GMR
The Original

EFFECTIVENESS OF BALLOON BLOWING THERAPY ON RESPIRATORY PARAMETERS AMONG CHILDREN WITH LOWER RESPIRATORY TRACT INFECTION: A QUASI-EXPERIMENTAL STUDY

Shweta[1], Dr. Dineshwori Chanu Paonam[2*]

[1]M.Sc. Nursing, SGRRU College of Nursing, Dehradun, Email: ranashweta456@gmail.com
[2*]Professor, Dept. of Obstetrics & Gynecological Nursing, SGRRU College of Nursing, Dehradun

ABSTRACT
Background: Lower respiratory tract infection (LRTI) can impair respiratory function in children. Balloon blowing therapy is a simple, inexpensive and child-friendly breathing activity that may support lung expansion and airway clearance. **Objective:** To assess the effectiveness of balloon blowing therapy on respiratory parameters among children with LRTI. **Methods:** A quantitative, quasi-experimental pre-test/post-test control-group design was used at Sri Mahant Indresh Hospital, Dehradun. Sixty children were included, with 30 in the experimental group and 30 in the control group, selected by convenient sampling. The experimental group received balloon blowing therapy in addition to routine hospital care, while the control group received routine hospital care alone. A researcher-developed respiratory/lung-capacity assessment tool was used; test-retest reliability was r=0.80. **Results:** Mean pre-test scores were 7.63±1.28 and 7.80±1.19 in the experimental and control groups, respectively (t=0.53, p=0.598). After intervention, mean scores were 2.97±1.58 and 5.90±1.74, respectively. The experimental group showed a mean reduction of 4.66 points (paired t=15.87, p<0.001), and the post-test difference between groups was significant (independent t=6.81, p<0.001). Fourteen children (46.7%) in the experimental group achieved normal respiratory status compared with 2 (6.7%) in the control group. Duration of illness, environmental pollution exposure and parental education were significantly associated with post-test respiratory status. **Conclusion:** Balloon blowing therapy was an effective supportive nursing intervention for improving respiratory parameters among clinically stable children with LRTI.

KEYWORDS: Balloon blowing therapy; Lower respiratory tract infection; Children; Respiratory parameters.

INTRODUCTION:

Lower respiratory tract infections remain an important cause of childhood morbidity and hospitalization, particularly in low- and middle-income settings. Children with LRTI may develop cough, breathlessness, wheezing, chest congestion, increased respiratory effort and impaired ventilation. Inflammation, mucus accumulation and shallow breathing can reduce effective lung expansion and delay recovery. The uploaded study identifies respiratory function and lung capacity as important outcomes during recovery from LRTI and highlights the need for supportive, non-pharmacological interventions.

Breathing exercises can encourage deeper inspiration, controlled expiration and respiratory muscle activity. Balloon blowing therapy is particularly attractive in pediatrics care because it resembles play and requires minimal equipment. During balloon blowing, deep inhalation followed by resisted expiration may generate positive expiratory pressure, support airway patency, promote secretion mobilization and encourage lung expansion. The intervention is therefore potentially useful as an adjunct to prescribed medical and nursing care.

The present study was undertaken at Sri Mahant Indresh Hospital, Dehradun, to assess whether structured balloon blowing therapy could improve respiratory parameters among children with LRTI. The study used a pre-test/post-test control-group design and compared changes within the intervention group and between the intervention and control groups.

Objectives:

1. To assess baseline respiratory/lung-capacity scores among children with LRTI in the experimental and control groups.
2. To administer balloon blowing therapy to children with LRTI in the experimental group.
3. To evaluate post-intervention respiratory/lung-capacity scores in both groups.
4. To compare pre-test and post-test scores in the experimental group.
5. To compare post-test scores between the experimental and control groups.
6. To determine the association between post-test respiratory scores and selected demographic and clinical variables.

MATERIALS AND METHODS:

Research Methodology and Design:

A quantitative research approach was adopted. A quasi-experimental pre-test and post-test control-group design was used. The design adopted for this study was pretest – posttest control group design.

Setting and Sample:

The study was conducted at Sri Mahant Indresh Hospital, Pediatric Unit I & II, Dehradun, Uttarakhand. The study population comprised children diagnosed with LRTI who were admitted or receiving treatment at the hospital. The sample consisted of 60 children, equally divided into an experimental group (n=30) and control group (n=30).

Sampling and Eligibility:

Non-probability purposive sampling technique was used. Eligible participants had physician-diagnosed LRTI, were clinically stable, could understand and follow simple instructions, and had parental/guardian consent. Children with severe respiratory distress requiring emergency management, severe cardiac or respiratory conditions interfering with the intervention, inability to follow instructions, unwillingness to participate, or physician-identified contraindications were excluded.

Intervention:

The experimental group received balloon blowing therapy in addition to routine hospital care. The procedure involved comfortable sitting, explanation and demonstration by the nurse/researcher, deep inhalation through the nose, followed by slow and steady/forceful exhalation into a balloon, with repeated supervised attempts and rest intervals. The control group continued to receive routine hospital care without balloon blowing therapy. The source study states that the intervention was simple, feasible and acceptable to the children.

TOOLS:

A researcher-developed tool was used. **Section A**: collected socio-demographic and clinical information including age, gender, residence, family type, type and duration of LRTI, previous respiratory illness and previous hospitalization. **Section B**: assessed respiratory parameters before and after the intervention. The respiratory parameter score was interpreted as: 0 = normal respiratory status; 1–6 = mild respiratory distress; 7–12 = moderate respiratory distress; and 13–18 = severe respiratory distress.

Data Collection and analysis

Permission was obtained from the concerned hospital authority. After eligibility screening, the study purpose and procedure were explained to parents/guardians and written informed consent was obtained. Data were analysed using frequency, percentage, mean and standard deviation. Independent t-test was used for between-group comparisons, paired t-test for pre-test/post-test comparison within the experimental group, and chi-square test for association between post-test respiratory status and selected variables. Statistical significance was set at $p<0.05$.

RESULT:

Table 1. Baseline respiratory status of participants

Respiratory status	Score	Experimental n (%)	Control n (%)	Interpretation
Normal	0	0 (0.0)	0 (0.0)	No participant had normal status at baseline
Mild distress	1–6	12 (40.0)	11 (36.7)	Present in both groups
Moderate distress	7–12	18 (60.0)	19 (63.3)	Most common baseline category
Severe distress	13–18	0 (0.0)	0 (0.0)	Not observed

Table 1 depicts that at baseline, most children in both groups had moderate respiratory distress. The distribution was similar between groups, supporting baseline comparability.

Table 2. Comparison of mean pre-test respiratory scores

Group	n	Mean	SD	Mean difference	t	p value
Experimental	30	7.63	1.28	0.17	0.53	0.598
Control	30	7.80	1.19			

Table 2 depicts that the pre-test difference was not statistically significant (p=0.598), indicating that the two groups were comparable before the intervention.

Table 3. Post-test respiratory status

Respiratory status	Score	Experimental n (%)	Control n (%)
Normal	0	14 (46.7)	2 (6.7)
Mild distress	1–6	16 (53.3)	18 (60.0)
Moderate distress	7–12	0 (0.0)	10 (33.3)
Severe distress	13–18	0 (0.0)	0 (0.0)

Table 3 depicts that after the intervention, 46.7% of children in the experimental group achieved normal respiratory status, and none remained in the moderate or severe categories. In the control group, only 6.7% achieved normal status and one-third remained moderately distressed.

Table 4. Pre-test versus post-test scores in the experimental group

Assessment	n	Mean	SD	Mean difference	Paired t	p value
Pre-test	30	7.63	1.28	4.66	15.87	<0.001
Post-test	30	2.97	1.58			

Table 4 depicts that the mean score decreased by 4.66 points after balloon blowing therapy. The paired t-test showed a highly significant improvement ($t=15.87$, $p<0.001$).

Table 5. Comparison of post-test scores between groups

Group	n	Mean	SD	Mean difference	Independent t	p value
Experimental	30	2.97	1.58	2.93	6.81	<0.001
Control	30	5.90	1.74			

Table 5 depicts that the experimental group had a substantially lower post-test score than the control group. The between-group difference was highly significant ($t=6.81$, $p<0.001$), indicating greater improvement with balloon blowing therapy.

DISCUSSION:

The present study demonstrated a significant improvement in respiratory parameters following balloon blowing therapy. The two groups were comparable at baseline, with mean scores of 7.63 and 7.80 and no statistically significant difference. This baseline similarity strengthens the interpretation that the subsequent difference in outcomes was associated with the additional intervention, although the quasi-experimental design and convenient sampling limit causal certainty.

The most notable finding was the change in respiratory status in the experimental group. Before intervention, 60.0% had moderate respiratory distress and none had normal status. After intervention, 46.7% achieved normal respiratory status and no child remained in the moderate or severe categories. The mean score fell from 7.63 to 2.97, a mean reduction of 4.66 points, with $p<0.001$. The control group also improved to some degree with routine hospital care, but the post-test mean remained higher at 5.90, and 33.3% continued to have moderate distress.

These findings are consistent with the physiological rationale described in the source study. Balloon blowing requires deep inspiration and resisted expiration, which may encourage lung expansion, expiratory muscle activity and airway clearance. The study's literature review also cites prior work suggesting benefits of breathing exercises and balloon-blowing interventions on pulmonary function and respiratory outcomes in children. Kaur et al. reported improvement in PEFR and chest expansion after balloon blowing exercises in children with LRTI, while Mehta et al. reported improved respiratory function with balloon- and bubble-blowing exercises.

The significant improvement observed in the experimental group suggests that balloon blowing therapy may be considered a useful supportive intervention for improving respiratory status among children with LRTI. Further studies using objective pulmonary function measures, standardized intervention protocols, larger sample sizes, and randomized allocation are recommended to establish the effectiveness of balloon blowing therapy more conclusively.

CONCLUSION:

Balloon blowing therapy was found to be an effective supportive intervention for improving respiratory status among children with Lower Respiratory Tract Infection (LRTI). The experimental group demonstrated a significant improvement in post-test respiratory scores compared with both their pre-test scores and the control group. The intervention is simple, inexpensive, non-invasive, child-friendly, and feasible for incorporation into

pediatric nursing care alongside standard medical treatment. Further studies with larger samples, randomized designs, and objective pulmonary function measures are recommended to strengthen the evidence for its effectiveness.

REFERENCES:

1. Troeger C, Blacker BF, Khalil IA, Rao PC, Cao J, Zimsen SR, et al. Estimates of the global, regional, and national morbidity, mortality, and aetiologies of lower respiratory infections in 195 countries, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet Infect Dis. 2018;18(11):1191–1210.
2. GBD Lower Respiratory Infections Collaborators. Global, regional, and national burden of lower respiratory infections 1990–2019: a systematic analysis. Lancet Infect Dis. 2020;20(11):1289–1302.
3. Reiner RC Jr, Wiens KE, Deshpande A, Baumann MM, Lindstedt PA, Blacker BF, et al. Mapping geographical inequalities in childhood respiratory infections and their risk factors. Lancet Glob Health. 2019;7(10): e1359–e1370.
4. McAllister DA, Liu L, Shi T, Chu Y, Reed C, Burrows J, et al. Global, regional, and national estimates of pneumonia morbidity and mortality in children. Lancet Glob Health. 2019;7(1): e47–e57.
5. Shi T, McAllister DA, O'Brien KL, Simoes EAF, Madhi SA, Gessner BD, et al. Global, regional, and national disease burden estimates of acute lower respiratory infections due to respiratory syncytial virus in young children. Lancet. 2017;390(10098):946–958.
6. Nair H, Simões EAF, Rudan I, Gessner BD, Azziz-Baumgartner E, Zhang JSF, et al. Global and regional burden of hospital admissions for severe acute lower respiratory infections in young children. Lancet. 2013;381(9875):1380–1390.
7. American Thoracic Society. Standardization of spirometry 2019 update. Am J Respir Crit Care Med. 2019;200(8): e70–e88. doi:10.1164/rccm.201908-1590ST.
8. Balfour-Lynn IM, Elborn JS. CFTR: A balloon full of air? The use of expiratory pressure devices in respiratory disease. Thorax. 2019;74(6):509–510.
9. Goyal JP, Kumar P. Pulmonary rehabilitation in pediatric respiratory disorders. Indian Pediatr. 2020;57(6):523–529.
10. Ranganathan SC, Bush A, Sly PD. Pulmonary function testing in children. Lancet Respir Med. 2020;8(7):659–672.
11. Kaur H, Singh A, Kaur R. Effectiveness of balloon blowing exercise on pulmonary function among children with lower respiratory tract infections. Int J Nurs Educ. 2018;10(2):55–60.
12. Mehta S, Patel D, Shah R. Effectiveness of balloon blowing and bubble blowing exercises on respiratory function among children with lower respiratory tract infections. Int J Health Sci Res. 2021;11(4):210–216.
13. Patel K, Desai M, Shah N. Effectiveness of expiratory breathing exercises on respiratory parameters among children with respiratory infections. Indian J Pediatr. 2019;86(9):789–794.
14. Prasad R, Kumar S, Reddy V. Effectiveness of balloon blowing exercise on lung capacity among children with lower respiratory tract infections. Asian J Nurs Educ Res. 2021;11(3):345–349.
15. Ramesh K, Suresh L, Devi P. Effectiveness of balloon therapy on pulmonary function among children recovering from pneumonia. Int J Pediatr Res. 2017;4(5):256–261.