

Effect of IMT and Breathing Retraining Technique in Asthmatic Patient: A Case Study

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ABSTRACT

Background: Asthma is a chronic respiratory disease that causes breathlessness, cough with sputum, and chest tightness due to which there is a decrease in respiratory muscle strength that further leads to elevating these symptoms due to minute allergen. Due to these symptoms, there is a significant decrease in PFT values i.e. FEV1, FVC, and the ratio (FEV1/FVC). So, there is a need for a study to check the effect of the IMT device along with the breathing retraining exercises on breathlessness, 6-minute walk distance, and PFT.

Methodology: A case study was designed to assess the effect of IMT and breathing retraining exercises on the respiratory muscles of asthmatic patient of age 20-25 years old. This study is designed for 21 days and IMT device was prescribed twice a day with 30 repetitions each whereas Breathing retraining exercises were prescribed twice a day with 2 sets of each exercise and 15 repetitions each. Pre- and post-values of PFT, 6-minute walk distance, fatigue severity score (FSS), and mMRC scale for dyspnea were noted and data was analyzed via MS Excel.

Result: According to the current study, there is a significant improvement in FEV1, FVC, and the ratio of these. This study shows that IMT devices and breathing retraining exercises are helpful in alleviating breathlessness and FSS. A significant improvement shows in the 6-minute walk distance after 21 days of protocol of IMT and breathing retraining exercises.

Conclusion: The study shows significant improvements in respiratory parameters, breathlessness, and functional capacity after implementing Inspiratory Muscle Training devices and breathing retraining exercises. These interventions alleviate breathlessness and reduce FSS, making them valuable components of comprehensive respiratory care strategies.

Keywords: IMT Device, Breathing Retraining Technique, PFT, FSS, mMRC

INTRODUCTION

Asthma is a chronic inflammatory disease of the respiratory tract. Chronic inflammation is associated with airway hyperresponsiveness (an exaggerated airway-narrowing response to specific triggers such as viruses, allergens, and exercise), which results in recurrent episodes of wheezing, breathlessness, chest tightness, and coughing that can vary in intensity over time. Symptom episodes frequently correspond with widespread but varying airflow obstruction throughout the

lungs, reversible spontaneously or with proper asthma medication, such as a fast acting bronchodilator (1). As per WHO (World Health Organization), Asthma affected an estimated 262 million people in 2019 and caused 455000 deaths (2).

In asthmatic people, airway obstruction is associated with increased inspiratory muscle effort due to resistance to airflow and dynamic hyperinflation of the lung (increased end-expiratory lung volume (3, 4). The increased work of breathing caused by dynamic hyperinflation has been

demonstrated to be a significant predictor of dyspnea in people with asthma, which is exacerbated by deterioration in the contractile characteristics of the respiratory muscles (5). Increased work of breathing may also raise the likelihood of inspiratory muscle fatigue (6), which may aggravate dyspnea and limit exercise tolerance (7). As a result, it is reasonable to suggest that improving the strength of the inspiratory muscles in patients with asthma who have increased inspiratory muscle work may lower the intensity of dyspnea and improve quality of life.

According to the previous studies, Inspiratory muscle training device (IMT) improves inspiratory muscle strength, exertional dyspnea (8, 9). And breathing retraining exercises helps in improving the QOL and improves the physiological changes (10). But there are no such studies which shows combined impact of both i.e. IMT and Breathing retraining exercises on dyspnea, exercises tolerance and PFT. So, there is need of study to assess the effect of both techniques on asthmatic patient so as to improve their QOL (exercise tolerance), and dyspnea. Therefore, this study aims to assess the effect of IMT and breathing retraining exercises on PFT values, mMRC scale for breathlessness, exercises tolerance, fatigue severity scale so as to improve the work of breathing in asthmatic patient.

MATERIALS & METHODS

A case study was designed to assess the effect of IMT device and breathing retraining exercises on asthmatic patient of age group 20-25 years. In this study, IMT device and breathing retraining exercises was used for 21 days. In breathing retraining exercises, deep breathing ex, pursed lip

breathing, thoracic expansion ex, and diaphragmatic breathing exercises were given.

After the approval from IEC committee, subject was invited for the study. A patient of 22-year-old female who is student by occupation was taken for the study who is diagnosed with asthma since last 10 years and is on bronchodilators via MDI. The purpose and whole procedure of research was explained to the subject and written consent was taken from her. Breathing retraining exercises were taught to the patient and asked her to do all the exercises of 2 sets of 15 repetitions each. Along with this IMT device was given to the patient. IMT device was used twice a day with 30 repetition each time. Resistance of IMT device is set on 9 cm of H₂O initially and ask the patient to note down the increasing resistance of IMT as per the need. 6-minute walk distance, PFT, mMRC scale for dyspnea, and fatigue severity scale were used as outcome measures. Pre- and post-values of all the variables were noted and data was entered in MS-Excel for analysis.

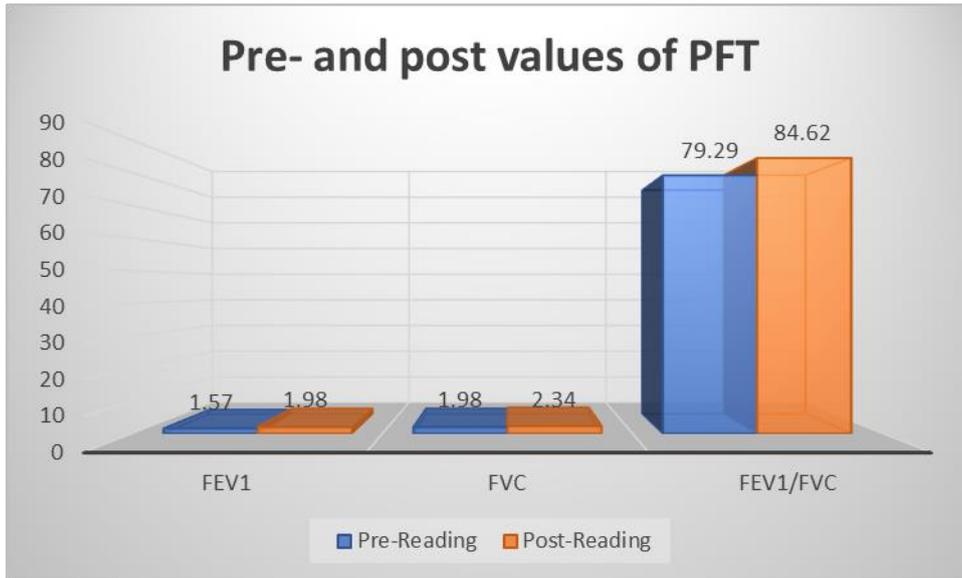
RESULT

Table. 1: Shows pre and post-value of PFT.

PFT	Pre-Reading	Post-Reading
FEV1	1.57	1.98
FVC	1.98	2.34
FEV1/FVC	79.29	84.62

Acc. To the table no.1:

- FEV1 for the pre is 1.57 whereas that of post value is 1.98.
- Similarly, FVC for pre- treatment value is 1.98 while that of post value is 2.34.
- FEV1/FVC for pre reading is 79.29 whereas that of post value is 84.62



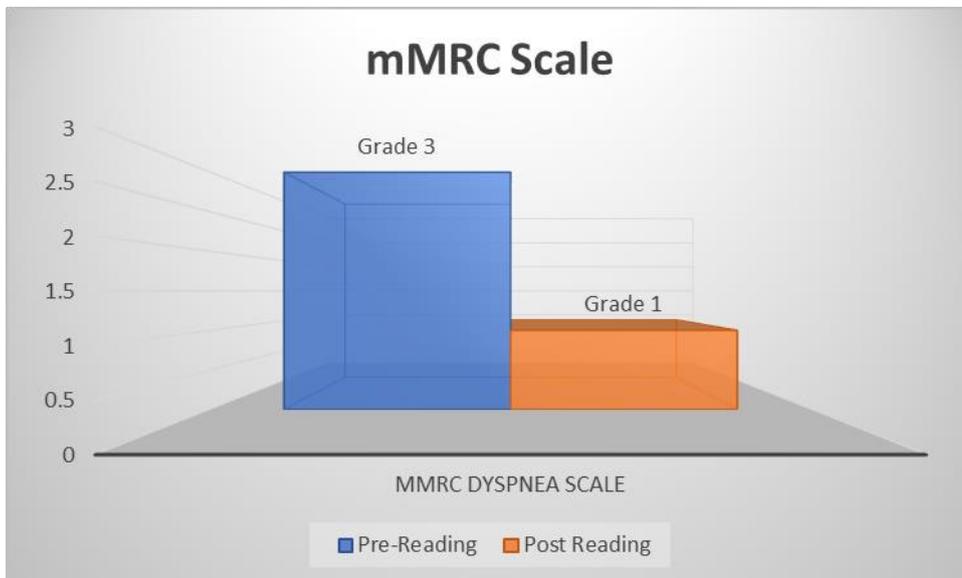
Graph 1: Pre And Post Values of PFT

	Pre-Reading	Post Reading
mMRC Dyspnea scale	Grade 3	Grade 1
6-minute walk distance	300 m	360 m
Fatigue severity score	40	32

Table no. 2: Shows the pre and post value of mMRC scale, 6-minute walk distance, fatigue severity scale.

According to table no. 2:

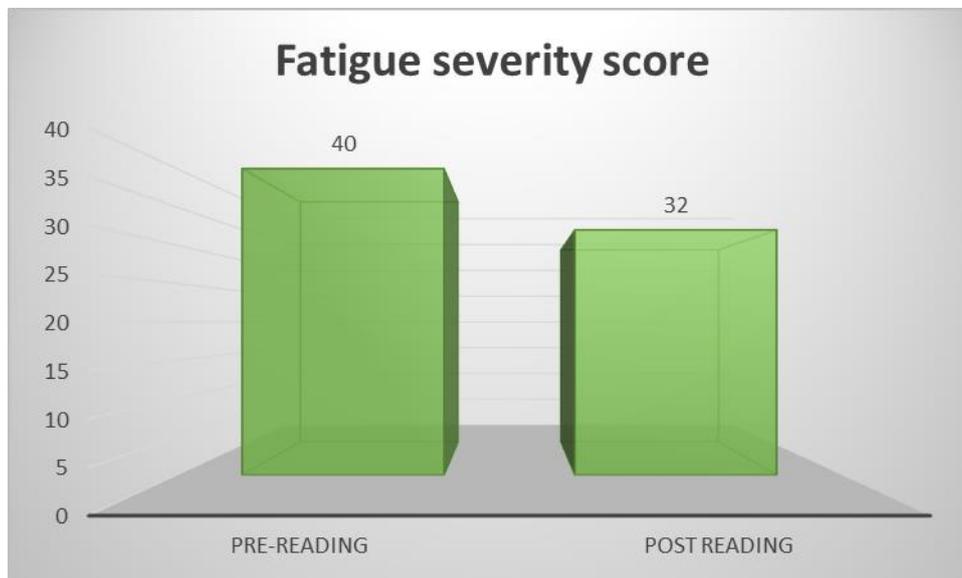
- Pre value of mMRC dyspnea scale is grade 3 whereas that of post value is grade 1.
- The pre value of 6-minute walk distance is 300 m while that of post value is 360 m.
- Similarly, pre value of fatigue severity score is 40 and that of post value is 32.



Graph 2: Pre And Post Values of mMRC Dyspnea score



Graph 3: Pre And Post Values of 6-minute walk distance



Graph 4: Pre And Post Values of Fatigue Severity Scale score

DISCUSSION

The main aim of the study was to assess the effect of IMT and breathing retraining exercises on PFT, 6-minute walk distance, fatigue severity scale and mMRC scale for breathlessness in asthmatic patient. This study was conducted on 22 years old female who is student was occupation was taken for the study. The main findings of this study was there is significant improvement in 6-minute walk distance, PFT values and attenuation in grading of mMRC scale which is for breathlessness, fatigue severity score.

According to the current census, 6-minute walk distance is significantly improved as pre reading is 300 m while post treatment value is 360 m, this shows that these techniques helpful in improving the exercise endurance of the patient. This may be due to the reason that due to 21 days of protocol there is improvement in lung functioning which leads to decreases in early breathlessness that increase the endurance and 6-minute walk distance of subject (3). The current data coined that there is significant improvement in all the parameters of PFT i.e. FEV1, FVC and the ratio between these (FEV1/FVC) which

suggests that improvement in the physiological characteristics of pulmonary system that may be due to breathing retraining exercises. As previous study suggests that Breathing retraining resulted in improvement not only in asthma control but in physiological indices across time as well (10).

According to the current study, there is significant improvement in dyspnea, i.e. alleviation in grading of mMRC scale as the pre- reading of mMRC scale is grade 3 while that of post value is grade-1. This may be due to the fact that the physiology of pulmonary system improves due to IMT device and breathing exercises and the capacity of lungs improves.

The current study shows that there is significant improvement in fatigue severity scale as there is improvement in lung function and strength of respiratory muscles which decreases the work of breathing and hence improves the fatigue severity score.

So, this study conclude that we can incorporate training of IMT and breathing exercises to improve the efficiency and QOL of Asthmatic patient.

Limitations of the study: The study was conducted on 1 subject so this potentially limiting the generalizability of findings. Furthermore, the utilization of a limited number of outcome measures may restrict the comprehensiveness of the investigation.

CONCLUSION

In conclusion, the current study reveals significant improvements in key respiratory parameters, including FEV1, FVC, and their ratio, following the implementation of Inspiratory Muscle Training (IMT) devices and breathing retraining exercises. The alleviation of breathlessness and reduction in FSS underscore the effectiveness of these interventions in enhancing respiratory muscle strength. Additionally, a substantial improvement in the 6-minute walk distance after a 21-day protocol of IMT and breathing retraining exercises further emphasizes their positive impact on

functional capacity. These findings collectively suggest the valuable role of IMT and breathing retraining techniques in managing Asthma, providing insights into their potential as beneficial components of comprehensive respiratory care strategies.

Declaration by Authors

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Conflict of Interest: The authors declare no conflict of interest.

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