



# Effect of Modified Pursed Lip Breathing in Pneumonatic Children

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## Abstract

Pursed lip breathing exercise help in increasing alveolar expansion in restrictive lung diseases. Pneumonia is one of the intrinsic restrictive lung diseases seen in children. So, here in this study restrictive lung diseases has been taken as it commonly affects the children. Pursed lip breathing exercise may help in increasing alveolar pressure & decreasing the secretions, which helps in improving the growth & ADL's in children. The aim of the study is to find the effect of modified pursed lip breathing by blowing into a water-filled bottle through a straw in pneumonatic children. **Study design:** Quasi experimental design, purposive sampling was done. Sample of 12 (8 males and 4 females) pneumonatic children have been taken from various hospitals in Hisar. All the participants received the intervention in rest time, one time a day, for one week. Intervention was given when the participant's medical conditions was stable & confirmed by the medical doctor. The modified pursed lip breathing exercise (in bottle which is filled with water by straw) was performed four times a minute for ten minutes. All the outcomes (Respiratory rate, Oxygen saturation, Heart rate/Pulse rate) were measured at baseline, then after one week of intervention. The pre and post intervention statistical data compared by using paired T test. Analysis was done for 12 patient, physical characteristics of data of the patient's include respiratory rate, heart rate, oxygen saturation. Male and female statistical data are compared by using the simple T test for different physical characteristics (respiratory rate, heart rate, oxygen saturation), and to test any statistical difference was set at  $p < 0.05$  and the valve of confidence was set at 95%. The result of the study indicates that modified PLB blowing into a water filled bottle through a straw decrease RR, HR, improve oxygen saturation. Based on this study we believe that modified pursed lip breathing exercise can be used as an adjective treatment for obstructive and restrictive pulmonary disease to improve oxygen saturation decrease RR, HR. **Conclusion:** This study concluded that modified pursed lip breathing exercise can be used as an adjacent with other traditional treatment for obstructive and restrictive pulmonary disease.

## Introduction

Pneumonia is the inflammation of the lung tissue, followed by the accumulation of the blood cells, fibrin and exudates in the alveoli. Affected part of the lungs become consolidated [Sembulingam, et. al., 2012].

According to World Health Organization (W.H.O) 2019, pneumonia is the single largest infectious reason for death in children worldwide. It affects children and families all over world, but is most prevalent in South Asia and Sub-Saharan Africa. Globally pneumonia is liable for high morbidity and mortality among children below 5 years of age. W.H.O. has estimated an incidence of 0.37 episodes per child per annum for clinical pneumonia, India accounts for 36% of the entire South East Asia regional burden [Mathew, et. al., 2011; Rudan., et. al., 2013]. Roughly ten to twenty percent of those episodes tend to be severe [Ghimire, et. al., 2012]. Within the most up-to-date estimate of acute lower respiratory infections (ALRI) associated mortality in India 2014, pneumonia was held liable for 369,000 deaths (28% of all deaths), making it the only most important killer during in this age group [Krishnan, et. al., 2015]. The national level surveys of India reported that the prevalence of ALRI only that was found to be 2.4–8.9% for the state of Maharashtra [International Institute for Population Sciences (IIPS), (DLHS –4), 2014; IIPS and ICF, (NFHS-4), 2017]. Children are often protected from pneumonia, it are often prevented with easy interventions, and treated with low-cost, low-tech medication and care.

To improve the case management of pneumonia in developing countries, W.H.O. developed the integrated management of childhood sickness guidelines in 1995. These guidelines defined severe pneumonia as the present of cough or difficulty in breathing and tachypnea ( $> 50$  breaths per minute for kids aged between 2–11 months and  $> 40$  breaths per minute for kids aged between 12–59 months) and lower chest indrawing, and one or more of the final danger signs, that include: associate inability to drink, persistent vomiting, convulsions, lethargy, unconsciousness, stridor in a calm child, severe malnutrition (as documented within the medical records); central cyanosis, or a saturation of oxygen of  $< 90\%$  in room air. Many low- and middle-income countries adopted these criteria.

W.H.O. 2014, changed the classification of pneumonia severity, definition of severe pneumonia requiring hospital admission is that the presence of cough or difficulty in breathing and tachypnea, and one or more of the final danger signs, but not lower chest indrawing.

The lungs are the vital organ of the body. That primary function is take part in gaseous exchanges, provides oxygen to the body, eliminate carbon dioxide from the body and additionally play a role in maintenance of acid-base balance of the body by control the carbon dioxide contains in the blood [Garrod, et. al., 2013]. In pneumonia the lung tissue are inflamed, followed by the accumulation of the blood cells, fibrin and exudates in the alveoli. Affected part of the lungs become consolidated [Sembulingam, et. al., 2012]. These affect the normal function of the lungs.

Children who experience clinical symptoms of pneumonia should get treatment quickly and exactly. Parents can bring the child with clinical symptoms to the closest health service center such as the health center or hospital to get the right handler until his condition improves. The matters that always arise in children with pneumonia who are taken to health facilities and hospitalized, those are respiratory distress characterized by rapid breathing, chest wall retraction, nasal lobe breathing and stridor (Rudan, et. al., 2013). Respiratory distress is the body's compensation for lack of oxygen as a result of low oxygen concentrations will stimulate the central nerve to increase respiratory frequency. If the effort isn't compensated, there will be a disturbance of the oxygenation status from mild to severe, even causing seriousness. The decrease in oxygen concentration to tissues is often caused by the presence of upper and lower airway obstruction due to increased secretion production in concert of the manifestations of airway inflammation (Ghimire, et. al., 2012).

The American Thoracic Society (ATS) defines Pursed Lip Breathing (PLB) as a breathing exercise during in which one slowly inhales air through the nose and slowly exhales it through a slightly opened mouth [Garrod, et. al., 2013].

The inability to tissue secretions is associate obstacle that is usually found in children aged infants to toddlers because at that age cough reflexes are still weak. Some effective alternative measures to overcome this problem are chest physiotherapy, that is commonly remarked as standard physiotherapy which includes postural drainage, vibration, and percussion [Abdelbasset, et. al., 2015].

Another alternative way to overcome the problem of ineffective airway clearance in children is by applying the pursed lip breathing (PLB) exercise. This exercise can be used as another to assist overcome the ineffectiveness of airway clearance in children [Tiep, et. al., 2013]. In addition, PLB is helpful for increasing alveolar expansion in each lung lobe. Therefore that alveolar pressure increases and can help push secretions on the airway during expiration and can induce normal breathing patterns [Roberts, et. al., 2009]. Therefore in the end, the pursed lip breathing exercise is expected to improve oxygenation status.

### **Aim of the study**

To find the effect of modified pursed lip breathing by blowing into a water-filled bottle through a straw in pneumonatic children.

## Objective

- To find the effect of modified pursed lip breathing exercise on breathing patterns in pneumonatic children.
- To find the effect of modified pursed lip breathing exercise on oxygen saturation in pneumonatic children.
- To find the effect of modified pursed lip breathing exercise on respiratory rate in pneumonatic children.
- To find the effect of modified pursed lip breathing exercise on heart rate in pneumonatic children.

**Study design:** Quasi experimental design

**Sampling:** Purposive sampling

**Sample size:** Sample of 12 (8 males and 4 females) pneumonatic children have been taken from various hospitals in hisar.

### Inclusion criteria

- Children aged between 5 to 12 years
- Children suffering from pneumonia
- Children not meeting oxygen demand due to pneumonia

### Exclusion criteria

- Patient with history of any other respiratory disorders, musculoskeletal disorders, neuromuscular disorders, cardiovascular disorders
- Psychological unstable patient
- Patient not willing to participate in the study

### Outcome measures

- Respiratory rate
- Oxygen saturation
- Heart rate

### Independent variables

- Modified pursed lip breathing exercise
- Pulse oximetry

### Dependent variables

- Age
- Gender
- Heart rate
- Oxygen saturation

### Equipment's

Pen, Consent form, Bottle, Straw, Water, assessment form, Oximeter, sanitizer.

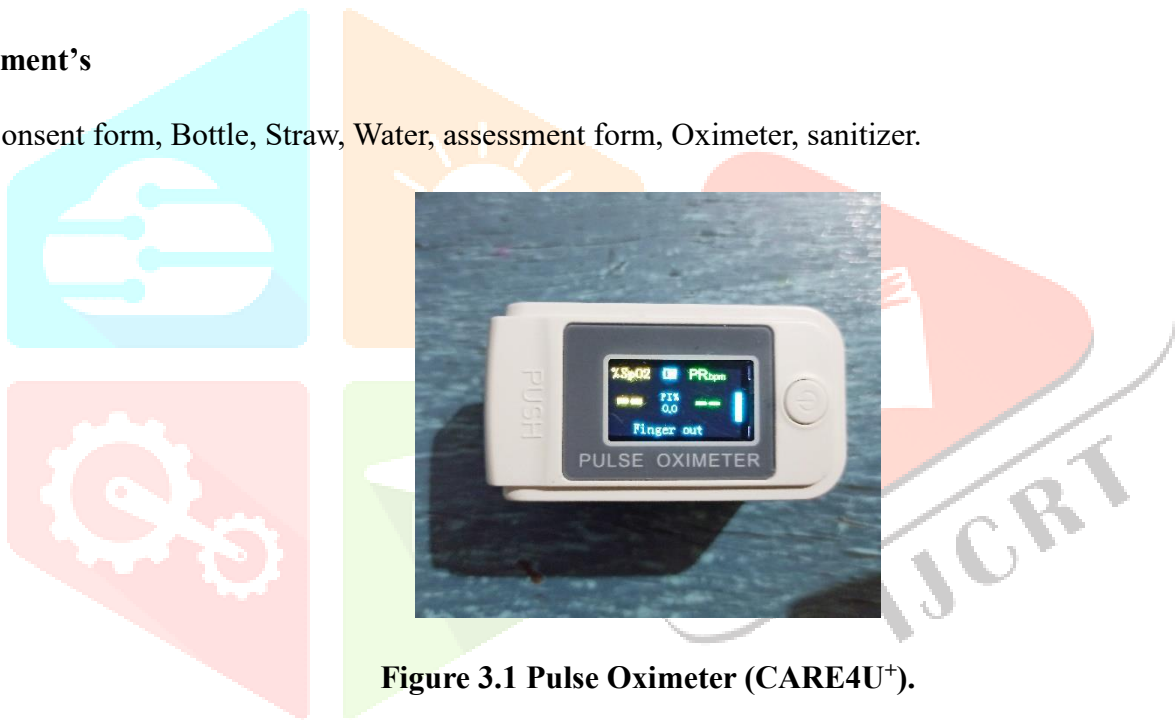


Figure 3.1 Pulse Oximeter (CARE4U+).



Figure 3.2 Bottle, Water, Straw.

## Protocol

Ethical approval was taken from the institutional ethical committee, Department of Physiotherapy, G.J.U.S & T Hisar Haryana. In this study participants were selected on the basis of inclusion criteria. Informed consent was taken from all the participant's parents before intervention. All the participants received the intervention in rest time, one time a day, for one week. Intervention was given when the participant's medical conditions was stable & confirmed by the medical doctor. The modified pursed lip breathing exercise (in bottle which is filled with water by straw) was performed four times a minute for ten minutes. All the outcomes (Respiratory rate, Oxygen saturation, Heart rate/Pulse rate) were measured at baseline, then after one week of intervention.

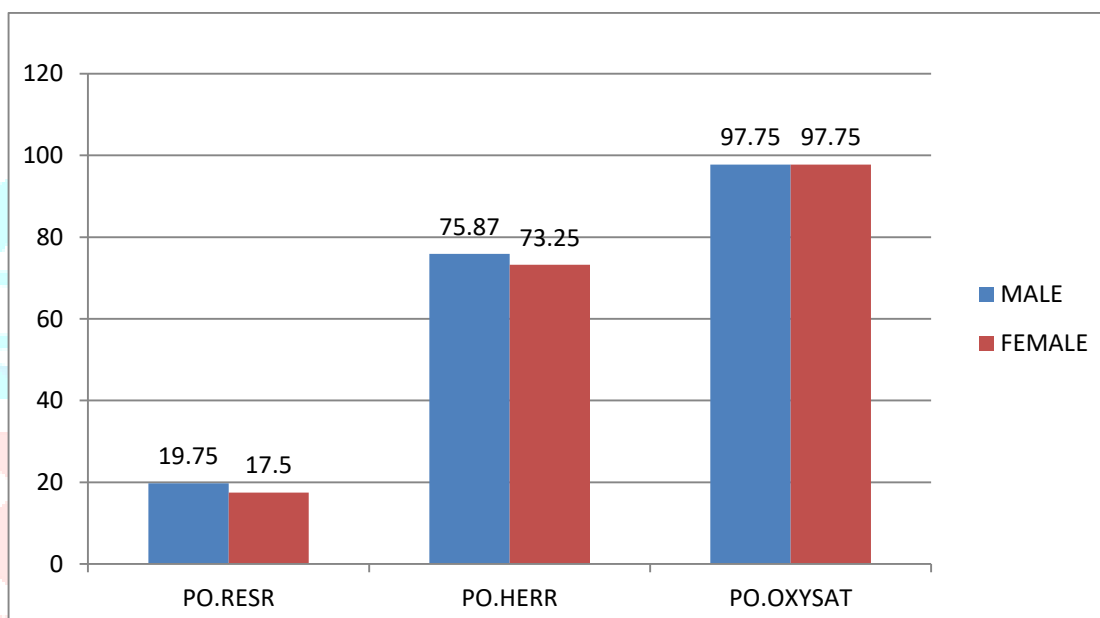
## Procedure

- Protocol was explained to the patient's parents and informed consent was taken from all the parents.
- Pursed lip breathing exercise demonstration was given to the patients.
- Therapist instructs the patient to sit with your back straight in comfortable position and relax your shoulders as much as possible.
- Before the intervention was given, the pulse oximeter was placed in the index finger of right hand and then the readings of heart rate and level of oxygen saturation was measured by pulse oximeter and respiratory rate was measured by observing the patient.
- Therapist told the patient to hold a bottle by both the hands which was filled by water and added a straw in it. Then the participants were told to take a deep breathe, inhale through the nose and slowly exhale (taking twice as long as to exhale as you took to breathe in) into the bottle which was filled with water through the straw.
- Perform the exercise for four times a minute for ten minutes, repeated for a period of six days.
- On the sixth day, after performing the exercise, therapist placed the pulse oximeter in the index finger of right hand and then the readings of heart rate and oxygen saturation was measured by pulse oximeter and respiratory rate was measured by observing the patient.

## Result

The statistics performed to analyze the data using the statistical package of social science (SPSS) for windows version 22.0. The pre and post intervention statistical data compared by using paired T test. Analysis was done for 12 patient, physical characteristics of data of the patient's include respiratory rate, heart rate, oxygen saturation. Male and female statistical data are compared by using the simple T test for different physical characteristics (respiratory rate, heart rate, oxygen saturation), and to test any statistical difference was set at  $p < 0.05$  and the value of confidence was set at 95%.

### Comparison between male and female for different variable post intervention



Paired T test are used to calculate the values of variables between the pre and post intervention. The mean of pre intervention respiratory rate  $23.91 \pm 2.60$  cycle/min and post intervention  $19.00 \pm 2.87$  cycle/min, mean of pre intervention heart rate  $78.58 \pm 3.77$  beats/min and post intervention  $75.00 \pm 4.05$  beats/min, mean of pre intervention oxygen saturation  $93.91 \pm 1.08\%$  and post intervention  $97.75 \pm 1.86\%$ . Simple T test are used to calculate the values of variables between male and female. The mean of pre intervention respiratory rate in male  $25.00 \pm 2.20$  cycle/min and female  $21.75 \pm 2.06$  cycle/min, post intervention respiratory rate in male  $19.75 \pm 2.43$  cycle/min and female  $17.50 \pm 3.46$  cycle/min, the mean of pre intervention heart rate in male  $79.25 \pm 4.23$  beats/min and female  $77.25 \pm 2.62$  beats/min and post intervention Heart rate in male  $75.87 \pm 4.47$  beats/min and female  $73.25 \pm 2.75$  beats/min, the mean of intervention oxygen saturation in male  $94.12 \pm 1.24\%$  and female  $93.50 \pm 0.57\%$  and post intervention oxygen saturation in male  $97.75 \pm 1.66\%$  and female  $97.75 \pm 2.50\%$ .

After statistically analysis study show that comparison between variables (respiratory rate, heart rate, oxygen saturation) pre and post intervention are Significant at 0.01% level, pre respiratory rate slightly

decreases in post intervention, pre heart rate also slightly decreases in post intervention, pre oxygen saturation increases in post intervention and comparison between male and female for different variable pre and post intervention are not significant.

## Discussion:

Many experimental studies has been done in chronic obstructive pulmonary diseases and restrictive pulmonary diseases in different-different population in different-different age to evaluate the effect of pursed lip breathing exercise on respiratory and cardiac parameters. The objective of this study to evaluate the effect of modified pursed lip breathing exercise by blowing into a water filled bottle through a straw on the respiratory rate, heart rate and oxygen saturation in pneumonatic children. This also concluded with a study conducted by Bhatt et al., on the result of PLB on RR and TV in patient with COPD. Their study concluded that, when ten min of PLB intervention given at rest and volitional PLB during with six min walk test, there was a decrease in RR and increase in TV compare with spontaneous respiration [Bhatt et al., 2012]. Lilik et. al., also conducted a study to evaluate the effect of modified pursed lips breathing exercise on oxygenation status in children, and concluded that modified pursed lips breathing exercise is beneficial for oxygenation saturation, and decreasing respiratory rate in children [Lilik et. al., 2019]. This also concluded with a study conducted by Muliasaria et al., on the effect of pursed lips breathing exercise towards kid's oxygenation status in pneumonia and concluded that pursed lips breathing exercise is beneficial for improvement in oxygenation status in preschoolers which suffering from pneumonia [Muliasaria et al., 2018]. Philip et. al., also conducted a study to evaluate the effect of pursed lips breathing exercises on the oxygen saturation levels of patients with COPD and concluded that pursed lips breathing exercise in COPD patients revealing feeling more comfortable, less shortness of breath, and increase in the value of oxygen saturation [Philip et. al., 2021]. In addition, many alternative studies have found that PLB exercise will decrease RR, HR, minute ventilation and increased TV, inspiratory time, total respiration cycle time and oxygen saturation [Mayer, et. al., 2018].

In this study after statistically analysis study show that comparison between variables (respiratory rate, heart rate, oxygen saturation) pre and post intervention are Significant at 0.01% level, that indicates modified PLB blowing into a water filled bottle through a straw decrease RR, HR, improve oxygen saturation. However, it's potential that modified PLB by blowing into a water filled bottle through a straw might keep the airways open longer and eases respiration which can cause slow the RR, improve respiration pattern by removing old air out of the lungs and permitting new air to enter and relieves shortness of breath. Once PLB performed properly, this also result in relaxation and relief of respiration issues. This contributes to escalating activities of parasympathetic nerve, that induce vasodilation and allow oxygen to be transported simply into the tissues which can cause improve oxygen saturation [Kliegman, et. al., 2016; McCance, et. al., 2014]. PLB by blowing into a water filed bottle through a straw like blowing into a pinwheel toy also can be used as a playing and distraction of child attention away from pain stimuli and also improve oxygen saturation [Gea, et. al., 2021]. In



this study comparison between male and female for different variable pre and post intervention are not significant.

### Clinical implication

The result of the study indicates that modified PLB blowing into a water filled bottle through a straw decrease RR, HR, improve oxygen saturation. Based on this study we believe that modified pursed lip breathing exercise can be used as an adjective treatment for obstructive and restrictive pulmonary disease to improve oxygen saturation decrease RR, HR.

### Conclusion

This study concluded that modified pursed lip breathing exercise can be used as an adjacent with other traditional treatment for obstructive and restrictive pulmonary disease.

### Limitation of this study

- The sample which has been taken small in number to find the successful rate. Future research with large population may help to establish the effect of modified pursed lip breathing in pneumonatic children.
- In this study no control group have been used.

### Future recommendation

- Study can be conducted with the sample size which are more in number.
- Study can be conducted with simple random sampling method.
- Study can be conducted with control group.

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