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The Effect of Buteyko Breathing Exercise on Peak Expiratory Flow Rate in Carpenters

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ABSTRACT

Background: Carpenters are exposed to wood dust during work. This leads to various health problems such as respiratory conditions and decrease in lung functions. Carpenters due to prolong exposure to wood dust causes a decrease in the peak expiratory flow rate. Buteyko breathing exercise is usually given the patients suffering from bronchial asthma this exercise helps to increase peak expiratory flow rate in asthma patients and is very useful.
Objective: The aim of the study is to find the effect of buteyko breathing exercise on peak expiratory flow rate in carpenters.
Methodology: An experimental study on a total of 30 carpenters among the age group of 35 to 45 years was included in the study. Peak expiratory flow rate of the carpenters were taken before giving Buteyko breathing exercise for 4 week, 2 session pre week. The difference of pre and post peak expiratory flow rate was then calculated. The data was statistically analysed using paired t-test.
Results: Buteyko breathing exercise improved the peak expiratory flow rate in carpenters after 4 weeks. ($p<0.0001$*)
Conclusion: Buteyko breathing exercise helps to improve peak expiratory flow rate in carpenters.

***Keywords*:** carpenters, peak expiratory flow rate, wood dust, Buteyko breathing exercise.

INTRODUCTION

Carpentry is one of the most common construction occupations. A large number of populations in India are engaged in carpentry tasks. Carpenters while making different furniture items, cabinets, frames, etc. are exposed to wood dust. This wood dust created when machines are used to cut or shape wooden materials are partially suspended into the air which is then inhaled by the carpenters and this leads to various health problems.[1]

Prolonged exposure to wood dust causes a decrease in pulmonary function and increase in prevalence of respiratory diseases. Respiratory diseases such as extrinsic allergic alveolitis, the organic dust toxic syndrome, occupational asthma, non-asthmatic chronic airflow obstruction and chronic bronchitis.[2] It is seen that there is a significant reduction in lung volume such as forced vital capacity (FVC), forced expiratory volume in 1 second (FEV1), peak expiratory flow rate (PEFR) and maximal mid expiratory volume (FEV25-75%).[3] There are many studies which proves that due to prolong exposure to wood dust the carpenters have reduced peak expiratory flow rate(PEFR).[3]

Peak expiratory flow rate is the maximum velocity with which air is forced out. It is expressed as liter/sec.[3] It is measured using a peak flow meter. It is a small hand-held device which helps to assess the airflow through the airways and also helps to determine the degree of

obstruction in them. The peak flow meter has 3 zones green zone (80-100%), yellow zone (50-80%) and red zone(less than 50%). The airway starts getting narrowed in yellow and red zone.[4] Since we know that carpenters has reduced peak expiratory flow rate so to combact this problem we considered using Buteyko breathing exercise.

The Buteyko breathing exercise is originated from Russia, in 1990s and is named after its originator, Dr. Konstantin Pavlovich Buteyko. Buteyko breathing exercise is a breathing exercise that teaches how to control the tendencies to overbreathe or hyperventilate. It is most commonly known as a breathing exercise for patients with asthma and is also known to be helpful in conditions such as chronic obstructive pulmonary disorder, chronic mouth breathing, sleep apnoea, and stress related disorders.[5]

The main technique of Buteyko breathing exercise is reduced-volume breathing, the patient tries to decrease minute volume and raise alveolar CO_2 by reducing tidal volume.[5] This reduced volume breathing is done in combination with breath-holding technique, the two most important being Control Pause and Maximum Pause.[6]

During Control pause, the patient gently inhales and then exhales through the nose and then holds the breath until the point the patients starts feeling their first desire to breath or until a jerk or involuntary movement of diaphragm is felt. During Maximum pause, the patients gently inhale and the exhales through the nose and the holds the breath as long as the patient can but not upto the point of severe discomfort. It is generally about double of control pause.[6]

A Buteyko breathing exercise session lasts upto 40 minutes.[6] It is seen in many studies that Buteyko breathing exercise helps to decrease peak expiratory flow rate and also helps to reduce the severity and recurrence of symptoms in asthma patients.[7]

Thus, the aim of the present study is to evaluate the effect of Buteyko breathing exercise on peak expiratory flow rate in carpenters.

MATERIAL AND METHODOLOGY

Materials used: Peak flow meter, Chair, Stop match, Pen, Paper.

Research design: It is an experimental study design. A sample of 30 carpenters was included in the study.

Research approach: Convenient sampling was done on the basis of their work experience and duration of work.

Inclusion Criteria: Carpenters in the age group of 35-45 years with informed consent. Having work experience of 8-10 years and working for 7-8 hours/day. Also those who had peak expiratory flow rate in the range of red and yellow zone.

Exclusion Criteria: Carpenters should be medically stable and should not have pre-existing respiratory and cardiovascular condition, recent thoracic surgery or trauma, history of smoking, hypertension and diabetes.

Sampling method: 30 Carpenters among the age group of 35-45 years were taken. The duration of study was 4 weeks the data was taken on the 1st day and on the last day of the 4th week.

Time and Duration: The duration of the study was 1 year. The duration of the data collection was 6 months. The time of the study was 4 weeks and the duration of each session was 40-45 minutes.

Data Collection Process: The data was collected with the help of peak flow meter on day 1. The subjects had to perform the test in standing position holding the peak flow meter horizontally without interfering with the movement of the markers (arrow) or covering the slot. The subject were asked to take a deep breath then exhale it by forceful expiration after maintaining air tight seal between the lip and mouth piece of the instrument. The test was repeated 3 times and the highest of these reading was taken. The carpenters with peak expiratory flow rate under red zone (50-80%) and

yellow zone (less than 50%) were taken in the study. Once the pre value of peak expiratory flow rate was taken it was followed by a session of Buteyko breathing exercise which was given for the next 4 weeks, 2 sessions per week on the last session of the 4th week peak expiratory flow rate was again measured to see any changes in the values.

PROCEDURE:

Buteyko breathing steps- The first thing to remember when practicing Buteyko breathing exercise is to breathe in a very controlled and shallow manner. It should be a gentle rhythm of breathing in and out.[8]

Step 1

Keep your mouth closed at all times and only use your nose to breath.

Step 2

Buteyko breathing requires that you breathe into your diaphragm (stomach) and not your chest. When breathing check to make sure your diaphragm inflates and deflates in a controlled manner and your chest remains still.

Step 3

When breathing ensures you breathe in a very shallow manner. This shallow controlled breathing also applies for the breathing in part.

Step 4

Sit in an upright position and shallow breath for around 2-3 min, also remember to breathe in fully and do not do partial inhales. After the 2-3 min period when you get to the exhaling part of your breathing, pinch your nose closed and pause your breathing until you feel the first urge to breath, (fig.1). This breath-holding technique is called as Control pause. For beginners, this may be as quick as a few seconds but as you progress you may be able to hold your breath as long as you can but not up to the point of discomfort. This breathing holding technique is called Maximum pause.

Step 5

After holding your breath for a comfortable amount of time, un-pinch your nose and resist the urge to draw in a big breath of air instead continue with the shallow breathing technique.

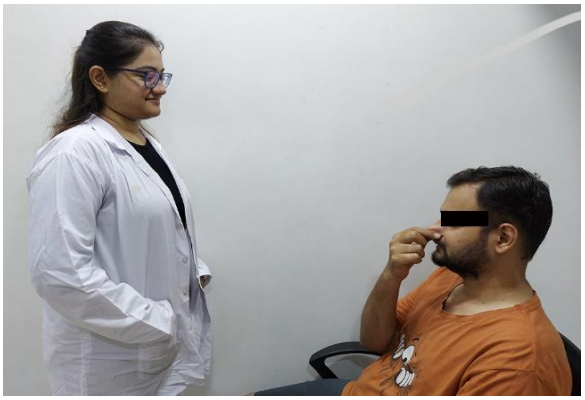


Figure.01: Subject in upright position. Pinching the nose and pausing the breath until the first urge to breathe.

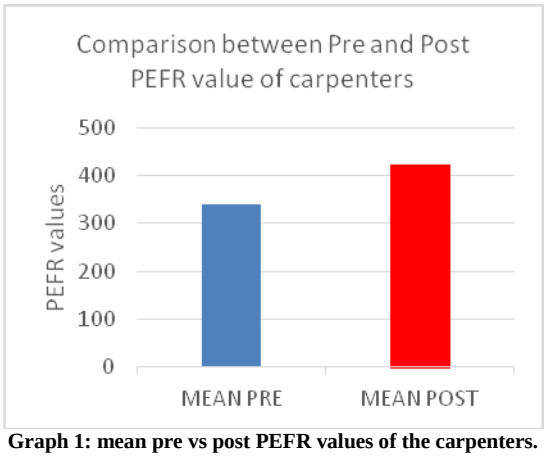
RESULTS AND ANALYSIS

The data was collected and the normality test was done of the mean. The data passed the normality test. Then paired t-test was done to compare the pre and post value where p value was found to be <0.0001 which is highly significant. The statistics was done using Graphpad Prism 9.0.0.

The subject participated in the study were carpenters. A total of 30 carpenters under the age group of 35 to 45 years were taken. The pre and post value of PEFR of the carpenters were taken.

The table shows the difference between of mean and standard deviation of pre and post PEFR value of carpenters.

Variables	Pre PEFR value	Post PEFR value
Mean	340	423.66
SD	85.055	83.727
P value	<0.0001	<0.0001



Graph 1: mean pre vs post PEFR values of the carpenters.

DISCUSSION

The aim of the study was to find the Effect of Buteyko Breathing exercise on Peak expiratory flow rate in Carpenters. A total of 30 carpenters among the age group of 35 to 45 years were taken. The carpenters were selected on the basis of inclusion and exclusion criteria. Their pre and post PEFR value was analyzed after giving Buteyko breathing exercise for 4 weeks. The result showed that after giving the Buteyko breathing exercise the PEFR of the carpenters was significantly improved.

Carpenters are exposed to a large amount of wood dust while doing carpentry work such as sawing, drilling and polishing. Because of this occupational exposure to wood dust they are prone to develop occupational asthma and variety of health problems such as dry cough, chronic bronchitis, shortness of breath, and reduced lung function deficits such as FVC, FEV1, and PEFR.[9]

The Peak expiratory flow rate is the maximum velocity with which air is forced out. It is used to determine the degree to which the bronchial airways are obstructed. The PEFR of carpenters is reduced due to continuous exposure to wood dust which causes inflammatory changes in the respiratory airways which leads to increase resistance due to wood dust particle leading to airway remodeling and hypertrophy of mucosal cells resulting in increased mucus secretion and plug formation which may cause airway obstruction and lung problems.[10]

Dr. Konstantin Buteyko developed a drug free therapy for bronchial asthma known as Buteyko breathing exercise. He discovered that the main cause of bronchospasm in bronchial asthma is CO2 deficiency in alveolar resulting from hyperventilation and low metabolic activity. The understanding and knowledge of this mechanism lead the development of the Buteyko breathing exercise which reverses not only asthma but also all other hyperventilation related diseases.[11] Buteyko breathing helps to improve bronchospasm which lead to increase maximize speed of expiration which leads to a significant improvement in PEFR.[12]

Buteyko breathing exercise when combined with other exercise such as walking also helps to reduced PEFR in asthma patients. Through the mechanism of increasing CO2 and producing nitric oxide which has bronchodilation effects and through decreasing inflammatory mediators so that it can reduce asthma symptoms.[13]

As we have already seen that carpenters have reduced PEFR due to their occupational exposure to wood dust and that the Buteyko breathing exercise helps to improve PEFR in asthmatic patients, thus this present study was taken to see the effect Buteyko breathing exercise has on the peak expiratory flow rate of carpenters.

CONCLUSION

Based on the results of our data analysis we found that before giving Buteyko breathing exercise the PEFR of carpenters was low as compared to the normal age predicted value. Thus it is concluded that there was significant improvement in peak expiratory flow rate of carpenters after giving Buteyko breathing exercise.

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Ethical Approval: Approved

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