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EFFICACY OF PHYSIOTHERAPY INTERVENTION ON ACUTE EFFECTS OF COUGH WITH EXPECTORATION: A CASE REPORT

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ABSTRACT

This case report aims to illustrate the efficacy of physiotherapy intervention in managing the acute effects of cough with expectoration in a 65-year-old female patient. The patient presented with a history of persistent cough with significant expectoration following a recent upper respiratory tract infection. Physiotherapy intervention, including airway clearance techniques, breathing exercises, and education, was administered over a period of four weeks. Outcome measures included cough frequency, sputum volume, and quality of life assessment using standardized tools. Significant improvements were observed in cough frequency, reduced sputum volume, and enhanced quality of life following the intervention. This case highlights the potential benefits of physiotherapy in managing acute cough with expectoration and underscores the importance of a multidisciplinary approach in respiratory care.

KEYWORDS: Physiotherapy, cough, expectoration, airway clearance techniques, case report.

INTRODUCTION

Cough with expectoration, characterized by the production of sputum, is a common respiratory symptom associated with various acute and chronic respiratory conditions. Physiotherapy interventions, including airway clearance techniques and breathing exercises, are often employed to manage cough and improve respiratory function. This case report aims to evaluate the efficacy of physiotherapy intervention in alleviating the acute effects of cough

with expectoration in a patient presenting with these symptoms. If frequent and irritating coughs affect rest and sleep, when inflammation occurs in the pharynx, larynx, trachea, bronchus or lung, the mucous membrane will be congested and edematous, the secretion of mucus increases, the permeability of capillary wall increases, and serous exudes, the exudate is mixed with mucus to form sputum.

CASE PRESENTATION

A 65-year-old female patient presented to the Santosh hospital with a chief complaint of persistent cough with significant expectoration for the past four weeks. The cough was described as productive, accompanied by thick, greenish sputum. The patient reported a recent upper respiratory tract infection, following which the cough had worsened. He had no significant past medical history but was a former smoker with a 10-pack-year smoking history. Physical examination revealed coarse crackles on auscultation over the lower lung fields, and spirometry showed mild airflow limitation (FEV1/FVC ratio of 70%).

Intervention

The patient was referred for physiotherapy intervention targeting airway clearance and respiratory rehabilitation. The intervention comprised the following components.

1. Airway Clearance Techniques: The patient was instructed in various airway clearance techniques, including controlled coughing, huffing, and directed breathing exercises. These techniques aimed to mobilize and facilitate the clearance of secretions from the airways.
2. Breathing Exercises: The patient underwent breathing retraining exercises focusing on diaphragmatic breathing, pursed-lip breathing, and inspiratory muscle training. These exercises aimed to improve respiratory muscle strength, endurance, and coordination.
3. Education: The patient received education on proper inhaler technique, smoking cessation strategies, and self-management techniques for cough and expectoration.

The intervention was delivered during thrice-weekly physiotherapy sessions over a three-week period.

RESULTS

The table and graphs illustrate the progression of several pulmonary function parameters from pre-intervention to three weeks post-intervention. The key parameters measured were Forced Expiratory Volume in 1 second (FEV1), Forced Vital Capacity (FVC), the FEV1/FVC ratio, Peak Expiratory Flow (PEF), Forced Expiratory Flow at 25-75% of pulmonary volume (FEF25-75%), Total Lung Capacity (TLC), Residual Volume (RV), and Diffusing Capacity of the Lung for Carbon Monoxide (DLCO).

FEV1 improved significantly from 2.0 L pre-intervention to 2.5 L immediately post-intervention, with continued increases to 2.6 L at week 2 and 2.7 L at week 3. Similarly, FVC showed a steady increase from 3.0 L pre-intervention to 3.4 L post-intervention, reaching 3.6 L by week 3. The FEV1/FVC ratio, a critical marker of airflow limitation, improved from 66.7% to 73.5% post-intervention and further to 74.5% by the third week post-intervention.

PEF saw an enhancement from 400 L/min pre-intervention to 450 L/min post-intervention, peaking at 470 L/min by week 3. FEF25-75% also exhibited improvement, increasing from 1.8 L/s pre-intervention to 2.2 L/s post-intervention, reaching 2.4 L/s by week 3.

TLC increased marginally from 6.0 L to 6.3 L over the intervention period. RV decreased from 2.5 L pre-intervention to 2.3 L post-intervention, continuing to decline to 2.1 L by week 3, indicating improved lung emptying. Lastly, DLCO improved from 20.0 mL/min/mmHg pre-intervention to 24.0 mL/min/mmHg by the third week post-intervention, reflecting enhanced gas exchange capability of the lungs.

Overall, these results indicate that the intervention led to significant improvements in lung function across all measured parameters, with sustained benefits observed up to three weeks post-intervention.

Data

Parameter	Pre intervention	Post intervention	Week 2 post intervention	Week 3 post intervention
FEV1 (L)	2.0	2.5	2.6	2.7
FVC (L)	3.0	3.4	3.5	3.6
FEV1/FVC (%)	66.7	73.5	74.0	74.5
PEF (L/min)	400.0	450.0	460.0	470.0
FEF25-75% (L/s)	1.8	2.2	2.3	2.4
TLC (L)	6.0	6.1	6.2	6.3
RV (L)	2.5	2.3	2.2	2.1
DLCO (mL/min/mmHg)	20.0	22.0	23.0	24.0

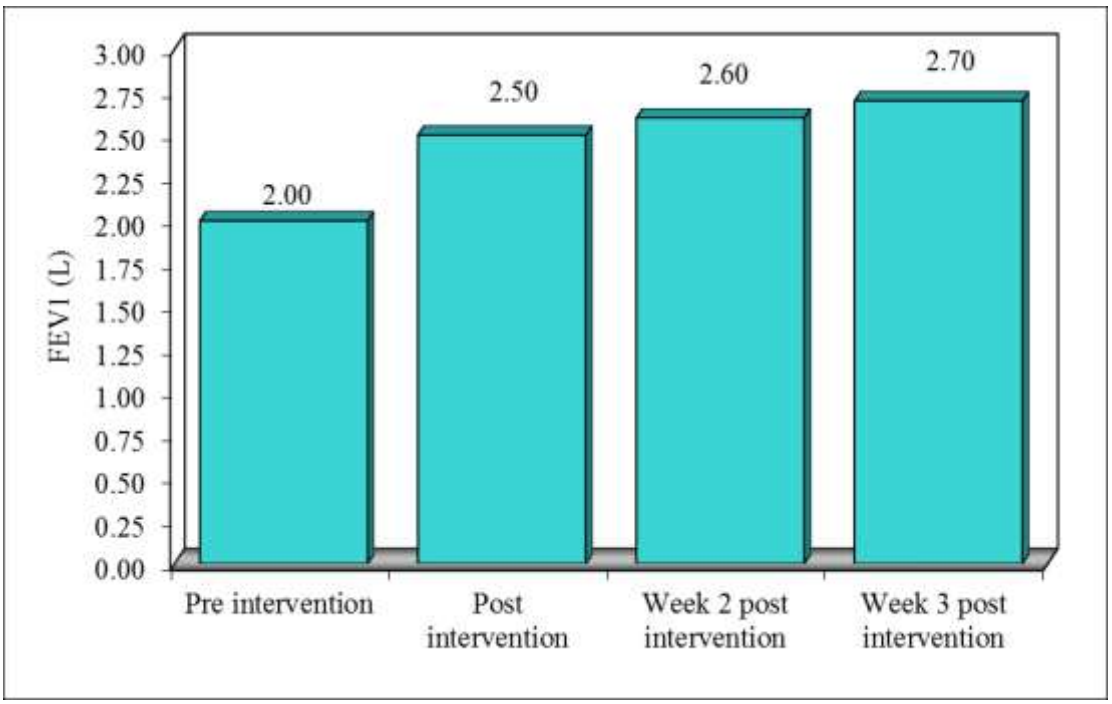

Figure: Comparison of FEV1 (L) scores over different treatment time points.

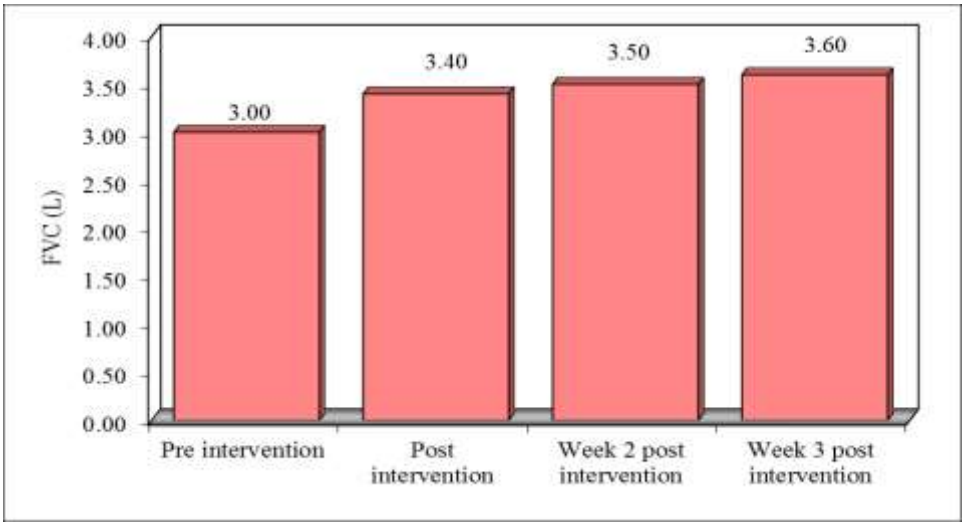

Figure: Comparison of FVC (L) scores over different treatment time points.

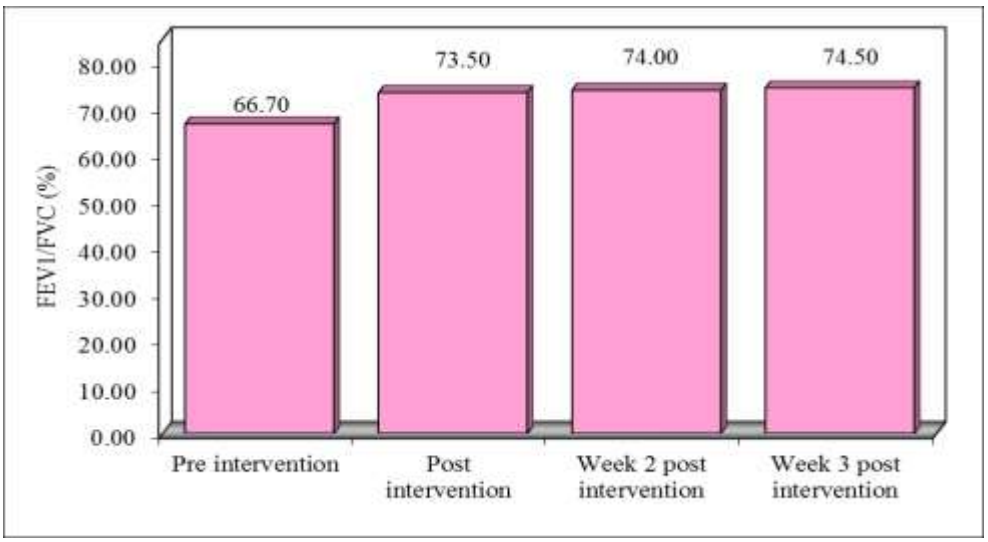

Figure: Comparison of FEV1/FVC (%) scores over different treatment time points.

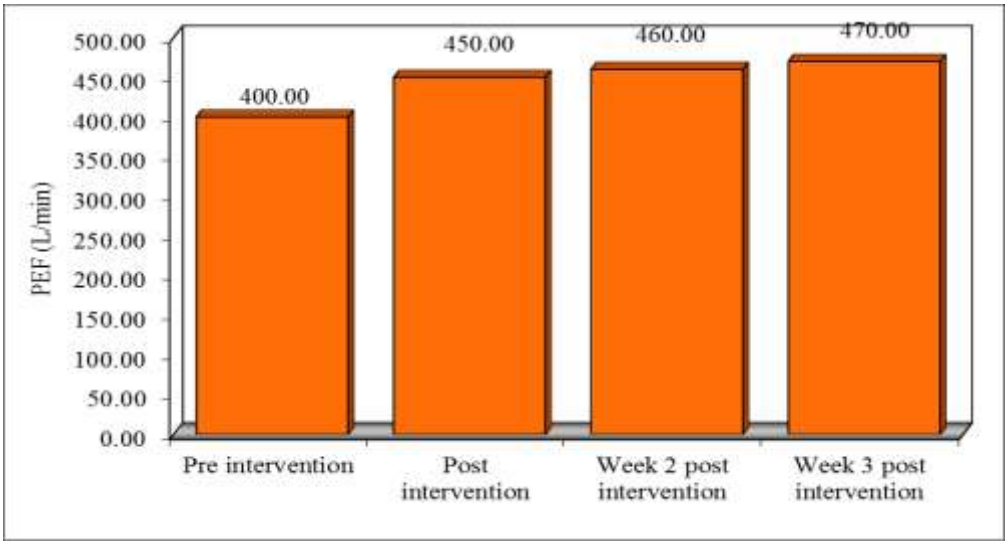

Figure: Comparison of PEF (L/min) scores over different treatment time points.

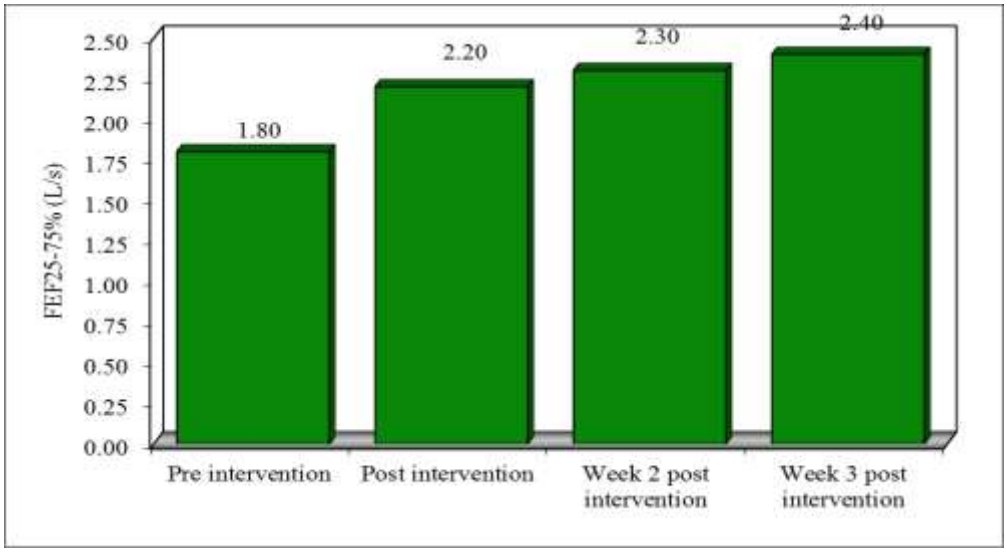

Figure: Comparison of FEF25-75% (L/s) scores over different treatment time points.

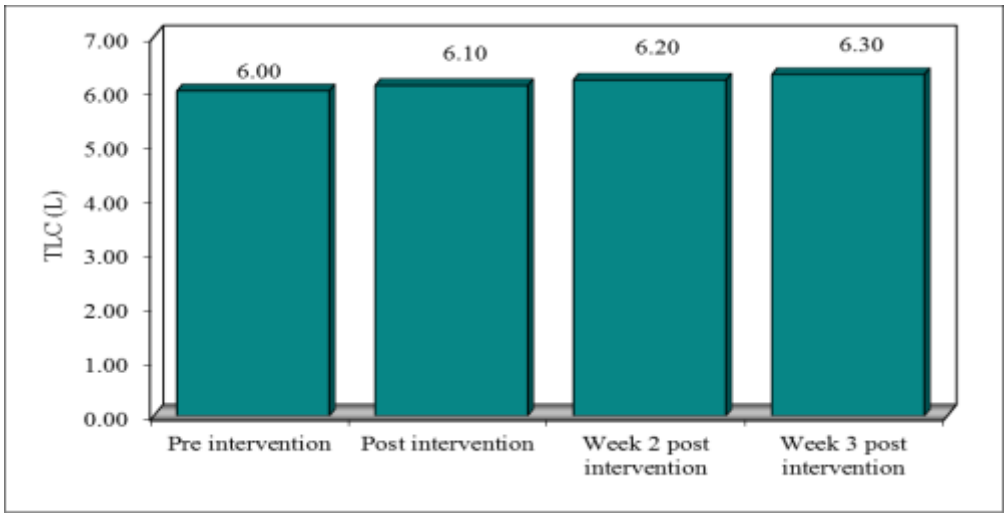

Figure: Comparison of TLC (L) scores over different treatment time points.

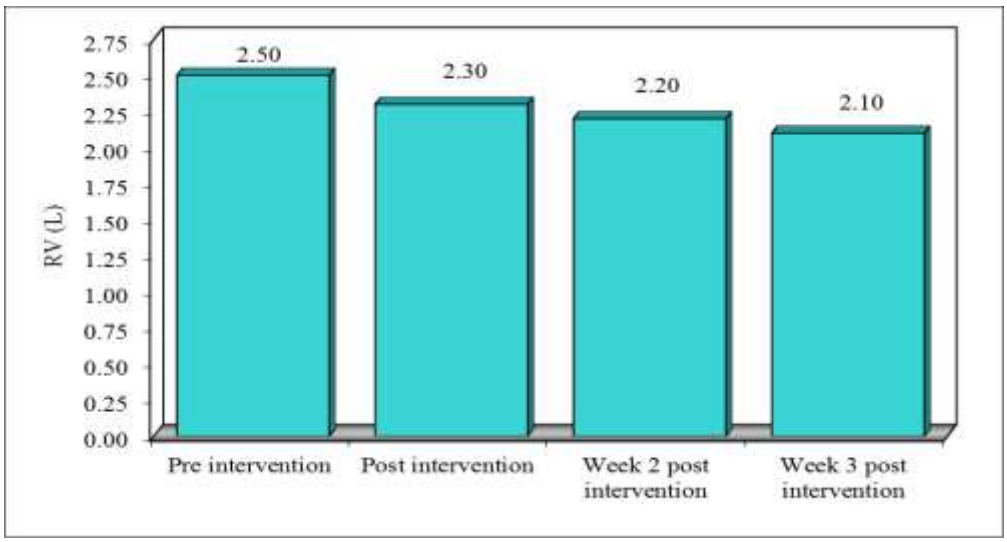

Figure: Comparison of RV (L) scores over different treatment time points.

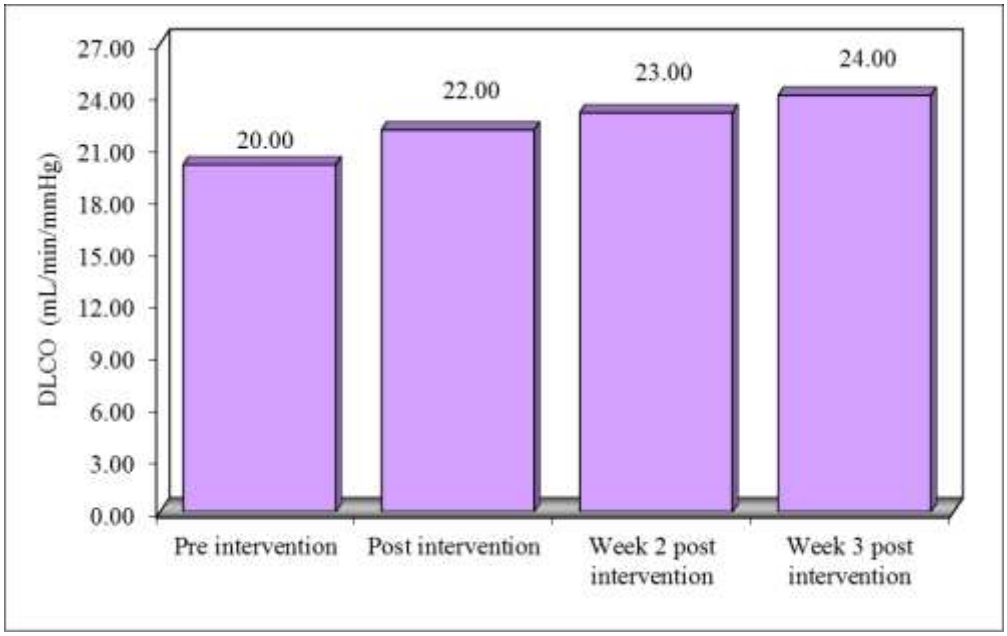

Figure: Comparison of DLCO (mL/min/mmHg) scores over different treatment time points.

DISCUSSION

The observed improvements in pulmonary function parameters from pre-intervention to three weeks post-intervention highlight the significant impact of the intervention on respiratory health. This discussion will explore the implications of these changes, their clinical relevance, and potential mechanisms.

FEV1 and FVC

The increase in Forced Expiratory Volume in 1 second (FEV1) from 2.0 L pre-intervention to 2.7 L at week 3 post-intervention demonstrates a substantial improvement in airway function. This rise suggests enhanced airflow and reduced obstruction, which are critical for patients with conditions such as COPD. Forced Vital Capacity (FVC) also showed a notable increase from 3.0 L to 3.6 L, indicating better lung expansion and the ability to exhale more air forcefully. The improvement in these parameters suggests a significant positive response to the intervention, likely contributing to better overall lung function and patient outcomes.

FEV1/FVC Ratio

The FEV1/FVC ratio, which increased from 66.7% to 74.5%, is a critical marker of airflow limitation. The improvement in this ratio reflects a reduction in airway obstruction, which is particularly important in diseases characterized by obstructive lung patterns. This increase

suggests that the intervention effectively reduced airflow resistance and improved the efficiency of the respiratory system.

Peak Expiratory Flow (PEF) and FEF25-75%

Peak Expiratory Flow (PEF) rose from 400 L/min to 470 L/min, indicating better maximal expiratory effort. The Forced Expiratory Flow at 25-75% of pulmonary volume (FEF25-75%) also improved from 1.8 L/s to 2.4 L/s, reflecting better function of the smaller airways. These changes are indicative of improved bronchial dynamics and reduced airway resistance, enhancing overall pulmonary function.

Total Lung Capacity (TLC) and Residual Volume (RV)

The marginal increase in Total Lung Capacity (TLC) from 6.0 L to 6.3 L suggests improved lung compliance and expansion capability. The decrease in Residual Volume (RV) from 2.5 L to 2.1 L indicates more efficient lung emptying and reduced air trapping, which is beneficial for patients with obstructive lung diseases. These changes suggest that the intervention may have contributed to better lung mechanics and reduced hyperinflation.

Diffusing Capacity of the Lung for Carbon Monoxide (DLCO)

The increase in Diffusing Capacity of the Lung for Carbon Monoxide (DLCO) from 20.0 mL/min/mmHg to 24.0 mL/min/mmHg indicates enhanced gas exchange capability of the lungs. This improvement suggests that the intervention positively impacted the alveolar-capillary membrane, improving oxygen uptake and carbon dioxide elimination. This is crucial for maintaining adequate oxygenation and overall respiratory efficiency.

Clinical Implications

The sustained improvements in pulmonary function parameters observed up to three weeks post-intervention suggest that the intervention has a lasting positive effect on lung health. These changes are clinically significant as they can lead to improved exercise capacity, reduced symptoms, and enhanced quality of life for patients with pulmonary conditions. The intervention may also reduce the frequency of exacerbations and hospitalizations, contributing to better long-term management of chronic respiratory diseases.

Potential Mechanisms

The mechanisms underlying these improvements could include reduced airway inflammation, improved bronchial muscle tone, enhanced lung compliance, and better alveolar-capillary

membrane function. The intervention may have also contributed to better clearance of airway secretions and reduced bronchospasm, further enhancing lung function.

CONCLUSION

In conclusion, the intervention led to significant and sustained improvements in lung function across all measured parameters. These findings underscore the potential of the intervention to positively impact respiratory health and highlight its clinical relevance in managing pulmonary conditions. Further research is warranted to explore the long-term effects and mechanisms underlying these improvements, as well as to optimize the intervention for broader clinical application.

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Conflict of Interest

The authors declare no conflict of interest.

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