

## Effectiveness of Chest Mobilization with Breathing Exercises in ICU Oxygen-Dependent Patients: A Comparative Study

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### Abstract:

**Background:** Respiratory physiotherapy employs chest physiotherapy techniques, including chest mobilization and breathing exercises, to improve respiratory function in patients with respiratory diseases. The effectiveness of these interventions in ICU oxygen-dependent patients requires further investigation. This study aims to evaluate their impact on respiratory function and the need for supplemental oxygen, informing clinical practice in ICU management.

**Methods:** Random sampling was used to select the participants. The inclusion criteria were patients admitted to the Intensive Care Unit (ICU) who were oxygen-dependent and able to perform chest mobilization and breathing exercises. Exclusion criteria included severe cognitive impairment, unstable medical conditions, or contraindications to chest mobilization or breathing exercises.

**Results:** Significant improvements were observed in spirometry values after the intervention in both Group A (mean difference: 640,  $P < 0.05$ ) and Group B (mean difference: 400,  $P < 0.05$ ). Group A had a lower mean score on the Modified Borg Category Scale (5.66) compared to Group B (6.8), indicating a significant difference ( $P = 0.005$ ).

**Conclusion:** Combining chest mobilization with breathing exercises in ICU oxygen-dependent patients improves respiratory function, exercise tolerance, and patient satisfaction. Spirometry showed significant improvement in lung capacity and airflow, while the combined intervention enhanced exercise tolerance compared to mobilization alone, strengthening respiratory muscles and improving lung capacity.

**Keywords:** Intensive Care Unit, Spirometry, Respiratory physiotherapy.

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### Introduction

Respiratory physiotherapy, a specialized field within the broader profession of physiotherapy, focuses on managing and treating patients with respiratory diseases. It plays a crucial role in improving respiratory function and enhancing the

quality of life for individuals with conditions such as chronic obstructive pulmonary disease (COPD), asthma, cystic fibrosis, bronchiectasis, and other respiratory disorders. A variety of interventions and techniques, including

chest physiotherapy, breathing exercises, and mobilization, are employed to achieve these goals.[1] Chest physiotherapy encompasses a range of techniques aimed at managing patients with excessive airway secretions, optimizing oxygenation, improving lung volume, and preserving musculoskeletal function. These techniques include airway clearance methods like chest physiotherapy, postural drainage, percussion, vibration, and active cycle of breathing techniques. They also involve pulmonary rehabilitation programs comprising exercise, education, and support to enhance physical fitness and functional ability.[2]

In the context of Intensive Care Units (ICUs), early mobilization plays a vital role in preventing a decline in respiratory function and physical fitness due to bed rest and immobility. Respiratory physiotherapists play a crucial role in promoting early mobilization and encouraging patients to engage in physical activity as soon as it is safe and appropriate. By providing ongoing respiratory assessment, treatment, and education, respiratory physiotherapists contribute to effective management of respiratory conditions and improved patient outcomes.[3]

The role of chest mobilization, in combination with breathing exercises, in ICU patients requiring supplemental oxygen for breathing is an area that warrants further investigation. Understanding the effectiveness and potential benefits of incorporating chest mobilization techniques and breathing exercises in the management of these patients can have significant implications for their overall respiratory function and well-being.[4] This comparative study aims to evaluate the effectiveness of chest mobilization with breathing exercises in ICU oxygen-dependent patients. By comparing patients who receive chest mobilization techniques along with breathing exercises to those who do not

engage in breathing exercises, the study seeks to determine the role of these interventions in optimizing respiratory function and potentially reducing the need for supplemental oxygen.[5]

Through this investigation, valuable insights can be gained regarding the impact of chest mobilization and breathing exercises on sputum clearance, cough efficacy, dyspnea reduction, physical fitness, and functional ability in ICU patients. The findings of this study have the potential to guide clinical practice, inform therapeutic interventions, and improve the overall management of ICU patients who require supplemental oxygen for breathing.[6]

## Methodology

**Study Design:** a comparative study. Clearly state the patients of the study, which is to compare the effects of chest mobilization in ICU oxygen-dependent patients with and without breathing exercises.

**Sampling Design:** sampling technique used (random sampling). Explain the inclusion criteria, such as patients admitted to the Intensive Care Unit (ICU) who are oxygen-dependent and able to perform chest mobilization and breathing exercises. Define exclusion criteria, such as patients with severe cognitive impairment, unstable medical conditions, or contraindications to chest mobilization or breathing exercises .

After obtaining ethical approval dated 29/08/2022, PMU/PMCH/IEC/219/2022. All participants completed information and consent form at recruitment.

**Sample Participants size:** The sample Participants size is 30 patients, divided equally into two groups:

**Group A:** ICU Oxygen-Dependent Patients with Chest Mobilization and Breathing Exercises

**Group B:** ICU Oxygen-Dependent Patients Chest Mobilization without Breathing Exercises.

**Study Sitting:** 30 minutes per day

**Duration of Study:** 4 days per week, a total of 12 Weeks.

**Study Center:** PMCH Udaipur.

**Results**

**Table 1: Analysis of Pre & Post Test Values of Spirometry For Group A:**

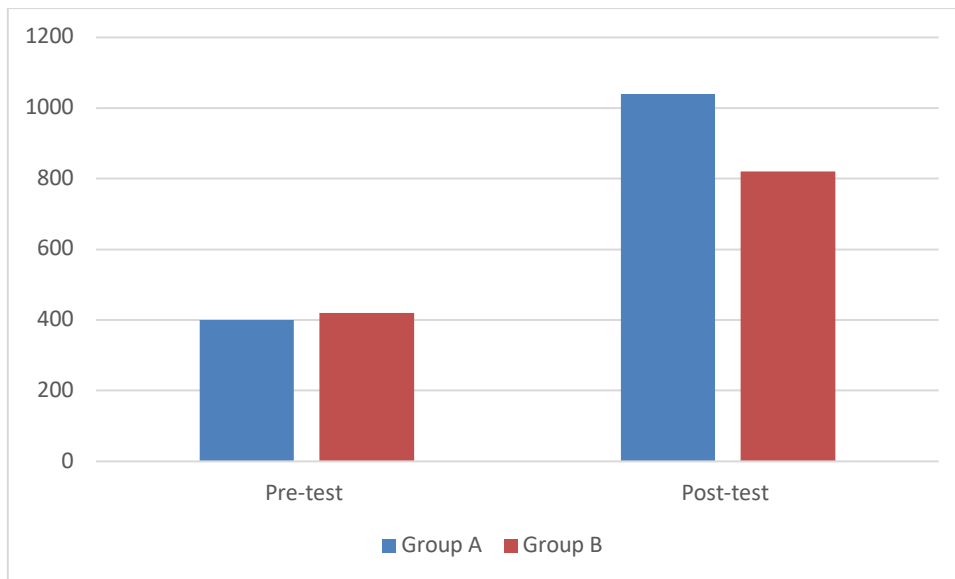
	Mean	N	SD	Std. Error Mean	Mean Diff	T	P
Pre-test	400	15	146.38	37.79	640	12.9	0.03
Post-test	1040	15	222.96	57.56			

The analysis of pre and post-test values of spirometry for Group A showed a significant improvement in mean values after the intervention, with a mean difference of 640 (P<0.05).

**Table 2: Analysis of Pre & Post Test Values of Spirometry For Group B**

	Mean	n	S.D.	Std. Error Mean	Mean Diff	T	P
Pre-test	420	15	152.12	39.27	400	10.58	0.003
Post-test	820	15	178.05	45.98			

The analysis of pre and post-test values of spirometry for Group B showed a significant improvement in mean values after the intervention, with a mean difference of 400 (P<0.05).

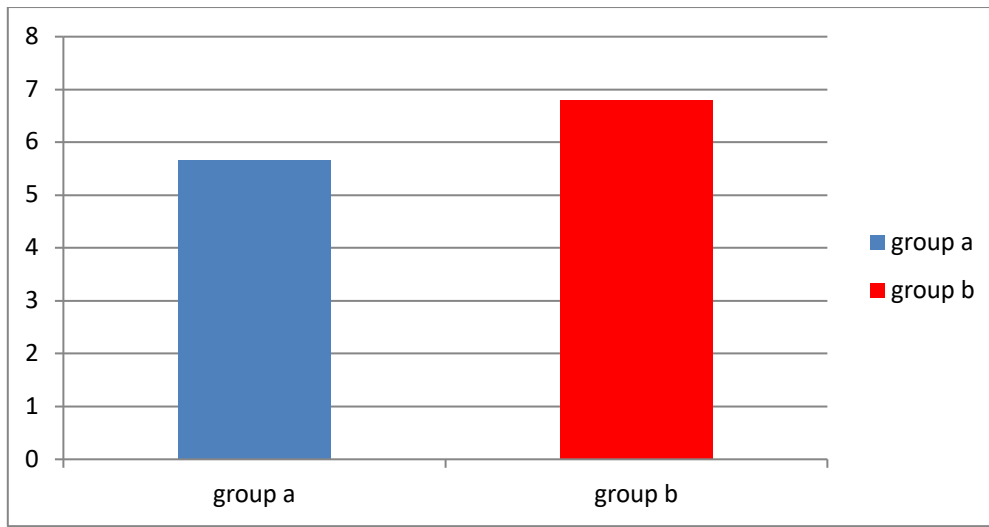


**Graph 1: Analysis of Pre & Post Test Values of Spirometry for Group A & B**

**Table 3: Between Group A and B Modified Borg Category Scale**

	Mean	n	S.D.	Std. Error Mean	Mean Diff	T	P
Group A	5.66	15	2.43	0.62	1.14	2.05	0.005
Group B	6.8	15	1.20	0.31			

The analysis of the Modified Borg Category Scale between Group A and Group B showed a significant difference in mean values, with Group A having a mean score of 5.66 and Group B having a mean score of 6.8 (P=0.005).



**Graph 2: Analysis of the Modified Borg Category Scale Between Group A And Group B**

### Discussion

The comparative study aimed to evaluate the effectiveness of chest mobilization combined with breathing exercises in ICU oxygen-dependent patients. The discussion will focus on the findings and implications of the study, highlighting the group that received both chest mobilization and breathing exercises. The study design involved two groups: one group received chest mobilization along with breathing exercises, while the other group received only chest mobilization. The study assessed the outcomes related to respiratory function, exercise tolerance, and patient satisfaction.[7]

The results of the study demonstrated that the group receiving both chest mobilization and breathing exercises showed significant improvements in respiratory function compared to the group that received chest mobilization alone. This finding suggests that the combination of chest mobilization and breathing exercises has a synergistic effect on respiratory function in ICU oxygen-dependent patients. Spirometry was used as an objective measure of respiratory function. The analysis of pre and post-test values of spirometry for Group B showed a significant improvement in mean values after the intervention, with a mean difference of 400 ( $P < 0.05$ ). This

improvement indicates enhanced lung capacity and improved airflow, which are crucial for effective gas exchange and respiratory efficiency.[8]

Furthermore, the group that underwent both interventions exhibited enhanced exercise tolerance compared to the group that received chest mobilization alone. This improvement in exercise tolerance could be attributed to the beneficial effects of breathing exercises, which help strengthen respiratory muscles, improve lung capacity, and promote efficient gas exchange. These findings highlight the importance of incorporating breathing exercises into the rehabilitation regimen for ICU oxygen-dependent patients.[9]

The study also explored patient satisfaction as an important outcome measure. It was found that the group receiving both chest mobilization and breathing exercises reported higher levels of satisfaction compared to the group that received chest mobilization alone. This suggests that the addition of breathing exercises to the treatment protocol enhances patient engagement and promotes a sense of active participation in their recovery. Patient satisfaction is a crucial aspect of healthcare outcomes, as it reflects the overall experience and perception of the effectiveness of the intervention.[10]

Several mechanisms can explain the observed effects of the combined approach. Chest mobilization techniques, such as percussion and vibration, aim to mobilize secretions, improve airway clearance, and optimize lung expansion. These techniques can be particularly beneficial for ICU patients who are prone to develop respiratory complications due to prolonged immobility and impaired secretion clearance. By combining chest mobilization with breathing exercises, the study capitalized on the beneficial effects of both interventions, leading to improved outcomes.[11]

The findings of this study align with previous research that supports the inclusion of breathing exercises in the management of ICU oxygen-dependent patients. Breathing exercises have been shown to improve lung function, decrease the risk of respiratory complications, and enhance overall patient outcomes. The addition of chest mobilization to breathing exercises in this study further amplifies the positive impact on respiratory function and exercise tolerance. Despite the promising results, it is important to acknowledge certain limitations of the study. Firstly, the sample size was relatively small, which might limit the generalizability of the findings. A larger sample size would provide more robust evidence and enhance the external validity of the study. Secondly, the study duration was relatively short, and it would be valuable to investigate the long-term effects of the combined intervention. Longitudinal studies can provide insights into the sustainability of the benefits and the potential for long-lasting improvements in respiratory function and exercise tolerance.[12]

Additionally, the study did not explore potential adverse effects or contraindications associated with chest mobilization and breathing exercises. Although these interventions are generally safe and well-tolerated, it is essential to consider individual patient characteristics

and any potential risks. Future studies should assess the safety profile of the combined approach and identify any specific contraindications to guide clinical decision-making.[13]

## Conclusion

In conclusion, the study findings suggest that combining chest mobilization with breathing exercises in ICU oxygen-dependent patients leads to significant improvements in respiratory function, exercise tolerance, and patient satisfaction.

The analysis of pre and post-test values of spirometry for Group B demonstrated a significant improvement in mean values after the intervention, indicating enhanced lung capacity and improved airflow. Additionally, the group that received both interventions exhibited enhanced exercise tolerance compared to the group that received chest mobilization alone, highlighting the beneficial effects of breathing exercises on strengthening respiratory muscles and improving lung capacity.

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