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Effect of Diaphragmatic Breathing Exercise On Intensity of Dyspnoea and Oxygen Saturation Among Chronic Obstructive Pulmonary Disease Patients

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ABSTRACT

Diaphragmatic breathing helps to strengthen the diaphragm and the abdominal muscles and thus allowing more air to move in and out of the lungs without tiring the chest muscles. This study was conducted to assess the effect of diaphragmatic breathing exercise on intensity of dyspnoea and oxygen saturation among Chronic obstructive pulmonary disease patients. The objectives of the study were to assess the effect of diaphragmatic breathing exercise on intensity of dyspnoea and oxygen saturation among COPD patients and to find out the association between the intensity of dyspnoea and oxygen saturation among COPD patients and selected demographic variables. The research design used was quasi experimental pre test post test control group design. 60 samples were selected by non- probability purposive sampling technique. Intensity of dyspnoea and oxygen saturation were assessed by using Modified Borg scale and pulse oxymeter respectively. The collected data were analyzed by using descriptive and inferential statistics. The results of the study show that Mann-Whitney U test was done to compare the pre test and post test score of dyspnoea and oxygen saturation based on experimental and control group. The pre test score of dyspnoea is 3.07 and post test score is 3.7, which is significant at 0.01 level of significance. The pre test score of oxygen saturation is 0.77 and post test score is 1.84, which shows that there is a change in oxygen saturation but not at the level of significance. Thus it can be concluded that diaphragmatic breathing exercise was effective in improving the intensity of dyspnoea and oxygen saturation among chronic obstructive pulmonary disease patients.

Keywords: Effect; COPD; Diaphragmatic breathing exercise; Dyspnea; Oxygen saturation.

CHAPTER 1

Introduction

'Inhale, and God approaches you. Hold the inhalation, and God remains with you. Exhale, and you approach God. Hold the exhalation, and surrender to God'

- Krishnamacharya

Background of the problem

Chronic obstructive pulmonary disease (COPD) is an umbrella term used to describe chronic, progressive and largely irreversible lung diseases.[1] It covers several lung conditions, including chronic bronchitis and emphysema. It is a condition that makes breathing difficult.[2]

COPD is broadly defined and encompasses several clinical and pathologic entities, primarily emphysema and chronic bronchitis. Emphysema is specifically defined in pathologic terms as alveolar wall destruction with irreversible enlargement of the air spaces distal to the terminal bronchioles and without evidence of fibrosis. Chronic bronchitis is defined as productive cough that is present for a period of 3 months in each of 2 consecutive years in the absence of another identifiable cause of excessive sputum production.[3]

COPD is a major public health problem, especially in the developing countries. It is a chronic inflammatory airway condition associated with episodes of acute deterioration of symptoms called exacerbations.[4] Exacerbations are an important outcome measure in chronic obstructive pulmonary disease due to their profound effect on the patient's quality of life and prognosis.[5]

COPD is a major cause of chronic morbidity and mortality throughout the world, resulting in an economic and social burden that is both substantial and also increasing in our country.[6] In 2005 three million people died from COPD, which corresponds to 5% of all deaths globally. It is currently the fourth leading cause of death worldwide, and the WHO predicts it will rise to the third leading cause by 2030. The World Health Organization (WHO) estimates 65 million people worldwide had moderate-to-severe COPD in 2004.[7] Chronic respiratory diseases are on the rise in India, accounting for approximately 9% of all deaths in 2005. Recent reviews of the epidemiology of COPD in India reported prevalence rates of 2%–22% (median 5%) in men and 1.2%–19% (median 2.7%) in women.[8] In India, the incidence is much higher mainly due to increasing pollution. India has an estimated 17 million people living with chronic obstructive pulmonary disease, a number that is going to rise, estimated to about 22 million by 2016.[9]

A study was conducted to assess the prevalence of COPD in rural area of Mysore. The result shows that out of the total 900 adults surveyed (Males: 453, Females: 447), the total prevalence of COPD was 7.1%. Males had a higher prevalence (11.1%) compared to females (4.5%). The prevalence of smoking was very high among men at 71.9% and all the women were nonsmokers.[10]

The major risk factors of chronic obstructive pulmonary disease are tobacco smoking, indoor air pollution such as biomass fuel used for cooking and heating, outdoor air pollution, occupational dusts and chemicals such as vapours, irritants, and fumes.[11] The other risk factors include genetic disorder known as alpha-1-antitrypsin deficiency, advancing age, people with asthma who smoke.[12]

The GOLD (Global Initiative for Chronic Obstructive Lung Disease) staging system classifies people with chronic obstructive pulmonary disease based on their degree of airflow limitation or obstruction. The worse a person's airflow limitation is, the lower their forced expiratory volume in one second. As chronic obstructive pulmonary disease progresses, forced expiratory volume in one second tends to decline. GOLD COPD staging uses four categories of severity for chronic obstructive pulmonary disease. They are stage I or mild COPD, stage II or moderate COPD, stage III or severe COPD and stage IV or very severe COPD.[13]

Chronic obstructive pulmonary disease is characterized by airflow limitation that is poorly reversible. Chronic inflammation plays a major role in Chronic obstructive pulmonary disease pathophysiology. Smoking and other airway irritants cause neutrophils, T-lymphocytes, and other inflammatory cells to accumulate in the airways. Once activated, they trigger an inflammatory response in which an influx of molecules, known as inflammatory mediators, navigate to the site in an attempt to destroy and remove inhaled foreign debris. Repeated exposure to airway irritants perpetuates an ongoing inflammatory response that never seems to shut itself off. Over time, this process causes structural and physiological

lung changes that get progressively worse. As inflammation continues, the airways constrict, becoming excessively narrow and swollen. This leads to excess mucus production and poorly functioning cilia, a combination that makes airway clearance especially difficult. When people cannot clear their secretions, they develop the hallmark symptoms of COPD, including a chronic, productive cough, wheezing and dyspnoea. Finally, the build-up of mucus attracts a host of bacteria that thrive and multiply in the warm, moist environment of the airway and lungs. The end result is further inflammation, the formation of diverticula (pouch-like sacs) in the bronchial tree, and bacterial lung infection, a common cause of COPD exacerbation.[14]

The main symptom is cough that continues for at least three months a year for two consecutive years.[15] The signs and symptoms of COPD include chronic productive cough**,** shortness of breath**,** wheeze, reduced exercise tolerance**,** hypoxia, increased jugular venous pressure, central cyanosis, hyper-expanded chest (barrel chest), laterally displaced heart apex**,** crackles and expiratory wheeze on auscultation**,** pitting oedema on ankles, decreased oxygen saturation**,** increased carbon dioxide, decreased partial pressure of oxygen and reduced forced expiratory volume in one second / forced vital capacity ratio.[16]

The diagnostic studies include pulmonary function tests in which spirometry is the most common lung function test which helps to track the progression of disease and to monitor how well treatment is working. Chest X-rays are also used to identify the main causes of chronic obstructive pulmonary disease and also to rule out other lung problems or heart failure. A computed tomography scan of the lungs can help to detect emphysema and to determine if the patient might benefit from surgery. Arterial blood gas analysis measures how well the lungs are bringing oxygen into the blood and removing carbon dioxide.[12]

The complications of chronic obstructive pulmonary disease include irregular heartbeat, right-sided heart failure, pneumonia, pneumothorax, severe weight loss, malnutrition and osteoporosis.[17]

A cross-sectional study was carried out among elderly COPD patients in KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum between January 2010 and December 2011. The result shows that the prevalence of osteoporosis was 65.7% and 18.6% had osteopenia.[18]

There is no known cure for COPD, but the symptoms are treatable and its progression can be delayed. The major goals of management are to reduce risk factors, manage stable COPD, prevent and treat acute exacerbations, and manage associated illnesses. The only measures that have been shown to reduce mortality are smoking cessation and supplemental oxygen.[19]

Inhaled bronchodilators are the primary medications used which results in overall benefit. They are of two types, β_2 agonists and anticholinergics. Both exist in long-acting and short-acting forms. In those with mild disease, short-acting agents are recommended on the needed basis. In those with more severe disease, long-acting agents are recommended. If long-acting bronchodilators are insufficient, inhaled corticosteroids are added. Long-term antibiotics are used to reduce the frequency of exacerbations and the mucolytics are useful in people who have very thick mucous.[19]

For those with very severe COPD surgery is helpful and may include lung transplantation or lung volume reduction surgery. Lung volume reduction surgery involves removing the parts of the lung. Lung transplantation is performed for younger individuals.[19]

Pulmonary rehabilitation is a non pharmacologic therapy that has emerged as a standard of care for patients with chronic obstructive pulmonary disease.[20] It reduces dyspnoea, fatigue, anxiety, depression,

improves exercise capacity, emotional function, health-related quality of life and enhances patients sense of control over their condition. It also reduces hospitalisation and shown to be cost-effective.[21]

Pulmonary rehabilitation is a comprehensive, multidisciplinary, patient-centered intervention that includes education, exercise, breathing techniques, nutritional advice, emotional support and the development of coping skills.[20]

Education includes teaching about the disease condition and ways to manage if symptoms worsen, advice to avoid respiratory infection or lung irritants, such as cigarette smoke or air pollution which worsen the condition, giving awareness on the importance of vaccinations and ways to prevent infections and making sure when and how to take the medicines, how to use inhalers, nebulizers and oxygen if getting oxygen therapy.[22]

Pulmonary rehabilitation exercises include lower-body exercises, upper-body exercises and exercises for breathing muscles. The lower body exercise vary from simple walking on a treadmill or around a track to more intense stair climbing. Upper body exercises include arm and chest exercises. Exercises for breathing muscles include breathing through a mouthpiece against resistance.[23]

Breathing techniques are the strategies that can improve breathing. Pursed-lips breathing and diaphragmatic (belly or abdominal or deep) breathing are two breathing techniques that can help to get the air needed without working so hard to breath. Pursed lip breathing is one of the simplest ways to control shortness of breath. It provides a quick and easy way to slow the pace of breathing and making each breath more effective.[24]

The diaphragm is the most efficient muscle of breathing. The abdominal muscles help to move the diaphragm and give more power to empty the lungs.[25] Diaphragmatic breathing is a pattern of breathing which distracts the patient from the distress of dyspnoea and alleviates the anxiety. This form of breathing is practiced when patient is comparatively less distressed. One hand is kept on the chest and another on the abdomen. Patient is instructed to take abdominal breathing by taking a deep slow inspiration and allow the abdominal wall to move outward. The possible mechanism of action of this method alters respiratory muscle recruitment and reduction in respiratory frequency.[15]

Overweight or underweight both of the conditions make it hard to breathe. In overweight, fat around the waist can push up against the diaphragm. This gives the lungs less room to expand during breathing. A healthy eating plan can help to lose weight. Underweight also can have breathing problems. People who have chronic lung diseases have trouble in maintaining weight. Weight lose can lead to lose of muscle mass. This weakens the muscles used for breathing. For underweight healthy eating plan is recommended which helps to avoid weight loss and loss of muscle mass.[22]

People having chronic lung diseases are more prone to depression, anxiety, and other emotional problems. Thus, many pulmonary rehabilitation programs offer counseling or support groups.[22]

A cross-sectional study was conducted to assess the prevalence of depression and associated risk factors in patients with COPD in Kolkata, India. 214 COPD patients were selected by purposive sampling from RG Kar Medical College, Kolkata. The result shows that 86% of COPD patients have depression. Among the respondents, 36.9% had moderately severe depression, 32.2% had moderate depression and 6.1% had severe depression.[26]

In those who have had a recent exacerbation, pulmonary rehabilitation appears to improve the overall quality of life and the ability to exercise, and reduce mortality. It has also been shown to improve the sense of control a person has over their disease, as well as their emotions.[19]

Most cases of COPD are potentially preventable through decreasing exposure to smoke and improving air quality. Other recommendations includes influenza vaccination once a year, pneumococcal vaccination once every 5 years and reduction in exposure to environmental air pollution.[19]

Need and significance of the study

Chronic obstructive pulmonary disease is characterized by limitation of airflow, both into and out of the lungs, that is not fully reversible.[27] It is a major cause of morbidity and mortality across the globe.[28] Globally, as of 2010, COPD affected approximately 329 million people (4.8% of the population) and is slightly more common in men than women. Between 1990 and 2010 the number of deaths from COPD has decreased slightly from 3.1 million to 2.9 million.[19] COPD is the fourth leading cause of death worldwide. The World Health Organization estimates 600 million people worldwide have COPD. It is projected to be the third leading cause of death by 2020.[29] There are currently 15 million cases of COPD and 25 million cases of asthma which are expected to grow by 50 percent by 2015. Kerala, Andhra Pradesh, Himachal Pradesh, Uttar Pradesh, Karnataka and West Bengal account for more than 68 percent of the acute respiratory diseases with Kerala topping the list.[30] COPD is preventable and can be managed. It continues to be an important cause of morbidity, mortality, and healthcare costs worldwide.[7] India contributes a significant and growing percentage of COPD mortality which is estimated to be amongst the highest in the world. This would translate to about 556,000 in case of India (>20%) out of a world total of 2,748,000 annually. Crude estimates suggest, there are 30 million COPD patients in India.[28]

Recently, chronic obstructive pulmonary disease has gained interest as a major public health concern. Currently, it is the focus of intense research because of its persistently increasing prevalence, mortality and disease burden. COPD was responsible for more than 2.5 million deaths worldwide in 2000 alone. It is one of the leading causes of disability worldwide and is the only disease for which the prevalence and mortality rates continue to rise.[3]

Diaphragmatic dysfunction and alterations of thoracoabdominal motions are common in patients with chronic obstructive pulmonary disease. Breathing strategies have been considered as an important component of pulmonary rehabilitation and refer to a range of techniques, which includes the diaphragmatic breathing. The principal aim of diaphragmatic breathing is to improve the participation of the abdominal motion while reducing the accessory muscles activity.[31]

In the normal breathing process two major groups of muscles are used. They are diaphragm and the rib muscles.[32] In chronic obstructive pulmonary disease air often becomes trapped in the lungs, pushing down on the diaphragm.[15] The diaphragm becomes weak and uses accessory muscles like neck, shoulders, rib muscles to breathe.[33] Diaphragmatic breathing is a technique that helps to strengthen the diaphragm and the abdominal muscles. This allows more air to move in and out of the lungs without tiring the chest muscles.[32] It also decreases the work of breathing by slowing the breathing rate, decrease oxygen demand, and use less effort and energy to breathe.[25]

Oxygen saturation refers to the extent to which hemoglobin is saturated with oxygen. Hemoglobin is an element in the blood that binds with oxygen to carry it through the bloodstream to the organs, tissues and cells of the body. Oxygen saturation levels are usually measured using pulse oximeter and it is normally 95-100%.[34] It is a noninvasive method of determining the oxygenation of the blood by measuring the amount of light transmitted through an area of skin.[35] In patients with COPD the oxygen saturation level tends to drop below normal (desaturation). This is due to chronically low levels of oxygen in the blood (hypoxemia).[34]

A study was conducted to assess the efficacy of diaphragmatic breathing on ventilation and breathing pattern of patients with chronic obstructive pulmonary disease. Twenty-nine patients with moderate and severe COPD were taken. After 4 minutes of natural breathing, subjects completed 2 minutes of diaphragmatic breathing followed by 4 minutes of natural breathing. The result shows that diaphragmatic breathing can improve breathing pattern and ventilatory efficiency without causing dyspnea in patients whose respiratory muscular system is preserved.[36]

Another study was conducted to assess the acute effects of deep diaphragmatic breathing in COPD patients with chronic respiratory insufficiency. Transcutaneous partial pressure of carbon dioxide, oxygen and arterial oxygen saturation, were continuously monitored in 25 COPD patients with chronic hypercapnia, during natural breathing and deep diaphragmatic breathing. Subjective rating of dyspnoea was performed by means of a visual analogue scale. The result shows that in severe chronic obstructive pulmonary disease patients with chronic hypercapnia, deep diaphragmatic breathing is associated with improvement of blood gases at the expense of a greater inspiratory muscle loading.[37]

I have selected this study, as it is a leading cause of morbidity, mortality and disability. During my clinical posting also I had found many patients with chronic obstructive pulmonary disease who were striving for life. And they often commented that they are suffering from intermittent dyspnoea and spending large amount of money every month for their treatment. This stuck me and I was motivated to take up this study because the efficacy of breathing techniques are mainly aiming at improving symptoms of dyspnea and it reduces hospitalization. It is shown to be cost-effective also.

Statement of the problem

A study to assess the effect of diaphragmatic breathing exercise on intensity of dyspnoea and oxygen saturation among Chronic obstructive pulmonary disease patients in selected hospitals at Thiruvananthapuram district.

Objectives

- To assess the effect of diaphragmatic breathing exercise on intensity of dyspnoea and oxygen saturation among COPD patients.
- To find out the association between intensity of dyspnoea and oxygen saturation among COPD patients and selected demographic variables.

Operational definitions

Effect

Effect refers to outcome obtained as a result of diaphragmatic breathing exercise which is measured with Modified Borg Scale and pulse oxymeter.

COPD

In this study the patients who have 2-5 score of dyspnoea with modified Borg scale is considered as chronic obstructive pulmonary disease.

Diaphragmatic breathing exercise

It refers to breathing that is done by contracting the diaphragm in COPD patients. In this study after 4 minutes of natural breathing, subjects will perform 2 minutes of diaphragmatic breathing exercise followed by 4 minutes of natural breathing two times a day for 5 days.

Dyspnea

Dyspnea refers to a subjective experience of breathing discomfort that consists of uncomfortable awareness of breathing that vary in intensity and it is measured by using dyspnea scale.

Oxygen saturation

In this study the patients who have oxygen saturation 85 - 95% are considered as COPD it is measured by standardized pulse oxymeter.

Hypotheses

- There is a significant reduction in the intensity of dyspnoea and different in oxygen saturation among patient with COPD before and after diaphragmatic breathing exercise.
- There is a significant association between the intensity of dyspnoea, oxygen saturation and selected demographic variables.

Conceptual framework

Conceptual framework is a theoretical structure of assumptions, principles, and rules that holds together the ideas comprising a broad concept.[38]

This study is intended to evaluate the effectiveness of diaphragmatic breathing exercise on intensity of dyspnoea and oxygen saturation among Chronic obstructive pulmonary disease patients. The conceptual framework of the present study is based on General System theory with input, throughput or process, output and feedback, first introduced by Ludwig Von Bertalanffy (1968).

According to general system theory, system is a set of interacting parts in a boundary which makes the system work well to achieve its overall objective. According to systems theory, a system is a group of elements that interact with one another in order to achieve the goal. An individual is a system because he/she receives input from the environment. This input when processed provides an output. All living systems are open. There is a continual exchange of matter, energy and information. The system is cyclical in nature and continues to be so, as long as the four parts keep interacting with each other. If there are changes in any of the parts, there will be alteration in all other parts. Feedback from within the system or from the environment provides information, which helps the system to determine its effectiveness.[39]

- **Input :**

Inputs include raw material, energy and resources processed to produce the outputs of the organization.[39]

In this study patient is a system with inputs from itself and those acquired from environment. Input includes age, sex, education, type of occupation, family income, habit of smoking, years of smoking and duration of illness after being diagnosed. Following this, Modified Borg scale and pulse oxymeter was used to assess the intensity of dyspnoea and oxygen saturation among COPD patients.

- **Throughput or Process**

Throughput is the processes used by the system to convert raw materials or energy (inputs) from the environment into products or services that are usable by either the system itself or the environment.[39]

In this study throughput is the administration of diaphragmatic breathing exercise to the chronic obstructive pulmonary disease patients morning and evening for 5 days.

- **Output**

Output is the product or service which results from the system's throughput or processing of technical, social, financial and human input.[39]

In the present study the reduction in the intensity of dyspnoea and increased oxygen saturation among patients with Chronic obstructive pulmonary disease is regarded as the product of the process.

- **Feedback**

Feedback is information about some aspect of data or energy processing that can be used to evaluate and monitor the system and to guide it to more effective performance.[39]

In this study the reduction in the intensity of dyspnoea and increased oxygen saturation among patients with Chronic obstructive pulmonary disease undergoing diaphragmatic breathing exercise in the post test indicate that the diaphragmatic breathing exercise is effective in reducing the intensity of dyspnoea and increasing oxygen saturation among patients with Chronic obstructive pulmonary disease undergoing diaphragmatic breathing exercise.

- **Environment**

Each system exists in an environment. A biological entity (human body) exists in a place with climate, food resources, and so on. It takes its input from this environment.[40]

The individual environment is the fixed constraint that may influence the effectiveness of diaphragmatic breathing on intensity of dyspnoea and oxygen saturation. The hospital may be considered as the environment.

The conceptual framework of the study is showed in figure 1.

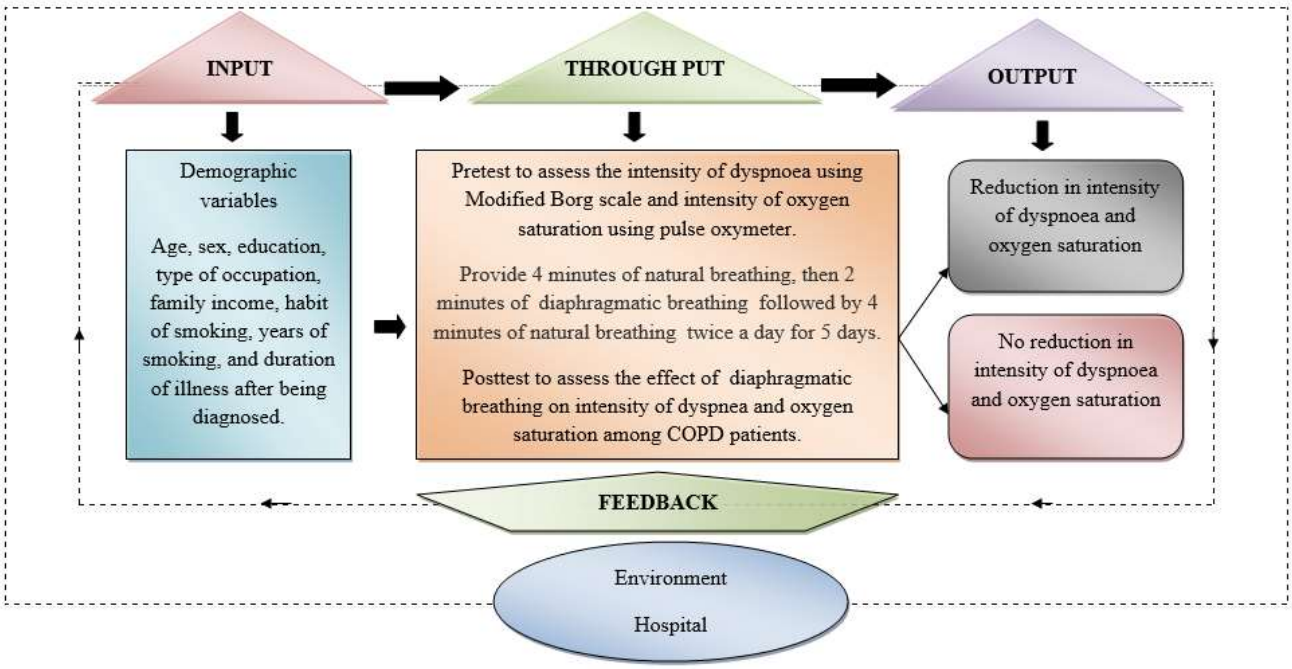


Figure 1: Schematic representation of conceptual framework for the study (based on Ludwing Von Bertalanffy's system theory)

CHAPTER 2

Introduction

A literature review is a description of the literature relevant to a particular field or topic. It gives an overview of what has been said, who the key writers are, what are the prevailing theories and hypotheses, what questions are being asked, and what methods and methodologies are appropriate and useful.[41]

A literature review is defined as a systematic, explicit, and reproducible method for identifying, evaluating, and synthesizing the existing body of completed and recorded work produced by researchers, scholars, and practitioners.[42]

The literature was reviewed under the following headings:

1. Studies related to prevalence of COPD.

2. Studies related to breathing exercise.
3. Studies related to effect of diaphragmatic breathing exercise.
4. Studies related to effect of diaphragmatic breathing exercise on dyspnoea and oxygen saturation.

1. Studies related to prevalence of COPD

A study was conducted to assess the epidemiology of COPD among females from rural area of district Ambala, Haryana. The community based, cross sectional study was conducted in 1027 females. The data was collected by interviewing the individuals by doing house to house visit by questionnaire based interview method, clinical examination and spirometry where necessary, after obtaining an informed and written consent. The result shows that the overall prevalence of COPD was observed as 5.1%. Kitchen fuel exposure and using biomass and coal as a fuel are strongly associated with development of COPD in rural females.[43]

A study was conducted to assess the proportion of adult medical patients who have chronic obstructive pulmonary disease, using the Global initiative for chronic obstructive lung disease guide-lines, and its relation to vascular disease. This is a prospective cross-sectional study. Spirometry was performed in 720 acute admissions. Sixty-seven percent of patients (480) had no airway disease including 35 (4.5%) with chronic cough and sputum with normal spirometry; 89 (12.4%) had asthma and 151 (20.9%) had COPD. Patients with COPD were significantly older [60.3 (16.6) years] than non-COPD patients [47.3 (18.5) years]. A greater percentage of patients with COPD had vascular disease (52%) than the non-COPD patients (40.1%). The result shows that the prevalence of COPD in acute hospital admissions is 20.9%; 11.7% of admissions have chronic sputum or cough with normal spirometry. Vascular disease is more prevalent in those with COPD.[44]

A study was conducted to determine the prevalence of chronic obstructive pulmonary disease in Spain to identify the level of undiagnosed disease and its impact on health-related quality of life and activities of daily living. A population-based sample of 4274 adults aged 40–80 years was surveyed. They were invited to answer a questionnaire and undergo pre bronchodilator and post bronchodilator spirometry. The result shows that the prevalence of COPD in individuals between 40 and 80 years of age in Spain is 10.2% and increases with age, tobacco consumption and lower educational levels. The rate of diagnosised COPD is very high and undiagnosed individuals with COPD already have a significant impairment in health -related quality of life and activities of daily living.[45]

A study was conducted to assess the prevalence of chronic obstructive pulmonary disease and its association with tobacco smoking and environmental tobacco smoke exposure among rural population. A field survey was conducted for chronic obstructive pulmonary disease epidemiology in the rural field practice area of Kempegowda Institute of Medical Sciences, Bangalore, which covers a population of 44,387 to find out the prevalence of COPD in adult subjects of 35 years and above using cluster sampling technique and to determine the association of tobacco smoking, environmental tobacco smoking exposure and type of cooking fuel used with COPD. The result shows overall prevalence of COPD was 4.36% and among males and females were 5.32%, 3.41% respectively. The prevalence was found to be increasing with an increase in age. The tobacco smoke and exposure to environmental tobacco smoking was significantly associated with higher odds of COPD with adjusted odds ratio 2.97 and 2.67 respectively. Thus, there was a significant association between tobacco smoking and environmental tobacco smoking exposure with COPD.[46]

A study was conducted to estimate the prevalence of COPD and its associated factors among non-smoking rural women in Tiruvallur district of Tamilnadu in Southern India. The cross-sectional study

was conducted among 900 non-smoking women aged above 30 years, from 45 rural villages in the period between January and May 2007. COPD assessments were done using a combination of clinical examination and spirometry. The result shows overall prevalence of COPD is 2.44%. COPD prevalence was higher in biomass fuel users than the clean fuel users 2.5 vs. 2% and it was two times higher (3%) in women who spend >2 hours/day in the kitchen involved in cooking. Use of solid fuel was associated with higher risk for COPD.[47]

A study was conducted to assess the epidemiology of chronic obstructive pulmonary disease and its relationship with tobacco smoking and environmental tobacco smoke exposure. Field surveys were conducted in both the urban and the rural populations at Bangalore, Chandigarh, Delhi and Kanpur with the help of a structured and validated questionnaire for diagnosis of asthma and COPD. A two-stage stratified sample design was employed where a village or an urban locality formed the first stage unit and a household formed the second stage unit. The result shows that COPD was diagnosed in 4.1% of 35295 subjects, with a male to female ratio of 1.56:1 and a smoker to nonsmoker ratio of 2.65: 1. Prevalence among beedi and cigarette smokers was 8.2% and 5.9%, respectively.[48]

A study was conducted to assess the emergence of chronic obstructive pulmonary disease as an epidemic in India. Chronic obstructive pulmonary disease, hitherto under diagnosed in India, is now recognized in 4-10 per cent of adult male population of India and several other Asian countries. The smoking associations with COPD were high from most countries i.e., 2.65 in India, 2.57 in China and 2.12 in Japan. In a large, multi centric study from India, the population prevalence of COPD was 4.1 per cent of 35295 subjects with a male to female ratio of 1.56:1. Almost all forms of smoking products such as cigarettes and beedi used in different states were found to be significantly associated with COPD. In non-smokers, especially women, exposure to indoor air pollution from domestic combustion of solid fuels was an important factor. More significantly the exposure to environmental tobacco smoke was an established cause for COPD. The odds ratio for risk from environmental tobacco smoke exposure in non-smokers (1.535) was significant during both the childhood and the adulthood. On an average, an Indian COPD patient spent about 15 per cent of his income on smoking products and up to 30 per cent on disease management. Tobacco smoking was also the most frequent cause of chronic cor pulmonale which occurred as a long term complication of COPD both amongst men and women.[49]

A study was conducted to assess the COPD prevalence in Asia -projections based on the COPD prevalence estimation model. This model is a validated, computerized tool that uses epidemiological relationships and risk factor prevalence to project the prevalence of COPD within a given population aged 30 years and older. The result shows total number of moderate to severe COPD cases in the 12 countries of this region, as projected by the model, is 56.6 million with an overall prevalence rate of 6.3%. The COPD prevalence rates for the individual countries range from 3.5% (Hong Kong and Singapore) to 6.7% (Vietnam).[50]

A study was conducted to estimate the prevalence of COPD as defined by British Thoracic Society criteria and the recent global initiative for chronic obstructive lung disease criteria and also to assess the proportion of underdiagnosis and symptoms in subjects with COPD, and to study risk factors for COPD. In 1996, 5892 of the obstructive lung disease in Northern Sweden study's first cohort could be traced to a third follow-up survey, and 5189 completed responses (88%) were received corresponding to 79% of the original cohort from december 1985. Of the responders, a random sample of 1500 subjects were invited to a structured interview and a lung function test, and 1237 of the invited completed a lung function test with acceptable quality. The result shows that in ages >45 years, the prevalence of COPD according to

the British thoracic society guidelines was 8%, and it was 14% according to the global initiative for chronic obstructive lung disease criteria. Fifty percent of elderly smokers had developed COPD. The large majority of subjects having COPD were symptomatic, while the proportion of those diagnosed as having COPD or similar diagnoses was small.[51]

2. Studies related to breathing exercise

A study was conducted to assess the effects of breathing maneuver and sitting posture on muscle activity in inspiratory accessory muscles in patients with chronic obstructive pulmonary disease. 12 men with COPD participated in the study. Inductive respiratory plethysmography and surface electromyography were used to simultaneously measure tidal value, respiratory rate, and muscle activity of the inspiratory accessory muscles during quiet natural breathing and pursed-lips breathing in three sitting postures: neutral position, with arm support, and with arm and head support. The result shows pursed-lips breathing induced a favorable breathing pattern compared to quiet natural breathing. Additionally, with arm support and with arm and head support positions increased muscle activity of the inspiratory accessory muscles during inspiration versus neutral position.[52]

A study was conducted to assess the effectiveness of controlled breathing techniques on anxiety and depression in hospitalized COPD patients. The sample comprised 46 male patients aged 67-86 years hospitalized with acute COPD exacerbation. Baseline and post intervention recordings of dyspnoea, anxiety and depression, quality of life, respiratory pressures, hand grip test and sleep quality were taken in all subjects. Subjects hospitalized due to acute COPD exacerbation showed high levels of dyspnoea and low values in overall quality of life as measured with the st. George's respiratory questionnaire. The result shows that controlled breathing exercises benefit patients hospitalized due to COPD exacerbation in anxiety and depression values.[53]

A study was conducted to assess the effect of volitional pursed-lips breathing on breathing pattern, respiratory mechanics, operational lung volumes, and dyspnea in patients with COPD. Eight patients include 2 women and 6 men with stable mild-to-severe COPD participated in the study. Wearing a tight-fitting transparent facemask, patients breathed for 8 minute each, with and without pursed-lips breathing at rest and during constant-work-rate bicycle exercise. The results shows pursed-lips breathing can have a variable effect on dyspnea when performed volitionally during exercise by patients with COPD.[54]

A study was conducted to compare 2 programs of prolonging expiratory time (pursed- lips breathing and expiratory muscle training) on dyspnoea and functional performance. A randomized controlled design was used. Changes over time in dyspnea and functional performance were assessed with a multi level modeling procedure. The results shows pursed lip breathing provided sustained improvement in exertional dyspnea and physical function.[55]

A study was conducted to assess the nurse- led breathing exercises in the home are significantly more effective for COPD patients with stage 3 or 4 COPD compared with standard medical care for COPD. The researchers studied 32 patients, half of which received education and nurse- led exercises in the home, and the other half received standard medical care. After 3 months on the program, both groups were tested for pulmonary function, forced expiratory volume in one second, functional breathing capacity, artery blood gas levels, dyspnea and quality of life. The result shows that the breathing exercise group tested significantly higher than at the beginning of the 3 months on all tests, while the control group had no improvement.[56]

A study was conducted to assess the effect of breathing exercises in reducing fatigue intensity in COPD patients. A total of 60 COPD patients participated in the study (30 in the breathing exercise group and

30 in the control group). Both groups completed a fatigue severity scale survey upon enrollment. Then the breathing exercise group received instruction in three respiratory exercise techniques (pursed-lips breathing, diaphragmatic breathing and effective coughing). The COPD patients in the breathing exercise group received instruction and supervision of the proper breathing and coughing techniques and then were asked to practice these techniques 4 times a day for 10 consecutive days. The control group did not receive the breathing/coughing training and were not instructed to utilize such techniques over the same 10 day period. After the 10 day study period, both groups again completed the fatigue survey and the researchers compared the pre- and post- results within and across each group. The result shows an average 27% reduction in fatigue intensity.[57]

A study was conducted to assess the effects of combination of inspiratory diaphragm exercise and expiratory pursed lip breathing exercise on pulmonary functions and respiratory muscle activation of stroke patients. 30 stroke patients were randomly and equally allocated to an experimental group and a control group, and the intervention was conducted five times per week for four weeks. In each session, both groups received rehabilitative exercise treatment for 30 minutes, and a feedback breathing device exercise for 15 minutes. In addition, the experimental group performed a combination of inspiratory diaphragm breathing exercise and the expiratory pursed-lip breathing exercise for 15 minutes. Prior to and after the intervention, patients pulmonary functions were measured using a spirometer. The result shows that combination breathing exercise improves pulmonary functions of stroke patients.[58]

A study was conducted to assess the effects of pursed-lip breathing on the respiratory function, arterial blood gases and the activities of daily living in patients with COPD. A before-after quasi-experimental study was conducted on 40 COPD patients in Kashan, Iran. Spirogram and arterial blood gas were tested before and after three-months of pursed-lip breathing exercise and the airway questionnaire 20 was used to assess activities of daily living. The result shows that the breathing retraining program can improve lung functions, arterial blood gas and the levels of activities of daily living.[59]

A study was conducted to assess the effects of pursed-lip breathing at rest on the behavior of heart rate and its variability, and on variations in blood pressure, respiratory rate and pulse oxygen saturation in subjects with chronic obstructive pulmonary disease. Sixteen subjects with COPD (seven in GOLD stage I, three in GOLD stage II and six in GOLD stage III; mean age 64±11 years; mean FEV_1 60±25% of predicted value) were assessed at rest, in a seated position, under the following conditions: ten minutes of normal breathing without pursed-lip breathing, eight minutes with pursed-lip breathing and ten minutes of normal breathing once more. The result shows that pursed-lip breathing produced significant changes in heart rate, respiratory rate and pulse oxygen saturation, and did not alter blood pressure in subjects with chronic obstructive pulmonary disease.[60]

A study was conducted to assess the effect of pursed lips breathing on ventilation, chest wall mechanics, and abdominal muscle recruitment in myotonic muscular dystrophy. The participants were 11 subjects with myotonic muscular dystrophy and 13 normal controls. And the result shows that pursed lips breathing led to increased tidal volume, increased minute ventilation, increased oxygen saturation, reduced respiratory rate, and reduced end expiratory lung volume. Dyspnea, respiratory effort, and fatigue increased slightly with pursed lips breathing. Electromyographic activity of the transversus abdominis and internal oblique muscles increased in myotonic muscular dystrophy only and was associated with an increase in gastric pressure.[61]

A study was conducted to assess the effect of pursed lip breathing on dyspnoea sensation, physiological responses and electromyographic activities of the sternomastoid muscle in acutely breathless patients

with moderate to severe COPD. 13 patients with acute exacerbation of COPD with forced expiratory volume in the first second and 70% of the predicted value were randomly assigned to two groups. The variables measured included subjective evaluation of dyspnoea using the modified Borg scale and objective measurements on end-tidal carbon dioxide, pulse oxygen saturation, respiratory rate, heart rate and electromyographic activities of the sternomastoid muscle. These variables were measured before and immediately after a spirometry test and at one minute intervals for four minutes after the spirometry test. During the four minutes, subjects in the pursed lip breathing group (n=7) underwent a protocol of pursed lip breathing whilst the control group (n=6) received no respiratory intervention. And the result shows that pursed lip breathing is effective in relieving the dyspnoea sensation in patients with acute exacerbation of COPD.[62]

3. Studies related to effect of diaphragmatic breathing exercise

A study was conducted to assess the effect of diaphragmatic breathing on exercise-induced oxidative stress and the putative role of cortisol and melatonin hormones in this stress pathway. They monitored 16 athletes during an exhaustive training session. After the exercise, athletes were divided in two equivalent groups of eight subjects. Subjects of the studied group spent 1 hour relaxing performing diaphragmatic breathing and concentrating on their breath in a quiet place. The other eight subjects, representing the control group, spent the same time sitting in an equivalent quite place. The result shows that relaxation induced by diaphragmatic breathing increases the antioxidant defense status in athletes after exhaustive exercise. These effects correlate with the concomitant decrease in cortisol and the increase in melatonin. The consequence is a lower level of oxidative stress, which suggests that an appropriate diaphragmatic breathing could protect athletes from long-term adverse effects of free radicals.[63]

A study to assess the effect of deep diaphragmatic breathing in rehabilitation exercises for the asthmatic patient. Sixty-seven asthmatic adults randomly assigned to either deep diaphragmatic breathing training, physical exercise training, or a waiting list control group participated in a 16-week program. Deep diaphragmatic training resulted in significant reductions in medication use and in the intensity of asthmatic symptoms. Importantly, a nearly 300% increase in time spent in physical activities also resulted from deep diaphragmatic training. The result shows that a follow-up at two months found many patients had returned to earlier medication levels and sedentary habits.[64]

A study was conducted to assess the effectiveness of abdominal breathing exercise in reducing mean blood pressure among hypertensive patients in selected hospitals at Mysore. The research approach adopted for the study was evaluative approach and the research design adopted was pre-experimental one group pre-test – post-test design. 60 hypertensive patients from male and female medical general ward had been selected. Tool comprised of demographic proforma, sphygmomanometer and stethoscope. Abdominal breathing exercise was administered to the samples after pre-assessment of mean blood pressure for ten minutes and post assessment of mean blood pressure is done at the gap of 5 minutes which is repeated 3 times a day and monitored for minimum of 3 days. And the result shows that the abdominal breathing exercise is found to be very effective in reducing the mean blood pressure.[65]

A study was conducted to assess the effect of diaphragmatic breathing on heart rate variability in ischemic heart disease patients with diabetes. Study population consisted of 145 randomly selected male patients out of which 45 had ischemic heart disease, 52 had ischemic heart disease and diabetes and the remaining 48 had ischemic heart disease and diabetic neuropathy. Heart rate variability was assessed by

5 minute-electrocardiogram using the time domain method. The intervention group was divided into compliant and non-compliant groups and follow-up recording was carried out after three months and one year. The result shows that the regular practice of diaphragmatic breathing significantly improves heart rate variability with a favorable prognostic picture in ischemic heart disease patients who have diabetes.[66]

A study was conducted to assess if diaphragmatic breathing exercise improves quality of life in asthma. Electronic databases were searched for randomized controlled trials. Data were extracted and risk of bias was assessed by two independent reviewers. Three randomized controlled trials were eligible for inclusion (254 subjects). Two studies compared diaphragmatic breathing exercise to asthma education, and one compared with asthma medication. The result shows there is a moderate evidence of improvement in quality of life following diaphragmatic breathing both in short-term and long-term basis.[67]

A study was conducted to assess the effect of breathing exercises (pranayama) in patients with bronchial asthma of mild to moderate severity. 50 cases of bronchial asthma were studied for 12 weeks. Patients were allocated to two groups: group A and group B (control group). Patients in group A were treated with breathing exercises (deep breathing, Brahmari, and Omkara, etc.) for 20 minutes twice daily for a period of 12 weeks. Patients were trained to perform Omkara at high pitch with prolonged exhalation as compared to normal Omkara. Group B was treated with meditation for 20 minutes twice daily for a period of 12 weeks. Subjective assessment, forced expiratory volume in one second, and peak expiratory flow rate were done in each case initially and after 12 weeks. And the result shows that after 12 weeks, group A subjects had significant improvement in symptoms, forced expiratory volume in one second, and peak expiratory flow rate as compared to group B subjects.[68]

4. Studies related to effect of diaphragmatic breathing exercise on dyspnoea and oxygen saturation

A study was conducted to assess the efficacy of diaphragmatic breathing on ventilation and breathing pattern of patients with chronic obstructive pulmonary disease. Twenty-nine patients with moderate and severe COPD were taken. After 4 minutes of natural breathing, subjects completed 2 minutes of diaphragmatic breathing followed by 4 minutes of natural breathing. The result shows, diaphragmatic breathing can improve breathing pattern and ventilatory efficiency without causing dyspnea in patients whose respiratory muscular system is preserved.[36]

A study was conducted to assess the effect of diaphragmatic and pursed lip breathing exercises on pulmonary functions tests and arterial blood gas for the patients with chronic obstructive pulmonary disease. The sample consisted of COPD patients hospitalized from January 2002 to May 2002. Case group has involved 16 patients and control group has involved 18 patients. Before treatment, blood has been taken from all the patients and arterial blood gas and pulmonary function test has been done. For the patients in the control group, care and treatment have been applied. The patients in the case group have been done pursed lip and diaphragmatic breathing exercises for ten days. After 10 days, blood has been taken and arterial blood gas and pulmonary functions tests have been done the patients in both groups and the results have been recorded. The result shows that there has been no significant difference between the case group and control group in terms of arterial blood gas and pulmonary functions tests results. And there has been a significant decrease in the breathing rate and dyspnea of the patients in the case group.[69]

A study was conducted to assess the acute effects of deep diaphragmatic breathing in COPD patients with chronic respiratory insufficiency. Transcutaneous partial pressure of carbon dioxide and oxygen and arterial oxygen saturation, were continuously monitored in 25 COPD patients with chronic hypercapnia, during natural breathing and deep diaphragmatic breathing. In eight of these patients, breathing pattern and minute ventilation were also assessed by means of a respiratory inductance plethysmography. In five tracheostomized patients, breathing pattern and mechanics were assessed by means of a pneumotachograph/pressure transducer connected to an oesophageal balloon. Subjective rating of dyspnoea was performed by means of a visual analogue scale. In comparison to natural breathing deep diaphragmatic breathing was associated with a significant increase in partial pressure of oxygen and a significant decrease in partial pressure of carbon dioxide with a significant increase in tidal volume and a significant reduction in respiratory rate resulting in increased minute ventilation. The result shows that chronic obstructive pulmonary disease patients with chronic hypercapnia, deep diaphragmatic breathing is associated with improvement of blood gases at the expense of a greater inspiratory muscle loading.[37]

A study was conducted to assess the effect of a diaphragmatic breathing training program on thoracoabdominal motion and functional capacity in patients with chronic obstructive pulmonary disease. A prospective, randomized controlled trial was used for the study. 30 subjects were randomly allocated to either a training group or a control group. Subjects in the training group completed a 4-week supervised diaphragmatic breathing training program (3 individualized weekly sessions), while those in the control group received their usual care. The result shows diaphragmatic breathing training program for patients with chronic obstructive pulmonary disease induced increased diaphragm participation during natural breathing, resulting in an improvement in functional capacity.[70]

A study was conducted to assess the changes in pulmonary functions after practicing diaphragmatic breathing for one month among 1st year MBBS students aged between 18-22 years. The study was conducted in forty samples, 20 males and 20 females. Peak expiratory flow rate and breath holding time was recorded in these subjects before and after one month of practicing diaphragmatic breathing. The result shows there was a significant increase in both peak expiratory flow rate and breath holding time after 1 month of diaphragmatic breathing maneuver depicting the beneficial effects of diaphragmatic breathing on pulmonary functions.[71]

A study was conducted to determine the effect of deep (diaphragmatic) breathing on pulmonary functions (peak expiratory flow rate and breath holding time) in healthy young individuals. The study was a case-control study consisting of 30 healthy individuals in the age group of 18-24 years. This study was conducted in the Department of Physiology, Adichunchanagiri institute of medical sciences, B.G. Nagara, Nagamangala Taluk, Mandya district. Pulmonary parameters were recorded before and after practicing deep breathing exercise daily for 3 months. Both peak expiratory flow rate and breath holding time were significantly increased at after practicing deep breathing. The result of this study shows that a simple maneuver of practicing deep breathing improves the pulmonary functions significantly even in the absence of any other form of physical exercise.[72]

A study was conducted to assess the effectiveness of deep (diaphragmatic) breathing exercise on pulmonary function among patients with chronic airflow limitation in a selected hospital at Mangalore. 40 patients fulfilling the inclusion criteria were randomly grouped into 20 as experimental and 20 as control. The pulmonary function test parameters were assessed in the control and experimental group before the intervention. Deep breathing exercise was provided to the experimental group 2 times per day

for a total of 7 days. On the 7th day after the treatment, the pulmonary function test parameters were reassessed in the control and the experimental group. The result showed that 7 days of deep breathing exercise for clients with chronic airflow limitation was very effective in improving pulmonary function.[73]

Summary

This chapter dealt with the reviews, regarding the various aspects of breathing, diaphragmatic breathing and reviews related to the effect of diaphragmatic breathing on patients with chronic obstructive pulmonary diseases. These studies supported the theoretical basis for the present study. The literature reviewed above had provided a better understanding and also broadened the investigators outlook which was a prerequisite for the research study.

CHAPTER 3

Introduction

Research methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically.[74]It is a collective term for the structured process of conducting research.[75]

This chapter deals with the method for the present study includes, research approach, research design, variables, population, sample and sampling technique, sampling criteria, development and description of tool, content validity of the tool, reliability of the tool, pilot study, data collection process and plan for data analysis. On the whole, it gives a general pattern for gathering and processing research data.

Research approach

Research approach involves the description of the plan to investigate the phenomenon under study in a structured, unstructured or a combination of the two methods.[76]

Quantitative approach involves the generation of data in quantitative form which can be subjected to rigorous quantitative analysis in a formal and rigid fashion.[74]

In this study, in order to accomplish the main objective of determining the effect of diaphragmatic breathing exercise on intensity of dyspnea and oxygen saturation among COPD patients, quantitative approach was adopted.

Research design

Research design can be defined as a blue print to conduct a research study, which involves the description of research approach, study setting, sampling size, sampling technique, tools and method of data collection and analysis to answer a specific research question or for testing research hypothesis.[76]

Quasi experimental pre test post test control group design was adopted for this study.

E - O_1 X O_2

C - O_1 O_2

E - Experimental group

C - Control group

O_1 - Pre test to assess the intensity of dyspnoea and oxygen saturation

X - Administration of diaphragmatic breathing exercise

O_2 - Assessment of intensity of dyspnoea and oxygen saturation after intervention.

Variables

Chinn and Kramer stated that variables are concepts at different level of abstraction that are concisely defined to promote their measurement or manipulation within study.[76]

Independent variable

An independent variable is a stimulus or activity that is manipulated or varied by the researcher to create the effect on the dependent variable.[76]

In this study the independent variable is the diaphragmatic breathing exercise.

Dependent variable

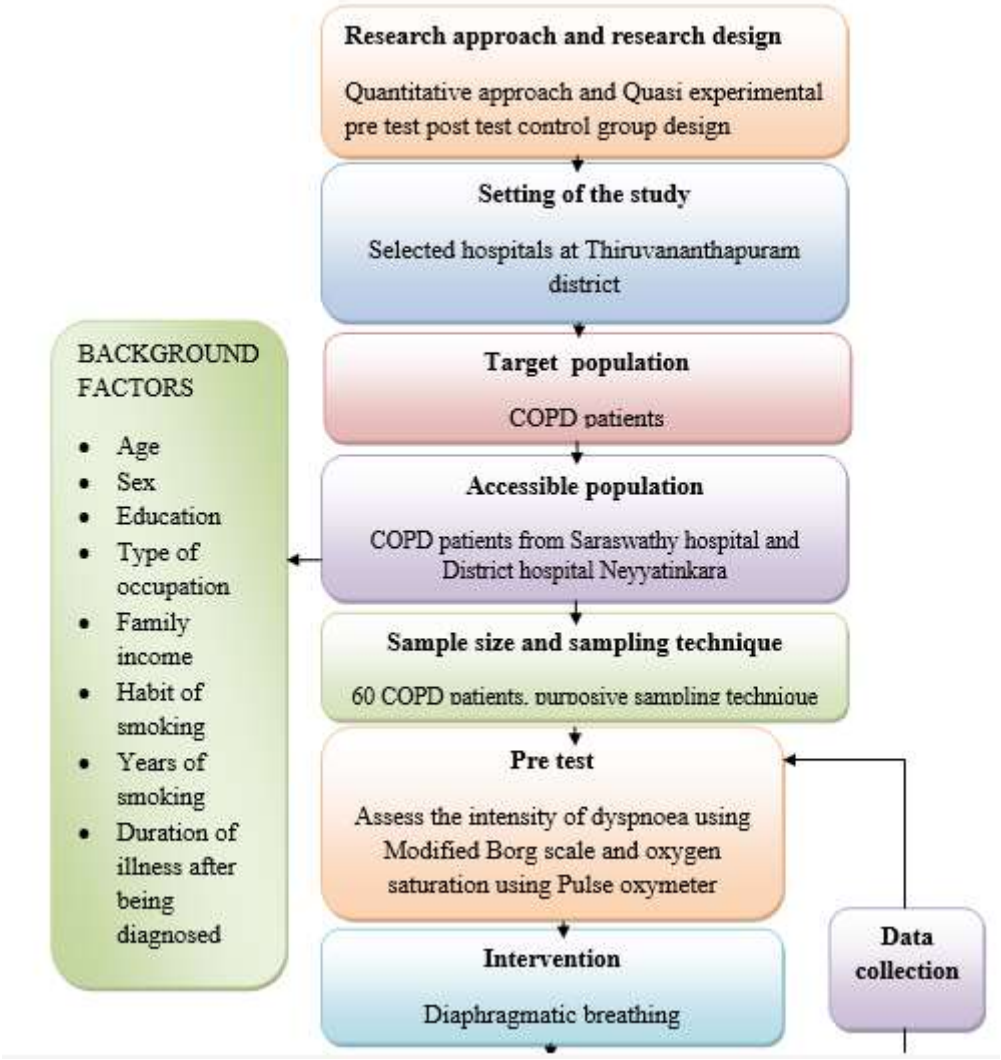
A dependent variable is the outcome or response due to the effect of the independent variable, which researcher wants to predict or explain.[76]

In this study the dependent variables are dyspnoea and oxygen saturation.

Demographic variables

Demographic variables are the characteristics and attributes of the study subjects.[76]

In this study the demographic variables are the age, sex, education, type of occupation, family income, habit of smoking, years of smoking, duration of illness after being diagnosed.



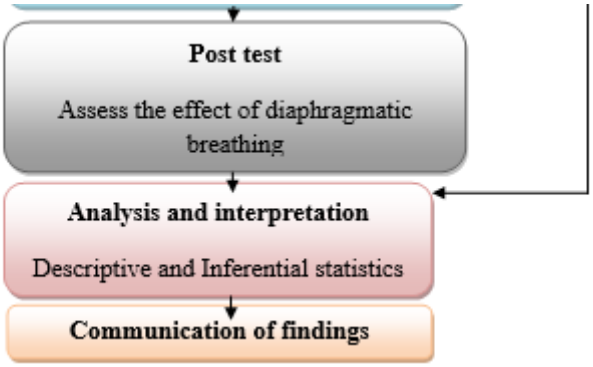


Figure 2: Schematic representation of the study

Setting of the study

Settings are the physical location and the condition in which data collection takes place in the study.[77]

The investigator conducted the study in selected hospitals at Thiruvananthapuram district**.** The hospital includes Saraswathy hospital, Parassala and district hospital, Neyyatinkara. Saraswathy hospital is a 200 bedded multispeciality hospital at Parassala in Thiruvananthapuram district near the Kerala – Tamil Nadu border, providing easy access to the people of both the states. And more than 50 COPD patients are admitted each month. District hospital, Neyyatinkara is a 450 bedded hospital situated near Neyyatinkara police station. And more than 125 COPD patients are admitted each month.

Population

A population is the entire aggregation of cases in which a researcher is interested.[77]

In this study the population consisted of all COPD patients between the age group of 50-80yrs, admitted in selected hospitals at Thiruvananthapuram district during data collection period.

Sample and sampling technique

- **Sample**

A sample is a subset of a population selected to participate in a research study.[76]

In the present study sample consists of 60 patients with COPD, 30 patients for experimental group from District hospital Neyyatinkara and 30 patients for control group from Saraswathy hospital Parassala.

- **Sampling technique**

Sampling is the process of selecting cases to represent an entire population so that inferences about the population can be made.[77]

In the present study, sample was selected by purposive sampling technique which is a type of non-probability sampling technique.

Inclusion criteria

Inclusion criteria give researchers a set of inclusive standards to screen potential participants.[78]

In this study inclusion criteria are,

Chronic obstructive pulmonary disease patients :

- who are in the age group of 50-80 yrs.
- who are willing to participate in the study.
- who are with Modified Borg scale score of 2-5.
- who are with oxygen saturation of 85-95%.
- who are available during the period of study.
- who are able to speak Malayalam.

Exclusion criteria

Exclusion criteria are used to determine whether a person should participate in a research study or whether an individual study should be excluded in a systematic review.[79]

In this study exclusion criteria are,

Chronic obstructive pulmonary disease patients :

- who are with Modified Borg scale score less than 2 and greater than 5.
- who are with oxygen saturation of less than 85% and greater than 95%.

Tool/Instruments

Tools are the device used to collect data.[77]By reviewing the literature and by consulting and discussing with experts, the tools were prepared. The tool consisted of

Section A: Demographic profile

Section B: Pulse oximeter for checking oxygen saturation.

Section C: Modified Borg Scale is used as dyspnoea assessment tool.

Development/selection of the tool

The various steps were adopted in the development of the tool. Review of literature and discussion with experts was done to collect adequate content for the tool preparations. A blue print was developed based on the obtained information from the review of literature and after discussion with the guide and experts.

Description of the tool

Section A: Demographic profile:

It consisted of 8 items such as age, sex, education, type of occupation, family income, habit of smoking, years of smoking and duration of illness after being diagnosed.

Section B: Pulse oximeter:

It is used for checking oxygen saturation. The patients who have oxygen saturation of 85 - 95% are taken for the study.

Section C: Modified Borg Scale:

It is used as dyspnoea assessment tool. Modified Borg scale represents entire range of severity of dyspnoea. It starts at number 0 where there is no breathlessness and progresses through to number 10 where breathing difficulty is maximal. The patient is asked to select a point on this scale that corresponds to his/her perception of dyspnoea. The patients who have 2-5 score of dyspnoea is taken for this study.

Score Interpretation:

0	-	No breathlessness
0.5	-	Just noticeable breathlessness
1	-	Very slight breathlessness
2	-	Slight breathlessness
3	-	Moderate breathlessness
4	-	Somewhat severe breathlessness
5	-	Severe breathlessness
6, 7	-	Very severe breathlessness
8, 9	-	Very very severe breathlessness
10	-	Maximum breathlessness

Content validity

Content validity is the extent to which the elements within a measurement procedure are relevant and representative of the construct that they will be used to measure.[80]

To ensure the content validity of the tool it was submitted to 5 experts, Mrs. Priya.J.R (Assistant professor, government college of nursing, Trivandrum), Mrs. Hepziba.E (Principal, Ruckmoni college of nursing, Vellarada), Mrs. Rajam (Associate professor, CSI college of nursing, Karakonam), Mrs. Ajitha Jothis.S.T (Assistant professor, CSI college of nursing, Karakonam), Mrs. Sherlin (Assistant professor, CSI college of nursing, Karakonam) in the field of medical surgical nursing and 2 doctors, Dr. N Satheesh Kumar (MD, Consultant physician, Saraswathy hospital), Dr. S Radha Krishnan (MD, Consultant physician, Saraswathy hospital). The tool was modified as per the suggestions from the experts and final tool was constructed.

Reliability of the tool

Reliability is the degree of consistency and accuracy with which an instrument measures the attribute for which it is designed to measure.[76]

The standardized Pulse oximeter is used for checking oxygen saturation and Modified Borg scale which is a subjective assessment scale is used for assessing dyspnoea.

Pilot study

Pilot study is a small scale preliminary study conducted in order to evaluate feasibility, time, cost, adverse events, and effect size in an attempt to predict an appropriate sample size and improve upon the study design prior to performance of a full-scale research project.[81]

A pilot study was carried out with 6 samples to determine the feasibility of the research. Formal permission for data collection was obtained from the concerned authority of Saraswathy hospital, Parassala. By non- probability purposive sampling technique, the investigator selected 6 COPD patients, out of which 3 was assigned for experimental group and 3 for control group who fulfilled the inclusion and exclusion criteria. The investigator introduced herself to the participants and explained objectives of the study and their oral consent was taken. The investigator collected the demographic data. After the pre test for the experimental group diaphragmatic breathing exercise is given morning and evening for 5 days. The patient is asked to lie on the back on a flat surface or in bed, with the knees bent and the head supported or sit comfortably, with the knees bent and shoulders, head and neck relaxed. A pillow under the knees will support the legs while lying on the bed. One hand is placed on the upper chest and the other just below the rib cage. This allows patient to feel the diaphragm move as they breathe. Breathe in slowly through the nose so that the stomach moves out against the hand. The hand on the chest should remain as still as possible. Tighten the stomach muscles, letting them fall inward and exhale through pursed lips. The hand on the upper chest must remain as still as possible. For the control group no intervention was provided. Post test was done on 5th day for experimental and control group. Analysis of data was done using descriptive and inferential statistics. The subjects were comfortable and co-operated well during the study and there were no modification the investigator proceeded with the main study after the pilot study. The study was found feasible and practicable.

Data collection process

Prior written permission was obtained from the concerned authorities. The investigator conducted the main study in the month of January and February for a period of 1 month. Sixty subjects were selected and explained the purpose of the study. Informed consent was obtained from the samples. As pre test intensity of dyspnoea and oxygen saturation were checked. The samples those who had Modified Borg scale score of 2-5 and oxygen saturation of 85-95% was selected for experimental and control group. For the experimental group diaphragmatic breathing exercise is given morning and evening for 5 days. For

the control group no intervention was provided. As post test intensity of dyspnoea and oxygen saturation were checked for both the experimental and control group on 5th day.

Plan for data analysis

Data analysis is the systematic organization and synthesis of research data and, in quantitative studies, the testing of hypotheses using those data.[77]

The data was planned to be analyzed on the basis of objectives and hypotheses by descriptive and inferential statistics.

- **Descriptive statistics**

Descriptive statistics is used to organize and summarize data to draw meaningful interpretations.[76]

Frequency and percentage distribution were used to study the demographic variables such as age, sex, education, type of occupation, family income, habit of smoking, years of smoking, duration of illness after being diagnosed.

- **Inferential statistics**

Inferential statistics are concerned with populations and use sample data to make an inference about the population or to test the hypotheses considered at the beginning of the research study.[76]

Wilcoxon signed rank test was used to assess the effect of diaphragmatic breathing exercise on intensity of dyspnoea and oxygen saturation among COPD patients.

Chi square test was used to find out the association between intensity of dyspnoea and oxygen saturation among COPD patients and selected demographic variables.

Summary

In this chapter research approach, research design, variables, population, sample and sampling technique, sampling criteria, development and description of tool, content validity of the tool, reliability of the tool, pilot study, data collection process and plan for data analysis were discussed.

CHAPTER 4

Introduction

Analysis and interpretation of data is the most important phase of the research process, which involves the computation of the certain measures along with searching for patterns of relationship that exists among data groups. Analysis is the process of organizing and synthesizing the data so as to answer research questions and test hypothesis.[76]

This chapter deals with analysis and interpretation of collected data to determine the effect of diaphragmatic breathing exercise on intensity of dyspnea and oxygen saturation among Chronic obstructive pulmonary disease patients. Hence in order to interpret the data in an intelligible form, the collected data was compiled, analyzed and interpreted in the light of the objectives and hypotheses of the study using descriptive and inferential statistics.

Organization of findings

The collected data is organized and analyzed under the following headings:

Section 1 - Demographic variables.

Section 2 - Effects of diaphragmatic breathing exercise on intensity of dyspnoea.

Section 3 - Effects of diaphragmatic breathing exercise on intensity of oxygen saturation.

Section 4 - Association between intensity of dyspnoea among COPD patients and selected demographic variables.

Section 5 - Association between intensity of oxygen saturation among COPD

patients and selected demographic variables.

Section 1: Demographic variables

This section deals with the demographic variables of the COPD patients. It includes age, sex, education, type of occupation, family income, habit of smoking, years of smoking, duration of illness after being diagnosed. Demographic variables of samples are explained in frequency and percentage distribution.

Table 1

Frequency and percentage distribution of samples according to the age

(n = 60)

Age	Experimental		Control	
	f	%	f	%
50 - 59 yrs	3	10.0	7	23.3
60 - 69 yrs	16	53.3	12	40.0
70 - 80 yrs	11	36.7	11	36.7
Total	30	100	30	100

Table 1 shows that majority of the samples in experimental group (53.3%) and control group (40%) were in the age group of 60-69yrs. Least number of samples in experimental group (10%) and control group (23.3%) were in the age group of 50-59yrs.

Table 2

Frequency and percentage distribution of samples according to the sex

(n = 60)

Sex	Experimental		Control	
	f	%	f	%
Male	15	50.0	15	50.0
Female	15	50.0	15	50.0
Total	30	100	30	100

Table 2 shows that in experimental and control group 50% of the samples were male and 50% of the samples were female.

Table 3

Frequency and percentage distribution of samples according to the education

(n = 60)

Education	Experimental		Control	
	f	%	f	%
Illiterate	7	23.3	5	16.7
Primary	11	36.7	6	20.0

High school	8	26.7	13	43.3
Degree & above	4	13.3	6	20.0
Total	30	100	30	100

Table 3 shows that in experimental group the majority (36.7%) of the samples had undergone primary and only 13.3% of samples had undergone degree and above. In the control group the majority (43.3%) of the samples had undergone high school, and only 16.7% of samples were illiterate.

Table 4
Frequency and percentage distribution of samples according to the type of occupation
(n = 60)

Type of occupation	Experimental		Control	
	f	%	f	%
Exposure to dust or allergens	16	53.3	19	63.3
Not exposed to dust or allergens	14	46.7	11	36.7
Total	30	100	30	100

Table 4 shows that the majority of samples in experimental group (53.3%) and in control group (63.3%) were exposed to dust or allergens.

Table 5
Frequency and percentage distribution of samples according to the family income
(n = 60)

Family income	Experimental		Control	
	f	%	f	%
< Rs.5000/-	6	20.0	5	16.7
Rs.5001 - 10,000/-	14	46.7	18	60.0
Rs.10,001 - 15,000/-	10	33.3	7	23.3
Total	30	100	30	100

Table 5 shows that the majority of the samples in experimental group (46.7%) and in control group (60%) had family income between Rs.5001-10,000/-. Least number of the samples in experimental group (20.0%) and in control group (16.7%) had family income < Rs. 5000/-.

Table 6
Frequency and percentage distribution of samples according to the habit of smoking
(n = 60)

Habit of smoking	Experimental		Control	
	f	%	f	%
Yes	11	36.7	10	33.3
No	19	63.3	20	66.7
Total	30	100	30	100

Table 6 shows that the majority of samples in experimental group (63.3%) and control group (66.7%) did not have the habit of smoking.

Table 7
Frequency and percentage distribution of samples according to the years of smoking
(n = 60)

If yes, years of smoking	Experimental		Control	
	f	%	f	%
<5 years	0	0.0	1	10.0
5 - 10 years	3	27.3	4	40.0
11 - 15 years	6	54.5	3	30.0
>15 years	2	18.2	2	20.0
Total	11	100	10	100

Table 7 shows that in the experimental group out of 30 samples only 11 samples had the history of smoking, in which the majority of samples (54.5%) had 11-15 years of smoking. In the control group out of 30 samples only 10 samples had the history of smoking, in which the majority of samples (40%) had 5-10 years of smoking.

Table 8
Frequency and percentage distribution of samples according to the duration of illness after being diagnosed
(n = 60)

Duration of illness after being diagnosed	Experimental		Control	
	f	%	f	%
0 - 2 yrs	4	13.3	4	13.3
3 - 5 yrs	3	10.0	13	43.3
6 - 8 yrs	13	43.4	8	26.7
Above 8 yrs	10	33.3	5	16.7
Total	30	100	30	100

Table 8 shows that in the experimental group the majority (43.4%) of the samples had COPD for 6-8 yrs, and only 10% of the samples had COPD for 3-5yrs. In the control group the majority (43.3%) of the samples had COPD for 3-5 yrs, and only 13.3% of the samples had COPD for 0-2yrs.

Section 2

Effects of diaphragmatic breathing exercise on intensity of dyspnoea.

This section deals with the effectiveness of diaphragmatic breathing exercise on intensity of dyspnoea in experimental group and comparison of diaphragmatic breathing exercise on intensity of dyspnoea among experimental and control group. According to Modified Borg Scale the patients who have 2-5 score of dyspnoea is taken for this study. The score interpretations are, 2- Slight breathlessness, 3- Moderate breathlessness, 4- Somewhat severe breathlessness, 5- Severe breathlessness.

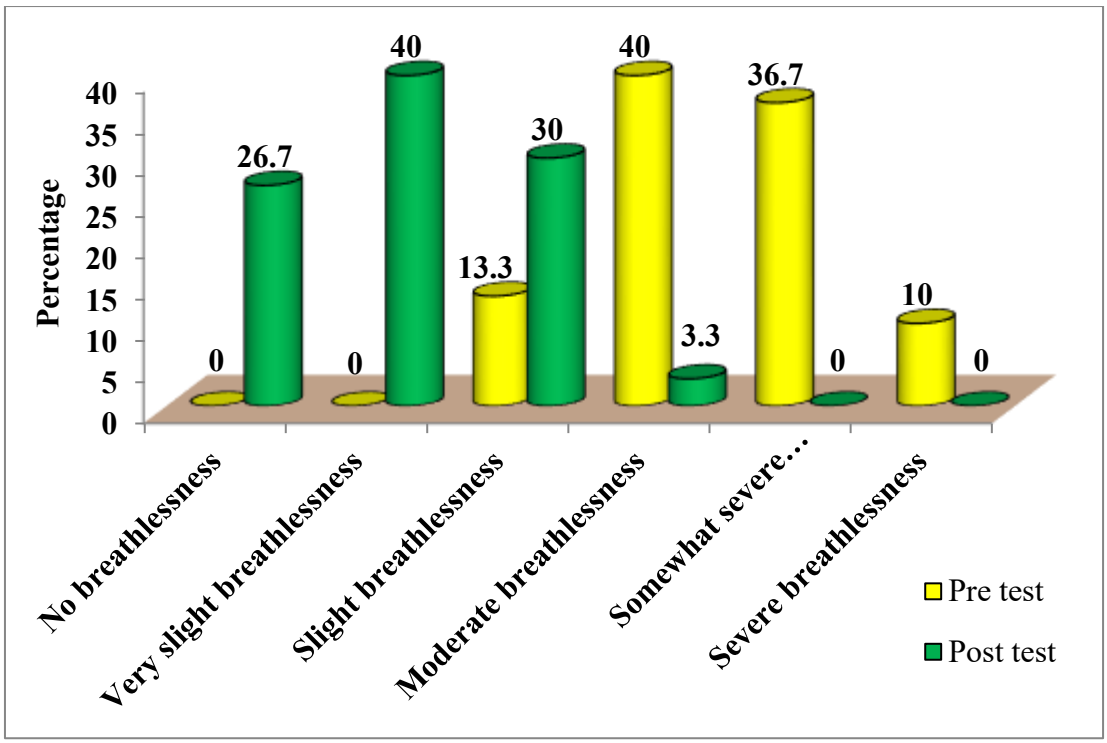


Figure 3: Effectiveness of diaphragmatic breathing exercise on intensity of dyspnoea in experimental group.

Figure 3 shows the pretest and posttest score of intensity of dyspnoea using Wilcoxon signed rank test. The pretest score reveals that the majority (40%) of the samples shows moderate breathlessness, and only 10% of samples shows severe breathlessness. The posttest score reveals that the majority (40%) of samples shows very slight breathlessness and only 3.3% of samples shows moderate breathlessness. The Wilcoxon signed rank test shows the score of 5 which is significant at 0.01 level. This shows there was a significant reduction in the intensity of dyspnoea after diaphragmatic breathing exercise.

Table 9
Comparison of diaphragmatic breathing exercise on intensity of dyspnoea among experimental and control group

Dyspnoea		Experimental		Control		Z#	P
		f	%	f	%		
Pre test	No breathlessness	0	0.0	0	0.0		
	Very slight breathlessness	0	0.0	0	0.0		
	Slight breathlessness	4	13.3	13	43.3		
	Moderate breathlessness	12	40.0	12	40.0	3.07**	0.002
	Somewhat severe breathlessness	11	36.7	5	16.7		
	Severe breathlessness	3	10.0	0	0.0		
Post	No breathlessness	8	26.7	1	3.3	3.7**	0.000

test	Very slight breathlessness	12	40.0	8	26.7
	Slight breathlessness	9	30.0	9	30.0
	Moderate breathlessness	1	3.3	11	36.7
	Somewhat severe breathlessness	0	0.0	1	3.3
	Severe breathlessness	0	0.0	0	0.0

Mann-Whitney U Test **: - Significant at 0.01 level

Table 9 shows the comparison of pre test and post test score of dyspnoea based on experimental and control group using Mann-Whitney U test. The pre test score is 3.07 and post test score is 3.7, which is significant at 0.01 level of significance. This shows there was a significant reduction in the intensity of dyspnoea after diaphragmatic breathing exercise.

Section 3

Effects of diaphragmatic breathing exercise on intensity of oxygen saturation

This section deals with the effectiveness of diaphragmatic breathing exercise on intensity of oxygen saturation in experimental group and comparison of diaphragmatic breathing exercise on intensity of oxygen saturation among experimental and control group. The Pulse oximeter is used for checking oxygen saturation. The patients who have oxygen saturation of 85 - 95% is taken for the study.

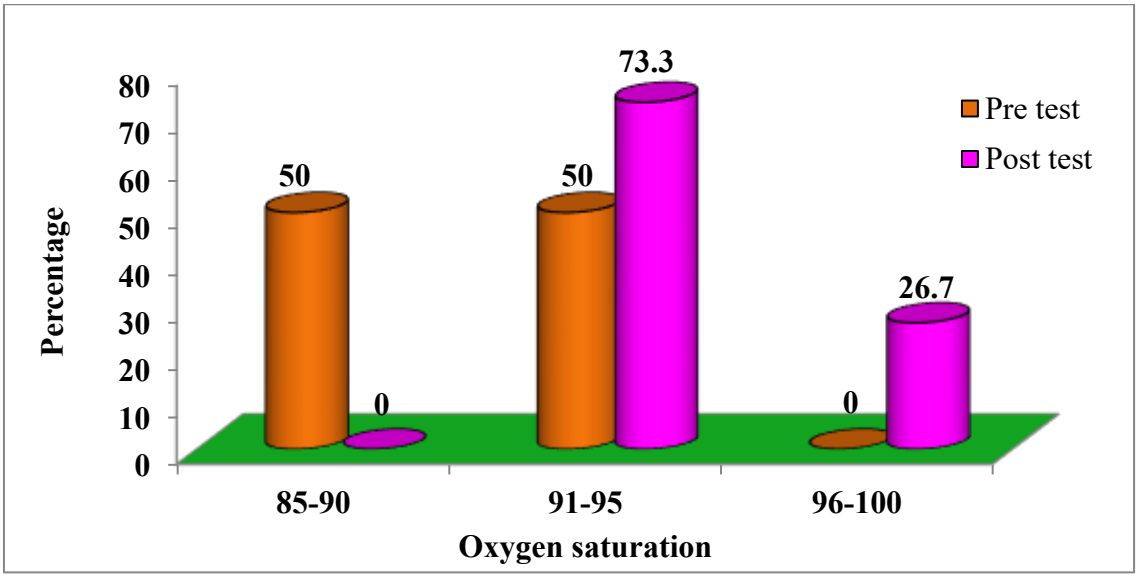


Figure 4: Effectiveness of diaphragmatic breathing exercise on intensity of oxygen saturation in experimental group.

Figure 4 shows the pretest and posttest score of intensity of dyspnoea using Wilcoxon Signed Rank Test. The pre test score shows 50% of samples had oxygen saturation of 85-90, 50% of samples had oxygen saturation of 91-95% and none of the samples had oxygen saturation of 96-100. The post test score shows the majority (73.3%) of samples had oxygen saturation of 91-95%, and none of the samples had oxygen saturation of 85-90. The Wilcoxon Signed Rank Test shows the value of 4.8 which is significant

at 0.01 level. And thus there was a significant improvement in the oxygen saturation after diaphragmatic breathing exercise.

Table 10
Comparison of diaphragmatic breathing exercise on intensity of oxygen saturation among experimental and control group

Oxygen saturation		Experimental f	Experimental %	Control f	Control %	Z#	p
Pre test	85 - 90	15	50.0	12	40.0	0.77	0.440
	91 - 95	15	50.0	18	60.0		
	96 – 100	0	0.0	0	0.0		
Post test	85 - 90	0	0.0	5	16.7	1.84	0.066
	91 - 95	22	73.3	20	66.7		
	96 - 100	8	26.7	5	16.7		

Mann-Whitney U Test

Table 10 shows the comparison of pre test and post test score of oxygen saturation based on experimental and control group using Mann-Whitney U test. The pre test score is 0.77 and post test score is 1.84, which shows that there is a change in oxygen saturation but not at the level of significance.

Section 4

Association between intensity of dyspnoea among COPD patients and selected demographic variables

This section intends to find out the association between intensity of dyspnoea among COPD patients and selected demographic variables such as age, sex, type of occupation, habit of smoking, years of smoking, duration of illness after being diagnosed. Association of the variables is calculated using chi square test.

Table 11
Association between intensity of dyspnoea among COPD patients and selected demographic variables

		Slight breathlessness f	Slight breathlessness %	Moderate breathlessness f	Moderate breathlessness %	Somewhat severe/Severe breathlessness f	Somewhat severe/Severe breathlessness %	χ^2	p
1. Age	**a.** 50 - 59 yrs	1	10.0	6	60.0	3	30.0	3.07	0.546
	b. 60 - 69 yrs	8	28.6	11	39.3	9	32.1		
	c. 70 - 80 yrs	8	36.4	7	31.8	7	31.8		
2. Sex	**a.** Male	8	26.7	14	46.7	8	26.7	1.2	0.549
	b. Female	9	30.0	10	33.3	11	36.7		
3. Type of occupation	**a.** Exposure to dust or allergens	10	28.6	15	42.9	10	28.6	0.43	0.808

	b. Not exposed to dust or allergens	7	28.0	9	36.0	9	36.0		
4. Habit of smoking.	**a.** Yes	4	19.0	10	47.6	7	33.3	1.48	0.477
	b. No	13	33.3	14	35.9	12	30.8		
5. If yes, years of smoking	**a.**<5 years	0	0.0	0	0.0	1	100.0	2.1	0.350
	b. >5 years	4	20.0	10	50.0	6	30.0		
6. Duration of illness after being diagnosed	**a.** 0 - 2 yrs	1	12.5	3	37.5	4	50.0	8.54	0.201
	b. 3 – 5 yrs	5	31.3	10	62.5	1	6.3		
	c. 6 - 8 yrs	6	28.6	7	33.3	8	38.1		
	d. Above 8 yrs	5	33.3	4	26.7	6	40.0		

Table 11 shows the chi square values of intensity of dyspnoea and selected demographic variables. It is revealed from the table that the obtained chi square value was not significant. And it shows that there was no association between intensity of dyspnoea among COPD patients and selected demographic variables.

Section 5

Association between intensity of oxygen saturation among COPD patients and selected demographic variables

This section intends to find out the association between intensity of oxygen saturation among COPD patients and selected demographic variables such as age, sex, type of occupation, habit of smoking, years of smoking, duration of illness after being diagnosed. Association of the variables is calculated using chi square test.

Table 12

Association between intensity of oxygen saturation among COPD patients and selected demographic variables

		85 – 90		**91 – 95**		χ^2	**P**
		f	**%**	**f**	**%**		
1.Age	**a.** 50 - 59 yrs	5	50.0	5	50.0	0.27	0.872
	b. 60 - 69 yrs	13	46.4	15	53.6		
	c. 70 - 80 yrs	9	40.9	13	59.1		
2.Sex	**a.** Male	14	46.7	16	53.3	0.07	0.795
	b. Female	13	43.3	17	56.7		
3.Type of occupation	**a.** Exposure to dust or allergens	16	45.7	19	54.3	0.02	0.895
	b. Not exposed to dust or allergens	11	44.0	14	56.0		
4.Habit of	**a.** Yes	10	47.6	11	52.4	0.09	0.765

smoking	**b.** No	17	43.6	22	56.4		
5.If yes, years	**a.** <5 years	1	100.0	0	0.0	1.16	0.283
of smoking	**b.** >5 years	9	45.0	11	55.0		
6.Duration of	**a.** 0 - 2 yrs	4	50.0	4	50.0		
illness after	**b.** 3 - 5 yrs	7	43.8	9	56.3		
being	**c.** 6 - 8 yrs	10	47.6	11	52.4	0.3	0.960
diagnosis	**d.** Above 8 yrs	6	40.0	9	60.0		

Table 12 shows the chi square values of intensity of oxygen saturation and selected demographic variables. It is revealed from the table that the obtained chi square value was not significant. And it shows that there was no association between intensity of oxygen saturation among COPD patients and selected demographic variables.

CHAPTER 5

Introduction

Results are the answers to research questions, obtained through an analysis of the collected data.[78] The aim of the study was to assess the effect of diaphragmatic breathing exercise on intensity of dyspnoea and oxygen saturation among Chronic obstructive pulmonary diseases patients. Data collection and analysis were carried out based on the objectives and hypotheses of the study. This chapter deals with the objectives, hypothesis and results of the study.

Objectives of the study

The objectives of the study were,

- To assess the effects of diaphragmatic breathing exercise on intensity of dyspnoea and oxygen saturation among COPD patients.
- To find out the association between intensity of dyspnoea and oxygen saturation among COPD patients and selected demographic variables.

Hypotheses

The following hypotheses were tested at 0.01 level of significance.

- There is a significant reduction in the intensity of dyspnoea and different in oxygen saturation among patient with COPD before and after diaphragmatic breathing exercise
- There is a significant association between the intensity of dyspnoea, oxygen saturation and selected demographic variables.

Results

The results of the study are discussed under the following headings:

- Description of sample characteristics.
- Effects of diaphragmatic breathing exercise on intensity of dyspnoea.
- Effects of diaphragmatic breathing exercise on intensity of oxygen saturation.
- Association between intensity of dyspnoea among COPD patients and selected demographic variables**.**
- Association between intensity of oxygen saturation among COPD patients and selected demographic variables.

Sample characteristics

- Majority of the samples in the experimental group (53.3%) and control group (40%) were in the age group of 60-69yrs.
- In both the experimental and control group both males and females were 50% each.
- Majority of the samples in the experimental group (36.7%) were with primary education and in the control group (43.3%) were with high school education.
- Most of the samples in the experimental group (53.3%) and in the control group (63.3%) were exposed to dust or allergens.
- Majority of the samples in experimental group (46.7%) and in control group (60%) had family income between Rs.5001-10,000/-.
- Most of the samples in experimental group (63.3%) and control group (66.7%) did not have the habit of smoking.
- In the experimental group out of 30 samples only 11 samples had the history of smoking, in which the majority of samples (54.5%) had 11-15 years of smoking. In the control group out of 30 samples only 10 samples had the history of smoking, in which the majority of samples (40%) had 5-10 years of smoking.
- Majority (43.4%) of the samples in the experimental group had COPD for 6-8 yrs. In the control group the majority (43.3%) of the samples had COPD for 3-5 yrs.

Effects of diaphragmatic breathing exercise on intensity of dyspnoea

- Wilcoxon signed rank test was done to find out the effect of diaphragmatic breathing exercise on intensity of dyspnoea among patients with chronic obstructive pulmonary disease in the experimental group. In the pre test majority (40%) of the samples had moderate breathlessness and in the post test majority (40%) of the samples had very slight breathlessness. And it was noticed that there was a significant difference between pre test and post test intensity of dyspnoea in the experimental group. The obtained value was 5, which is statistically significant at 0.01 level. Hence the diaphragmatic breathing exercise was effective in reducing intensity of dyspnoea among chronic obstructive pulmonary disease patients.
- Mann-Whitney U test was done to compare the pre test and post test score of dyspnoea based on experimental and control group. The pre test score is 3.07 and post test score is 3.7, which is significant at 0.01 level of significance. This shows that there was a significant reduction in the intensity of dyspnoea after diaphragmatic breathing exercise. Hence the diaphragmatic breathing exercise was effective in reducing intensity of dyspnoea among chronic obstructive pulmonary disease patients.

Effects of diaphragmatic breathing exercise on intensity of oxygen saturation

- Wilcoxon signed rank test was done to find out the effect of diaphragmatic breathing exercise on intensity of oxygen saturation among patients with chronic obstructive pulmonary disease in the experimental group. In the pre test 50% of the samples had oxygen saturation of 85-90% and 50% of samples had oxygen saturation of 91-95% and in the post test majority (73.3%) of the samples had oxygen saturation of 91-95%. And it was noticed that there was a significant difference between pre test and post test intensity of oxygen saturation in the experimental group. The obtained value was 4.8, which is statistically significant at 0.01 level. Hence the diaphragmatic breathing exercise was effective in reducing intensity of oxygen saturation among chronic obstructive pulmonary disease patients.

- Mann-Whitney U test was done to compare the pre test and post test score of oxygen saturation based on experimental and control group. The pre test score is 0.77 and post test score is 1.84, which shows that there is a change in oxygen saturation but not at the level of significance.

Association between intensity of dyspnoea among COPD patients and selected demographic variables

Chi square (χ^2) test was done to find out the association between intensity of dyspnoea among COPD patients and selected demographic variables. There was no significant association between intensity of dyspnoea and selected demographic variables such as age, sex, type of occupation, habit of smoking, years of smoking, duration of illness after being diagnosed.

Association between intensity of oxygen saturation among COPD patients and selected demographic variables

Chi square (χ^2) test was done to find out the association between intensity of oxygen saturation among COPD patients and selected demographic variables. There was no significant association between intensity of oxygen saturation and selected demographic variables such as age, sex, type of occupation, habit of smoking, years of smoking, duration of illness after being diagnosed.

CHAPTER 6

Discussion, summary and conclusion

Introduction

This chapter discusses the major findings of the study in relation to similar studies conducted by the other researcher. It also mentions the discussion, summary, conclusion, nursing implication, limitations and future recommendations of the study.

Discussion

Discussion presents the major findings of the present study under different headings with relevance to objectives and reviews them in relation to the findings from other studies. The aim of the study was to determine the effect of diaphragmatic breathing exercise on intensity of dyspnoea and oxygen saturation among Chronic obstructive pulmonary diseases patients. Findings of the study are discussed in terms of objectives and hypothesis that are formulated during the beginning of the study.

Sample characteristics

Majority of the samples in the experimental group (53.3%) and control group (40%) were in the age group of 60-69yrs. In both the experimental and control group both males and females were 50% each. Most of the samples in the experimental group (36.7%) were with primary education and in the control group (43.3%) were with high school education. Majority of the samples in the experimental group (53.3%) and in the control group (63.3%) were exposed to dust or allergens. Most of the samples in the experimental group (46.7%) and in the control group (60%) had family income between Rs.5001-10,000/-. Majority of the samples in experimental group (63.3%) and control group (66.7%) did not have the habit of smoking. In the experimental group out of 30 samples only 11 samples had the history of smoking, in which the majority of samples (54.5%) had 11-15 years of smoking. In the control group out of 30 samples only 10 samples had the history of smoking, in which the majority of samples (40%) had 5-10 years of smoking. Majority (43.4%) of the samples in the experimental group had COPD for 6-8 yrs. In the control group the majority (43.3%) of the samples had COPD for 3-5 yrs.

The first objective of the study was to assess the effects of diaphragmatic breathing exercise on intensity of dyspnoea and oxygen saturation among COPD patients.

From the present study, it was found that the Wilcoxon signed rank test score shows dyspnoea was significantly reduced among chronic obstructive pulmonary disease patients after administration of diaphragmatic breathing exercise. In the pre test majority (40%) of the samples had moderate breathlessness and in the post test majority (40%) of the samples had very slight breathlessness. And it was noticed that there was a significant difference between pre test and post test intensity of dyspnoea in the experimental group. The obtained value was 5, which is statistically significant at 0.01 level. This shows the effectiveness of diaphragmatic breathing exercise. Hence the diaphragmatic breathing exercise was effective in reducing intensity of dyspnoea among chronic obstructive pulmonary disease patients.

It was found that the Mann-Whitney U test was done to compare the pre test and post test score of dyspnoea based on experimental and control group. The pre test score is 3.07 and post test score is 3.7, which is significant at 0.01 level of significance. This shows that there was a significant reduction in the intensity of dyspnoea after diaphragmatic breathing exercise. Hence the diaphragmatic breathing exercise was effective in reducing intensity of dyspnoea among chronic obstructive pulmonary disease patients.

It was found that the Wilcoxon signed rank test score shows oxygen saturation was significantly reduced among chronic obstructive pulmonary disease patients after administration of diaphragmatic breathing exercise. In the pre test 50% of the samples had oxygen saturation of 85-90% and 50% of samples had oxygen saturation of 91-95% and in the post test majority (73.3%) of the samples had oxygen saturation of 91-95%. And it was noticed that there was a significant difference between pre test and post test intensity of oxygen saturation in the experimental group. The obtained value was 4.8, which is statistically significant at 0.01 level. This shows the effectiveness of diaphragmatic breathing exercise. Hence the diaphragmatic breathing exercise was effective in reducing intensity of oxygen saturation among chronic obstructive pulmonary disease patients.

It was also found that the Mann-Whitney U test was done to compare the pre test and post test score of oxygen saturation based on experimental and control group using. The pre test score is 0.77 and post test score is 1.84, which shows that there is a change in oxygen saturation but not at the level of significance. Hence the research hypothesis H_1 is partially accepted.

The above findings is supported by a study which was conducted to assess the effect of diaphragmatic and pursed lip breathing exercises on pulmonary functions tests and arterial blood gas for the patients with chronic obstructive pulmonary disease. The sample consisted of COPD patients hospitalized from January 2002 to May 2002. Case group has involved 16 patients and control group has involved 18 patients. Before treatment, blood has been taken from all the patients and arterial blood gas and pulmonary function test has been done. For the patients in the control group, care and treatment have been applied. The patients in the case group have been done pursed lip and diaphragmatic breathing exercises for ten days. After 10 days, arterial blood gas and pulmonary functions tests have been done in the patients in both groups. The result shows that there has been no significant difference between the case group and control group in terms of arterial blood gas and pulmonary functions tests results. And there has been a significant decrease in the breathing rate and dyspnea of the patients in the case group.[69]

The above finding is also supported by a study which was conducted to assess the effect of a diaphragmatic breathing training program on thoracoabdominal motion and functional capacity in patients with chronic obstructive pulmonary disease. A prospective, randomized controlled trial was used for the study. 30 subjects were randomly allocated to either a training group or a control group.

Subjects in the training group completed a 4-week supervised diaphragmatic breathing training program (3 individualized weekly sessions), while those in the control group received their usual care. The result shows diaphragmatic breathing training program for patients with chronic obstructive pulmonary disease induced increased diaphragm participation during natural breathing, resulting in an improvement in functional capacity.[70]

The second objective of the study was to find out the association between intensity of dyspnoea and oxygen saturation among COPD patients and selected demographic variables.

Chi square (χ^2) test was done to find out the association between intensity of dyspnoea and oxygen saturation among COPD patients and selected demographic variables. There was no significant association between intensity of dyspnoea, oxygen saturation and selected demographic variables such as age, sex, type of occupation, habit of smoking, years of smoking, duration of illness after being diagnosed. Hence the research hypothesis H_2 is rejected.

The above findings are supported by a study which was conducted in selected hospital at Mangalore, to assess the effectiveness of deep breathing exercise on pulmonary function among patients with chronic airflow limitation. 40 patients fulfilling the inclusion criteria were randomly grouped into 20 as experimental and 20 as control. The pulmonary function test parameters (the forced vital capacity and the forced expiratory volume in the one second), were assessed in the control and experimental group before the intervention. Deep breathing exercise was provided to the experimental group 2 times per day for a total of 7 days. On the 7th day after the treatment, the pulmonary function test parameters under study were reassessed in the control and the experimental group and were compared. The result showed that 7 days of deep breathing exercise for clients with chronic airflow limitation was very effective in improving pulmonary function. And there was no significant association between pulmonary function and selected demographic variables at 0.05 level of significance.[73]

Summary

The main purpose of the study was to assess the effect of diaphragmatic breathing exercise on intensity of dyspnoea and oxygen saturation among COPD patients in selected hospitals at Thiruvananthapuram district. Quantitative research approach was used in the study and the research design was quasi experimental pre test post test control group design.

The objectives of the study was to assess the effect of diaphragmatic breathing exercise on intensity of dyspnoea and oxygen saturation among COPD patients and to find out the association between intensity of dyspnoea and oxygen saturation among COPD patients and selected demographic variables. The study attempted to examine the following hypothesis, there is a significant reduction in the intensity of dyspnoea and different in oxygen saturation among patient with COPD before and after diaphragmatic breathing exercise and there is a significant association between the intensity of dyspnoea, oxygen saturation and selected demographic variables.

The conceptual framework of the study is based on General systems theory with input, process or throughput, output and feedback. An extensive review of related literature for this study was done by the investigator, which helped to develop the conceptual framework and selection of the tool. The literature reviews also helped in determining the effectiveness of intervention and plan the analysis. The population of the study was COPD patients between 50 and 80 years in selected hospitals at Thiruvananthapuram district. Purposive sampling which is a type of non- probability sampling was used in this study. Modified Borg scale is used as dyspnoea assessment tool and a standardized pulse oxymeter was used to check the oxygen saturation.

To ensure the content validity, the tool was given to 9 experts. After the pre test for the experimental group diaphragmatic breathing exercise is given morning and evening for 5 days. For the control group no intervention was given. Post test was done on 5th day.

The data gathered were analyzed and interpreted based on the objectives. Descriptive statistics used were frequency and percentage. Inferential statistics used to test hypothesis at 0.01 level of significance were Wilcoxon signed rank test and Chi square test.

The findings of the study showed that there is a significant decrease in the intensity of dyspnoea and oxygen saturation after diaphragmatic breathing exercise.

Conclusion

The findings of the study showed that in the post test there was a significant reduction in the intensity of dyspnoea and oxygen saturation. Hence it is revealed that the diaphragmatic breathing exercise was effective in reducing intensity of dyspnoea and oxygen saturation among COPD patients. The study showed no association of intensity of dyspnoea and oxygen saturation with the selected demographic variables.

Nursing implications

The findings of the present study have implication in the field of nursing education, nursing service, nursing administration and nursing research.

Nursing education

- Conduct seminars and workshops for students and nursing personnels regarding the effect of diaphragmatic breathing exercise.
- The nursing curriculum should also provide opportunity to plan and conduct health education regarding diaphragmatic breathing.
- Effective teaching material and demonstration should be used to express the content area clearly.

Nursing service

- Community health nurse can impart the knowledge regarding diaphragmatic breathing exercises to COPD patients.
- Nurses working in the hospitals and students during their clinical posting will be able to demonstrate diaphragmatic breathing exercises to the patient and relatives.

Nursing administration

- Administrators should take provision for in-service education programme regarding breathing exercises.
- The nurse administrators can develop an institutional protocol for the pulmonary rehabilitation of COPD patients.
- The nurse administrators can encourage the nurses to provide health education to the COPD patients because it is an effective and cost effective one.
- The study will help nursing administrative authority to recognize the need for conducting pulmonary rehabilitation programme.

Nursing research

- By conducting research and formulating new theories, researchers can improve the knowledge, skill and attitude of nurses and ultimately can improve the status and standard of the nursing profession.

- Disseminate the findings of research through seminars, workshops and publishing in nursing journals.
- Findings of the study help to expand the body of professional knowledge upon which further research can be conducted.
- The study will be a valuable reference for further researcher.

Limitations

- The sample size was relatively small and hence the generalization of the study could be done with caution.
- The study was limited only to those who were able to speak Malayalam.
- The study was limited only to those who were having Modified Borg scale score of 2-5 score and oxygen saturation of 85-95%.
- Subjects were selected only from two hospitals in Thiruvananthapuram district, hence generalization can only be made for the subjects studied.

Recommendations

- On the basis of the findings of the study, the following recommendations have been made for further study:
- A similar study can be under taken with a larger sample size to generalize the findings.
- A comparative study can be done to assess the effect of diaphragmatic and pursed lip breathing among COPD patients in selected hospitals.
- A similar study could be conducted in different settings.
- A study can be done to assess the knowledge on breathing exercise among COPD patients.
- Replication of the study can be conducted with different in schedule and more than 5 days of administration of diaphragmatic breathing.
- Protocols should be implemented in the hospital regarding diaphragmatic breathing exercise.

Summary

This chapter dealt with discussion, summary, conclusion, implication, limitation and recommendations. And it was found that administration of diaphragmatic breathing exercise was effective in reducing intensity of dyspnoea and oxygen saturation among COPD patients.

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