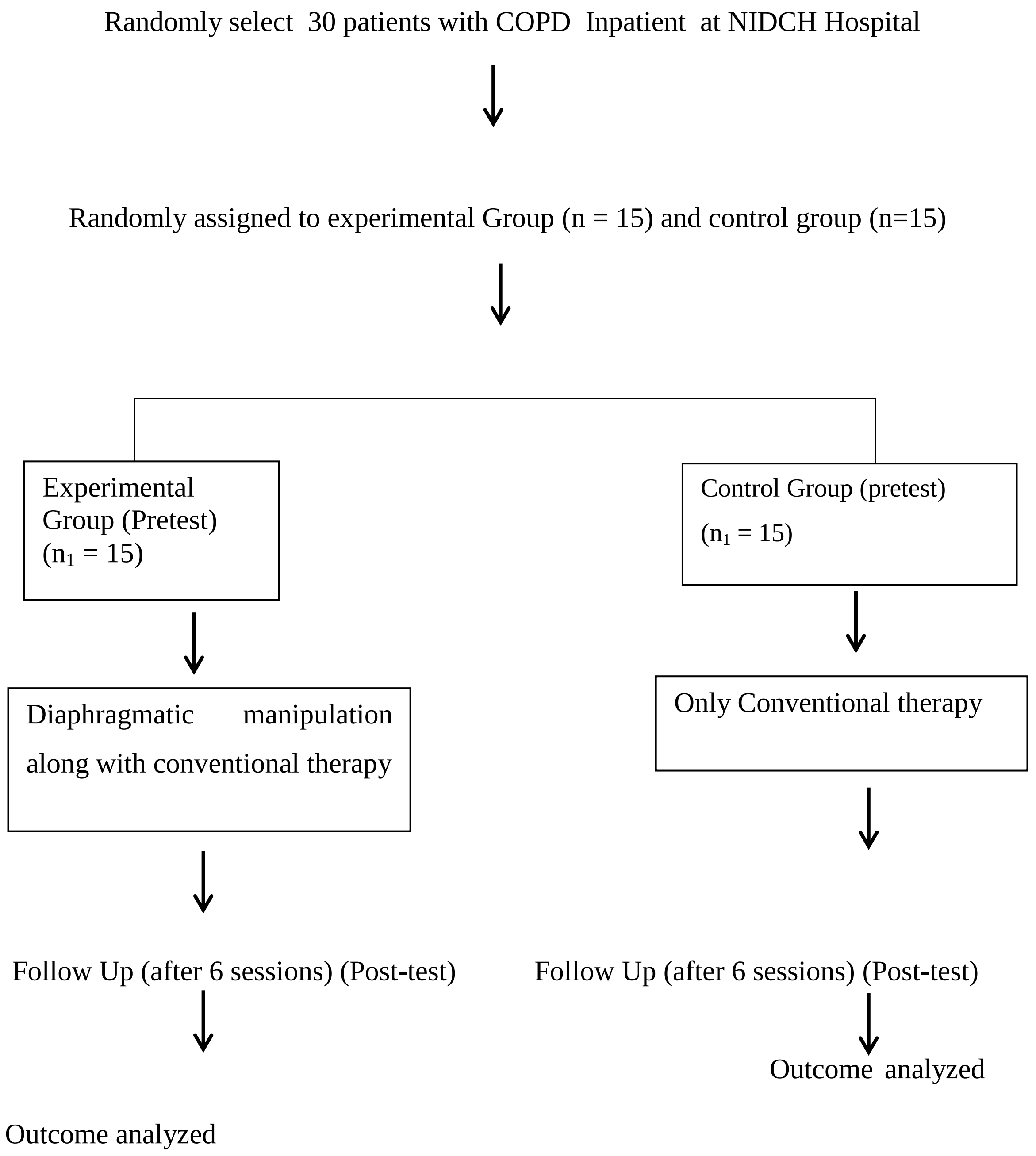
CHAPTER-III METHODOLOGY

3.1 Study Design

The study was conducted by using a Experimental Research design with two different groups. Only the experimental group received diaphragmatic manipulation along with conventional physiotherapy while in control group received only conventional physiotherapy treatment.

This was the study of single blinded Experimental Research design and data collectors were blinding in this study.

Flow-chart of the phases of randomized control trial design



3.2 Study Site

Study area was NIDCH, Mohakhali because there have a lot of COPD patients admitted there.

3.3 Study Population

A population refers to the entire group of people or items that meet the criteria set by the researcher. The populations of this study was COPD patients.

3.4 Sample & Sampling techniques

Thirty patients with COPD was selected randomly then 15 patients was randomly assigned to Diaphragmatic manipulation with conventional physiotherapy group and 15 patients to the only conventional physiotherapy group for this randomized control trial study. The samples were given numerical number C1, C2, C3 etc. for the control group and E1, E2, E3 etc. for experimental group.

3.5 Data analysis

Data was decorated with the software named Statistical Package for the Social Science (SPSS). Microsoft office Excel 2013 was used to decorating the bar chart, pie charts, independent ‘t’ test was done for the analysis of pulmonary function after treatment of both control and trial groups. Independent t test used for between group analyses. The result of this study was consisted of quantitative data.

3.6 Inclusion criteria

- Age ranged from 40-70 years, with moderate stage of COPD (Ashraf, et al.,2015).
- No clinical evidence of obvious exercise limiting cardiovascular or neuromuscular diseases.
- All participants were not involved in previous rehabilitation program at least 4 months prior to the study and had no recent infectious exacerbations for the 2 months preceding the study, with no history of psychiatry or psychological disorders.
- Initial medical screening was performed for each patient prior to the study (Ashraf, et al., 2015).

3.7 Exclusion criteria

- Patients were excluded if they had significant or unstable cardiac, musculoskeletal or psychological problems or medication that could affect or interfere with their performance or affect their safe participation, any known abdominal pathologies, history of gastroesophageal reflux of any degree, persistent hiccups within previous three months, a history of serious injury to the spine or thorax, including costal or spinal fractures or history of diaphragm surgery, bronchial asthma or restrictive lung disease or receiving long-term oxygen therapy (Ashraf, et al.,2015).

3.8. Treatment Protocol

Two physiotherapists who were expert in treatment of diaphragmatic manipulation were involved in treatment of patients. All the physiotherapists have the experience have more than five years, in the aspect of chest physiotherapy. It was arranged in service training to share the information to practical demonstration regarding diaphragmatic manipulation therapy including types of exercise, dose, repetition and patient position. In addition the types, dose, repetition, duration of conventional care including breathing exercise, purse lip breathing exercise, and exercise therapy was taken permission from head of Physiotherapy department, national institute of diseases of chest and hospital(NIDCH). In control group treatment protocol that was provided which was followed through the documents that was written by expert physiotherapists in NIDCH. Researcher was collecting those written treatment from the date of 18.03.17 to 26.04.17.

Table-I: Experimental Group Treatment Protocol

Treatment option	Duration/Repetition
Diaphragmatic manipulation	3 repetition in each session in one set
Deep breathing exercises	10 repetition in each session
Pulse lip breathing exercises	10 repetition in each session
Costal breathing exercise	10 repetition in each session
Spirometry exercise	5 minute in each session

Table-II: Control Group Treatment Protocol

Treatment option	Duration/Repetition
Deep breathing exercises	10 repetition in each session
Purse lip breathing exercises	10 repetition in each session
Costal breathing exercise	10 repetition in each session
Spirometry exercise	5 minute in each session

3.9 Ethical Consideration

The research proposal was submitted to the Institute Review Board (IRB) of BHPI for oral presentation and defense was done in front of the IRB. Then the IRB was approved the proposal.

The permission from the concerned authorities obtained ensuring the safety of the participants. In order to eliminate ethical claims, the participants set free to receive treatment for other purposes as usual. Each participant informed about the study before beginning and given written consent.The research proposal was submitted to the Institutional Review Board (IRB) of Bangladesh Health Professions Institute (BHPI) and approval was obtained from the board. Bangladesh Medical and Research Council (BMRC) and World Health Organization (WHO) guidelines also were followed to conduct the study.

A signed informed consent form received from each participant. The participants were informed that they had the right to meet with outdoor doctor if they think that the treatment was not enough.

The participant was informed that they were completely free to decline answering any question during the study and free to withdraw their consent and terminate participation at any time.

Withdrawal of participation from the study affected their treatment in the physiotherapy department and they would still get the

30 patients were enrolled in the study. Among them, 15 in the diaphragmatic manipulation with conventional treatment group (experimental group) and 15 in the only conventional treatment group (control group). The whole subject of both experimental and control group scored their respiratory rate, pulse rate, oxygen saturation rate, after 6 minute walk test measure pulse rate and oxygen saturation rate before and after completing treatment.

Socio-Demographic Information

Distribution of the respondent by their age:

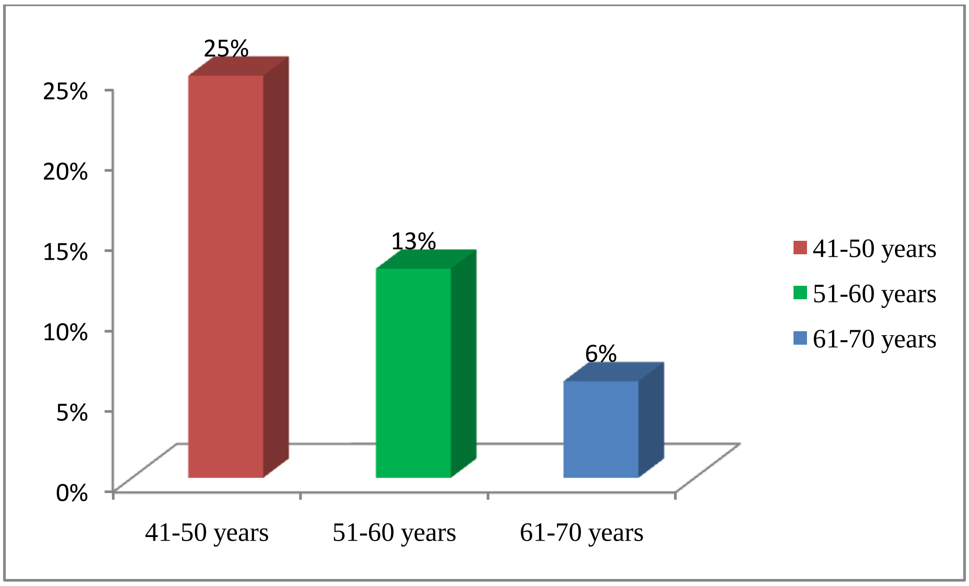
Table– III: Mean age of the participants of experimental and control group

Experimental Group		Control Group	
Subjects	Age (Years)	Subjects	Age (Years)
E1	70.00	C1	70.00
E2	65.00	C2	43.00
E3	65.00	C3	54.00
E4	41.00	C4	66.00
E5	52.00	C5	60.00
E6	70.00	C6	70.00
E7	55.00	C7	65.00
E8	64.00	C8	52.00
E9	45.00	C9	70.00
E10	65.00	C10	65.00

E11	70.00	C11	70.00
E12	65.00	C12	70.00
E13	70.00	C13	52.00
E14	48.00	C14	66.00
E15	55.00	C15	60.00
Mean Age	60	Mean Age	62.2

From the above mentioned table, it is obvious that mean age of participant in control group was 62.2 years and whereas experimental group mean age was 60 years on average (Table-III).

Figure – 1: Age Range of the Participants

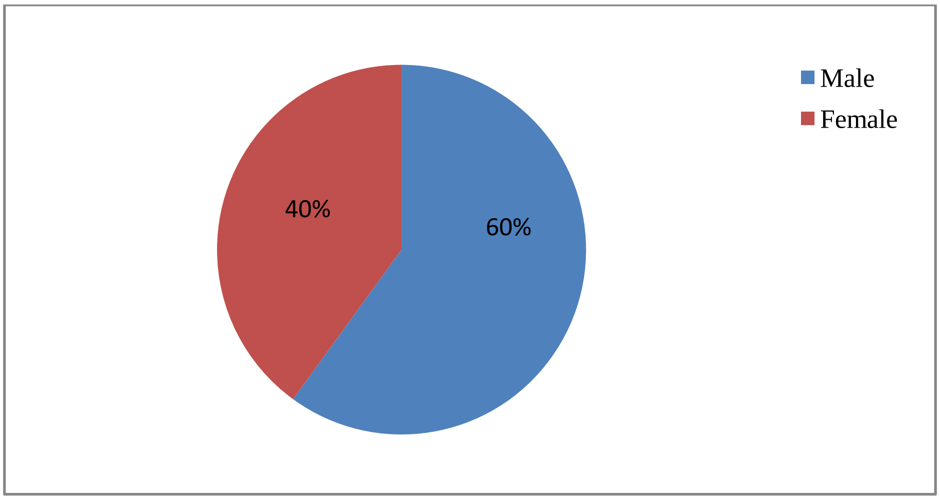


Above graph (figure-1) shows that maximum age range 25% that age range was 41-50 years were suffering COPD in this study, rest of 13% that age range was 51-60 years were also suffering COPD and least of people 6% that age range was 61-70 years were also suffering COPD.

4.2 Distribution of the respondent by their gender:

In this research, it is obvious that sex of participant in experimental and control group was male 60% (n=18) and female 40% (n=12) (Figure-2).

Figure – 2 Gender of total participants



Occupation of the participants: This below table-IV showed that among the participants farmer were the highest rate that was about 40% (n=12). Businessman participants were second highest rate that was 37% (n=11). Service holder participants were 20% (n= 06) and house wife participants were 3% (n=1)

Table–IV: Occupation of the participants

	Frequency	Percent
Service holder	06	20.0
House wife	01	3.0
Farmer	12	40.0
Business	11	37.0
Total	30	100.0

Educational Qualification:

This below table-V showed that SSC passed participants were highest rate that was about 40% (n=12), Primary passed participant were second highest rate that was 33% (n=10), HSC passed; illiterate Participants were according to 23%, 3%.

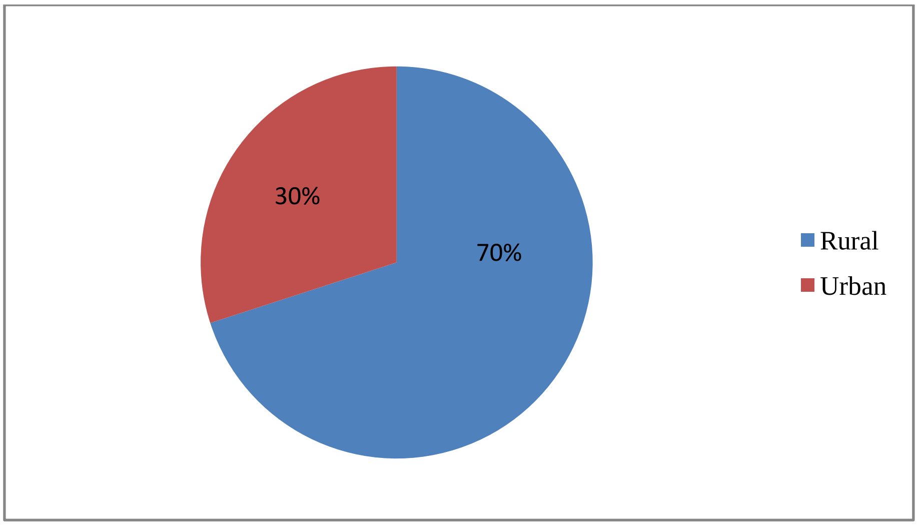
Table-V: Educational qualification

Level of Education	**Frequency**	**Percent**
Illiterate	1	3.3%
Primary	10	33.3%
SSC	12	40%
HSC	7	23%
Total	30	100%

Living area:

In this research it was estimated that people having COPD 70% (n=21) Patients were living at rural area and whereas 30% (n=09) patients were living at urban are

Figure-3: Living area of the participants



Estimate respiratory rate status:

Table-VI: Comparisons of changes of respiratory rate between experimental and control group

Experimental Group				Control Group			
Subject	Pre-test	Post-test	Subject Differences	Subject	Pre-test	Post-test	Subject Differences
E1	29.00	23.00	6	C1	31.00	24.00	7
E2	34.00	22.00	12	C2	27.00	22.00	5
E3	28.00	22.00	6	C3	27.00	24.00	3
E4	27.00	23.00	4	C4	30.00	23.00	7
E5	28.00	24.00	4	C5	32.00	23.00	9
E6	28.00	23.00	5	C6	33.00	26.00	7
E7	26.00	24.00	2	C7	28.00	23.00	5
E8	33.00	20.00	13	C8	31.00	24.00	7
E9	28.00	22.00	6	C9	27.00	21.00	6
E10	32.00	35.00	3	C10	30.00	24.00	6
E11	34.00	35.00	1	C11	28.00	23.00	5
E12	28.00	23.00	5	C12	32.00	25.00	7
E13	28.00	24.00	4	C13	28.00	22.00	6
E14	27.00	22.00	5	C14	32.00	23.00	9
E15	28.00	22.00	6	C15	27.00	27.00	0
Mean	29.2	24.26	4.93	Mean	29.53	23.6	5.93

In this study, pre-test mean score of respiratory rate on stop watch scale at resting position was 29.2 in experimental group and 29.5 among control group. On post test score after treatment showed that respiratory rate on stop watch rating scale had reduced in both groups (Table-VI). Above table shows us that in experimental group mean differences within subject was 4.93 whereas in control group mean differences within subject was 5.93.

Estimate pulse rate between experimental and control group:

Table-VII: Comparisons of changes of pulse rate between experimental and control group

Experimental Group				Control Group			
Subject	Pre-test	Post-test	Subject Differences	Subject	Pre-test	Post-test	Subject Differences
E1	105.00	97.00	8	C1	108.00	101.00	7
E2	112.00	102.00	10	C2	104.00	98.00	6
E3	99.00	92.00	7	C3	105.00	100.00	5
E4	102.00	97.00	5	C4	107.00	100.00	7
E5	104.00	98.00	6	C5	109.00	98.00	11
E6	104.00	96.00	8	C6	112.00	103.00	9
E7	101.00	96.00	5	C7	104.00	96.00	8
E8	113.00	100.00	13	C8	118.00	101.00	17
E9	88.00	81.00	7	C9	104.00	97.00	7
E10	105.00	108.00	3	C10	107.00	97.00	10
E11	112.00	115.00	3	C11	104.00	96.00	8

E12	99.00	93.00	6	C12	107.00	98.00	9
E13	101.00	95.00	6	C13	99.00	92.00	7
E14	104.00	98.00	6	C14	109.00	98.00	11
E15	103.00	96.00	7	C15	109.00	109.00	0
Mean	103.46	97.6	5.86	Mean	107.06	99.4	8.13

In this study, pre-test mean score of pulse rate on digital pulse oxymeter at resting position was 103.46 in experimental group and 107.06 among control group. On post test score after treatment showed that pulse rate on digital pulse oxymeter had reduced in both groups (table-VII). Above table shows us that in experimental group mean differences within subject were 5.86 whereas in control group mean differences within subject was 8.13.

Estimate Lung volume between experimental and control group:

Table-VIII: Comparisons of changes of Lung volume between experimental and control group

Experimental Group				Control Group			
Subject	Pre-test	Post-test	Subject Differences	Subject	Pre-test	Post-test	Subject Differences
E1	500.00	600.00	100	C1	450.00	500.00	50
E2	400.00	550.00	150	C2	500.00	600.00	100
E3	550.00	700.00	150	C3	500.00	550.00	50
E4	600.00	700.00	100	C4	500.00	550.00	50
E5	500.00	600.00	100	C5	500.00	500.00	0
E6	450.00	550.00	100	C6	500.00	550.00	50
E7	550.00	650.00	100	C7	450.00	550.00	100
E8	400.00	600.00	200	C8	450.00	500.00	50
E9	600.00	750.00	150	C9	500.00	600.00	100
E10	500.00	400.00	-100	C10	500.00	550.00	50
E11	450.00	400.00	-50	C11	450.00	550.00	100
E12	550.00	700.00	150	C12	450.00	500.00	50
E13	600.00	750.00	150	C13	550.00	650.00	100
E14	500.00	600.00	100	C14	500.00	500.00	0
E15	600.00	750.00	150	C15	600.00	550.00	-50
Mean	516.66	620	103.33	Mean	493.33	546.66	53.33

In this study, pre-test mean score of lung volume on peak flow meter at resting position was 516.66 in experimental group and 493.33among control group. On post test score after treatment showed that lung volume on peak flow meter had improved in both groups (table-VIII). Above table shows us that in experimental group mean differences within subject was103.33 whereas in control group mean differences within subject was 53.33.

Estimate O2 saturation rate between experimental and control group:

Comparisons of changes of O2 saturation rate between experimental and control group

Table –IX: Comparisons of changes of O2 saturation rate between experimental and control group

Experimental Group				Control Group			
Subject	Pre-test	Post-test	Subject Differences	Subject	Pre-test	Post-test	Subject Differences
E1	91.00	94.00	3	C1	90.00	93.00	3
E2	90.00	95.00	5	C2	93.00	95.00	2
E3	94.00	95.00	1	C3	95.00	95.00	0
E4	94.00	95.00	1	C4	91.00	94.00	3
E5	90.00	94.00	4	C5	92.00	95.00	3
E6	90.00	95.00	5	C6	94.00	95.00	1
E7	93.00	96.00	3	C7	90.00	95.00	5

E8	90.00	96.00	6	C8	90.00	93.00	3
E9	96.00	95.00	-1	C9	93.00	96.00	3
E10	93.00	91.00	-2	C10	91.00	95.00	4
E11	91.00	91.00	0	C11	90.00	95.00	5
E12	94.00	95.00	1	C12	92.00	94.00	2
E13	93.00	96.00	3	C13	94.00	95.00	1
E14	93.00	95.00	2	C14	92.00	95.00	3
E15	95.00	95.00	0	C15	94.00	93.00	-1
Mean	92.46	103	2.06	Mean	92.06	94.53	2.46

In this study,pre-test mean score of oxygen saturation on pulse oxy meter at resting position was 92.46 in experimental group and 92.06 among control group. On post test score after treatment showed that oxygen saturation on pulse oxy meter had improved in both groups (table-IX). Above table shows us that in experimental group mean differences within subject was 2.06whereas in control group mean differences within subject was 2.46.

Estimate pulse rate after walking between experimental and control group:

Comparisons of changes of pulse rate after 6 min walking between experimental and control group

Table – X: Comparisons of changes of pulse rate after walking between experimental and control group

Experimental Group				Control Group			
Subject	Pre-test	Post-test	Subject Differences	Subject	Pre-test	Post-test	Subject Differences
E1	121.00	110.00	11	C1	129.00	119.00	10
E2	130.00	110.00	20	C2	121.00	107.00	14
E3	110.00	100.00	10	C3	120.00	100.00	20
E4	118.00	106.00	12	C4	128.00	118.00	10
E5	120.00	111.00	9	C5	128.00	114.00	14
E6	121.00	111.00	10	C6	126.00	121.00	5
E7	117.00	105.00	12	C7	121.00	111.00	10
E8	131.00	108.00	23	C8	129.00	119.00	10
E9	96.00	110.00	14	C9	121.00	104.00	17
E10	121.00	128.00	7	C10	128.00	118.00	10
E11	130.00	128.00	2	C11	121.00	111.00	10
E12	111.00	101.00	10	C12	123.00	117.00	6
E13	117.00	104.00	13	C13	110.00	100.00	10
E14	121.00	107.00	14	C14	128.00	114.00	14

E15	119.00	104.00	15	C15	126.00	111.00	15
Mean	118.86	109.53	9.33	Mean	123.93	112.26	11.66

In this study, pre-test mean score of pulse rate after 6 min walk test on pulse oxy meter at resting position was 118.86 in experimental group and 123.93 among control group. On post test score after treatment showed that pulse rate on pulse oxy meter had reduced in both groups (table-X). Above table shows us that in experimental group mean differences within subject was 9.33 whereas in control group mean differences within subject was 11.66.

Estimate O2 saturation rate after walking between experimental and control group:

Table-XI: Comparisons of changes of O2 saturation rate after walking between experimental &control group

Experimental Group				Control Group			
Subject	Pre-test	Post-test	Subject Differences	Subject	Pre-test	Post-test	Subject Differences
E1	88.00	92.00	4	C1	86.00	90.00	4
E2	87.00	92.00	5	C2	87.00	91.00	4
E3	90.00	92.00	2	C3	89.00	93.00	4
E4	90.00	92.00	2	C4	87.00	91.00	4
E5	87.00	91.00	4	C5	88.00	91.00	3
E6	87.00	91.00	4	C6	91.00	92.00	1
E7	89.00	92.00	3	C7	87.00	91.00	4
E8	87.00	93.00	6	C8	86.00	90.00	4
E9	91.00	92.00	1	C9	87.00	92.00	5
E10	88.00	86.00	-2	C10	87.00	90.00	3
E11	86.00	88.00	2	C11	87.00	91.00	4
E12	90.00	91.00	1	C12	87.00	89.00	2
E13	89.00	92.00	3	C13	90.00	92.00	2
E14	87.00	91.00	4	C14	88.00	91.00	3
E15	91.00	92.00	1	C15	89.00	90.00	1

Mean	88.46	105	2.66	Mean	87.73	90.93	3.2

In this study, pre-test mean score of oxygen saturation rate after 6 min walk test on pulse oxy meter at resting position was 88.46 in experimental group and 87.73 among control group. On post test score after treatment showed that pulse rate on pulse oxy meter had improved in both groups (table-XI). Above table shows us that in experimental group mean differences within subject was 2.66 whereas in control group mean differences within subject was 3.2.

There was slight significant difference in Respiratory rate and pulse rate between the two groups at baseline and post test score. Pre (baseline) and post treatment inter group comparison was done using independent t-test which shows statistically significant in experimental groups in pulse rate (p=.005), oxygen saturation (p=.000) and oxygen saturation rate after 6 min walk test (p=.00) and whereas in control group in pulse rate (p=.005), oxygen saturation (p=.000) and oxygen saturation rate after 6 min walk test (p=.000).

Pre test and post test scores of all respiratory parameters had been put on MS excel and find out the differences and again put it to SPSS 16 and get the result of independent-t test whether all respiratory parameters were significant or not significant. All the dependent variables were analyzed between and within group. Between group analyses were calculated using independent t test. As there was two different group of subjects and all the dependent variables were parametric variable so the test statistic supported independent t test as different subject design.

Mean and SD for pre and post RR, SpO2, PR, after 6 min walk test measure pulse rate and oxygen saturation rate were measured at baseline and after 6 sessions of treatment. Significance was accepted at <0.05 level of probability.

Table XII: Between Group Comparison of RR, PR, SPO2 and after 6 min walk test measure pulse rate and oxygen saturation rate.

Parameter	Pre mean	Post mean	t value	P value	Significant
Respiratory rate	29.30 ± 2.71	22.30 ± 3.05	1.093	.284	Not Significant
Pulse rate	103 ±6	97.6 ±5	3.044	.005	Significant
O2 saturation	92 ±2	103 ± 4	7.34	.05	Significant
Pulse rate after 6 min walk test	119 ± 9	109 ± 8	7.34	.000	Significant
Oxygen saturation rate after 6 min walk test	88 ±1	105 ± 5	.881	.386	Not Significant

Respiratory Rate: within experimental group analysis result:

Similarly it was found that within experimental group analysis in respiratory rate variable the degree of freedom was 14 and the calculated t value was 7.95. However, the table value of 14 degree of freedom for t values are 1.34 1.76 2.14 2.62 2.97 4.14

So, the calculated t value is greater than 4.14 which represent the p value of .0005. Thus, it was claimed that before and after application of Diaphragmatic manipulation along with conventional physiotherapy for experimental group showed statistically significant (p=.00). This means that Diaphragmatic manipulation along with conventional physiotherapy was also effective for reduction of RR among patients with COPD.

Respiratory Rate: within control group analysis result:

In this study, control group subjects were 15 and control group participants received only conventional physiotherapy for COPD. In fact, within control group analysis followed the same subject design formula. In addition, the level of measurement of respiratory rate (counted by stopwatch) devotes the parametric data. As this one was the same subject design in within group analysis and level of measure was parametric, this experiment was calculated using paired‘t’ test formula.

After conducting the test statistics it was found that within control group analysis in respiratory rate variable the degree of freedom was 14 and the calculated t value was 10.20. However, the table value of 14 degree of freedom for t values are 1.34 1.76 2.14 2.62 2.97 4.14

So, the calculated t value is greater than 4.14 which represent the p value of .0005. Thus, it was claimed that before and after application of conventional physiotherapy for control group showed statistically significant (p=.00). This means that conventional physiotherapy was effective for reduction of RR among patients with COPD.

Table XIII: Within Group Comparison through paired t test for variables of RR, PR, SPO2 and after 6 min walk test measure pulse rate and oxygen saturation rate in statistically significance at the following level of significance

		Experimental Group			**Control Group**		
No.	Variables	Observed "t" value	Observed "P" value	Significant/Not Significant	Observed "t" value	Observed "P" value	Significant/Not Significant
01	Respiratory rate	7.9	.00	Significant	10.20	.000	Significant
02	Pulse rate	7.8	.00	Significant	8.59	.000	Significant
03	O2 saturation	17.13	.00	Significant	.17	.08	Not Significant
04	Pulse rate after 6 min walk test	3.8	.002	Significant	11.36	.000	Significant
05	Oxygen saturation rate after 6 min walk test	5.19	.000	Significant	12.33	.000	Significant

In this way experimental group pulse rate (p=.00), oxygen saturation rate (p=.00), pulse rate in 6 minute walk test (p=.002), oxygen saturation rate in 6 min walk test (p=.00), it shows significant. It indicates that diaphragmatic manipulation along with conventional physiotherapy was effective for those variables. In comparison control group pulse rate (p=.00), oxygen saturation rate (p=.08), pulse rate in 6 minute walk test (p=.002), oxygen saturation rate in 6 min walk test (p=.00) was significant. It indicates that conventional physiotherapy was effective for those variables but only for oxygen saturation rate this treatment was not significant.

CHAPTER-V DISCUSSION

The purpose of this study was to investigate the effect of 6-week diaphragmatic manipulation therapy in patients with moderate COPD. The main outcome of this study was that although COPD patient can significantly benefit from either diaphragm manipulative treatment along with conventional therapy or only conventional physiotherapy.

The increased risk of COPD among farmers over the age of 50 years in our study was significant 40% (n=12) risk factor of having COPD.

It was also observed that majority of the COPD patients respondents completed at least SSC education 40% (n=12) as well as their low educational status most commonly occur COPD.

Study demonstrated that among thirty participants in both experimental and control group pulse rate, oxygen saturation rate and oxygen saturation rate after 6 minute walk test it was significant. It indicates that diaphragmatic manipulation along with conventional physiotherapy whether as only conventional physiotherapy had a great impact on reducing pulse rate and improving functional capacity in patients with moderate type of COPD.

Impaired exercise capacity and reduced health related quality of life are common features of COPD patients (Puhan, et al., 2004). Assessment of functional capacity has gained importance in understanding the impact of disease and establishment of COPD-management procedures. The development of valid and reliable measures of exercise capacity in COPD patients reflects the growing perception of the importance of monitoring and maintaining in exercise capacity COPD patients (Carter, et al., 2003).

The diaphragm plays an important role in maintaining efficient quiet breathing pattern (Bartley, et al., 2006). Diaphragm displacement in COPD patients using ultrasound and found significant reduction in diaphragm mobility compared with normal healthy subjects (Yamaguti, et al.,2008). Diaphragm and internal intercostal muscles abnormalities and hypertonicity are commonly observed musculoskeletal changes in COPD patients (Sammut, 2002), resulting in disturbed and dysfunctional breathing pattern (Courtney,2009). Pathologically increased workload in COPD results in dysfunction of the diaphragm and rib cage (Courtney, 2009). Flattening of diaphragm seen in COPD can decrease the movement of the lower ribs and reduce the efficiency of respiration, thereby reducing ventilation of the lungs; finally producing undesirable health consequences (Hruby, 2003). Manipulative therapy of the diaphragm increases its excursion and hence improves breathing mechanics, (Ettlinge, 2003) facilitates bronchial tree lymphatic flow and so reduces airways congestion and beneficially reduce the hypertonicity of the diaphragm shown in COPD by stretching it (DiGiovanna, 2005), so increasing its efficacy during inspiration as well as in expiration (Wallace et al., 2003). Manipulative treatment is effective in health as well as in disease. Manipulative treatment significantly improves FVC and FEV1 in normal individuals (Engel and Vemulpad, 2007). Manipulative techniques for COPD can increase thoracic cage and ribs mobility, mobilize thoracic spine and so can improve PF; not only in adults but also in paediatrics (Guiney, et al., 2005) and postoperative patients. Influences of manipulative procedures were further evaluated in other pathological cases, manipulative treatments significantly improve respiratory parameters in patients with idiopathic Parkinson's syndrome (Yao et al., 2013).

Studies evaluating the effect of manipulative treatment on PF in COPD patients have produced variable results. There were so many published studies in the field of COPD management; however few studies reported manipulative treatment as an important and useful modality for COPD patients (Seffinger, et al., 2011). Majority of available studies focuses mainly on measuring acute effects of applied treatment on health or disease (Noll, et al., (2008).

COPD patients treated with manipulative procedures can gain significant improvement in forced expiratory flow at 25%-50% of vital capacity and at the mid-expiratory phase. Worsening of residual volume and total lung capacity can be attributed to over manipulation, utilization of "thoracic lymphatic pump technique" that resulted in rapid lungs inflation while COPD patients were not able to fully exhale because of the underlying pathology (Noll, et al., 2008). COPD patients' responses to sequential manipulation sessions of four weeks interval were evaluated by Noll, et al., 2008 and results revealed an easing of symptoms, worsened PF and increased residual volume (Noll, et al., 2009). COPD patients benefit greatly from thoracic spine and chest cage manipulation through reduction in COPD symptoms and increases oxygen saturation (Cosmai, 2003). Beneficial effects of manipulative therapy in COPD can be also explained on the basis of improvement of primary and accessory respiratory muscles' fibers, that in turn can be reflected on better functioning small and medium airways (Zanotti, et al., 2012).

Limitation of the study:

Time and resources were limited which have a great deal of impact on the study and affect the result of the study to generalize for wider population. The small sample size may constitute a limitation as to the general ability of findings from this study.Being a single-center study, and including a uniform population of participants receiving regular therapy, findings may not be representative of the general population.

CHAPTER-VI	CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Functional outcomes of COPD patients may be limited by pulmonary, musculoskeletal constraints and low functional capacity. Diaphragmatic manipulation procedures yielded significant benefits on both pulmonary function and functional capacity in patients with moderate COPD. Furthermore; results reported better responses of pulmonary function and functional capacity to combined application of both procedures. Furthermore, COPD is the world burden for disability. It reduces functional outcomes and COPD patients may be limited by pulmonary, musculoskeletal constraints and low functional capacity. Some physical intervention may help to prevent or reduce lung compliances. Diaphragmatic or costal manipulation plays an important role in lung function parameters including force expiratory volume in one second (FEV1) and functional vital capacity (FVC) ratio. These procedures have also significant benefits on both pulmonary function and functional capacity in patients with moderate COPD. The diaphragmatic manipulation along with costal manipulation has greater benefits on chests kinematics, lung function and functional capacity for the patient with chronic obstructive pulmonary disease (COPD).

6.2 Recommendation

- Although chronic effects of manipulative procedures on COPD were evaluated, but still there are a lack in our knowledge regarding to how extent these effects will persist. The duration of the study was relatively short, so in future wider time would be taken for conducting the study. In this study, the investigator took the participants only from the one selected hospital as a sample for the study. So for further study investigator strongly recommended to include the COPD patients from all over the Bangladesh to ensure the generalize ability of this study.
- Further large RCT with good methodological quality is needed in this field especially for COPD patients.
- To see the actual difference between diaphragmatic manipulation and other interventions further RCT is needed where one group will receive diaphragmatic manipulation alone and another group will receive another means of physiotherapy interventions.

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বাংলাদেশ হেল্‌থ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)

Bangladesh Health Professions Institute (BHPI)

(The Academic Institute of CRP)

Ref. CRP/BHPI/IRB/04/17/51

Date: 21/04/2017

To
Md. Rofiqul Islam
Part – II, M.Sc. in Physiotherapy
Session: 2013-2014, DU Reg. No. 8515
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

Subject: Approval of the thesis proposal – "Effectiveness of diaphragmatic manipulation along with conventional physiotherapy for patients with chronic obstructive pulmonary disease (COPD).

Dear Md. Rofiqul Islam,

The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application on December 13, 2017 to conduct the above mentioned thesis, with yourself, as the Principal investigator. The Following documents have been reviewed and approved:

Sr. No.	Name of the Documents
1	Thesis Proposal
2	Questionnaire (English and Bengali version)
3	Information sheet & consent form.

Since the study involves answering a questionnaire, that takes 10 to 15 minutes and have no likelihood of any harm to the participants the members of the Ethics committee has approved the study to be conducted in the presented form at the meeting held at 09:00 AM on December 17, 2017 at BHPI.

The institutional Ethics committee expects to be informed about the progress of the study, any changes occurring in the course of the study, any revision in the protocol and patient information or informed consent and ask to be provided a copy of the final report. This Ethics committee is working accordance to Nuremberg Code 1947, World Medical Association Declaration of Helsinki, 1964 - 2013 and other applicable regulation.

Best regards,

Millathossain

Muhammad Millat Hossain
Assistant Professor, MRS
Member Secretary, Institutional Review Board (IRB)
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

সিআরপি-চাপাইন, সাভার, ঢাকা-১৩৪৩, বাংলাদেশ, ফোন ঃ ৭৭৪৫৪৬৪-৫, ৭৭৪১৪০৪ ফ্যাক্স ঃ ৭৭৪৫০৬৯

CRP-Chapain, Savar, Dhaka-1343, Tel : 7745464-5, 7741404, Fax : 7745069, E-mail : contact@crp-bangladesh.org, www.crp-bangladesh.org

Permission Letter

December 13, 2016
Head of Physiotherapy Department
Bangladesh Health Professions Institute (BHPI)
Savar, Dhaka-1343.

Subject: Regarding permission to collect data from Mohakhali NIDCH to conduct a research project.

Through: Course Coordinator, MSc in Physiotherapy Program.

Sir,

Greetings from Bangladesh Health Professions Institute (BHPI).

It is your kind attention that Bangladesh Health Professions Institute (BHPI)- an academic institute of CRP, has been conducting M.Sc. in Physiotherapy under Faculty of Medicine of University of Dhaka (DU) since 2014. My thesis entitled "Effectiveness of diaphragmatic manipulation along with conventional physiotherapy for patients with COPD at NIDCH " under honorable supervisor, Md. Obaidul Haque, Associate Professor & Head of the department of Physiotherapy, Bangladesh Health Professions Institute (BHPI). The purpose of study is to identify effectiveness of diaphragmatic manipulation for patients with COPD. It is a randomised controlled research study. Data collection will require the patients and will occur for six weeks from 1st April, 2017. Data collectors will receive informed consents from all participants. Any data collected will be kept confidential. Ethical approval is received from the Institutional Review Board (IRB) of Bangladesh Health Professions Institute. I have chosen National Institute of diseases of chest and hospital to collect required data. Now I am looking for your kind approval to start my data collection. I would like to assure that anything of my research project will not harmful for the participant.

Therefore I look forward to your cooperation by giving me permission for data collection at NIDCH, Mohakhali, Dhaka.

Yours faithfully

(Md. Rofiqul Islam)
Part-2, M. Sc. in physiotherapy Program
Session: 2013-14
BHPI, CRP, Savar, Dhaka-1343

Allowed
13/12/2016
Md. Obaidul Haque
Associate Professor & Head of the Department
Department of Physiotherapy
Bangladesh Health Professions Institute (BHPI)
CRP, Chapain, Savar, Dhaka-1343

বাংলাদেশ হেল্‌থ প্রফেশন্স ইনষ্টিটিউট (বিএইচপিআই)
BANGLADESH HEALTH PROFESSIONS INSTITUTE (BHPI)
(The Academic Institute of CRP)
CRP-Chapain, Savar, Dhaka, Tel: 7745464-5, 7741404 , Fax: 7745069
BHPI-Mirpur Campus, Plot-A/5, Block-A, Section-14, Mirpur, Dhaka-1206. Tel: 8020178,8053662-3, Fax: 8053661

সিআরপি-বিএইচপিআই/০৪/১৭/৯৬৮ তারিখ ঃ ০১.০৪.২০১৭

প্রতি
পরিচালক
ন্যাশনাল ইনস্টিটিউট অব ডিজিস অব দ্য চেস্ট এন্ড হসপিটাল
ঢাকা।

বিষয় ঃ রিসার্চ প্রজেক্ট এর জন্য আপনার প্রতিষ্ঠান সফর ও তথ্য সংগ্রহ প্রসঙ্গে।

জনাব,
আপনার সদয় অবগতির জন্য জানাচ্ছি যে, পক্ষাঘাতগ্রস্তদের পুনর্বাসন কেন্দ্রে-সিআরপি'র শিক্ষা প্রতিষ্ঠান বাংলাদেশ হেলথ্ প্রফেশনস্ ইনষ্টিটিউট (বিএইচপিআই) ঢাকা বিশ্ববিদ্যালয় অনুমোদিত এমএসসি ইন ফিজিওথেরাপি কোর্স পরিচালনা করে আসছে।

উক্ত কোর্সের ছাত্রছাত্রীদের কোর্স কারিকুলামের অংশ হিসাবে বিভিন্ন বিষয়ের উপর থিসিস করা বাধ্যতামুলক।

বিএইচপিআই'র পার্ট-২ (চূড়ান্ত) এমএসসি ইন ফিজিওথেরাপি কোর্সের ছাত্র মোঃ রফিকুল ইসলাম তার থিসিস সংক্রান্ত কাজের তথ্য সংগ্রহের জন্য আগামী ০২.০৪.২০১৭ থেকে ৩১.০৫.২০১৭ তারিখ পর্যন্ত আপনার প্রতিষ্ঠানে সফর করতে আগ্রহী। তার থিসিসের শিরোনাম-

" Effectiveness of diaphragmatic manipulation along with conventional Physiotherapy for patients with COPD at NIDCH."

তাই তাকে আপনার প্রতিষ্ঠান সফর এবং প্রয়োজনীয় তথ্য প্রদান সহ সার্বিক সহযোগীতা প্রদানের জন্য অনুরোধ করছি।

ধন্যবাদান্তে

01.04.17

মোঃ ওবায়দুল হক
সহযোগী অধ্যাপক ও বিভাগীয় প্রধান
ফিজিওথেরাপি বিভাগ
বিএইচপিআই, সিআরপি।

INFORMED CONSENT (English)

Assalamualaikum,

I am Md. Rofiqul Islam, student of M.Sc. in Physiotherapy student, Bangladesh Health Professions Institute (BHPI) under the Faculty of Medicine, University of Dhaka. To obtain my master degree program, I have to conduct a research project and it is a part of my study. My research title is **"Effectiveness of diaphragmatic manipulation along with conventional physiotherapy patients with chronic obstructive pulmonary disease(COPD).**" To fulfill my research project, I need to take some information from you to collect data. So, you can be a respected participant of this research and the conversation time will be 20-30 minutes. I would like to inform you that this is a purely academic study and will not to be used for any other purposes. I assure that all data will be kept confidential. Your participation will be voluntary. You may have the rights to withdraw consent and discontinue participation at any time of the study. You also have the right to reject a particular question that you don't like.

If you have any query about the study, you may contact with researcher Mohammad Rofiqul Islam or my supervisor Md. Obaidul Haque, Associate Professor & Head, department of Physiotherapy, BHPI, CRP, Savar, Dhaka-1343.

Do you have any questions before start this session?

So, can I proceed with the interview?

☐ Yes ☐ No

Signature of the participant and Date …………………………….

Signature of the data collector and Date …………………………………

Signature of the witness and Date …………………………

সম্মতিপত্র (বাংলা)

আসাসালামু আলাইকুম আমার নাম রফিকুল ইসলাম, আমি এই গবেষণাটি বাংলাদেশ হেল্থ প্রফেশনাল ইনস্টিটিউট (বি এইচ পি আই), ঢাকা বিশ্ববিদ্যালয়ের চিকিৎসা অনুষদের অধীনে করছি যা আমার ফিজিওথেরাপী মাষ্টার্স কোর্সের আংশিক অধিভুক্ত যার শিরোনাম হল "শ্বাসতন্ত্রে বাধাগ্রস্থ দীর্ঘস্থায়ী রোগীদের ডায়াফার্ম মাংস পেশীর প্রসারিত করার পদ্দতির কার্যকারীতা"। ফরমে উল্লেখিত কিছু প্রশ্নের উত্তর দেয়ার জন্য আন্তরিকভাবে অনুরোধ জানাচ্ছি যা আনুমানিক ২০-৩০ মিনিট সময় নিবে। আমি আপনাকে অবগত করছি যে, এটা কেবলমাত্র আমার অধ্যয়নের সাথে সম্পর্কযুক্ত এবং অন্য কোন উদ্দেশ্যে ব্যবহার হবে না । আমি আপনাকে আরো নিশ্চয়তা প্রদান করছি যে সকল তথ্য প্রদান করবেন তার গোপনীয়তা বজায় থাকবে এবং এই তথ্যের উৎস অপ্রকাশিত থাকবে। এমনকি গবেষণাটির শেষে এই সকল তথ্য নষ্ট করে ফেলা হবে। এই অধ্যয়নে আপনার অংশগ্রহন স্বেচ্ছাপ্রণোদীত এবং আপনি যে কোন সময় এই অধ্যয়ন থেকে কোন নেতিবাচক এবং ফলাফল কোন বিব্রতবোধ ছাড়াই নিজেকে প্রত্যাহার করতে পারবেন। এছাড়াও কোন নির্দিষ্ট প্রশ্ন অপছন্দ হলে উত্তর না দেয়ার এবং সাক্ষাৎকারের সময় কোন উত্তর না দিতে চাওয়ার অধিকার আপনার আছে।

যদি আপনার এই গবেষণা সম্পর্কে কিছু প্রশ্ন করার থাকে অথবা একজন অংশগ্রহনকারী হিসেবে এটা আপনার অধিকার, তাহলে আপনি গবেষক রফিকুল ইসলাম, সাথে যোগাযোগ করতে পারেন। ফিজিওথেরাপী বিভাগ, বি এইচ পি আই, সাভার, ঢাকা-১৩৪৩ এই ঠিকানায়।

এই সাক্ষাৎকার শুরু করার আগে আপনার কি কোন প্রশ্ন আছে ?

আমি আপনার অনুমতি নিয়ে এই সাক্ষাৎকার শুরু করতে যাচ্ছি ?

☐ হ্যা ☐ না

সাক্ষাৎকার প্রদানকারীর স্বাক্ষর .... তারিখ ....

সাক্ষাৎকার গ্রহনকারীর স্বাক্ষর .... তারিখ ....

স্বাক্ষীর স্বাক্ষর .... তারিখ ....

ENGLISH QUESTIONAIRRE

Research Title: Effectiveness of diaphragmatic manipulation for patients with chronic obstructive pulmonary disease (COPD) at some selected hospitals of Dhaka city.

NAME:

IDNO: | | | |

DATE OF INTERVIEW: | | | | | | |

CONTACT NO: | | | | | | | | | | | |

ADDRESS:

VILL.		P.O.	
P.S.		DIST.	

Part- A, Socio-demographic information

Please give tick ( ) mark in the correct answer

Serial	Questions	Response
1.	Age	………… (Years)
2.	Sex	☐ Male ☐ Female
3.	Marital status	☐ Married ☐ Unmarried ☐ Widow ☐ Divorced
4.	Educational qualification	☐ I literature ☐ Primary completed ☐ S.S.C completed ☐ H.S.C completed ☐ Graduation
5.	Occupation	☐ Housewife ☐ Service holder ☐ Day laborer ☐ Business ☐ Others
6	Living place	☐ urban area ☐ Rural area.

Part B Medical information :(To be filed out by Physiotherapist)

(Pre test data)

Serial	Questions	Response
1.	Respiratory rate at resting position to be measure(per minute)	
2.	Pulse rate at resting position to be measure(per minute) (To be measure by pulse oximeter)	
3.	Volume of lung(CC) (To be measure by Spiro meter)	
4.	Blood oxygen saturation level (To be measure by pulse oximeter)	
5.	After 6 minute walking measuring pulse rate. (To be measure by pulse oximeter)	
6.	After 6 minute walking measuring respiratory rate.	
7.	Forced vital capacity(FVC)	

Part- B, Medical information: (To be filed out by Physiotherapist)

(Post test data)

Serial	Questions	Response
1.	Respiratory rate at resting position to be measure(per minute)	
2.	Pulse rate at resting position to be measure(per minute) (To be measure by pulse oximeter)	
3.	Volume of lung(CC) (To be measure by Spiro meter)	
4.	Blood oxygen saturation level (To be measure by pulse oximeter)	
5.	After 6 minute walking measuring pulse rate. (To be measure by pulse oximeter)	
6.	After 6 minute walking measuring respiratory rate.	
7.	Forced vital capacity(FVC)	

বাংলা প্রশ্নাবলী

গবেষণার বিষয় ঃ- “শ্বাসতন্ত্রে বাধাগ্রস্ত দীর্ঘস্থায়ী রুগীদের ডায়াফার্ম মাংশপেশী প্রশারিত করার পদ্ধতির কার্যকারিতা”

নামঃ

আই.ডি নংঃ | | | | সাক্ষাৎকারের তারিখঃ | | | | | | |

ফোন নাম্বারঃ | | | | | | | | | | | |

ঠিকানা

গ্রামঃ		ডাকঘর	
থানা		জেলা	

ব্যক্তিগত তথ্যাবলী

সঠিক উত্তরের পাশে টিক চিহ্ন দিনঃ

ক্রঃনং	প্রশ্নসমূহ	উত্তর
১.	বয়স	
২.	লিঙ্গ	☐ পুরুষ ☐ মহিলা
৩.	বৈবাহিক অবস্থা	☐ বিবাহিত ☐ অবিবাহিত ☐ তালাকপ্রাপ্ত
৪.	শিক্ষাগত যোগ্যতা	☐ নিরক্ষর ☐ প্রাথমিক ☐ এস.এস.সি ☐ এইচ.এস.সি ☐ স্নাতক
৫.	পেশা	☐ গৃহিনী ☐ চাকুরিজীবি ☐ শ্রমিক ☐ ব্যবসায়ী ☐ অন্যান্য
৬.	বসবাসের স্থান	☐ শহর ☐ গ্রাম

পর্ব-২ চিকিৎসা সংক্রান্ত তথ্য

(চিকিৎসার পূর্বের তথ্য)

ক্রমিক	প্রশ্ন	
০১	মিনিটে কত বার শ্বাস গ্রহন করেন	
০২	প্রতি মিনিটে হৃদ স্পন্দন কত	
০৩	ফুসফুসের আয়তন কত	
০৪	রক্তে অক্সিজেন এর মাত্রা	
০৫	**৬ মিনিট হাটার পর** হৃদ স্পন্দন কত	
০৬	**৬ মিনিট হাটার পর** রক্তে অক্সিজেন এর মাত্রা	
০৭	**শক্তির মাধ্যমে যে পরিমাণ বায়ু বের হয়(FVC)**	

পর্ব-২ চিকিৎসা সংক্রান্ত তথ্য

(চিকিৎসার পরের তথ্য)

ক্রমিক	প্রশ্ন	
০১	মিনিটে কত বার শ্বাস গ্রহন করেন	
০২	প্রতি মিনিটে হ্রদ স্পন্দন কত	
০৩	ফুসফুসের আয়তন কত	
০৪	রক্তে অক্সিজেন এর মাত্রা	
০৫	**৬ মিনিট হাটার পর** হ্রদ স্পন্দন কত	
০৬	**৬ মিনিট হাটার পর** রক্তে অক্সিজেন এর মাত্রা	
০৭	**শক্তির মাধ্যমে যে পরিমাণ বায়ু বের হয়(FVC)**	