

## Effect of Chest Physiotherapy in Acute Exacerbation Chronic Obstructive Disease: - A Comparative Study

Dr. Minhaj Tahir<sup>1</sup>, Dr. Tahzeeb Fatima<sup>2</sup>, Dr. Devendra Trivedi<sup>3</sup>

Assistant Professors<sup>1, 2, 3</sup>

Dept of Physiotherapy, Rama University, Kanpur, India

---

### Abstract

**Objective:** To find out the Effect of Chest Physiotherapy in Acute Exacerbation Chronic Obstructive Disease (COPD):- A Comparative Study

**Material and Methods:** - The total 30 Patient suffering from chronic obstructive pulmonary disease was randomly allocated into two groups, experimental group (n= 15) treated with active chest physiotherapy techniques along with medical treatment and control group (n=15) treated with only medical treatment. Both groups was assessed using visual analogue scale (VAS) for breathlessness, Peak expiratory flow rates (PEFR) and Oxygen saturation level (SaO<sub>2</sub>) before and after 2 weak treatment program.

**Result:** - Patient in both groups reported significant improvement after 2 weeks of treatment program compared to baseline on all outcome measure except PEFR that was not significantly improve in control group. Compared to control group, experimental group showed more improvement on PEFR and on VAS for breathlessness .It was three time better results over the control group.

**Conclusion:** - Active chest physiotherapy techniques along with medical treatment are more effective in acute exacerbation of chronic obstructive pulmonary disease then medical treatment alone.

---

Date of Submission: 06-05-2020

Date of Acceptance: 20-05-2020

---

### I. INTRODUCTION

**Chronic Obstructive Pulmonary disease (COPD)** is a type of obstructive Lung disease characterized by long term breathing Problems and poor airflow<sup>1,8</sup> The main symptoms include shortness of breath and cough with sputum production. COPD is progressive disease, meaning it typically worsens over time.(wiki9) Eventually everyday's activity such as walking or getting dressed become difficult.<sup>3</sup> Chronic bronchitis and emphysema are older terms used to different type of COPD.<sup>10</sup>The term chronic bronchitis is still used to define a productive cough that is present for at least three month each year for two year.<sup>1</sup> Those with such a cough are at a greater risk of developing COPD. The term emphysema is also used for the abnormal presence of air or other gas within tissues.

Airflow obstruction can be related to any or all of the following problems:

- Retained secretions
- Inflammation of the mucosal lining of airway walls
- Bronchial constriction related to increased tone or spasm of Bronchial smooth muscle
- Weakening of the support structure of airway walls
- Air sac destruction and air sac over inflation with destruction of surfactant.

Chronic obstructive pulmonary disease is a major public health problem and has a significant effect on the elderly. It is often associated with multiple co morbidities.

The most common cause of COPD is Tobacco Smoking, with a smaller number due to factors such as air pollution and genetics.<sup>2</sup> In developing word, one of the common cause of air pollution is poorly vented heating and cooking fires. Long term exposure to these irritants causes an inflammatory response in the Lungs, resulting in narrowing of the small airways and breakdown of lungs tissue.<sup>5</sup>The diagnosis is based on poor airflow as measured by lung function test.<sup>4</sup> In contrast Asthama, the airflow reduction does not improve much with the use of bronchodilators.<sup>3</sup>

Most cases of COPD can be prevented by reducing exposure to risk factors. This include decreasing rates of smoking and improving indoor and outdoor air quality.<sup>3</sup> While treatment can slow worsening, no cure is known.<sup>3</sup>COPD treatment include smoking cessation, vaccination, respiratory rehabilitation, and often inhaled bronchodilators and steroids.<sup>2</sup> Some people may benefit from long-term Oxygen therapy or lungs transplantation.<sup>5</sup> In those who have acute worsening, increased use medications antibiotics, steroids and hospitalization may be needed.<sup>2</sup>

The most common of COPD are shortness of breath, and a cough that produces sputum. These symptoms are present for a prolonged period of time and typically worsen over time.<sup>5</sup> It is unclear whether different types of COPD exist,<sup>2</sup> while previously divided into emphysema and chronic bronchitis, emphysema is only a description of lung changes rather than a disease itself, and chronic bronchitis is simply descriptors of symptoms that may or may not occur with COPD.

As of 2015, COPD affected about 174.5 million people.<sup>6</sup> It typically occurs in people over the age of 40.<sup>3</sup> Males and Females are affected equally commonly. In 2015, it resulted in 3.2 million deaths; up from 2.5 million deaths in 1990.<sup>7</sup> More than 90% of these deaths occur in developing countries. The number of deaths is projected to increase further because of higher smoking rates in the developing country, and an ageing population in many countries. It resulted in an estimated economic cost of & 2.1 trillion in 2020.

The management focuses not only on medical treatment but stressing healthy life style encouragement for physical activity level and overall healthy related quality.

Chest physiotherapy is a crucial part of respiratory disease management that facilitates removal of secretion from lungs, improving lung volume, breathing re-education and respiratory muscle training. Chest physiotherapy includes active techniques, passive techniques and advanced techniques for improving lung function in many dimensions. Manual or passive chest physiotherapy techniques are Percussion, Vibration, shaking, rib spring and postural drainage while active techniques include active cycle breathing techniques [ACBT], Autogenic Drainage, Huffing Coughing and Flutter Devices.

Active cycle breathing technique (ACBT) which is a form of ACTs include deep breathing exercise, thoracic expansion exercise and forced expiratory technique. The ACBT correct breathing pattern and it strengthens the respiratory muscle with airway clearance; these all in a combination improve respiratory functions in COPD patients.<sup>11</sup>

Previously the physiotherapy management of COPD only includes mobility and transfer training while chest physiotherapy for improving the lungs was less focused.<sup>12</sup> Theoretically removal of sputum from the lung airways and strengthening of respiratory muscles through chest physiotherapy techniques can improve shortness of breath, oxygen saturation and overall quality of life in such patients. This technique reported safe and effective in removal of secretion from lungs due to COPD.<sup>13</sup> Manual technique/ passive technique considered less safe for COPD patients compared to active techniques due to its harmful effect like Bronchospasm, atelectasis, arterial unsaturation and hemodynamic disturbance.

## **II. MATERIAL AND METHODS**

There was carried out 30 patients with 15 patients in each group. Both of the study groups received medical treatment but one of the groups (experimental group) received chest physiotherapy additionally. The trial duration was 2 weeks. The patients allotted in to 2 groups randomly by making computer generated sequences. The physiotherapist only treated the patients with chest physiotherapy techniques and did not play a role in patients assessment was given independently to physiotherapy treatment.

The patients enrolled in the study on the following eligibility criteria. 1) Male and female patient 2) 45-60 years age 3) Hospitalized patients diagnosed by a medical doctor as COPD with acute exacerbation as a primary diagnosis and chronic bronchitis as a secondary diagnosis 4) Patients with pronounced symptoms of sputum retention with coughing 5) Ability to tolerate active techniques 6) Well oriented patients. The patients were excluded on following criteria 1) severe attack with longer expected hospital stay up to 2 weeks 2) cardiac or any other condition that contra-indicated chest physiotherapy 3) COPD with secondary diagnosis of emphysema 4) any other associated lung pathological condition 5) Pain with more than 2 points on visual analogue scale while doing active techniques 6) Patients with history of lung surgery.

The Patient was assessed on inclusion and exclusion criteria by a medical doctor who was the part of the study. The entire patient was treated at Medical ward. A Previous medical history was taken for previous attack of acute exacerbation and associated length of Hospital stay. There were three outcome measures used in this study. The Peak expiratory flow rates (PEFR) measured with help of flow meter, the oxygen saturation (SaO<sub>2</sub>) measured by pulse oxymetry and breathlessness level evaluated by 100 mm visual analogue scale (VAS).

The experimental group was treated with chest physiotherapy along with medical treatment. The ACBTs was delivered to patients in the sitting comfortable position or half lying position on the hospital bed. The technique was applied in following steps.

1. Breathing control exercise: this step consisted breath in through the nose and breathe out through pursed lips, while the abdomen was supposed to move up with inspiration and move down with expiration. The step repeated for 8-10 times.

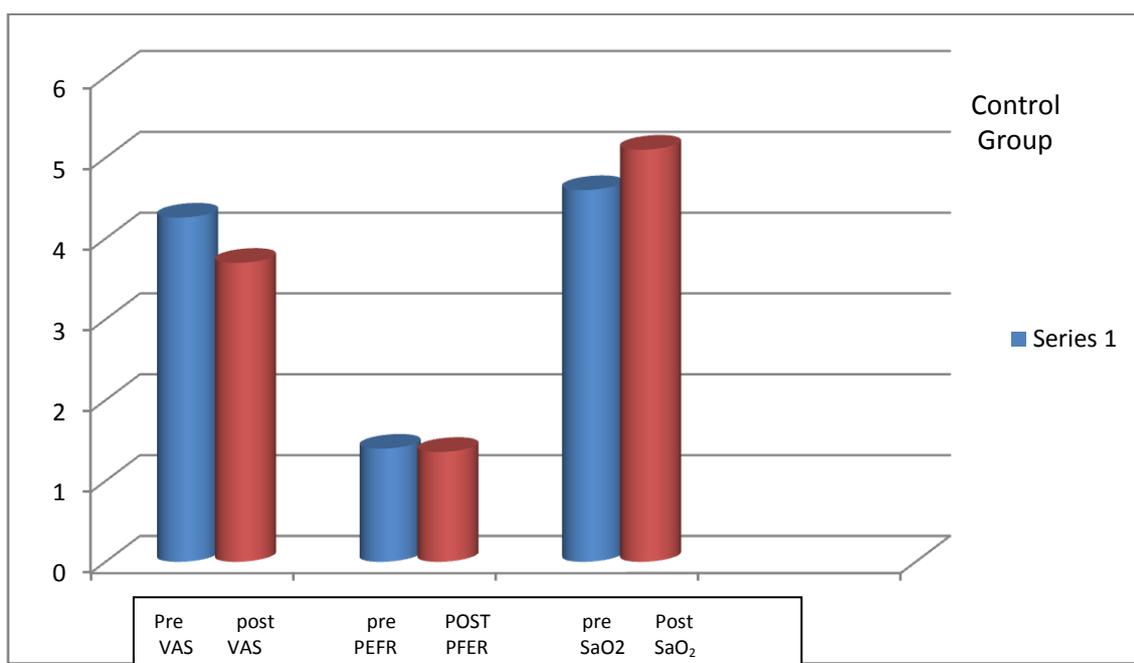
2. Thoracic expansion exercise: this step consisted of full inspiration with holding air inside lungs for 1-3 seconds and then full end with pursed lips. It was performed 3-4 times on patients.

3. Forced expiration technique includes 1-3 huff followed by forceful cough for 2- 3 times. Step 1 was considered as a relaxation techniques and used it at any time for correction breathlessness. Total time taken for whole procedure was 30-40 minutes with repetitions for above steps 11.

### III. RESULTS

The Means were computed for age and previous number of acute exacerbations. Descriptive statistic: The mean age of the subjects in group A was  $53 \pm 3.7$  year while in group B mean age was  $55 \pm 3.8$  years. The previous numbers of acute exacerbation of COPD for group A was  $3.0 \pm 0.84$  times and in group B it was  $2.6 \pm 0.62$ times. The sample constituted on n=8 men, =7 women in group A and n=9 men, n=6 women in group B.

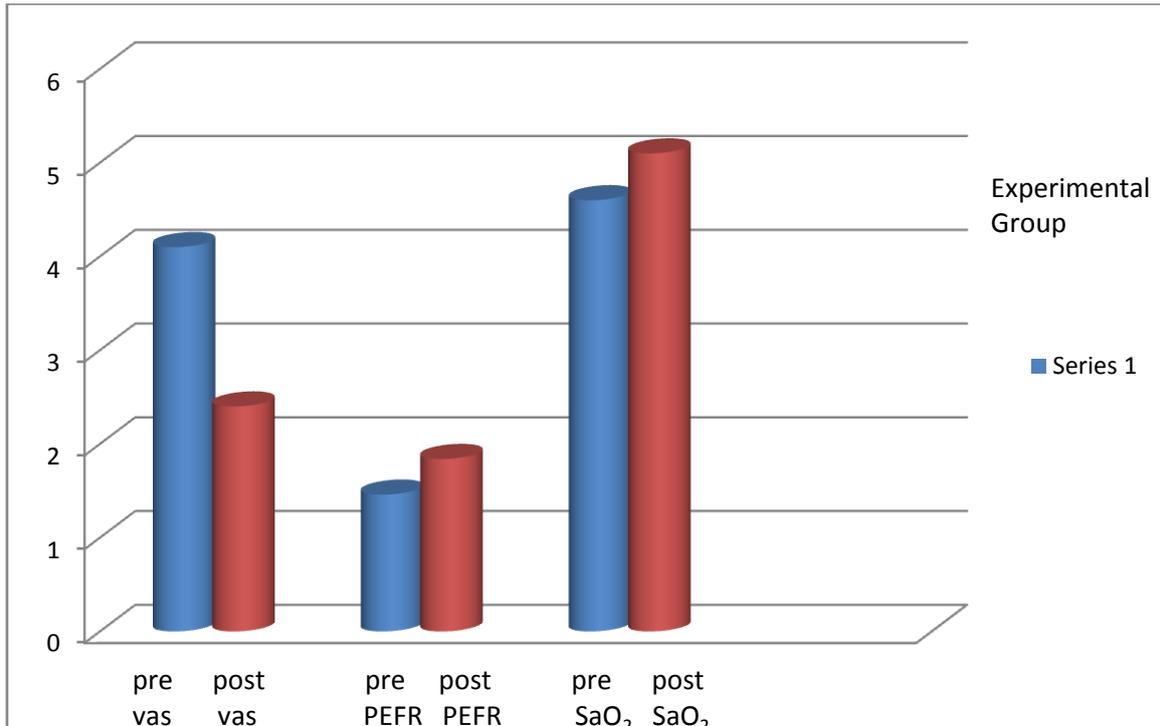
The baseline means of VAS, SaO<sub>2</sub> and PEFR of both groups indicates that the patients were similar on baseline.(F1 f2) The within group analysis for VAS, SaO<sub>2</sub> and PEFR was done periods t-test in both control and experimental group for was  $0.40 \pm 0.63$  with p=0.003 for PEFR  $2.00 \pm 25.89$  with p= 0.76 and for SaO<sub>2</sub>  $-3.7 \pm 3.10$  with p= 0.00 using 95% CL. (F2 ) Using independent t-test ,the means difference for VAS , SaO<sub>2</sub> and PEFR between groups (group A and B) Using the 95% CI was 1.53,-6.7 and -25.65 respectively with statistically significant value (P< 0.05).



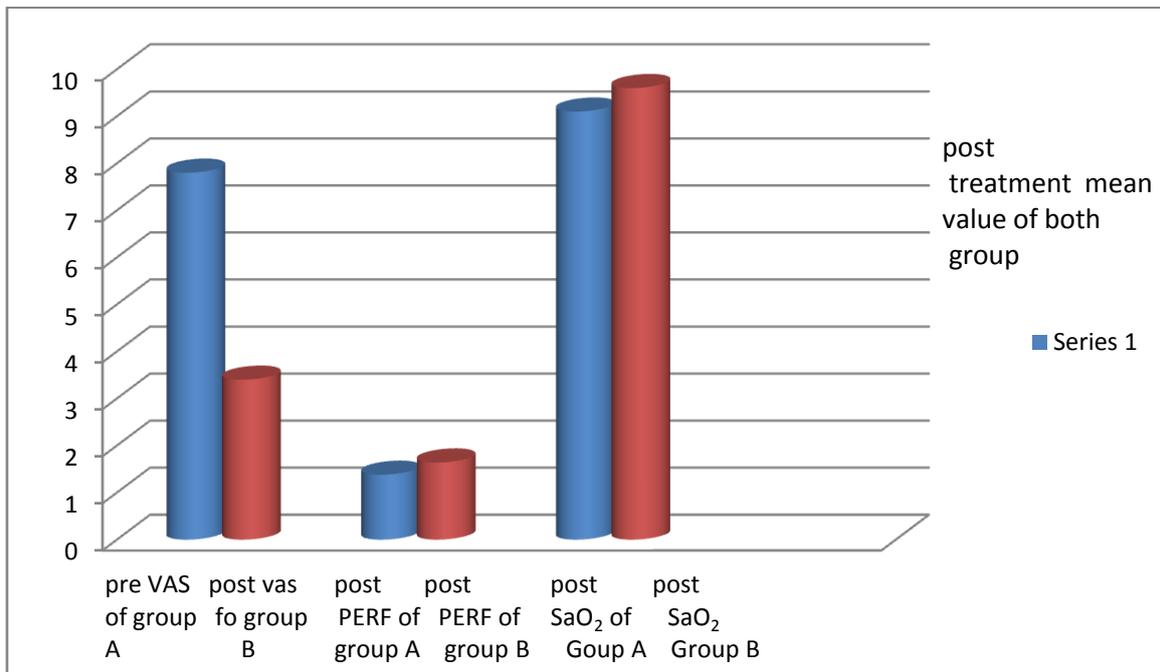
Pre and post treatment volume of

1. VAS for breathlessness 2. Peak expiratory flow rates 3. SaO<sub>2</sub>

Figure 1: Means of VAS, PEFR and SaO<sub>2</sub> on baseline and after treatment (Control Group)



Pre and post treatment volume of  
 2. VAS for breathlessness 2. Peak expiratory flow rates 3. SaO<sub>2</sub>  
**Figure 2: Means of VAS, PEFR and SaO<sub>2</sub> on baseline and after treatment (Experimental group)**



**Figure 3: Means of Vas, PEFR and SaO<sub>2</sub> post treatment for control and experimental group.**

#### IV. DISCUSSION

The present study was conducted to strengthen the evidence regarding effect of chest physiotherapy in acute exacerbation of COPD. The research was about the effectiveness of ACBTs in COPD acute exacerbation. This study concluded for effectiveness for chest physiotherapy for COPD patients presented with acute exacerbation specially in improving peak expiratory flow rates. Smith J and Aggarwal R et al conducted study on similar aspect and both of them reported for significant improvement in experimental group (received chest physiotherapy with medical treatment) on SaO<sub>2</sub> and PEFR compared to control group received medical

treatment only.<sup>7,14</sup> One of the systemic reviews agreed for use of both active and passive techniques in acute exacerbation of COPD but did not favor it on large scale.<sup>15</sup>

The inconsistent result in that area may be due to the variety of outcome measures used and their relative sensitivity differences for chest physiotherapy techniques. The physiological improvements in SaO<sub>2</sub> peak expiratory rates are associated with release of sputum from chest, deep penetration of alveolar air into lungs and with correcting the breathlessness and exercise endurance, these all can be carried out by chest physiotherapy techniques and these were mechanisms considered for effectiveness of chest physiotherapy in cystic fibrosis.<sup>16</sup> In contrast, now there is rising evidence to support pulmonary rehabilitation during or shortly after acute exacerbation of COPD.<sup>17</sup> A recent meta-analysis demonstrated significant evidence for improvements in exercise capacity and health-related quality of life associated with chest physiotherapy after acute exacerbation of COPD. They also suggested pulmonary rehabilitation for patients who are clinically unstable.<sup>14</sup>

The baseline level of dyspnoea while performing daily living activities was almost unchanged, which was a favorable result, considering the nature and expected prognosis of COPD. The dyspnoea did not adversely affect physical tolerance, objectified by a six-minute walk test.

There is sufficient evidence in the experimental group that chest physiotherapy improves mucus transport but the mucus was not clear in which groups of patients not receiving chest physiotherapy. The amount of expectorate sputum might predict which patients are likely to benefit from chest physiotherapy, and that CPT should be applied in patients who expectorate more than 25 mL/d during the session. The patients most likely to benefit from secretion clearance techniques are those with objective signs of secretion retention.

They followed patients 12 months with one group receiving medical treatment only and another group receiving chest physiotherapy additionally. Their outcome measures were perception of dyspnoea and chronic respiratory problems. They reported that patients can achieve worthwhile benefits through physiotherapy and these benefits can persist for 2 years almost.<sup>18</sup>

## V. CONCLUSION

Chest physiotherapy is more effective in improving breathlessness level, SaO<sub>2</sub> and peak expiratory flow rates in acute exacerbation of COPD along with standard medical treatment than medical treatment alone. The estimated effect of chest physiotherapy in COPD patients is about three times more pronounced with medical treatment compared to medical treatment alone.

## REFERENCES

- [1]. <sup>AB C D</sup> Vogelmeier CF, Criner GJ, Martinez FJ, Anzueto PJ, Bourbeau J, et al (April 2017). "Global strategy for the diagnosis, management and prevention of chronic obstructive pulmonary disease 2017 report: GOLD Executive Summary".
- [2]. Decramer M, Janssens W, Miravitlles M (April 2012) "Chronic Obstructive Pulmonary disease". *Lancet*. 379 (9823):1341-51.
- [3]. "Chronic Obstructive Pulmonary disease (COPD) Fact sheet No 315. WHO January 2015. Archived from the original on 4 March 2016. Retrieved 4 March 2016.
- [4]. Nathell L, Nathell M, Malmberg P, Larsson K, (December 2007). "COPD Diagnosis related to different guidelines and spirometry techniques". *Respiratory research*. 8(1): 89. doi:10.1186/1465-9921-8-89. PMC 2217523. PMID 18053200.
- [5]. Rabe KF, Hurd S, Anzueto A, Barnes PJ, Buist SA, Calverley P, Fukuchi Y, Jenkins C, Rodriguez-Roisin R, Van Weel C, Zielinski J (September 2007). "Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease: GOLD executive summary".
- [6]. GBD 2015 Disease and injury incidence and prevalence collaborators (October 2016). "Global, regional, and national incidence, prevalence, and years lived with disability for 320 diseases and injuries, 1990-2015: a systematic analysis for the global burden of disease study 2015". *Lancet*. 388 (10053): 1545-1602. Doi: 10.1016/S0140-6736(16)31678-6. PMC 5055577. PMID 27733282.
- [7]. GBD 2015 Mortality and cause of death collaborators (October 2016) "Global regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980-2015: a systematic analysis for the global burden of disease study 2015". *Lancet*. 388 (10053):1459-1544. Doi: 10.1016/S0140-6736(16)31012-1. PMC 5388903. PMID 27733281.
- [8]. Roversi S, Corbetta L, Clini E (May 2017). "Gold 2017 recommendation for COPD patients: towards a more personalized approach." *COPD research and practice*. 3. Doi: 10.1186/s40749-0024-y.
- [9]. Vesbo J (2013). "Definition and overview" Global strategy for diagnosis, management, and prevention of chronic obstructive pulmonary disease. *American journal of respiratory and critical care medicine*. 187. Global initiative for chronic obstructive Lung disease. pp. 1-7. Doi: 10.1164/rccm.201204-0596pp. PMID 22878278.
- [10]. "Chronic Obstructive pulmonary disease (COPD)". WHO. Retrieved 6 June 2019. "The more familiar terms of "chronic bronchitis" and "Emphysema" have often been used as labels for this condition."
- [11]. Smitha J Efficacy of autogenic drainage and the active cycle of breathing techniques in patients with chronic bronchitis: A comparative study 2013.
- [12]. Harth L, Stuart J, Montgomery C, Pinitier K, Czyzo S, Hill K, et al. Physical therapy practice patterns in acute exacerbation of chronic obstructive disease. *Canadian respiratory journal*. 2009; 16(3):86-92.
- [13]. Bellone A, Lasciolari R, Raschi S, Guzzi L, Adone R. Chest physiotherapy in patient with acute exacerbation of chronic bronchitis: Effectiveness of three methods. *Archives of physical medicine and rehabilitation*. 2000;81(5):558-60.
- [14]. Aggaral R, Shaphe MA, George C, Vats A. A comparison of flutter and active cycle of breathing techniques in acute exacerbation of chronic Obstructive Pulmonary disease patients. *Indian Journal of physiotherapy and occupational therapy*. 2010;4(3):60-64.
- [15]. Holland AE, Button BM. Is there a role for airway clearance techniques in chronic obstructive pulmonary disease? *Chronic respiratory disease*. 2006;3(2):83-91.
- [16]. Salh W, Bilton D, Dodd M, Webb A. Effect of exercise and physiotherapy in during sputum expectoration in adult with cystic fibrosis. *Thorax*. 1989;44(12):1006-8.

- [17]. Vargas F, Bui HN, Boyer A, Salami LR, Gbikpi-Benis-San G, Guenard H, et al. Intrapulmonary percussive ventilation in acute exacerbation of COPD patients with mild respiratory acidosis: A Randomized controlled trial [ISRCTN17802078]. *Critical care*. 2005;9(4):R382.
- [18]. Guell R, Casen P, Belda J, Sangenis M, Morante F, Guyatt GH, et al. Long term effect of outpatient rehabilitation of COPD: a randomized trial. *CHEST Journal* 2000;117(4):976-83.

Dr. Minhaj Tahir, et. al. "Effect of Chest Physiotherapy in Acute Exacerbation Chronic Obstructive Disease: - A Comparative Study." *International Journal of Engineering Science Invention (IJESI)*, Vol. 09(05), 2020, PP 01-06.