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Effect of bubble PEP on vital parameters in hospitalized COPD patients-an experimental study

Dr. Prajakta Patil
PhD Scholar, Department of Physiotherapy, Sumandeep Vidyapeeth, deemed to be University, Piparia, Vadodara, Gujarat, India

Dr. Nalina Gupta
Professor, College of Physiotherapy, Sumandeep Vidyapeeth, deemed to be University, Vadodara, Gujarat, India

Dr. Lata Parmar
Department of Physiotherapy, Sumandeep Vidyapeeth, deemed to be University, Piparia, Vadodara, Gujarat, India

Abstract---Chronic bronchitis and emphysema are included in the group of illnesses known as Chronic Obstructive Pulmonary Disease (COPD). Breathing becomes more difficult with COPD with time. Although lung damage cannot be reversed, lifestyle adjustments and medication adjustments can help to manage the symptoms. It is seen most frequently in adults all over the world and which has a negative impact on the patients' quality of life as it relates to their health, presents a significant obstacle for medical professionals and other health care workers. The biggest cause of death throughout the world is COPD. The prognosis of COPD patients may be improved by the management of functional and psychological deficits, as well as the reduction of activity restrictions. According to the new GOLD recommendations that has released in 2020, the goal focuses on the symptomatic treatment of COPD and the reduction of the risk of adverse health events that will have an effect on COPD patients over the long run in the form of exacerbations. In this paper we studied an effect of bubble PEP on vital parameters in hospitalized COPD patients. The data collection was done through sample collection techniques. Almost 174 patients' data was collected including both genders and three groups were created based upon grade and severity. In the extensive experimental analysis various test was applied on data and interpreted different test results with its correlation. Finally different test showed set of parameters and its positive or negative

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influence with correlation for COPD and showed the patients' health graph.

Keywords---COPD, vital parameters, PEP, bubble PEP, exacerbation.

Introduction

COPD causes lung deterioration and makes it challenging to breathe. COPD combines bronchitis and emphysema. Blocked lung airways generate a large amount of mucus. This excessive mucus production inflames, narrows, and clogs the airways, causing breathing difficulties. Emphysema damages lung air sacs. In a fit individual, the air sacs expand during exhalation and inhalation to pump oxygen into the lungs. In emphysema, the airways lose flexibility and do not supply the normal respiration process. Airway inflammation, mucociliary failure, and airway structural alterations are COPD pathogenesis. COPD causes airway, lung tissue, and pulmonary artery irritation.

Positive expiratory pressure (PEP) is an airway clearance technique that works by splinting the airways open during expiration and allowing greater movement of air. It is one of the effective forms of immediate airway clearance. In case of secretions accumulation, PEP allows an increased volume of air to accumulate behind the sputum via collateral ventilation, moving sputum centrally towards larger airways to facilitate the expectoration (Holland and Button 2006). Commercial PEP devices available in the market are expensive like Thera PEP, Resistex PEP Mask, Pari RC Cornet, Flutter and the Acapella, ranging from Rs 2500 to 6000 approximately. However an alternative form of PEP that is inexpensive and is being successfully used in New Zealand and Australian by physiotherapists in the treatment of COPD is bubble-PEP. Bubble-PEP is an easily constructed & low cost device consisting of a bottle, part-filled with water, and a piece of tubing, through which the patient exhales to create bubbles in the water (Mestriner et al 2009).

Despite bubble-PEP being commonly used in other countries, there are few / almost no studies stating the effectiveness of this particular device in India, to the best of our knowledge, indicating the need of undertaking this study. In India, Physiotherpists might not be sure of its effectiveness in clinical practice due to scarcity of evidence in Indian population. In developing country like India where many patients belong to low socioeconomic strata, and the study set up is going to be for the same category patients, low cost device if proven effective can be a boon to COPD patient for management of COPD. Hence this study was planned to be undertaken to prove its efficacy in COPD patients first in hospitalized patients and then it can also be extended to be used largely at the community level & also can be important part of home programme. The research paper is divided into various section. Section II discusses the literature survey of various researchers in detail. In section III, methods and tools used in our work is described. Statistical analysis is described in section VI. In section V and VI, result, discussion and conclusion are illustrated.

Literature Survey

Anders Bjerg et al. [1] highlight changes that have been occurring simultaneously in the occurrence of rhinitis, smoking, and a variety of indicators that are indicative of asthma. The study came to the conclusion that the severity of the link among rhinitis and asthma kept the same even if the occurrence of rhinitis rose significantly between the years 1990 and 2008 but the prevalence of the majority of asthma symptoms did not. The significant reduction in smoking is likely to have neutralized the driving influence of enhanced rhinitis on the occurrence of asthma symptoms. This was the hypothesis put up by researchers. This finding is one major indication that reduced smoking has favorable effects on the respiratory health of the public as a whole. Patients who are experiencing respiratory symptoms, especially dyspnea, may benefit from the focused use of spirometry for the identification of airflow obstruction, according to the recommendations made by Amir Qaseem et al. [2]. According to the ERS, ACP, ATS, and ACCP, therapy with inhaling bronchodilators may be utilized for COPD patients who are stable and who are experiencing respiratory symptoms and whose FEV1 is about 60% and 80% of what was predicted. Therapy with inhaled bronchodilators is recommended by the ERS, ACP, ATS, and ACCP for steady COPD patients who have respiratory issues and have a FEV1 that is projected to be 60%.

Positive expiratory pressure is a method that is utilized to increase sputum clearance amid acute exacerbations of COPD, as Christian R. Osadnik et al. [3] explained. Positive expiratory pressure is a method. It is not entirely apparent how PEP therapy affects medically important results when administered throughout acute exacerbations. The purpose of this study was to investigate the impact that PEP therapy has on the symptoms, QoL, and probability of future exacerbations experienced by patients diagnosed with AECOPD. According to research conducted by Giorgia Patrizio et al. [4] chronic obstructive lung illness is linked to an increased likelihood of developing pulmonary illnesses. This concern not only has a detrimental impact on the patients' QoL but also raises the overall societal and medical expenditures. As a consequence of this, there is a requirement for an efficient rehabilitation treatment that includes airway clearance. In this study, positive expiratory pressure therapy was compared with a new instrument for bronchial clearance called an Expiratory Flow Accelerator (EFA). According to research conducted by A. Aliverti et al. [5,] progressive hyperinflation is not the sole reason limiting exercise capacity in people who have stable COPD. An accurate assessment of the capacity of the chest wall can help determine the various patterns of pulmonary muscle activity that occur during physical activity.

There is presently no agreement on the criteria that should be used to diagnose COPD, as stated by B.R. Celli et al. [6]. Within the context of a population-based sample, this research assessed how the estimated prevalence of airflow limitation changed depending on which criteria of airway obstruction was used. Lung function and exacerbations of COPD have been linked to short-term air pollution exposure, as per research conducted by Tamara Schikowski et al. [7]. Furthermore, the impact of extended exposure to suspended solids from industrial and vehicles on COPD, as measured by lung function, has not been

investigated up until this point. The purpose of this research was to explore the effect that long-term air pollution exposure has on the respiratory symptoms as well as pulmonary function of women who are 55 years old. It paid particular attention to COPD as described by GOLD standards, and it also assessed the impact of air pollution on respiratory illnesses by using questionnaire data and by measuring lung function.

The research came to the conclusion that prolonged exposure to PM_{10} and NO_2, as well as residing in close proximity to a major road, can raise the likelihood of developing COPD and may have a negative impact on lung function. According to Denis E O'Donnell MD et al. [8] COPD is a major respiratory illness in Canada that is preventable and treatable but unfortunately remains underdiagnosed. The purpose of the present article from the Canadian Thoracic Society is to provide up-to-date information so that patients with this condition receive optimal care that is firmly based on scientific evidence. Important summary messages for clinicians are derived from the more detailed Update publication and are highlighted throughout the document. Three key messages contained in the update are: use targeted screening spirometry to establish a diagnosis and initiate prompt management (including smoking cessation) of mild COPD; improve dyspnea and activity limitation in stable COPD using new evidence-based treatment algorithms; and understand the importance of preventing and managing acute exacerbations, particularly in moderate to severe disease.

According to Jayson et al. [9], the acapella is a device that uses oscillatory PEP to clear away secretions in COPD patients. It does this by sending vibratory impulses into the lungs, which shakes the mucus plugs in the patient's lungs, which in turn makes the patient cough more effectively and expels more secretion. The diaphragm is the primary effective muscle of breathing, and diaphragmatic breathing assists in strengthening the diaphragm, which in turn reduces the amount of work and effort that is wasted while breathing. Breathing exercises that include pushing against a barrier while the patient is exhaling are a common kind of treatment for individuals who suffer from COPD, as stated by Monika Fagevik Olsén et al. [10]. (COPD). In this trial, persons who have COPD are given chest physiotherapy procedures that include PEP. These treatments are intended to treat and avoid pulmonary deterioration. COPD is a chronic disease that requires therapeutic approach that incorporates the expertise of multiple disciplines, with an increasing focus on patient self-management, as stated by Mohamed Shamakh et al. [11]. In the care of COPD, physiotherapists make use of a wide variety of airway clearance procedures, such as Acapella and PEP. PEP and acapella were found to enhance respiratory function in patients with intermediate COPD in this study. ACBT on its alone demonstrated improvements, albeit to a smaller extent than those shown by Acapella and PEP together. Patients with clinically stable COPD who were hospitalized to a lung rehabilitation center were studied by Annemie M.W.J. Schols et al. [12] to investigate the occurrence of body mass reduction as well as its characteristics. They conducted a series of tests with the goal of determining which of two measures of depletion, body mass or fat-freemass, is better at predicting levels of physical disability.

In patients who have an AECOPD, Brigitte Eastwood et al. [13] examine the outcomes of bubble-PEP with those of TheraPEP® and standardised

physiotherapy. In addition, they evaluate the patients' levels of fulfillment with the intervention and determine whether or not it will be possible to recruit participants. This study covers the procedures that were used and the challenges that were encountered when carrying out the clinical trial. These difficulties included concerns around the recruiting of participants, interventions, evaluation schedule, and selection of outcome measures. Bernd Lamprecht et al. [14] findings back with the hypothesis that never smokers make up a sizeable proportion of COPD sufferers.

According to their findings, a higher risk for COPD within never smokers is connected with a number of factors in regard to advancing age, including a history of asthma and, in the case of women, a lower level of education. According to Graciela E. Silva et al. [15], for a number of years, asthma and COPD have been treated as separate entities, each with their own unique clinical path. Nevertheless, with time, the two diseases may have characteristics that are remarkably similar to one another, regardless the fact that at the point of diagnosis they have separate physiologic aspects and various risk considerations. The purpose of this research is to investigate whether or not there is a connection between having asthma as diagnosed by a medical professional and having a higher risk of developing COPD later in life among a group of 3,099 adults living in Tucson, Arizona. The study came to the conclusion that having asthma that has been diagnosed by a physician is substantially connected with an elevated risk for chronic bronchitis, emphysema, and COPD.

COPD is a major source of death and morbidity around the world, according to research that was conducted by Raquel Marcoa et al. [16]. This illness has been the focus of the GOLD project's efforts to raise awareness as well as develop management and prevention strategies. This study assessed how patients with COPD are recategorized using the GOLD 2017 system (in comparison to the GOLD 2011 system), determined the degree of agreement among classifications in regards to allocation to classifications, and compared the ability of every categorization to forecast future exacerbations. It has been suggested by Ana M. Menezes et al. [17] that the GOLD 2007 classification displays greater consistency over the course of time in comparison to the GOLD 2013 classification. As per GOLD 2013/2017 categorization, there were no discernible patterns found either the distribution of sufferers or the incidence-mortality ratios.

The researchers Yu-He Hu et al. [18] came to the conclusion that in comparison to the GOLD from 2011, the GOLD from 2017 categorized more individuals into Groups A and B. These groups include patients whose lung function is much worse and who have a higher BODE index. According to the exhaustive analysis of the new categorisation, Groups B and D can have a more severe case of the illness. Furthermore, future research will need to investigate whether or not the novel grading system is accurate in determining a patient's prognosis and whether or not it provides useful information regarding the administration of medications. According to Stephen Milan et al. [19] the pharmacologic treatment of acute exacerbation COPD is considered to be standard practice. The purpose of this research is to investigate whether or not the addition of treatment with a PEP device either with or without an oscillatory mechanism to conventional care leads in a shorter length of stay (LOS) in the hospital for individuals who are

admitted for AECOPD. It has been shown that patients treated for AECOPD may have a shorter length of stay in the hospital if they receive supplementary therapy using a PEP device rather than normal care. Although preliminary data indicates that the inclusion of an oscillatory mechanism component to PEP therapy will result in an additional reduction in hospital LOS, more extensive multicenter randomized controlled studies are required to verify these findings. There is a 100-fold discrepancy between the usage of carbocisteine and OPEP equipment in COPD, with significantly fewer devices prescribed than are part of the phenotypes doctors perceive them to be beneficial in. This was observed by Ruth Barker et al. [20]. The fact that physiotherapists have varying perspectives on therapy thresholds underscores the importance of doing studies into the efficacy of OPEP equipment in the context of certain patient morphologies.

Methods and Tools

COPD is the target population since latest stats reveal India is evolving in demographic trends, industrialization, socioeconomic profile, contamination, health burden, illness pattern, dominant-disorder-composition, morbidity, and fatality factors. Like China, India has a high COPD death rate that is rising. Similar study with 20 patients not practicing regular chest physiotherapy were enrolled in a randomized crossover trial of 3 months of twice daily chest physiotherapy using an oscillatory positive expiratory pressure device compared with 3 months of no chest physiotherapy. The outcome measures were the Leicester Cough Questionnaire (LCQ). Additional outcomes included 24-h sputum volume, forced expiratory volume in 1 s (FEV1), forced vital capacity (FVC), forced expiratory flow at 25–75% of FVC,(FEF25–75%), maximum inspiratory pressure (MIP), maximum expiratory pressure (MEP), exercise capacity, sputum microbiology and St George's Respiratory Questionnaire (SGRQ). The treatment effect in the study was estimated using the differences of the pairs of observations from each patient. The study showed significant improvement in all domains and total LCQ score with regular chest physiotherapy sputum volume increased significantly with regular chest physiotherapy as did exercise capacity and SGRQ total score No significant differences were seen in sputum bacteriology, FEV1, FVC, FEF25–75%, MIP or MEP.[14]

Study design

An Experimental study

Study Setting

In Patient Department (IPD) of Pulmonary Medicine department of general medical hospital, Pune.

Study Duration

4 years

Sampling technique

Computerized randomization.

Inclusion Criteria

- Moderate (FEV1 50-80% predicted) and severe (FEV1 30-49%predicted) COPD as per GOLD (Global Initiative for Obstructive Lung Disease) criteria.
- Both male & female patients above 40 yrs

Exclusion Criteria

- Patients already using any form of PEP at home.
- Receiving bi-level positive airway pressure treatment
- Barotrauma,
- Undrained Pneumothorax,,
- Active Haemoptysis
- Any other medical condition restricting the patient participation

Patients were divided into group A,B,C by computerised randomization.

- **Group A**- Conventional treatment
- **Group B**–Conventional treatment + Acapella
- **Group C**–Conventional treatment + Bubble PEP

Statistical Analysis

- In order to provide a concise overview of the information that is gathered, descriptive statistics such as frequency, percentage, mean, standard deviation, and CI was calculated.
- The analysis of variance known as Anova was used to compare the means of two distinct groups.
- A paired t-test was used to compare the means of the two different dependent groups.
- In order to determine whether or not there is a correlation between two qualitative variables, we have utilized Pearson's chi-square test.

Results and Discussion

We consider a total of 174 participant including male and females whose age is more than 40 years. There was drop out of 6 patients due to various reasons like, discharge against medical advice, unwillingness to continue the treatment, shifting to ICU due to other medical conditions. Total 168 patients were statistically analyzed.

Table 1
Pre-Post Analysis Using Paired t-Test

Heart Rate		Mean	N	SD	SE	% Change	t-Value	P-Value	Result
Group A	Pre	88.77	56	12.08	1.61	14.97	12.482	<0.05	Sig
	Post	75.48	56	8.14	1.09				
Group B	Pre	91.27	56	12.23	1.63	19.00	16.526	<0.05	Sig
	Post	73.93	56	7.28	0.97				
Group C	Pre	91.89	56	12.37	1.65	16.77	12.431	<0.05	Sig
	Post	76.48	56	7.58	1.01				

Since observations are quantitative and normally distributed. Paired t-test is carried out to test significance in pre test and post test mean value is Group A, Group B and Group C. From above table we can observe that P-Value for Group A, Group B and Group C is less than 0.05. Hence, we can conclude that, there is significant effect observed in Group A, Group B and Group C.

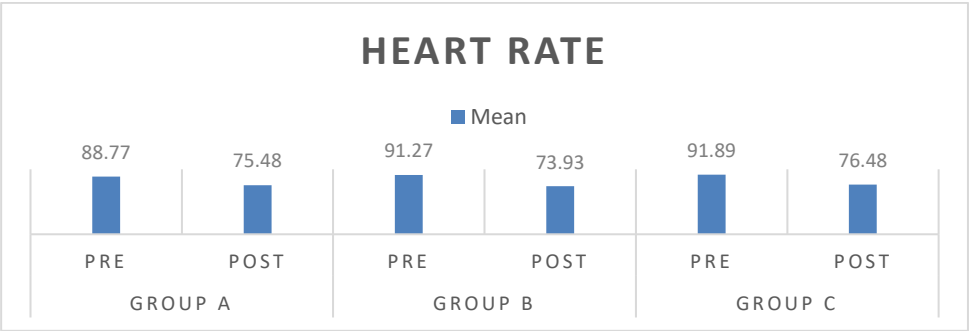

Table 2
Comparison Among Three Groups using Analysis of Variance (ANOVA) Test

	N	Mean Diff	SD	SE	95% C.I. for Mean Diff		F-Value	P-Value
					LL	UL		
Group A	56	13.43	7.72	1.03	11.36	15.50	4.758	0.010
Group B	56	17.73	6.90	0.92	15.88	19.58		
Group C	56	16.20	7.80	1.04	14.11	18.28		

One Way ANOVA test is carried out for comparison among three groups. From above table we can observe that, P-Value is less than 0.05. Hence, we can conclude that, there is significant difference among three groups. Further we can observe that, mean difference for Group B is greater than Group A and Group C. Hence, we can conclude that, effect observed in Group B is more than Group A and Group C.

Table 3
Pairwise comparison using Bonferroni Post-hoc Analysis

I	II	Mean Difference (I-II)	Std. Error	P-Value
Group A	Group B	-4.30357*	1.41	0.008
Group A	Group C	-2.77	1.41	0.156
Group B	Group C	1.54	1.41	0.837

Post-hoc analysis is carried out using Bonferroni method for pair wise comparison between Group A, Group B and Group C. Above table shows that, there is significant difference between Group A and Group B.

Table 4
Pre-Post Analysis Using Paired t-Test

SBP		Mean	N	SD	SE	% Change	t-Value	P-Value	Result
Group A	Pre	133.71	56	6.61	0.88	2.70	7.402	<0.05	Sig
	Post	130.11	56	6.17	0.82				
Group B	Pre	133.89	56	6.85	0.92	2.75	7.299	<0.05	Sig
	Post	130.21	56	6.10	0.81				
Group C	Pre	134.93	56	8.29	1.11	2.13	2.895	<0.05	Sig
	Post	132.05	56	10.01	1.34				

Since observations are quantitative and normally distributed. Paired t-test is carried out to test significance in pre test and post test mean value is Group A, Group B and Group C. From above table we can observe that P-Value for Group A, Group B and Group C is less than 0.05. Hence, we can conclude that, there is significant effect observed in Group A, Group B and Group C.

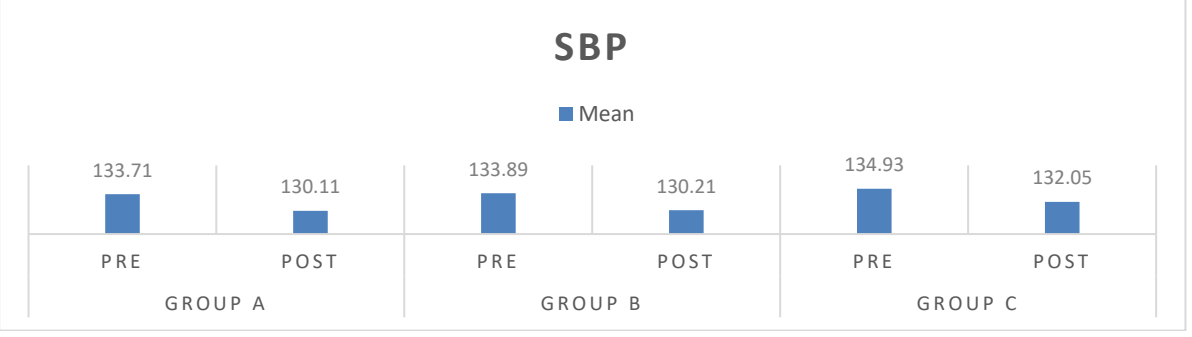

Table 5
Comparison Among Three Groups using Analysis of Variance (ANOVA) Test

	N	Mean Diff	SD	SE	95% C.I. for Mean Diff		F-Value	P-Value
					LL	UL		
Group A	56	4.61	2.22	0.30	4.01	5.20	3.411	0.035

Group B	56	4.54	2.66	0.35	3.82	5.25		
Group C	56	6.09	5.09	0.68	4.73	7.45		

One Way ANOVA test is carried out for comparison among three groups. From above table we can observe that, P-Value is less than 0.05. Hence, we can conclude that, there is significant difference among three groups. Further we can observe that, mean difference for Group C is greater than Group A and Group B. Hence, we can conclude that, effect observed in Group C is more than Group A and Group B.

Table 6
Pairwise comparison using Bonferroni Post-hoc Analysis

I	II	Mean Difference (I-II)	Std. Error	P-Value
Group A	Group B	0.07	0.67	1.000
Group A	Group C	-1.48	0.67	0.086
Group B	Group C	-1.55	0.67	0.046

Post-hoc analysis is carried out using Bonferroni method for pair wise comparison between Group A, Group B and Group C. Above table shows that, there is significant difference between Group B and Group C.

Table 7
Pre-Post Analysis Using Paired t-Test

DBP		Mean	N	SD	SE	% Change	t-Value	P-Value	Result
Group A	Pre	80.75	56	6.79	0.91	3.63	3.733	<0.05	Sig
	Post	77.82	56	6.33	0.85				
Group B	Pre	81.29	56	6.42	0.86	5.49	5.933	<0.05	Sig
	Post	76.82	56	6.16	0.82				
Group C	Pre	82.55	56	6.52	0.87	4.56	6.254	<0.05	Sig
	Post	78.79	56	6.95	0.93				

Since observations are quantitative and normally distributed. Paired t-test is carried out to test significance in pre test and post test mean value is Group A, Group B and Group C. From above table we can observe that P-Value for Group A, Group B and Group C is less than 0.05. Hence, we can conclude that, there is significant effect observed in Group A, Group B and Group C.

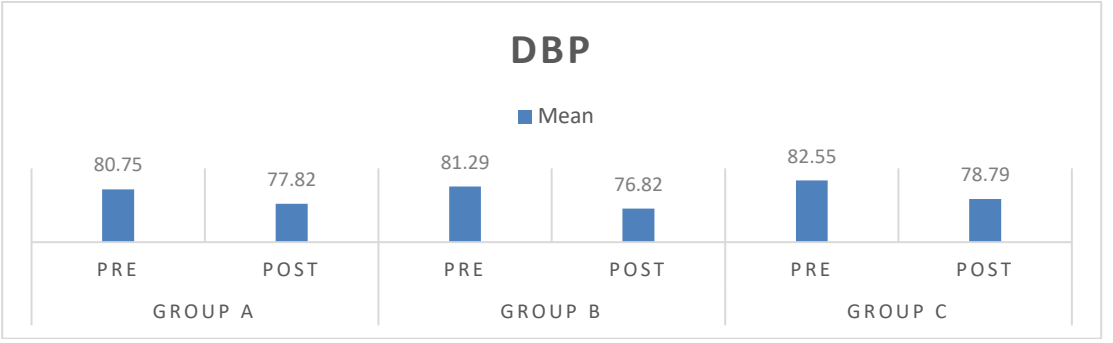

Table 8
Comparison among Three Groups using Analysis of Variance (ANOVA) Test

	N	Mean Diff	SD	SE	95% C.I. for Mean Diff		F-Value	P-Value
					LL	UL		
Group A	56	4.93	4.30	0.57	3.78	6.08	1.021	0.362
Group B	56	5.61	4.47	0.60	4.41	6.80		
Group C	56	4.48	3.79	0.51	3.47	5.50		

One Way ANOVA test is carried out for comparison among three groups. From above table we can observe that, P-Value is greater than 0.05. Hence, we can conclude that, there is no significant difference among three groups.

Table 9
Pairwise comparison using Bonferroni Post-hoc Analysis

I	II	Mean Difference (I-II)	Std. Error	P-Value
Group A	Group B	-0.68	0.79	1.000
Group A	Group C	0.45	0.79	1.000
Group B	Group C	1.13	0.79	0.473

Post-hoc analysis is carried out using Bonferroni method for pair wise comparison between Group A, Group B and Group C. Above table shows that, there is no significant difference between Group A, Group B and Group C.

Table 10
Pre-Post Analysis Using Paired t-Test

Respiratory Rate		Mean	N	SD	SE	% Change	t-Value	P-Value	Result
Group A	Pre	27.36	56	3.82	0.51	27.61	16.031	<0.05	Sig
	Post	19.80	56	3.20	0.43				
Group B	Pre	27.84	56	3.34	0.45	34.19	29.256	<0.05	Sig
	Post	18.32	56	2.67	0.36				
Group C	Pre	28.70	56	4.69	0.63	36.84	21.427	<0.05	Sig
	Post	18.13	56	2.74	0.37				

Since observations are quantitative and normally distributed. Paired t-test is carried out to test significance in pre test and post test mean value is Group A, Group B and Group C. From above table we can observe that P-Value for Group A, Group B and Group C is less than 0.05. Hence, we can conclude that, there is significant effect observed in Group A, Group B and Group C.

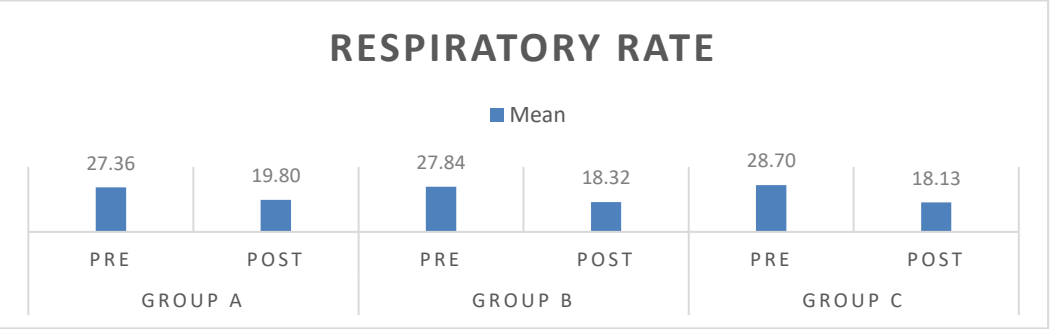

Table 11
Comparison Among Three Groups using Analysis of Variance (ANOVA) Test

	N	Mean Diff	SD	SE	95% C.I. for Mean Diff		F-Value	P-Value
					LL	UL		
Group A	56	7.59	3.45	0.46	6.67	8.51	12.221	0.000
Group B	56	9.52	2.43	0.33	8.87	10.17		
Group C	56	10.57	3.69	0.49	9.58	11.56		

One Way ANOVA test is carried out for comparison among three groups. From above table we can observe that, P-Value is less than 0.05. Hence, we can conclude that, there is significant difference among three groups. Further we can observe that, mean difference for Group C is greater than Group A and Group B. Hence, we can conclude that, effect observed in Group C is more than Group A and Group B.

Table 12
Pairwise comparison using Bonferroni Post-hoc Analysis

I	II	Mean Difference (I-II)	Std. Error	P-Value
Group A	Group B	-1.92857*	0.61	0.006
Group A	Group C	-2.98214*	0.61	0.000
Group B	Group C	-1.05	0.61	0.261

Post-hoc analysis is carried out using Bonferroni method for pair wise comparison between Group A, Group B and Group C. Above table shows that, there is significant difference between Group A and Group B also between Group A and Group C.

Table 13
Pre-Post Analysis Using Paired t-Test

SPO2		Mean	N	SD	SE	% Change	t-Value	P-Value	Result
Group A	Pre	95.63	56	1.88	0.25	2.11	-11.741	<0.05	Sig
	Post	97.64	56	1.76	0.24				
Group B	Pre	95.61	56	1.50	0.20	3.44	-19.071	<0.05	Sig
	Post	98.89	56	1.09	0.15				
Group C	Pre	95.07	56	1.96	0.26	4.09	-15.784	<0.05	Sig
	Post	98.96	56	1.09	0.15				

Since observations are quantitative and normally distributed. Paired t-test is carried out to test significance in pre test and post test mean value is Group A, Group B and Group C. From above table we can observe that P-Value for Group A, Group B and Group C is less than 0.05. Hence, we can conclude that, there is significant effect observed in Group A, Group B and Group C.

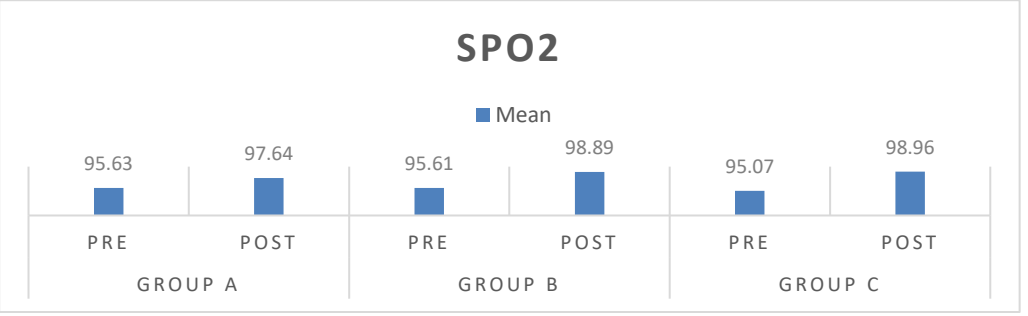

Table 14
Comparison Among Three Groups using Analysis of Variance (ANOVA) Test

	N	Mean Diff	SD	SE	95% C.I. for Mean Diff		F-Value	P-Value
					LL	UL		
Group A	56	2.05	1.23	0.16	1.72	2.38	22.442	0.000
Group B	56	3.29	1.29	0.17	2.94	3.63		
Group C	56	3.89	1.85	0.25	3.40	4.39		

One Way ANOVA test is carried out for comparison among three groups. From above table we can observe that, P-Value is less than 0.05. Hence, we can conclude that, there is significant difference among three groups. Further we can observe that, mean difference for Group C is greater than Group A and Group B. Hence, we can conclude that, effect observed in Group C is more than Group A and Group B.

Table 15
Correlation coefficient between age and previous hospitalization

		Previous Hospitalization
Age	Pearson Correlation	0.662
	P-Value	0.000
	N	168

Karl Pearson's correlation coefficient is calculated to test correlation between age and previous hospitalization. Above table shows correlation coefficient between age and previous hospitalization is 0.662. We can conclude that, there is positive correlation between age and previous hospitalization.

Conclusion

Due of clinical data, the condition of COPD and associated medical and non-medical therapies may now be avoided. In developing countries like India, where the majority of COPD patients originate from low socioeconomic backgrounds, there are significant contextual barriers to treating these patients with appropriate therapy. These sufferers' social, psychological, financial, and professional needs should be met adequately, and reformation of current healthcare policy is strongly suggested. In India, an effective program to combat home pollution, workplace exposures, and chewing tobacco and cigarettes should be implemented. It is critical to educate COPD patients about the need of physical activity as part of pulmonary rehabilitation. COPD treatment necessitates a multi-disciplinary approach as well as personalization of these medicines. Various non-pharmacological therapies should be advocated as an adjunct to pharmaceuticals because they have previously been demonstrated to be effective in preventing impairments, overcoming malnutrition, and minimizing exacerbations, all of which enhance HRQOL in chronic respiratory illnesses. Future innovation has to be cost-effective, thorough, multifaceted, integrated, and centered on the individual, non-pharmacological ways, such that the vast majority of people can receive treatment and benefit.

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