Journal for Re Attach Therapy and Developmental Diversities
eISSN: 2589-7799
2025 June; 8 (2): 01-08

Assess the Effectiveness Of Balloon Blowing Exercise On Respiratory Parameters Among The Patients With Lower Respiratory Tract Infection In Selected Hospital Of Bihar.

Ms. Khushboo Nesha Khatun[1*], Mrs Babita Kumari[2], Dr Priyanka Chaudhary[3], Ms. Pooja Kumari[4]

[1*] M. Sc. Nursing (Medical Surgical Nursing), Akal College Of Nursing Baru Sahib, Eternal University (H.P) Email ID-khushbooneshak@gmail.com
[2] Assistant Professor (Medical Surgical Nursing), Akal College Of Nursing Baru Sahib, Eternal University (H.P)
[3] Professor (Medical Surgical Nursing), Akal College Of Nursing Baru Sahib, Eternal University (H.P)
[4] M. Sc. Nursing (Medical Surgical Nursing), Akal College Of Nursing Baru Sahib, Eternal University (H.P)

Abstract

Introduction: Breath is the finest gift of nature. Be grateful for this wonderful gift. The aim of the study was to assess the effectiveness of Balloon Blowing Exercise on respiratory parameters among the patients with lower respiratory tract infection and to improve their breathing.

Methods: Quasi Experimental (Non-randomised control group design) was adopted. Non-probability Purposive sampling technique was used to select 60 lower respiratory tract infection patients and they were equally divided into experimental and control group. Data was collected using clinical parameters scale (respiratory rate and oxygen saturation) and modified dyspnoea scale at selected hospital of Bihar.

Result: Study findings revealed that in experimental group pre-interventional respiratory rate impairment was 1.90±0.66 which reduced to 0.70±0.53, oxygen saturation impairment was 2.36±0.61 which reduced to 0.60±0.56 and dyspnoea level was 1.90±0.60 which reduced to 0.50±0.57 after intervention. Whereas, in control group pre-interventional respiratory rate impairment was 2.06±0.52 which reduced to 1.43±0.50, oxygen saturation impairment was 2.00±0.58 which reduced to 1.83±0.64 and dyspnoea level was 1.96±0.66 which reduced to 1.46±0.62 during post-test. Intervention was not given to control group. Calculated each p value was<0.05 level of significant. In experimental group t-value was 11.93, 22.49 and 15.38 while in control group it was 7.07, 1.98, and 5.38 for respiratory rate, oxygen saturation and modified dyspnoea scale respectively.

Conclusion: According to study findings balloon blowing exercise was effective on respiratory parameters among patients with lower respiratory tract infection.

Keywords: LRTI, respiratory rate, oxygen saturation rate, modified dyspnea scale

1. INTRODUCTION

A positive term, health emphasizes both physical abilities social and personal resources. The means to live a whole life with meaning and purpose are provided by a healthy lifestyle. An individual in good physical health is probably experiencing optimal body functions and processes. This is caused by more than just the lack of illness. A healthy diet, regular exercise, and enough sleep are all important for maintaining good health.

An acute illness affecting the trachea (windpipe), airways, and lungs, which comprise the lower respiratory system, is commonly referred to as a lower respiratory tract infection (LRTI). Included in LRTI are bronchitis, pneumonia, pulmonary tuberculosis and hemoptysis. An infection of the lungs, more especially of the lower airways, results in a (RTI). The area of the respiratory system that is affected by lower respiratory tract infections is different from that of upper respiratory tract infections. Upper respiratory tract infections affect the structures in or above the larynx, whereas lower respiratory tract infections affect the airways beneath the larynx. LRTIs are infections affecting the trachea and alveolar sacs, which are part of the airways below the larynx. LRTI are described in a variety of ways. After drawing in air from the upper respiratory system, these structures emit carbon dioxide in return for the oxygen they have absorbed.

Hospitalized LRTI incidence rates (per 100,000 person-years) raised with age, from 148 for 18–49 years to 6,884 for ≥ 85 years; relative risks (RRs) for ages 50–64, 9.6 for 65–74, 23.0 for 75–84, and 46.6 for ≥ 85 years were found in comparison to ages 18–49. LRIs were expected to have 344 million cases worldwide in 2021, or 4,350 episodes per 100,000 persons, by the 2021 (GBD) Injuries, and Risk Factors Study (GBD). According to the report, there were 218 million LRI-related deaths in 2021, or 27.7 deaths for every 100,000 persons.

Due to hospital admissions related to COVID-19, the incidence of (LRTI) in adults in 2022 exceeded pre-pandemic levels. Compared to influenza-associated LRTI hospital admissions prior to the pandemic, the incidence of COVID-19-associated LRTI hospital admissions was 1.2 times higher. However, it was 0.2 times lower than the incidence of RSV-associated LRTI hospital admissions prior to the pandemic. 2022 saw a 28% increase in the in-hospital incidence of all-cause LRTI deaths compared to pre-pandemic levels.

In general, LRTIs are more dangerous than upper respiratory infections and inflict a significant financial burden on healthcare systems. The overall number of LRTI-related mortality has somewhat decreased since 1993. Nonetheless, they continued to be the primary cause of death among all infectious diseases in 2022, accounting for 6.9% of all fatalities that year as well as 3.9 million deaths globally.

Each year, acute respiratory infections claim the lives of over 5 million people. Pneumonia is the most common cause of death, hospitalization, and medical consultation among these. Mortality, morbidity, and microbial etiology are all influenced by a number of factors, including age, underlying disease, and environment. The authors also make use of current information regarding the respiratory bacteria with the highest frequency of drug resistance. Physicians must be aware of these various clinico-epidemiological scenarios in order to treat bronchitis and pneumonia effectively.

Adults who have (LRTIs) may be susceptible to a range of microorganisms, such as viruses, bacteria, and fungus. Although viruses are the most prevalent cause of this infection, bacteria and other uncommon organisms can also be the cause. Most occurrences of bronchiolitis and bronchitis are caused by viruses. Streptococcus pneumoniae is the most frequent bacterial cause of community-acquired pneumonias People can spread these bacteria from one another via sneezing, coughing, or making indirect touch with surfaces. weakness, exhaustion and coughing.[8] These pathogens are transported in microscopic droplets. Additionally, breathing aerosolized material or aspirating upper airway flora can allow infectious organisms to infiltrate the LRTI.

Micro-organism from upper respiratory tract travels to the medium and small bronchi as well as the bronchiole, where it causes epithelial necrosis and triggers an inflammatory reaction. Alveolar air trapping results from the partial obstruction caused by the edema and exudate that is forming. This obstruction is most noticeable on expiration. There could be many locations of atelectasis if the trapped air is completely blocked and absorbed. LRTI symptoms can range from minor symptoms like congestion, runny nose, dry cough, sore throat, low-grade fever, and moderate headache to more severe ones. severe cough, wheezing, tightness or pain in the chest, quick or difficult breathing, and bluish skin from oxygen deprivation. A general shift in well-being (reduction in energy, appetite, and fluid intake) is another indication. Medical history, physical examination, chest X-ray, blood tests, sputum culture, respiratory virus panel, and bronchoscopy are all tools a clinician can use to diagnosis an LRTI.

A lot of (LRTIs) heal on their own and don't require further care. Since there isn't a single treatment for all LRTIs, if you do require medical attention, your doctor will select a course of action based on the symptoms you are exhibiting.[9] Since the majority of LRTIs are viral, treatment usually involves no medication. Nonetheless, a few over-the-counter medications could offer some symptom relief: Pain and fever can be reduced by nonsteroidal anti-inflammatory medicines (NSAIDs), such as aspirin, ibuprofen, and naproxen. Acetaminophen is also useful in treating fever and pain. Breathing difficulties and wheezing can be alleviated by using a bronchodilator inhaler. Antibiotics may be administered if an LRTI is bacterial, based on the severity of the infection and your general condition. These address the infection's bacterial etiology.

vaccinations against pneumococcal pneumonia and influenza in high-risk adults with underlying respiratory conditions. Check the location of the tube and give feedings slowly to avoid aspiration during nasogastric tube feedings. Properly dispose of secretions to prevent the spread of infection. Talk about and practice relaxing techniques to ease tension, anxiety, and stress. Pursed lip breathing can help regulate the depth and rate of breathing as well as enhance respiratory muscle coordination when used intermittently and during dyspnoea.

In a medical or therapeutic setting, blowing air into a balloon to inflate it is known as balloon blowing, which is a respiratory exercise. It helps strengthen respiratory muscles, improve breathing control, and improve lung function when administered in respiratory treatment or pulmonary rehabilitation.

Balloon treatment is an empirical example that patients with respiratory illnesses can use to improve their daily care. During the balloon-blowing exercise, the intercostal muscles contract, expanding and lifting the ribs and diaphragm. At this point, oxygen can enter the lungs and carbon dioxide can exit. It has been shown that patients with respiratory tract illnesses may benefit from balloon therapy. In developing countries like India, this medication is among the most

effective. The balloon-blowing exercise improves pulmonary functions, respiratory muscle strength, chest mobility, and lumbar mobility in addition to correcting the improper breathing pattern.

2.STATEMENT OF PROBLEM

A quasi-experimental study to assess the effectiveness of Balloon Blowing Exercise on respiratory parameters among the patients with lower respiratory tract infection in selected hospital of Bihar.

3.OBJECTIVES

- To assess the respiratory parameters among the patients with lower respiratory tract infection in experimental and control group.
- To determine the effectiveness of Balloon Blowing Exercise on respiratory parameters among the patients with lower respiratory tract infection in experimental group.
- To compare the Effectiveness of Balloon Blowing Exercise on respiratory parameters among the patients with lower respiratory tract infection in experimental and control group.
- To find out association between pre interventional and post interventional respiratory parameters among the patients with lower respiratory tract infection in experimental group and control group with their selected socio-demographic variables

4. REVIEW OF LITERATURE

A quasi-experimental (2023) was conducted on Effect of Balloon-Blowing Exercise on Oxygen Saturation in COVID-19 Patients. Purposive sampling methods were used to collect 250 samples. Oxygen saturation is measured with a pulse oximeter. As oxygen saturation increased following the balloon exercise, the data showed that the exercise was successful. Pre- and post-values involving 95.685±1.645 and 98.123±1.445, respectively, showed a significant difference, according to the analysis.[18]

A quasi-experimental (March 2023) was conducted efficiency of the Balloon Blowing Technique on Post-COVID-19 Survivors' Quality of Life, Exercise Tolerance, and Peak Expiratory Flow Rate. 30 participants were chosen using inclusion and exclusion criteria, and they were subsequently split into two groups. In Group B (control group, n = 15), diaphragmatic breathing exercise was administered, while balloon blowing method and diaphragmatic breathing exercise were given to Group A (experimental group, n = 15). To analyse the results, the paired and independent t tests were used. $P < 0.05$ was maintained as the significant level. The post-test results for peak expiratory flow, $p < 0.05$, indicate that the experimental and control groups' post-test scores differ significantly. When it comes to exercise tolerance, the post-test results indicate a significant difference between the experimental and control groups ($p<0.05$)

6.RESEACH METHODOLOGY

Quasi Experimental (Non-randomised control group design) was adopted. Non-probability Purposive sampling technique was used to select 60 lower respiratory tract infection patients and they were equally divided into experimental and control group. Data was collected using clinical parameters including respiratory rate, oxygen saturation and modified dyspnoea scale at selected hospital of Bihar. To find the feasibility of the study and reliability of the tool pilot study was done on 6 sample and obtained r=0.75 using Karl Pearsson test-retest method. Ethical Clearance were taken from ethical clearance committee of Eternal University, Baru Sahib. Paired 't' test was used to compare the Effectiveness of Balloon Blowing Exercise on respiratory parameters among the patients with lower respiratory tract infection in experimental group. ANOVA was used to find out association between pre and post interventional respiratory parameters among the patients with lower respiratory tract infection in experimental group and control group with their socio demographic variables.

7. RESULTS

Assessment of pre-interventional and post interventional respiratory parameters among patients in experimental group and control group.

OBJECTIVE-1: To assess the respiratory parameters among the patients with lower respiratory tract infection in experimental and control group.

n=60

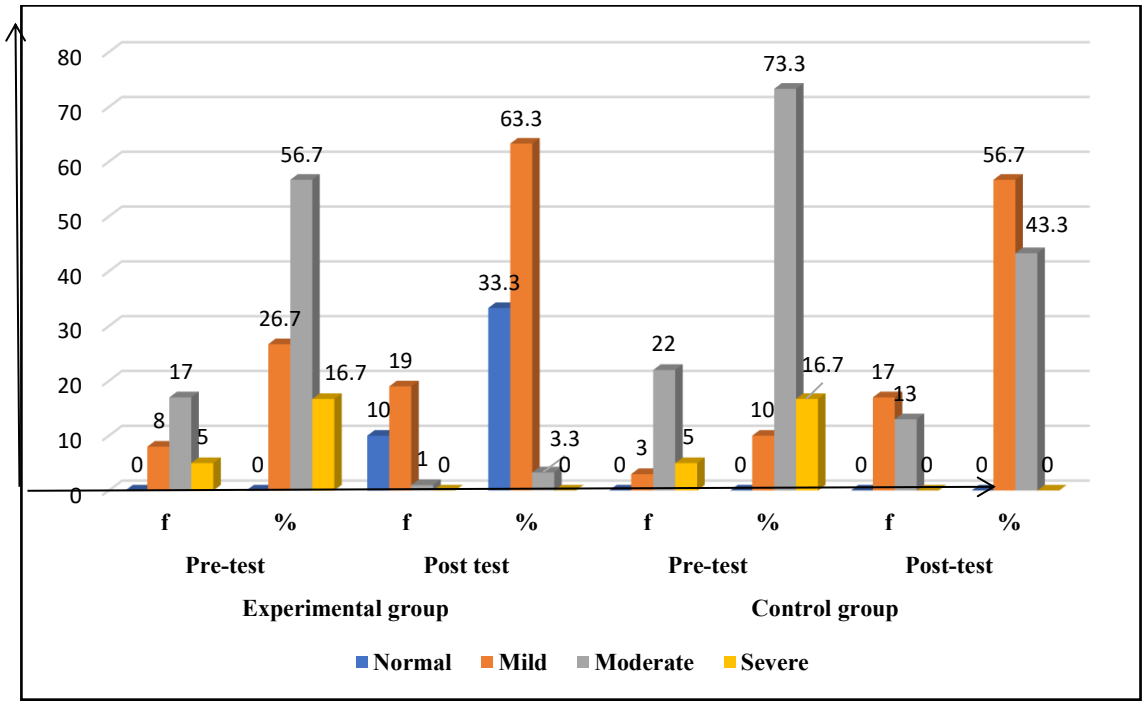
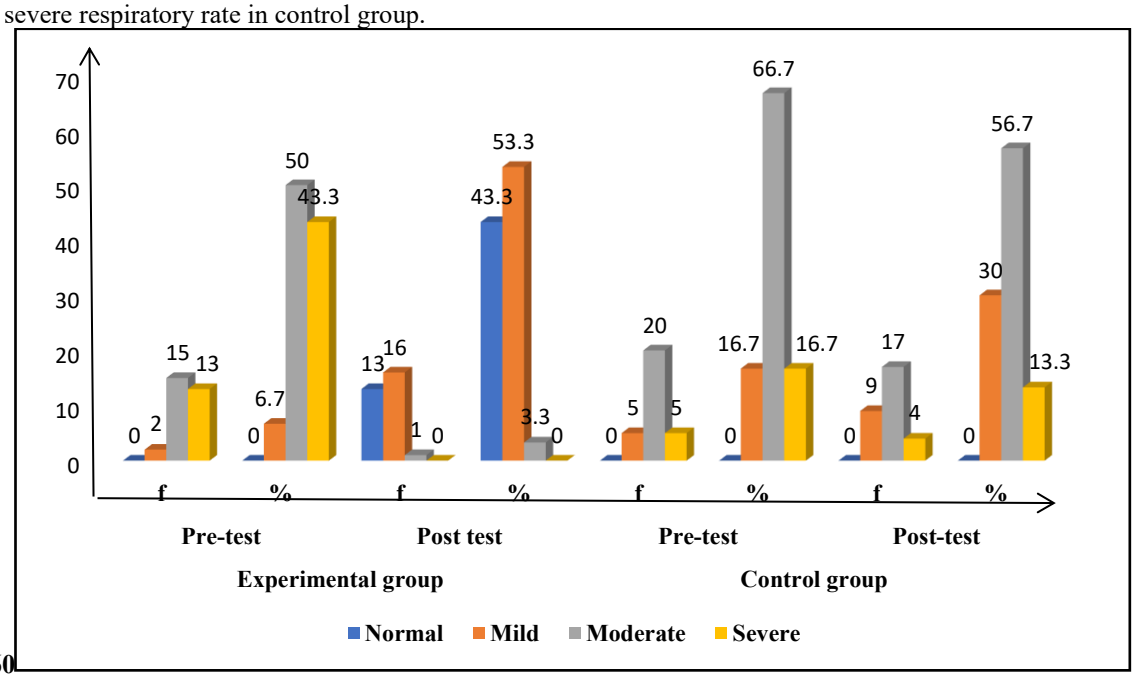


Figure 4.1: Findings related to frequency and percentage distribution of respiratory rate among the lower respiratory tract infection in experimental and control group.

Figure 4.1 shows frequency and percentage distribution of pre interventional respiratory rate among patients in experimental group that none of the patients had normal respiratory rate, 8 (26.7%) had mild respiratory rate, 17 (56.7%) had moderate respiratory rate, 5 (16.7%) had severe respiratory rate. Whereas post interventional respiratory rate, 10 (33.3%) had normal respiratory rate, 19 (63.3%) had mild respiratory rate, 1 (3.3%) had moderate respiratory rate, and none of the patients had severe respiratory rate.

In control group that none of the patients had normal respiratory rate, 3 (10.0%) had mild respiratory rate, 22 (73.3%) had moderate respiratory rate, and 5 (16.7%) had severe respiratory rate. Whereas post interventional respiratory rate, no one had normal respiratory rate,17 (56.7%) had mild respiratory rate,13 (43.3%) had moderate respiratory rate, and no one had severe respiratory rate in control group.

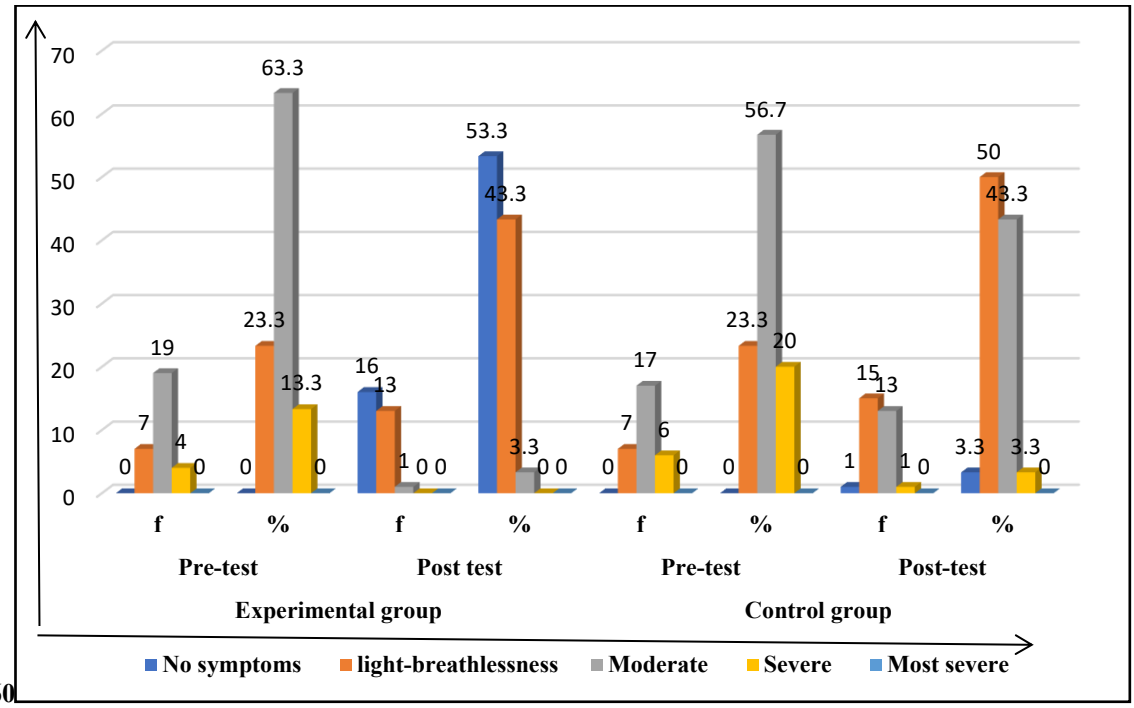


n=60

Figure 4.2: Findings related to frequency and percentage distribution of oxygen saturation rate among the lower respiratory tract infection in experimental and control group.

Figure 4.2 shows the frequency and percentage distribution of pre-interventional level of oxygen saturation among the patients in experimental group that no one had normal oxygen saturation, 2(6.7%) had mild impaired oxygen saturation, 15 (50.0%) had moderate impaired oxygen saturation, and 13 (43.3%) had severe oxygen saturation impaired oxygen saturation. Whereas post interventional level of oxygen saturation, 13 (43.3%) had normal oxygen saturation, 16 (53.3%) had mild impaired oxygen saturation 1 (3.3%) had moderate impaired oxygen saturation, and none of the in had severe impaired oxygen saturation.

In control group pre interventional level of oxygen saturation among the patients that none of the patient had normal oxygen saturation, 5 (16.7%) had mild impaired oxygen saturation, 20 (66.7%) had moderate impaired oxygen saturation, and 5 (16.7%) had severe impaired oxygen saturation. Whereas post interventional level of oxygen saturation among the patients that none of the patient had normal oxygen saturation, 9 (30.0%) had mild impaired oxygen saturation, 17 (56.7%) had moderate impaired oxygen saturation, and 4 (13.3%) had severe impaired oxygen saturation.



n=60

Figure 4.3: Findings related to percentage distribution of modified dyspnea scale among the patients with lower respiratory tract infection in experimental and control group.

Figure 4.3 shows that the frequency and percentage distribution of pre-interventional level of dyspnea among the patients in experimental group that no one had dyspnea symptoms, 7 (23.3%) had mild, 19 (63.3%) had moderate, 4 (13.3%) had severe and none of had most severe level of dyspnea. Whereas post interventional level of dyspnea among the patient were 16 (53.3%) had no symptoms, 13 (43.3%) had mild, 1 (3.3%) had moderate, and none of had severe or most severe level of dyspnea.

In control group, pre interventional level of dyspnea among the patients that no one had no symptoms, 7 (23.3%) had mild, 17 (56.7%) had moderate, 6(20.0%) had severe, and no one had most severe level of dyspnea. Whereas post interventional level of dyspnea among the patient were 1 (3.3%) had no symptoms, 15 (50.0%) had mild, 13 (43.3%) had moderate, 1(3.3%) had severe, and no one had most severe level of dyspnea.

OBJECTIVE-2: To determine the effectiveness of Balloon Blowing Exercise on respiratory parameters among the patients with lower respiratory tract infection in experimental group.

Table 4.2 Finding related to determine respiratory parameters in experimental group n=30

	Experimental group			
	Pre test		Post test	
	Mean	SD	Mean	SD
Respiratory rate	1.90	0.66	0.70	0.53
Oxygen saturation rate	2.36	0.61	0.60	0.56
Modified dyspnea scale	1.90	0.60	0.50	0.57

Table 4.2 Shows that the mean SD pre-interventional respiratory rate among patients in experimental group, were mean 1.90 and SD 0.66, post interventional were mean 0.70 and SD 0.53, pre interventional oxygen saturation rate, were mean 2.36 and SD 0.61, post interventional 0.60 and SD 0.56, pre interventional modified dyspnea were mean 1.90 and SD 0.60, post interventional modified dyspnea were mean 0.50 and SD 0.57.

OBJECTIVE-3: To compare the effectiveness of Balloon Blowing Exercise on respiratory parameters among the patients with lower respiratory tract infection in experimental and control group.

Table: 4.3 Finding related to compare the pre interventional and post interventional on respiratory parameters in experimental and control group.

n=60

Group	Experimental group				Control group			
	Pre-test	Post-test			Pre-test	Post-test		
	Mean±SD	Mean±SD	**p	t	Mean±SD	Mean±SD	p	t
Respiratory rate	1.90±0.66	0.70±0.53	0.00	11.93	2.06±0.52	1.43±0.50	0.00	7.07
Oxygen saturation rate	2.36±0.61	0.60±0.56	0.00	22.49	2.00±0.58	1.83±0.64	0.05	1.98
Modified dyspnea scale	1.90±0.60	0.50±0.57	0.00	15.38	1.96±0.66	1.46±0.62	0.00	5.38

Table 4.3: depicts, pre interventional respiratory rate in experimental group was 1.90±0.66, post interventional was 0.70±0.53, and t- value was 11.93, pre interventional oxygen saturation rate was 2.36±0.61, post-interventional was 0.60±0.56, and t- value was 22.49, pre-interventional modified dyspnea scale was 1.90±0.60, post-interventional was 0.50±0.57 and t- value was 15.38 which was highly significant at p value 0.00, it means the respiratory rate, oxygen saturation rate and modified dyspnea scale was improved after the exercise, pre interventional respiratory rate, in control group was, 2.06±0.52, post interventional was 1.43±0.50, and t- value was 7.07, pre interventional oxygen saturation was 2.00±0.58, post interventional was 1.83±0.64, and t- value was 1.98, pre interventional modified dyspnea scale was 1.96±0.66, post interventional was 1.46±0.62 and t- value was 5.38. Hence it is inferred that effectiveness of balloon blowing exercise among patients with lower respiratory tract infection has high impact in reducing clinical parameters and modified dyspnea scale in experimental group as compare to the control group.

8. DISCUSSION

Discussion Based on Study Objectives

OBJECTIVE-I: To assess the respiratory parameters among the patients with lower respiratory tract infection in experimental and control group.

The findings revealed that in frequency and percentage distribution of pre interventional respiratory rate among patients in experimental group none of the patients had normal respiratory rate, 8 (26.7%) had mild respiratory rate, 17 (56.7%) had moderate respiratory rate, 5 (16.7%) had severe respiratory rate. Whereas post interventional respiratory rate, 10 (33.3%) had normal respiratory rate, 19 (63.3%) had mild respiratory rate, 1 (3.3%) had moderate respiratory rate, and none of the patients had severe respiratory rate. In control group that none of the patients had normal respiratory rate, 3 (10.0%) had mild respiratory rate, 22 (73.3%) had moderate respiratory rate, and 5 (16.7%) had severe respiratory rate. Whereas post interventional respiratory rate, no one had normal respiratory, 17 (56.7%) had mild respiratory rate,13 (43.3%) had moderate respiratory rate, and no one had severe respiratory rate in control group. Hence it concluded that experimental as well as control group both has impaired respiratory rate before intervention but, after the intervention in experimental group there is more improvement as compare to control group.

Findings related to the frequency and percentage distribution of pre-interventional level of oxygen saturation among the patients in experimental group shows that no one had normal oxygen saturation, 2(6.7%) had mild impaired oxygen saturation, 15 (50.0%) had moderate impaired oxygen saturation, and 13 (43.3%) had severe oxygen saturation impaired oxygen saturation. Whereas post interventional level of oxygen saturation, 13 (43.3%) had normal oxygen saturation , 16 (53.3%) had mild impaired oxygen saturation 1 (3.3%) had moderate impaired oxygen saturation, and none of had severe impaired oxygen saturation In control group pre interventional level of oxygen saturation among the patients that none of the patient had normal oxygen saturation, 5 (16.7%) had mild impaired oxygen saturation, 20 (66.7%) had moderate impaired oxygen saturation, and 5 (16.7%) had severe impaired oxygen saturation. Whereas post interventional level of oxygen saturation among the patients that none of the patient had normal oxygen saturation, 9 (30.0%) had mild impaired oxygen saturation, 17 (56.7%) had moderate impaired oxygen saturation, and 4 (13.3%) had severe impaired oxygen saturation. Hence it concluded that experimental as well as control group both has impaired oxygen saturation before intervention but, after the intervention in experimental group there is more improvement as compare to control group.

Findings related to the frequency and percent distribution of pre-interventional level of dyspnea among the patients in experimental group shows that no one had no symptoms, 7 (23.3%) had mild, 19 (63.3%) had moderate, 4 (13.3%) had severe and none of had most severe level of dyspnea. Whereas post interventional level of dyspnea among the patient were 16 (53.3%) had no symptoms, 13 (43.3%) had mild, 1 (3.3%) had moderate, and none of had severe or most severe level of dyspnea. In control group, pre interventional level of dyspnea among the patients that no one had no symptoms, 7 (23.3%) had mild, 17 (56.7%) had moderate, 6(20.0%) had severe, and no one had most severe level of dyspnea. Whereas post interventional level of dyspnea among the patient were 1 (3.3%) had no symptoms, 15 (50.0%) had mild, 13 (43.3%) had moderate, 1(3.3%) had severe, and no one had most severe level of dyspnea. Hence it concluded that experimental as well as control group both has impaired dyspnea before intervention but, after the intervention in experimental group there is more improvement as compare to control group.

A similar study Was conducted entitled Effectiveness of balloon therapy on respiratory status of patient with lower respiratory tract disorders by Dr. Shaji H. at medical ward MGMC&RI. The study findings support current study findings that is regular practice of balloon therapy can improve the respiratory status to a greater extent among patient with lower respiratory disorders.

OBJECTIVE-2: To determine the effectiveness of Balloon Blowing Exercise on respiratory parameters among the patients with lower respiratory tract infection in experimental group.

Shows that the mean SD pre-interventional respiratory rate among patients in experimental group, were mean 1.90 and SD 0.66, post interventional were mean 0.70 and SD 0.53, pre interventional oxygen saturation rate were mean 2.36 and SD 0.61, post interventional 0.60 and SD 0.56, pre interventional modified dyspnea were mean 1.90 and SD 0.60, post interventional modified dyspnea were mean 0.50 and SD 0.57.

OBJECTIVE-3: To compare the effectiveness of Balloon Blowing Exercise on respiratory parameters among the patients with lower respiratory tract infection in experimental and control group.

Findings depicts, pre interventional respiratory rate impairment in experimental group was 1.90±0.66, post interventional was 0.70±0.53 and t- value was 11.93, pre interventional oxygen saturation rate was 2.36±0.61, post-interventional was 0.60±0.56, and t- value was 22.49, pre-interventional modified dyspnea scale was 1.90±0.60, post-interventional was 0.50±0.57and t- value was 15.38 which was highly significant at p value 0.00, it means the respiratory rate, oxygen saturation rate and modified dyspnea scale was improved after the exercise, pre interventional respiratory rate in control group was, 2.06±0.52, post interventional was 1.43±0.50, and t- value was 7.07, pre interventional oxygen saturation was 2.00±0.58, post interventional was 1.83±0.64, and t- value was 1.98, pre interventional modified dyspnea scale was 1.96±0.66, post interventional was 1.46±0.62 and t- value was 5.38. Hence it is concluded that there is effects of balloon blowing exercise on respiratory parameters among patients with lower respiratory tract infection in experimental group. **Thus, H_1 is accepted**.

OBJECTIVE-4: To find out the association between pre interventional and post interventional respiratory rate among the patients with lower respiratory tract infection in experimental and control group with their selected socio demographic variables.

The AVOVA was used to find out the association between the respiratory parameters with their selected sociodemographic variables in experimental and control group. There was significant association found between modified dyspnea scale with area of residence in control group.

CONCLUSIONS

The current study was related to Effectiveness of balloon blowing exercise on respiratory parameters among the patients with lower respiratory tract infection in selected hospital of Bihar. Purposively participants were divided into two group that is experimental and control group. Pre interventional test was done for both the group to assess respiratory parameters including respiratory rate, oxygen saturation and dyspnea scale. Balloon blowing exercise given as intervention only to experimental group that is 10 blows in two session for 4 days. After the intervention post interventional test was done for both experimental as well as control group. On comparison of both groups intervention was found effective for all the respiratory parameters that is respiratory rate, oxygen saturation and dyspnea level at $p<0.05$ level of significant. The aim of the study was to use balloon blowing exercise for the patient with lower respiratory tract infection to reduce respiratory impairment.

9. REFERENCE

- Misra, A., Pawar, R., & Pal, A. (2023). Effect of Balloon-Blowing Exercise on Oxygen Saturation in COVID-19 Patients. https://doi.org/10.7759/cureus.4025.
- Balloon Breathing Exercise for Improved Lung Capacity | PulmonaryFibrosisNow.org. (n.d.). https://pulmonaryfibrosisnow.org/2020/03/10/balloon-breathing-exercise-for-improved-lung-function/

- Weycker, D., Ahuva Averin, Houde, L., Ottino, K., Shea, K., Sato, R., Gessner, B. D., Yacisin, K., Curcio, D., Begier, E., & Rozenbaum, M. (2024). Rates of Lower Respiratory Tract Illness in US Adults by Age and Comorbidity Profile. Infectious Diseases and Therapy, 13(1), 207–220. https://doi.org/10.1007/s40121-023-00904-z
- Seo, K., & Cho, M. (2018). The effects of a balloon-blowing exercise in a 90/90 bridge position using a ball on the pulmonary function of females in their twenties. Journal of Physical Therapy Science, 30(10), 1267–1270. https://doi.org/10.1589/jpts.30.1267
- Kanniappan, V., & Manivannan, V. (2020). Efficacy of Balloon Blowing Exercise on Peak Expiratory Flow Rate in Young Adult Smokers. Journal of Lifestyle Medicine, 10(2), 116–120. https://doi.org/10.15280/jlm.2020.10.2.116