



## COMPARITIVE STUDY OF IMMEDIATE EFFECT OF CHEST MOBILITY EXERCISE AND CONVENTIONAL BREATHING EXERCISE ON CHEST EXPANSION ON PLASTIC FACTORY WORKER- AN EXPERIMENTAL STUDY

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**ABSTRACT** **CONTEXT:** Chest Mobility Exercise is an advanced therapeutic approach practiced by experienced occupational therapists for the rehabilitation of Chronic Obstructive Pulmonary Disorders. The primary challenge in Plastic Factory Worker is respiratory distress. **AIM:** To find out immediate effect of Chest Mobility Exercises and Conventional Breathing Exercises on Chest Expansion on Plastic Factory Worker. **SETTING AND DESIGN:** The interventional study was carried out in Plastic Factories of Abu Road. **METHOD AND MATERIAL:** 40 Subjects were included in the basis of inclusion and exclusion criteria and divided into 2 groups with 20 participants in each groups. In one group received Chest Mobility Exercises With Chest Expansion and other group received Conventional Breathing Exercises With Chest Expansion. **Result :** Statistically is significant ( $p > 0.05$ ) the result showed high significant difference between the two groups. There was increased effect of chest mobility exercise compare to conventional breathing exercise. **Conclusion:** The above study concluded that the conventional breathing exercise has higher significance value for the plastic factory workers and it is easy to perform for the participants.

**KEYWORDS :** Chest Mobility Exercise , Conventional Breathing Exercise , Chest Expansion , PEFR , Plastic Factory Workers.

### INTRODUCTION

Work and work related environment is one which determines the individual's health in present scenario. As an average normal person spend maximum of its time in his working environment it is major contributor in determining the person's overall health<sup>1</sup>.

A good quality of air is an important factor for normal health of an Individual. In 2016 ,WHO estimated 91% of the world population were breathing low quality air than the WHO guideline. It was predicted that 4.2 million premature deaths occurred worldwide in 2016 due to polluted air. Majority of those deaths occurred in low income countries including South East Asia. The burden of health hazards due to air pollution on developing countries continues to raise every year<sup>2</sup>.

Occupational exposure to dust is well known phenomenon , especially in developing countries. Although sources of air pollutants include power plants , plants plastic factories refineries and petrochemical industries the emission of particulate are quite high in quarries<sup>3</sup>.

Occupational lung disease are affecting the respiratory system , including occupational asthma , black lung disease (coal worker's pneumoconiosis ) , Chronic Obstructive Pulmonary Disease (COPD) , silicosis. The plastic industry manufactures polymer materials commonly called plastics and offers services in plastics Important to a range of industries , including packaging , building and construction , electronics , aerospace , and transportation<sup>4</sup>.

It is part of the chemical industry. In addition , as mineral oil is the major constituent of plastic , it is regarded as a part of the petrochemical industry. Besides plastics production , plastic engineering is an important part of the industrial sector. The latter field is dominated by engineering plastic as raw material because of its better mechanical and thermal properties than the more widely used commodity plastics<sup>5</sup>.

The plastic industry depend on two main substance: polyvinyl chloride (PVC) and styrene. PVC is a hard , tough light weight , highly versatile polymer. Styrene is a strong and flexible<sup>6</sup>. Epidemiological studies indicate that workers exposed to plastic factory an increased suffering from massive exposure to PVC , which is toxic through all routes of exposure - inhalation ingestion and skin contact and is also carcinogenic in humans. It cause coughing , wheezing and breathlessness , headache , ataxia , drowsiness , coma , nausea , vomiting , diarrhoea and abdominal pain<sup>6</sup>.

It may also cause chronic bronchitis and obstructive pulmonary changes<sup>7</sup>.

Chronic Obstructive Pulmonary Disease (COPD), a common preventable and treatable disease , is characterized by persistent airflow limitation that is usually progressive and that is cost by an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gasses. COPD is a major cost of morbidity and mortality. Several factors can identify populations at risk of exacerbations.

COPD exacerbation as an event in the natural course of the disease that is characterized by a change in the patients baseline dyspnea , cough and sputum that is beyond normal day - to - day variations<sup>8</sup>.

Pneumoconiosis are parenchymal lung disease that arise from inhalation of inorganic dust at factory work. Free silica is responsible for causing occupational disease , silicosis and so on. Silica refers to the chemical compound silicon dioxide ( $\text{SiO}_2$ ) , which occurs in a crystalline or non crystalline form.

Crystalline silica may be found in more than one form. The polymorphic form of crystalline silica are alpha quartz , beta quartz , tridymite , cristobalite , keatite , corsite , and moganite<sup>9</sup>. Silicosis is an interstitial pulmonary disease secondary to the inhalation of crystalline silica , usually in the form of quartz , and less commonly as cristobalite and tridymite.

Due to continues exposure of plastic can cause obstructive or restrictive lung disease. It may increase hyper responsiveness of bronchial mucosa , dry cough , shortness of breath etc. The restrictive lung disease result in decrease in vital capacity and pulmonary parameter depending on the duration of exposure to the plastic.

Peak Expiratory Flow Rate (PEFR) as a measurement of ventilatory function was first introduced by Hadron in 1942 and was accepted in 1949 as an index of spirometry. By definition it is "The largest expiratory flow rate achieved with maximal inspiration , expressed in liters/minute (BTPS)"<sup>10</sup>

### OSSMAX PEAK FLOW METER

Rossmax peak flow meter is completely compact , portable and light weight . This device is strictly for adults and not for children . This peak flow meter comes with in built , flexible three zone management system and it has easily readable measurement range 60 - 800 litre /minute . It can be used multiple times as it comes with the disposable mouthpiece design which is also washable .

Set red indicator to bottom of scale stand up , take a deep breath , place your mouth around the peak flow meter and hold it horizontally and

form a tight seal around your lips. Blow the air out as hard and as fast as possible.

The number were indicator , stops is your peak measurement repeat the steps 1, 2, 3 twice more to obtain three readings. Record the highest reading in your daily record chart<sup>11,12</sup>.

**NOTE:** Coughing and spitting into the meter will adversely affect your reading and should be avoided<sup>11,12</sup>.

### NEED OF STUDY

One of the main areas that are facing the negligence of government is the workers employed in the plastic industries who are deprived from the basic safety measures against occupational hazards<sup>13</sup>. Many studies have been conducted on occupational disease and other respiratory condition. But no study has been conducted for the respiratory function for plastic factory workers.

Physiotherapy can be beneficial to check the detouring condition of the workers and decrease the further respiratory health consequences. Both breathing exercises and chest mobility exercises have shown effect on chest wall expansion and has increase force expiratory volume in other cardio pulmonary conditions. But comparison has not been made between two techniques for the plastic factory workers.

Therefore this study will add to growing body of knowledge that if these two techniques yield comparable outcomes and if one technique is superior to the other, which should be the ideal choice of therapy.

### AIM OF THE STUDY

- The aim of the study is to compare the immediate effect of chest mobility exercise and conventional breathing exercise on chest expansion on plastic factory workers.

### OBJECTIVES OF THE STUDY

- To find out the immediate effect of chest mobility exercise on chest expansion on plastic factory workers.
- To find out the immediate effect of conventional breathing exercise on chest expansion on plastic factory workers.
- To compare between two techniques the immediate effect of chest mobility exercise and conventional breathing exercise on chest expansion on plastic factory workers.

### HYPOTHESIS

#### NULL HYPOTHESIS

- There is no significant difference between the immediate effect of chest mobility exercise and conventional breathing exercise.

#### ALTERNATE HYPOTHESIS

- There is significant difference between the immediate effect of chest mobility exercise and conventional breathing exercise.

### MATERIAL AND METHODOLOGY

- Study setting:** Shri U.S.B. College of Physiotherapy , Abu Road.
- Source of data:** Various Plastic Factories at Abu Road.
- Method of collection of data:**
- Study population:** Plastic Factory Workers.
- Sample size:** 40 Plastic Factory Workers.
- Sampling method:** Convenient sampling.
- Study design:** An Experimental study.

#### Material to be used:

- Consent form
- Data form
- Pen
- Notepad
- Weight machine
- Measure tape
- Pulse oximeter
- Peak Expiratory Flow Meter
- Spirit
- Cotton
- Tissue paper

#### Criteria for selection:

##### Inclusion criteria:

- Male
- Work Experience 5 or more than that
- Smoking
- Tobacco Chewing
- Alcohol Consumption
- Non Use of Protective device

##### Exclusion criteria

- Female
- No clerical staff
- Participants with other form of congenital impairments.
- Participants with any COPD conditions.
- Participants with any chest deformities.
- Participants on medications.
- Uncooperative participants

### MEASUREMENT PROCEDUR

After the approval of the study from the ethical committee , 40 subjects from Plastic Factory Workers who fulfilled the inclusion and exclusion criteria were taken for the study purpose. Written inform consent was signed by each subject before proceeding for the study procedure. Before starting the study the brief assessment was taken. Subjects were then explained about the test and procedure to be conducted. Total 40 subjects were randomly divided into two groups . Each had 20 subjects.

Group - A : Received Chest Mobility Exercise

Group - B: Received Conventional Breathing Exercise

- The subjects were informed that their participation is entirely voluntary. Questionnaires was used for data collection. Question related to education and socioeconomic status , total duration of working in years was noted. Symptoms associated with any respiratory disease or history of previous respiratory illness and any medication taken were recorded. Height and weight were recorded.

- Peak expiratory flow meter was used for measuring ventilatory function. Tested their maximum expiratory capacity through PEFM before and after the exercise.

- Before the procedure proper instructions were given to the subjects for using PEFM.

- Subjects were asked to stand upright , inspire maximally , and then blow out as fast as taken into the mouthpiece (PEFM).

- The procedure was repeated 3 times at interval of 2 minutes and the best recording was taken.

- Each time the mouthpiece was disinfected with the spirit solution to avoid infection.

- Anthropometrical parameters (height , weight , BMI ) , PEFR was taken by peak flow meter.

- Both the groups received different techniques.

- Group - A :** Received chest mobility exercise , which include

- Rib Rotation Exercise
- Chest Wall Rotation
- Lateral Flexion Of Chest wall
- Chest Wall Extension
- Pectoralis Major Muscle Stretching

- Group - B:** Received conventional breathing exercise , which include

- Deep Breathing Exercise
- Deep Coughing Exercise
- Pursed- Lip Breathing Exercise
- Forced Expiratory Huffing Technique
- Diaphragmatic Breathing Exercise

- Repetition:** Each maneuver was repeated for 3 times for both the groups. PEFR was used as outcome measure which was recorded before and after intervention .

**RESULT**All statistical analysis was done by SPSS statistics version 20.0 for windows software. Microsoft excel was used to calculate median and to generate graphs and tables.

**TABLIESAND GRAPHS**

Forty subjects were divided into two groups .

Group A Chest MobilitExercise An Experimental group Group B Conventional Breathing Exercises a Control group Group A (m = 20) and Group B (m= 0)

**Table 3.4 : mean and SD of age in years.**

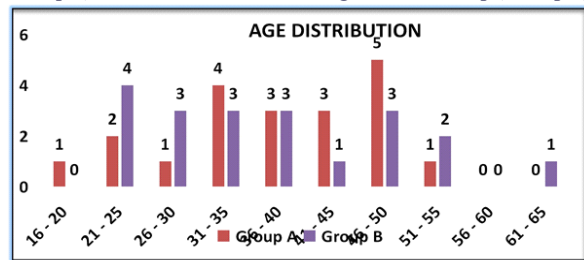
GROUP	N	MEAN	SD
GROUP A	20	33.85	±11.08
GROUP B	20	37.4	±11.22

**Graph :** Age distribution of Chest Mobility Exercise Group ( Group A) and Conventional Breathing Exercise Group ( Group B)

**TABLE 3.5 : AGE DISTRIBUTION OF CHEST MOBILITY EXERCISES GROUP (A) AND CONVENTIONAL BREATHING EXERCISES GROUP(B)**

AGE	GROUP A	GROUP B
16 - 20	1	0
21 - 25	2	4
26 - 30	1	3
31 - 35	4	3
36 - 40	3	3
41 - 45	3	1
46 - 50	5	3
51 - 55	1	2
56 - 60	0	0
61 - 65	0	1

**Graph 4.1 : Age distribution of Chest Mobility Exercise Group ( Group A) and Conventional Breathing Exercise Group ( Group B)**



**Interpretation :** The above table 3.4 and Graph 3.5 show the age distribution in age (year) in Group A and in Group B

**Wilcoxon Sign Rank test** Was used for pre treatment and post treatment comparison for Group A and Group B.

**Mann Whitney U test** Was used for between group comparison of Group A and Group B.

**Table 4.2 : Intragroup comparison of pre treatment and post treatment of chest mobility exercise in Group A**

Group A	Mean		SD		Z	P
	Pre	Post	Pre	Post		
	277	362	46.237	49.161	-3.924	0.000

**INTERPRETATION :** The above table 4.2 shows the result of Wilcoxon sign Rank test which shows there was significant difference between the pre and post chest mobility exercise in group A.

**Table 4.3 : Intragroup comparison of pre and post treatment of Conventional Breathing Exercise in Group**

Group B	Mean		SD		Z	P
	Pre	Post	Pre	Post		
	260	370	44.129	91.133	-3.944	0.000

**INTERPRETATION :** The above table 4.3 shows the result of Wilcoxon sign Rank test which shows there significant difference between the pre and post conventional breathing exercise in group B.

**Table 4.4 : Intergroup comparison of post treatment on both the groups.**

INTERGROUP (Group A - B)	Z	Sig.	Mann -Whitney U
	-1.272	0.211	153.500

**DISCUSSION**

The study was to compare the immediate effect of chest mobility exercise and conventional breathing exercise on chest expansion on plastic factory workers.

In present study , when the values of pre treatment and post treatment chest mobility exercise and conventional breathing exercise analyzed , it was statistically proven that there is significant improvement in conventional breathing exercise group and when comparison was done between the groups , from both the techniques conventional breathing exercise was proved more significant.

Those workers who has more than five years exposure of the environmental dust in the working area has an adverse effect of the respiratory system on the plastic factory workers. Due to exposure of the polyvinyl chloride (PVC) and styrene that cause deposit in the lungs which cause Asthma and during study it was found there was decrease mobility at the lower lobe of the lungs compare to the middle and apical lobe. By performing conventional breathing exercise it was found that after the exercise protocol there was marked increase in the peak expiratory flow rate which stated significant outcome.

**Dharmesh Parmar et al (2013)** Conducted study on the immediate effect on chest mobilization technique on chest expansion in patients of COPD with restrictive impairment and concluded that chest wall mobilization has significant effect on chest expansion in COPD patients who are having restrictive impairment of chest wall in later stage of disease.<sup>14</sup>

**Juliano T Wada et al (2016)** Conducted study to find out effect of aerobic training combine with respiratory muscle stretching on the functional exercise capacity and thoracoabdominal kinematics in patients with COPD and concluded that aerobic training combine with respiratory muscle stretching increase the functional exercise capacity with decreased dyspnea in patients with COPD these effects are associated with an increase efficacy of the respiratory muscles and participation of the ABD compartment.<sup>19</sup>

**CLINICALIMPLICATION**

Result suggest that from both the technique i.e chest mobility exercise and conventional breathing exercise it is proved that conventional breathing exercise are more effective than chest mobility exercise on plastic factory workers. So , conventional breathing exercise can be more beneficial for this group of participants .

**LIMITATIONS**

- Only Male Participants were taken.
- Long term follow up was not taken.
- Result could be generalized to all age groups.
- Only 5 year or more exposure participants to be taken.

**FURTHER RECOMMENDATIONS**

- Treatment can be given for longer duration with follow up.
- Study can be done on female participants.
- Further studies can be done with larger sample size.
- This study can be done by taking different outcome measures.
- Further studies can be done with different occupational group.

**CONCLUSION**

It can be concluded between the chest mobility exercise and conventional breathing exercise , has significant increase of the PEFR and chest expansion results for conventional breathing exercise and chest mobility exercise.

Hence ,it can be concluded that , conventional breathing exercise proved to be more effective than chest mobility exercise on plastic factory workers.

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