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## **A Study on the Effect of Pulmonary Hygiene on Respiratory Functions in Chronic Obstructive Pulmonary Disease Patients at a Hospital in Erode.**

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### **ABSTRACT**

**Background:** Chronic Obstructive Pulmonary Disease (COPD) is a common condition characterized by long-term airway blockage. Symptoms such as breathlessness during physical activity and fatigue significantly affect patients' quality of life (QoL), limiting their ability to engage in various physical activities. The aim of this study is to evaluate the impact of pulmonary hygiene on respiratory function in individuals with COPD. **Design:** A pre-experimental design using a one-group pre-test and post-test approach. **Setting:** Ashok Krishna Hospitals, Erode. **Participants:** A total of 30 patients with Chronic Obstructive Pulmonary Disease, selected using purposive sampling and meeting the

*inclusion criteria, participated in the study. **Selection Criteria:** Inclusion criteria included COPD patients aged 20 to 60 years, of both genders, and in stages 1 and 2 of the disease. **Methods:** The study involved 30 COPD patients who received pulmonary hygiene interventions, including chest physiotherapy for 5 minutes twice a day, huffing for 5 minutes twice a day, and pursed-lip breathing for 5 minutes three times a day. The assessment was carried out using an observational rating scale. **Results:** The results of the study showed that the pre-test mean score was  $8.37 \pm 0.65$ , equivalent to 46.5%, while the post-test mean score was  $16.3 \pm 1.66$ , representing 90.56%. The paired t-test value was 27, which was notably higher than the critical value of 2.05. A significant relationship was found between respiratory parameters and age, although no significant correlation was identified with other demographic factors. **Conclusion:** Pulmonary hygiene has been shown to be very effective in improving respiratory function in individuals with Chronic Obstructive Pulmonary Disease.*

***Keywords:** Chronic Obstructive Pulmonary Disease, breathlessness, physical activity, respiratory parameters, chest physiotherapy.*

## **INTRODUCTION**

“A nonsmoker is forced to find food, but for a smoker breakfast can be a cigarette”

- Brokefaint

Chronic Obstructive Pulmonary Disease (COPD) is a preventable and treatable condition characterized by airflow limitation that is not fully reversible. Chronic Obstructive Pulmonary Disease (COPD) is characterized by progressive airflow limitation, often caused by an abnormal inflammatory response in the lungs to harmful particles or gases. While cigarette smoking is the leading cause, other factors like air pollution, exposure to irritants in the workplace, and recurrent severe respiratory infections also contribute to the disease. Infectious agents such as Haemophilus influenzae and Streptococcus pneumoniae are commonly involved. Genetic factors like Alpha-1 antitrypsin deficiency and aging may also influence disease development [1].

COPD affects approximately 210 million people globally. In 2004, it was the fourth leading cause of death, responsible for 5.1% of global deaths, and is projected to become the third leading cause of death (8.6%) by 2030. COPD is also a major contributor to chronic illness, ranked 11th in 2002 and expected to rise to 7th place by 2030. The prevalence of COPD in adults varies widely, ranging from 0.2% in Japan to 37% in the United States. In the Asia-Pacific region, the COPD prevalence rate is 6.3%, higher than the global average of 3.8%, according to World Health Organization data. About 48% of COPD patients are undergoing treatment [2-4].

In 2018 study describes pursed-lip breathing as a technique where one inhales slowly through the nose for two counts, keeping the mouth closed. After taking a normal breath, you pucker your lips as though preparing to whistle and then exhale slowly. Pursed-Lip Breathing (PLB) helps to elongate the exhalation, creating resistance that slows the breath and opens the airways, reducing anxiety and improving lung function. This exercise is commonly used by individuals with COPD during pulmonary rehabilitation programs and in daily activities to enhance breathing efficiency and alleviate dyspnea. By closing the lips during exhalation, PLB creates a positive expiratory pressure in the airways, which improves airflow [5,6].

## **NEED FOR STUDY**

Chronic Obstructive Pulmonary Disease (COPD) leads to more than 3 million deaths each year, making it the third leading cause of death globally. Projections suggest that by 2030, COPD will remain the third most common cause of death worldwide.

At present, it is the fourth leading cause of death globally, with expectations to become the third leading cause by 2020. COPD often occurs alongside heart conditions, as both share similar risk factors, underlying mechanisms, and symptoms, leading to worse health outcomes. Cardiovascular diseases encompass a range of conditions with varying causes, treatments, and results. From an epidemiological standpoint, individuals with COPD are especially vulnerable to cardiovascular diseases. In fact, the risk of death from heart disease in people with moderate COPD exceeds the risk of death from respiratory failure. Clinical guidelines emphasize the importance of managing comorbid conditions in COPD patients, noting that controlling these conditions is beneficial despite the potential risks associated with many medications. However, the full survival benefits of aggressively treating both cardiac diseases and COPD in patients with both conditions remain unclear. This paper focuses on the management of COPD patients who also have ischemic coronary disease, heart failure, and arrhythmias, due to the importance of these conditions in terms of both their prevalence and impact on prognosis [7].

Chest physiotherapy as a collection of physical techniques aimed at improving lung function and facilitating easier breathing. This therapy helps to expand the lungs, strengthen respiratory muscles, and clear thick mucus from the airways. This technique is part of bronchial hygiene therapy and involves a deliberate, controlled cough that is taught and supervised by healthcare providers. The investigator observed that many individuals suffering from COPD experience a diminished quality of life and face challenges in performing daily activities [8].

#### **OBJECTIVES:-**

- To examine the respiratory function of patients with Chronic Obstructive Pulmonary Disease both before and after undergoing pulmonary hygiene.
- To assess the effect of pulmonary hygiene on enhancing respiratory function in individuals with Chronic Obstructive Pulmonary Disease.
- To explore the correlation between post-treatment respiratory scores and the demographic characteristics of patients with Chronic Obstructive Pulmonary Disease.

#### **VARIABLES**

A variable is defined as a concept or abstract idea that can be quantified or measured. In research, it refers to the measurable characteristics, qualities, traits, or attributes of a specific individual, object, or situation under investigation. In this study, the

independent variable is pulmonary hygiene, while the dependent variable is respiratory parameters.

### **SETTING OF THE STUDY**

Research settings refer to the particular environments where data is gathered. The selection of the setting was influenced by factors such as the practicality of carrying out the study, the availability of participants, and obtaining necessary approvals from the appropriate authorities.

### **RESEARCH DESIGN**

The research design used for the present study was **Pre - experimental design** where **pretest and post test test design** was selected to assess effectiveness of nursing intervention on selected respiratory parameters among patients with **Chronic Obstructive Pulmonary Disease**.

### **SAMPLE SIZE**

The total sample size consisted of 30 patients diagnosed with Chronic Obstructive Pulmonary Disease.

### **SECTION – A: DESCRIPTION OF PATIENTS ACCORDING TO THEIR DEMOGRAPHIC CHARACTERISTICS**

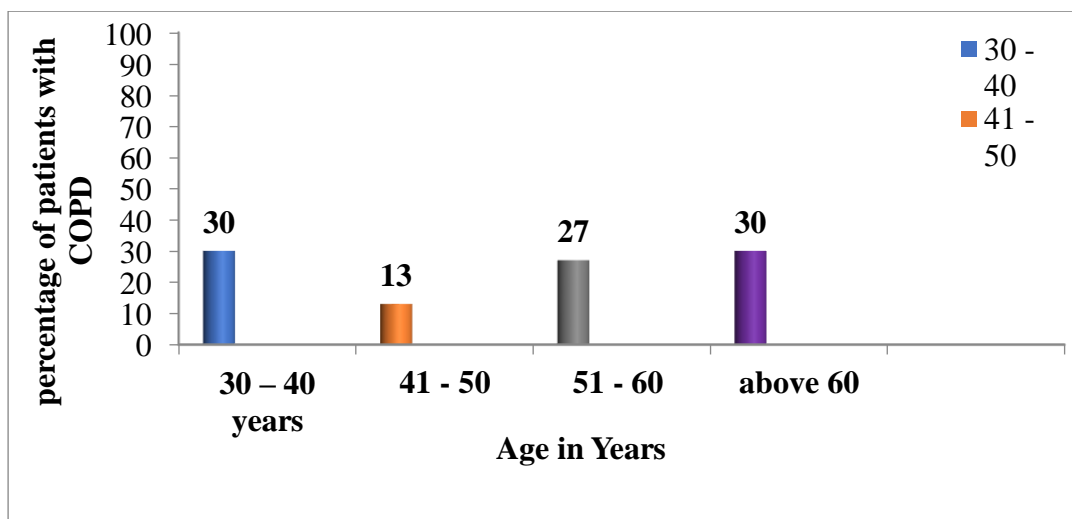
**Table: 1 Frequency and percentage distribution of samples according to their demographic variables. (n = 30)**

<b>Sl.N0:</b>	<b>Demographic Variables</b>	<b>Frequency (n)</b>	<b>Percentage (%)</b>
<b>1</b>	<b>Age in year</b>		
	<b>a) 30 – 40 years</b>	9	30%
	<b>b) 41 – 50 years</b>	4	13%
	<b>c) 51 – 60 years</b>	8	27%
	<b>d) Above 60years</b>	9	30%
<b>2</b>	<b>Gender</b>		
	<b>a) Male</b>	19	63%
	<b>b) Female</b>	11	37%
<b>3</b>	<b>Duration of illness</b>		
	<b>a) Less than 1 years</b>	7	23%
	<b>b) 1-3 years</b>	7	23%

	c) 3 – 5 years	10	34%
	d) Above 5 years	6	20%
<b>4</b>	<b>Number of previous hospitalization for respiratory problem</b>		
	a) Nil	2	7%
	b) 1-3 times	-	-
	c) 3-6 times	28	93%
	d) More than 6 times	-	-
<b>5</b>	<b>Family history of chronic obstructive pulmonary disease</b>		
	a. Parents	14	47%
	b. Siblings	6	20%
	c. Grand parents	10	33%
	d. Relatives	-	-
<b>6</b>	<b>History of smoking</b>		
	a. Do not smoke	5	17%
	b. $\leq 1$ pocket/day	3	10%
	c. 2-3 pockets /day	10	33%
	d. $>3$ pockets/day	12	40%
<b>7</b>	<b>CO-Morbid condition</b>		
	a. Hypertension	13	43%
	b. Diabetes mellitus	17	57%
	c. Tuberculosis	-	-
	d. Others	-	-

Table 1 presents the demographic details of patients with Chronic Obstructive Pulmonary Disease in both experimental groups I and II. These characteristics include age, gender, duration of illness, number of previous hospitalizations due to respiratory issues, family history of COPD, smoking history, and the presence of comorbid conditions. Distribution

of samples according to their **age** in pre experimental group shows that the majority the of patients with Chronic Obstructive Pulmonary Disease 30% were in the age group of 30 to 40 years 13% were in the age group of 41 to 50 years and 27% were in the age group 51 to 60 years and 30% were in the age group of >60 years. The distribution of samples by gender reveals that 63% of patients with Chronic Obstructive Pulmonary Disease were male, while 43% were female. Distribution of samples according to the **duration of illness** most percentage 23% of less than 1 year , 23% of 1to 3 years , 34% of 3 to 4 years and 20% Of above 5 years. Distribution of samples according to the **Number of previous hospitalization for respiratory problem** most percentage 7% of Nil, 0% of 1 to 3 times , 93% of 3- 6 times and 0% of more than 6 times. Distribution of samples according to the **Family history of Chronic Obstructive Pulmonary Disease** most percentage of 47% of parents, 20% of siblings, 33% of grandparents and 0% of relatives. Distribution of sample according to the History of smoking most percentage of 17% do not smoke, 10% of  $\leq 1$  packet/day, 33% of 2-3 packets / day and 40% of  $> 3$  packets /day. Distribution of samples according to the CO-Morbid condition most percentage of 43% of Hypertension, 57% of Diabetes and 0% of Tuberculosis & Others (Fig 1).



**Figure 1: Bar diagram showing the frequency and percentage distribution of patients with Chronic Obstructive Pulmonary Disease**

## **SECTION B - ASSESS THE LEVEL OF RESPIRATORY PARAMETERS**

### **AMONG PATIENTS WITH COPD FOR BEFORE AND AFTER PULMONARY HYGIENE**

**Table: 2 Frequency and percentage distribution of the pre test and posttest score of level of respiratory parameters among patients with Chronic Obstructive Pulmonary Disease.**

Level of Respiratory Parameters	Pretest scores		Posttest scores	
	Frequency	Percentage	Frequency	Percentage
	(n)	(%)	(n)	(%)
No risk	-	-	26	87%
Prone to risk	14	47%	4	13%
Intended risk	16	53%	-	-
High risk	-	-	-	-

The frequency and percentage distribution of pretest and posttest scores for respiratory parameters among patients with Chronic Obstructive Pulmonary Disease show that, in the pretest, 53% of patients were at risk, while 47% were at a higher risk. In contrast, the posttest results indicated that 87% of patients were no longer at risk, and only 13% remained at risk. The results suggest that pulmonary hygiene had a notable positive effect on the respiratory function of patients with Chronic Obstructive Pulmonary Disease (Table 2).

**SECTION C - ASSESS THE EFFECTIVENESS OF PULMONARY FUNCTION ON RESPIRATORY PARAMETERS AMONG PATIENT WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE.**

**Table 3** Paired ‘t’ test value of pretest and posttest scores of respiratory parameters among patients with Chronic Obstructive Pulmonary Disease.

Respiratory Parameters	‘t’ value	Level of significance
Respiratory rate	20.2	p < 0.05 significant
Oxygen saturation	17.86	p < 0.05 significant
Heart rate	18.22	p < 0.05 significant
Temperature	2.15	p < 0.05 significant
Incentive Spirometry	11.65	p < 0.05 significant
Breath holding time	16.41	p < 0.05 significant

<b>Total</b>	<b>27</b>	<b>p &lt; 0.05 significant</b>
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A paired t-test was conducted to evaluate the difference in pre- and post-test scores for respiratory parameters (such as respiratory rate, oxygen saturation, heart rate, temperature, incentive spirometry, and breath-holding time) in patients with Chronic Obstructive Pulmonary Disease. The calculated paired t-value was 27, which was significantly higher than the table value of 2.05. In conclusion, pulmonary hygiene demonstrated effectiveness in improving the respiratory parameters of COPD patients (Table 3)

**Table 4** A comparison of the mean, standard deviation, and mean percentage of pretest and posttest scores for respiratory parameters in patients with Chronic Obstructive Pulmonary Disease, categorized by area.

Respiratory parameters	Max scores	Patients with COPD						Difference in mean %
		Pre test			Post test			
		Mean	SD	Mean %	Mean	SD	Mean %	
Respiratory rate	3	1.1	0.32	36.6%	2.8	0.41	93.33%	56%
Oxygen saturation	3	1.3	0.48	43.3%	2.93	0.24	97.67%	54%
Heart rate	3	1.13	0.37	37.6%	2.8	0.41	93.33%	55%
Temperature	3	2.73	0.45	91%	2.87	0.35	95.67%	5%
Incentive Spirometry	3	1.03	0.17	34.3%	2.33	0.48	77.67%	44%
Breath holding time	3	1.03	0.17	34.3%	2.57	0.5	85.67%	52%
<b>Total</b>	<b>18</b>	<b>8.37</b>	<b>0.65</b>	<b>46.5%</b>	<b>16.3</b>	<b>1.66</b>	<b>90.56%</b>	<b>44.5%</b>

In pre test the mean score for respiratory rate ( $1.1\pm 0.32$ ) which is 36.6%, oxygen saturation ( $1.3\pm 0.48$ ) which is 43.3%, heart rate ( $1.13\pm 0.37$ ) which is 37.6%, temperature ( $2.73\pm 0.45$ ) which is 91%, Incentive spirometry ( $1.03\pm 0.17$ ) which is 34.3% and breath holding time ( $1.03\pm 0.17$ ) which is 34.3% whereas in the post test the mean score for respiratory rate ( $2.8\pm 0.41$ ) which is 93.33%, oxygen saturation ( $2.93\pm 0.24$ ) which is 97.67%, heart rate ( $2.8\pm 0.41$ ) which is 93.33%, temperature ( $2.87\pm 0.35$ ) which is 95.67%, Incentive spirometry ( $2.33\pm 0.48$ ) which is 77.67% and breath holding time ( $2.57\pm 0.5$ ) which is 85.67% and mean percentage difference are respiratory rate 56%, oxygen saturation 54%, heart rate 55%, temperature 5%, spirometry 44% and breath holding time 52% (Table 4).

Similarly the overall mean score was ( $8.37\pm 1.29$ ), which is 46.5% where as in post test the mean score was ( $16.3\pm 1.66$ ) which is 90.56%. It is showing the difference of 44.5%. Pulmonary hygiene appears to be highly effective in improving respiratory parameters in patients with Chronic Obstructive Pulmonary Disease.

**SECTION D - FIND OUT THE ASSOCIATION BETWEEN THE POST TEST SCORES ON RESPIRATORY PARAMETERS AMONG PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE AND THEIR DEMOGRAPHIC VARIABLES**

**Table 5 Association between the demographic variables and the post test scores of respiratory parameters among patient with Chronic Obstructive Pulmonary Disease**

<b>Demographic variables</b>	<b>DF</b>	<b>Chi-square value</b>	<b>TV</b>	<b>Level of significance</b>
Age	1	6.69	3.84	<b>significant</b>
Gender	1	0.11	3.84	Not significant
Duration of illness	2	2.27	5.99	Not significant
Number of previous hospitalization for respiratory problem	1	2.82	3.84	Not significant
Family history of chronic obstructive pulmonary disease	3	6.72	7.82	Not significant
History of smoking	2	2.02	5.99	Not significant
Co morbid condition	2	1.92	5.99	Not significant

**Not significant at  $p < 0.05$ .**

Chi square was calculated to find out the association between the post test scores of respiratory parameters among patients with COPD and their demographic variables (Age, gender, Duration of illness, Number of previous hospitalization for respiratory problem, Family history of chronic obstructive pulmonary disease, history of smoking and Co morbid condition). Therefore, it can be concluded that age is the only factor with a significant association, while there is no significant link between the post-test scores and respiratory parameters in patients with Chronic Obstructive Pulmonary Disease when compared to other demographic variables [9,10]. Any observed differences in these variables appear to be due to chance rather than representing a true difference (Table 5).

## **CONCLUSION**

The study concluded that pulmonary hygiene had a significant positive impact on respiratory parameters in patients with Chronic Obstructive Pulmonary Disease. Furthermore, carrying out this study offered the researcher valuable knowledge and hands-on experience in the research field. The study's successful completion was made possible through the continuous support and guidance of the mentors, as well as the cooperation of the participants who willingly took part in the study.

### **Nursing Implication**

The results of the study have important implications for nursing services, nursing administration, and nursing research.

- ❖ Chronic Obstructive Pulmonary Disease it will help to identify the respiratory difficulties.
- ❖ The nurses should know the Chest physiotherapy, Huffing and pursed lip breathing exercise and educate them about the benefits of pulmonary hygiene and encourage the patients with Chronic Obstructive Pulmonary Disease and to practice it.

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