



## The Effectiveness of Balloon Therapy Vs Incentive Spirometry on Physiological Parameters among Children with Lower Respiratory Tract Infection

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### ABSTRACT

Globally, every year the Lower respiratory tract infection (LRTI) increases the childhood mortality. In 2017, the mortality among children aged < 5 years and 5 – 14 years are estimated around 808.9 thousands and 43.9 thousands respectively. There are many non pharmacological measure are involving in treating the respiratory illness like breathing exercises, oxygen therapy, nebulisation and so on. This study was aimed to compare the effect of Balloon therapy Vs Incentive spirometry on physiological parameters among children with LRTI. 60 children between 7-14 years of age with LRTI were selected by purposive sampling technique to receive either balloon therapy or Incentive spirometry. Pre-assessment of physiological parameters (Respiratory rate, Heart rate, Temperature, Oxygen saturation, Chest retraction, and Breath sounds, Use of accessory muscles, Cough, Sputum, Nasal flaring and Dyspnea) was done and both the groups were instructed to either blow balloon or incentive spirometry for 10 times in one sitting for 3 sitting at the interval of 3 hour a day for 5 days. Post assessment was done at the end of 5<sup>th</sup> day. The findings of the study shows that there was significant difference observed between pre and post test mean score of physiological parameters both in Balloon therapy (27.77 & 38.3) and Incentive spirometry (27.1 & 35.77) group. After the intervention, statistically significant difference was noted (2.686) between two group at  $p=0.009$  level of significance. The study implies though Balloon therapy and Incentive spirometry are equally effective in improvement of physiological parameters of children with LRTI, Balloon therapy is more effective in reducing the level of respiratory distress among children with LRTI.

**Keywords:** balloon therapy, incentive spirometry, lower respiratory tract infection.

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### INTRODUCTION

According to united Nation Population fund 2021, worldwide children aged 0 – 14 years comprises of 25.3 % of the total population. In India, children populations were estimated in 2019 about 26.62%. Children are greatest asset to the society. Late prime minister Pandit Jawaharlal Nehru said "The children of today will make the India of tomorrow. The way we bring them up will determine the future of the country" (1).

Lower respiratory tract infections are most common causes of death than upper respiratory tract infections. Lower respiratory tract infection is responsible for the deaths of four and a half million children each year, accounting for 30% of all deaths in childhood (2).

Pneumonia and Bronchiolitis are most common types of LRTI in children. Pneumonia accounts for most of the deaths in children 5 years of age. Childhood Bronchial Asthma varies widely from many countries. At the age of six to seven years, the prevalence ranges from 4 to 32%. UK has the highest prevalence of severe Bronchial Asthma in the world. It has also increased the number of preventable hospital emergency visits and admissions. Apart from being the leading cause of hospitalization for children, it is one of the most important chronic conditions causing elementary school absenteeism(3).

According to global burden of disease (GBD), in 2017, the mortality due to lower respiratory tract infection among children aged < 5 years and 5 – 14 years are estimated around 808.9 thousand (36.4%) and 43.9 thousands (23%) respectively. In developing countries for every 7 seconds a child dies because

of an acute respiratory infection (ARI), usually pneumonia. In India, the incidence of LRTI was 9.76% of males and it is most common in children at the age of 1-4 years. In Tamilnadu 2.4 million children were affected by LRTI in 2018 (4). There are several medications are used to treat the lower respiratory tract infection. Non pharmacological measures are also helpful in improving the lung function and increase the oxygen supply to the body. The respiratory problem will be curbed while following any of these measures such as breathing exercise, balloon blowing, pursed lip breathing, blowing of air in to the water with a straw, candle blowing, mouth organ playing and so on. All these will help the children to have the clear airway and expand the lung parenchyma by insulating the efficiency of respiratory muscle. So the researcher decided to do the comparative study to find the effectiveness of balloon therapy Vs incentive spirometry among children with lower respiratory tract infections and to help the children and family to improve the health status of the children (5).

## MATERIAL AND METHODS

The quantitative in approach with Quasi experimental two group pretest-posttest design were used. Total 60 children with the age group of 7-14 years those who diagnosed with LRTI were selected through non probability purposive sampling technique in pediatric ward of Government Head Quarters hospital. The selected children were divided into 2 groups (Group 1-Balloon therapy: Group 2- Incentive spirometry). The questionnaire has two sections such as Demographic variables and Physiological parameters. The overall score was classified as No distress, Mild distress, Moderate distress and Severe distress based on the score obtained by the participants.

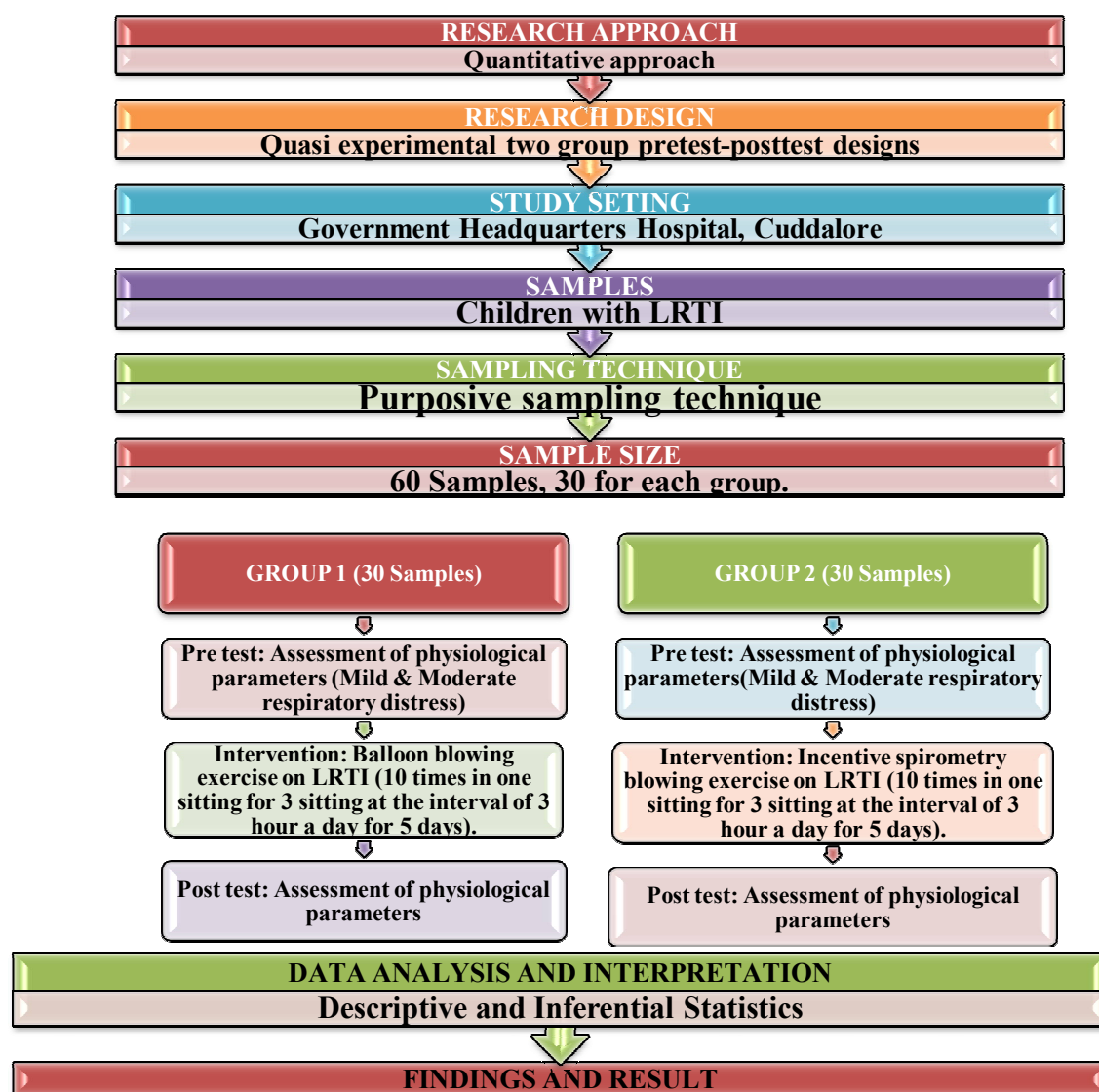


Fig 1: Schematic Representation of Research Methodology

## RESULTS

The findings reveal that the demographic profile in group 1 (balloon therapy) highest percentage of the children (36.6%) are belongs to the age between 9-11 years and 11-14 years respectively, 73.3% are females, 30.0% are studying at above 7<sup>th</sup> standard, 33.3% children's father studied Intermediate or diploma, 40.0% Children's mother studied Middle school, 50.0% children's mothers are Home maker, 66.7% children's fathers are Private employee, 60.0% family income is greater than Rs.10000, 73.3% are belonged to nuclear family, 50.0% are residing at rural & urban respectively, 50.0% are second child in the family, 76.7% are having Two child in the family, 70.0% are belongs to Hindu, 73.3% were exposed to respiratory infection between one to two times, 50.0% are having Family history of cigarette smoking & no Family history of cigarette smoking respectively, 93.3% are speaking Tamil, 70.0% are having no habits of balloon blowing.

The demographic profile in group 2 (incentive spirometry) highest percentage of the children (53.3%) are belongs to the age between 11-14 years, 56.7% are females, 36.7% are studying above 7<sup>th</sup> standard, 33.3% children's mother studied Intermediate or diploma, 40.0% children's father studied Intermediate or diploma, 60.0% children mothers are Home maker, their fathers are Private employee and their family income is greater than Rs.10000, 83.3% are belongs to nuclear family, 56.7% are residing at urban, 66.7% are the second child in the family, 46.7% are having Two child in the family, 100.0% are belongs to Hindu, 63.3% are exposed to respiratory infection between one to two times, 53.3% are having Family history of cigarette smoking, 96.7% are speaking Tamil, 70.0% are having no habits of balloon blowing.

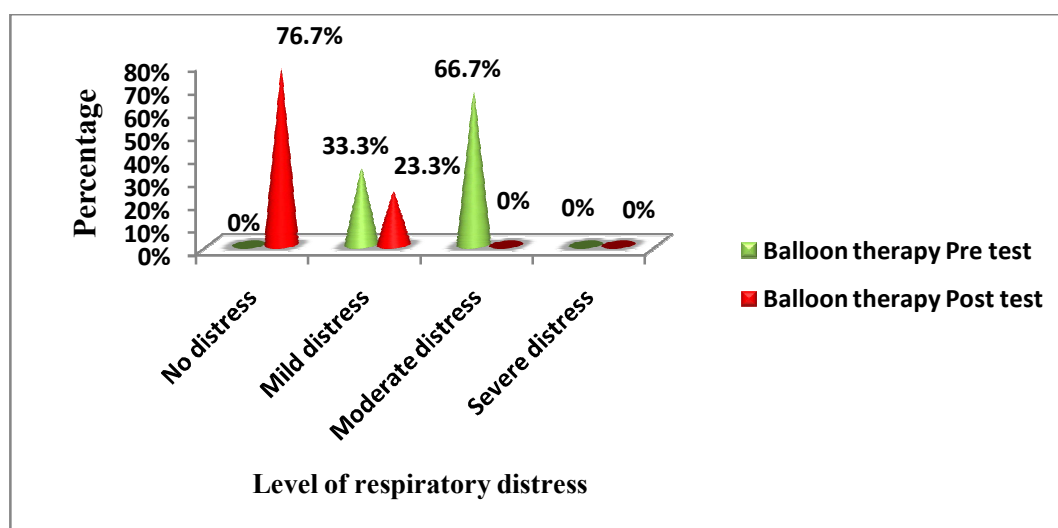


Fig 2. Percentage distribution of the children according to the level of respiratory parameters before and after balloon therapy (group 1)

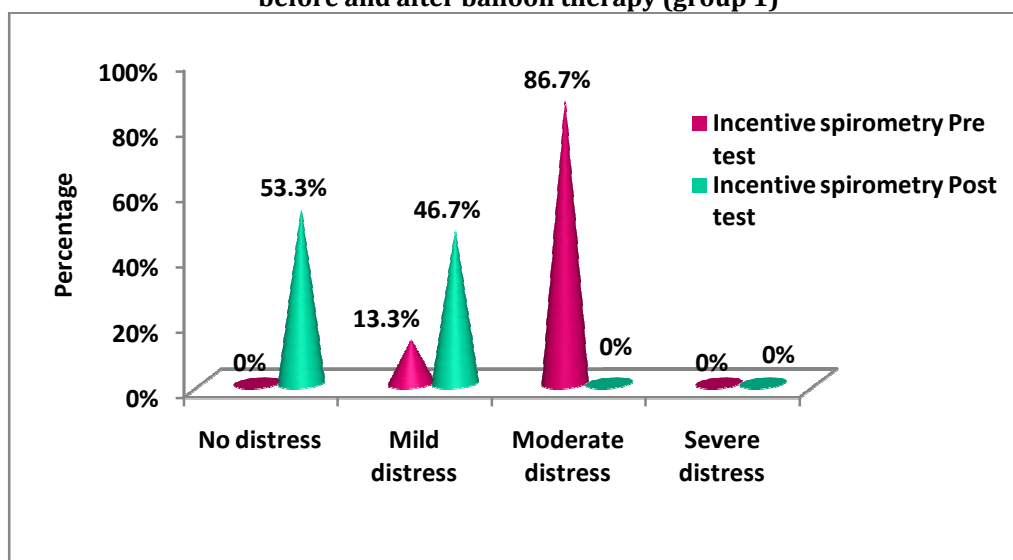
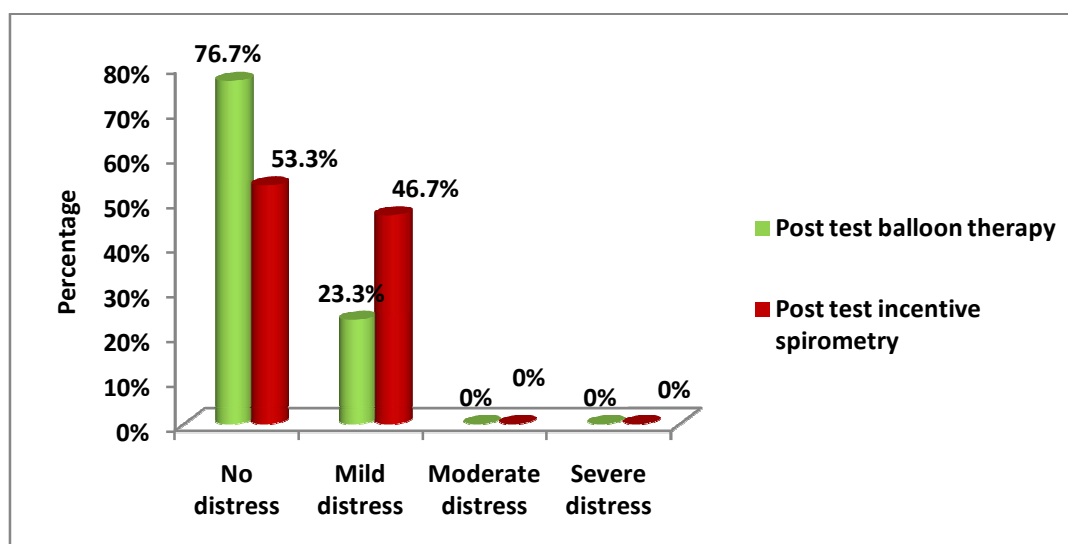


Fig 3. Percentage of the children according to the level of respiratory parameters before and after incentive spirometry (group 2)



**Fig. 4.** Percentage of the children in Balloon therapy (group 1) and Incentive spirometry (group 2) according to the level of respiratory parameters after the intervention.

**Table 4.1:** Mean and standard deviation and paired 't' value on pre and post-test level of respiratory parameters among children in group 1: N=30

Group 1	Mean	Standard deviation	Paired 't' test	p value
Balloon therapy				
Pre test	27.77	1.851	13.554*	0.000*
Post test	38.3	1.269		S

p=0.000\* S- Significant; NS- Non Significant

**Table 4.2:** Mean and standard deviation and paired 't' value on pre and post-test level of respiratory parameters among children in group 2. N=30

Group 2	Mean	Standard deviation	Paired 't' test	p value
Incentive spirometry				
Pre test	27.1	3.65	11.709*	0.000*
Post test	35.77	3.655		S

p=0.000\* S- Significant; NS- Non Significant

**Table 4.3:** Mean, standard deviation and unpaired t value of the post-test level of respiratory parameters among children in balloon therapy group and incentive spirometry group after intervention N=60

Group	Mean	Standard deviation	Unpaired t value	p value
Balloon therapy	38.3	3.65	2.686*	0.009*
Incentive spirometry	35.77	3.655		

p=0.009\* S- Significant; NS- Non Significant

## DISCUSSION

### Demographic variables

The findings reveal that the demographic profile in group 1 (balloon therapy) highest percentage of the children (36.6%) are belongs to the age between 9-11 years and 11-14 years respectively, 73.3% are females, 30.0% are studying at above 7<sup>th</sup> standard, 33.3% children's father studied Intermediate or diploma, 40.0% Children's mother studied Middle school, 50.0% children's mothers are Home maker, 66.7% children's fathers are Private employee, 60.0% family income is greater than Rs.10000, 73.3% are belonged to nuclear family, 50.0% are residing at rural & urban respectively, 50.0% are second child in the family, 76.7% are having Two child in the family, 70.0% are belongs to Hindu, 73.3% were exposed to respiratory infection between one to two times, 50.0% are having Family history of cigarette smoking &

no Family history of cigarette smoking respectively, 93.3% are speaking Tamil, 70.0% are having no habits of balloon blowing.

The demographic profile in group 2 (incentive spirometry) highest percentage of the children (53.3%) are belongs to the age between 11-14 years, 56.7% are females, 36.7% are studying above 7<sup>th</sup> standard, 33.3% children's mother studied Intermediate or diploma, 40.0% children's father studied Intermediate or diploma, 60.0% children mothers are Home maker, 60.0% children fathers are Private employee, 60.0% children's family income is greater than Rs.10000, 83.3% are belongs to nuclear family, 56.7% are residing at urban, 66.7% are the second child in the family, 46.7% are having Two child in the family, 100.0% are belongs to Hindu, 63.3% are exposed to respiratory infection between one to two times, 53.3% are having Family history of cigarette smoking, 96.7% are speaking Tamil, 70.0% are having no habits of balloon blowing.

The result was consistent with Sreedevi [6] has conducted a study on Effectiveness of balloon blowing on respiratory parameters among children with Lower Respiratory Tract Infection in selected hospitals, Kanyakumari district. The major findings of the demographic variable are similar to this study (most of the children's are second child of the family, Hindu religion, their family income is more than Rs.10000, their fathers are private employee, the children's are having one to two episode of respiratory tract infection per year and they doesn't have the history of practicing balloon blowing exercise previously).<sup>(6)</sup> Similarly Ranjita [7] has conducted a study on Effect Of Strelnikova Exercise On Respiratory Parameters Among Children With LRTI In Selected Hospital Bhubaneswar which shows the similar demographic variable findings (most of the children are females and belongs to nuclear family).

**The first objective of the study was to assess the physiological parameters of children with lower respiratory tract infection before balloon therapy (Group 1).**

The findings reveal the level of respiratory distress level among children in group 1 (balloon therapy) in pre test 66.7% of children are having moderate distress, 33.3% of children are having mild distress and none of them are in severe distress and no distress. Hence it can be interpreted that most of the children's are having moderate respiratory distress.

**The second objective of the study was to assess the physiological parameters of children with lower respiratory tract infection before incentive spirometry (Group 2).**

The findings reveal the level of respiratory distress level among children in group 2 (incentive spirometry) in pre test 86.7% of children are having moderate distress, 13.3% of children are having mild distress and none of them are in severe distress and no distress. Hence it can be interpreted that most of the children's are having moderate distress.

**The Third objective of the study was to find the effectiveness of balloon therapy Vs incentive spirometry on physiological parameters of children with lower respiratory tract infection after the intervention:**

**Balloon therapy**

The findings reveal the level of respiratory distress level among children in balloon therapy before and after the intervention, in pre test 66.7% of children are having moderate distress, 33.3% of children are having mild distress and none of them are in severe distress and no distress. In post test 76.7% of the children are having no distress, 23.3% of the children are having mild distress and none of them are having moderate and severe distress. The mean score on the level of respiratory parameters among children, in group 1 the mean value was 27.7 in pre test and 38.3 in post test respectively. The estimated paired 't' value was 13.554\* which is significant at  $p=0.000$ . It shows balloon blowing exercise was effective in reducing respiratory distress. Hence the hypothesis 1 was accepted.

**Incentive spirometry**

The findings reveal the level of respiratory distress level among children in incentive spirometry before and after the intervention, in pre test 86.7% of children are having moderate distress, 13.3% of children are having mild distress and none of them are in severe distress and no distress. In post test 53.3% of the children are having no distress, 46.7% of the children are having mild distress and none of them are having moderate and severe distress. The mean score on the level of respiratory parameters among children, in group 2 the mean value was 27.10 in pre test and 35.77 in post test respectively. The estimated paired 't' value was 11.709\* which is significant at  $p=0.000$  It shows balloon blowing exercise was effective in reducing respiratory distress. Hence the hypothesis 2 was accepted.

However when compared with incentive spirometry balloon blowing group children are recovered from the respiratory distress and the one fourth of the children are having mild distress. It was interpreted that balloon blowing is effective than the incentive spirometry on children with LRTI.

This results was consistent with Miss Smita Manjusha Das, [8] conducted a study on effect of balloon therapy Vs Bubble therapy on LRTI among 3-12 years children. The findings of the study shows that there was significant difference observed between pre and posttest mean score of physiological parameters

both in bubble and balloon group at  $p < 0.0001$ . Highly statistically significant difference was observed in all physiological parameters between both group ( $p$ - value 0.0001, 0.01 and 0.009) respectively. The study implies that both bubble and balloon blowing exercise are equally effective in improvement of physiological parameters of children with lower respiratory tract infection.

Another study by Renuka, [9], found that the effect of balloon therapy on patient with LRTI. They were concluded that there was a statistically significant improvement in the pre and post test respiratory rate ( $p < 0.001$ ).

A similar study by Dr. B. Mahalakshmi [10], concluded in her study that before balloon therapy the pretest mean score and standard deviation of respiratory distress was  $19.77 \pm 6.794$  whereas after the posttest mean and standard deviation was  $24.29 \pm 6.247$ . There was a statistical significant difference found at 5% level of significance.<sup>(10)</sup>

Another study by Shakila & kokilavani [11], found that the pre intervention mean and standard deviation was  $27.0 \pm 4.61$  and in posttest I the score was  $22.2 \pm 5.78$ , posttest II score was  $16.2 \pm 0.752$ . The calculated  $t$  value was 6.467 for posttest I and 10.09 for posttest II. It was concluded that balloon blowing exercise was significantly improve the breathing pattern of asthma children.

**The fourth objective of the study was to compare the physiological parameters of children with lower respiratory tract infection between two groups after the intervention:**

The results shows that the mean score on the level of respiratory parameters among children after the intervention in group 1 was 38.3, in group 2 was 35.77 respectively. The estimated unpaired  $t$  value was 2.686\*, which is significant at  $p = 0.009$ . It shows the significant difference in the post-test level of respiratory parameters among children in both the groups. Hence the hypothesis 3 was accepted.

Arunima [12] conducted a study on effect on balloon therapy vs spirometry on promotion of respiratory function in children with respiratory infections. Quasi experimental two group pretest and posttest design was used. 40 children from the age group of 2-6 years with ARI were the samples in this study. The researcher found that balloon therapy seems more effective in reducing respiratory symptoms in children with respiratory problems in comparison with spirometry. As the data supports balloon therapy is more effective than spirometry.

A similar study by Bhuvaneshwari and Kunjachan [13], conducted a study on effect of balloon therapy versus spirometry in promotion of respiratory function in children with lower respiratory tract infection at SMCH. They used quasi experimental research pretest posttest design with 60 samples. It shows that balloon therapy was statistically significant at the level of heart rate and O<sub>2</sub> saturation at  $p < 0.05$  level between pre and posttest than the spirometry group.

The fifth objective of the study was to associate the physiological parameters before the intervention among children with lower respiratory tract infection with their selected demographic variables:

The results shows that there is no significant relationship between physiological parameters with demographic variables such as Age, Sex, education, Parent's education and occupation, Residence, Religion, Order of birth, No of children in family, Income, Frequency of respiratory infection, Smoking history and Previous habit of balloon blowing. So the stated hypothesis 4 is not accepted.

Similarly, Mahalakshmi [10] found no association between age of the child, gender, education of the children, number of children in the family, parent occupation, type of family, number respiratory infection during last year, monthly income of the family etc [10].

## CONCLUSION

Children are wealth of the nation. The duty of nation is to safeguard our treasure. Most of the children are having respiratory problem due to polluted environment, overcrowding, smoke zone, bacteria and virus etc. These factors will affect the children easily because of their weak immune system. In order to promote the children health certain types of play are useful such as blowing balloon, candle, and air in the water by straw, incentive spirometry and so on. This study has proved that the balloon blowing is highly effective in reducing the respiratory distress. Also research recommends that the balloon blowing can be practice at pediatric ward hospitalized children. This may be helpful in improving the physical mental and emotional wellbeing of children.

## CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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