

Effects of Inspiratory Muscle Training on Functional Mobility in Parkinson's Patients

Dr. Pournima Pawar¹, Dr. Ujwal Yeole², Miss Pranita Mogali³

¹Assistant Professor, Tilak Maharashtra Vidyapeeth, Pune.

²Associate Professor and Principal, Tilak Maharashtra Vidyapeeth, Pune,

³Intern, Tilak Maharashtra Vidyapeeth, Pune.

Corresponding Author: Dr. Pournima Pawar

ABSTRACT

Background: Patients suffering from Parkinson's disease have strength deficit, rigidity, respiratory dysfunction which are the leading cause of aspiration and pneumonia in Parkinson's patients.

Aim and Objectives: To find out the effect of inspiratory muscle training on functional mobility in Parkinson's patient using Lindop Parkinson's Assessment scale.

Methodology: 30 participants were selected according to inclusion and exclusion criteria and consent was taken. The study group included 30 patients with Parkinson's disease classified using Modified Hoehn and Yahr scale 1-3 in "drug on" period. It included age group 50-80 years with mean of (65.467±7.5). All the patients were assessed with Maximum Inspiratory Pressure using Inspiratory muscle training device and Lindop Parkinson's Assessment before and after the training period of 4 weeks. All subjects were trained 5 times a week for 15 minutes per session for 1 month.

Results: Following the training period, there was a significant improvement in functional mobility. Lindop Parkinson's Assessment scale pre-intervention in Grade 1 of Modified Hoehn and Yahr scale was (19.5±2.87) and post-intervention was (24±2.7). Lindop Parkinson's Assessment scale pre-intervention in Grade 2 was (19.66±3.90) and post-intervention was (23.55±2.78). Lindop Parkinson's Assessment scale pre-intervention in Grade 3 was (15.28±3.38) and post-intervention was (20.85±2.77).

Conclusion: We conclude that Inspiratory Muscle Training improves functional mobility in Parkinson's patients.

Key Words: Functional mobility, Inspiratory muscle strength, Parkinson's disease, Lindop Parkinson's assessment scale, Modified Hoehn and Yahr classification of disability.

INTRODUCTION

Parkinson's disease (PD) is a progressive neurologic disorder characterized by a large number of motor and non-motor features that can have a variable degree impact on the functions. There is degeneration of dopaminergic neurons in the substantia nigra and pars compacta. [1]

Rest tremors, bradykinesia, rigidity and loss of postural reflexes are generally considered the cardinal signs of PD. Other secondary motor symptoms are dysarthria, dysphagia, micrographia, shuffling gait, festination, glabellar reflexes and non-motor symptoms are cognitive/neurobehavioral abnormalities, sleep disorders and sensory abnormalities.

Increased levels of fatigue are associated with decreased levels of leisure physical activity. PD patients with more severe fatigue are more sedentary and have poorer functional capacity and physical function compared with patients with less fatigue. [2]

Respiratory disorders in Parkinson's disease (PD) cause morbidity and mortality due to pulmonary functional impairments. Less coordinated and less explosive muscle force has contributed to decrease in peak expiratory flow (PEF) and MEF75% values, and maximal voluntary ventilation (MVV) decreases in PD as a result of the

impaired performance and reduced efficiency during repetitive motor tasks which in part reflects abnormal agonist-antagonist muscle activity. [4]

The impact of lung disease on daily living activities in Parkinson disease patients is higher in patients with restrictive pulmonary dysfunctions (Schwab-England test and turning in bed and adjusting bedclothes, falling, walking and freezing when walking items of UPDRS) and airway obstructions (handling utensils, dressing and hygiene items of UPDRS). Airway obstructions or restrictive pulmonary dysfunctions present a high prevalence in Parkinson disease, contributing as a main factor for Daily Living Activities dysfunctions. [5]

Inspiratory muscle training improves strength, dyspnoea and functional capacity in healthy subjects and in obstructive and restrictive pulmonary disease. Airways obstructions or restrictive pulmonary dysfunctions present a high prevalence in Parkinson's disease, contributing as a main factor for daily living activities. Therefore, the evaluation and rehabilitation of respiratory disturbances should be systematically included in the management of these patients. [6]

Bradykinesia is caused due to strength deficits in patients with Parkinson's disease (PD). There is little research done that examines the effect of resistance training on muscle force production, muscle size, and mobility in persons with PD. Parkinson's disease is associated with swallowing and respiratory dysfunction which increases the risk of aspiration and pneumonia. [7-12]

Inspiratory muscle training weakness is common in patients with early-stage PD and is stable over two-year period. [13]

Degree of impairment of respiratory muscles can be assessed by measuring maximum inspiratory pressure (MIP) and maximum expiratory pressure (MEP). Respiratory muscles are affected by rigidity in Parkinson's disease. These muscles

respond to training in a similar manner as limb muscles when appropriate physiological load is applied. [14]

MATERIALS AND METHODS

The study design was an experimental study. 30 samples were collected according to inclusion and exclusion criteria from recognised hospitals in and around Pune. Target population were patients medically diagnosed with Parkinson's disease in "drug on" period. Convenient sample was the sampling method. The study included patients of age group between 50-80 years and both the genders.

Inclusion criteria-

1. Individual with age group between 50-80 years and both genders.
2. Patients medically diagnosed with Parkinson's disease in "drug on" period.
3. Patients in 1st, 2nd and 3rd stage of Modified Hoehn-Yahr Classification of disability.
4. Parkinson's disease since 2 years.

Exclusion criteria-

1. Patients in 4th and 5th stage of Modified Hoehn-Yahr classification of disability.
2. Any previously diagnosed cardiorespiratory conditions.
3. Patients with cognitive impairment.
4. Patients who are not willing to participate.

Outcome measure-

1. Lindop Parkinson's Assessment scale. [16]
2. Inspiratory Muscle Strength. [15]

Materials used in the study were the demographic sheet, consent form, Threshold Inspiratory muscle training device and Lindop Parkinson's Assessment scale. A survey was carried out on 50 Parkinson's patients across hospitals in and around Pune. Amongst these, 30 patients were selected according to the inclusion and exclusion criteria. Permission was taken from the Institutional ethical committee of Tilak Maharashtra Vidyapeeth, department of Physiotherapy. The consent form was filled by the subjects.

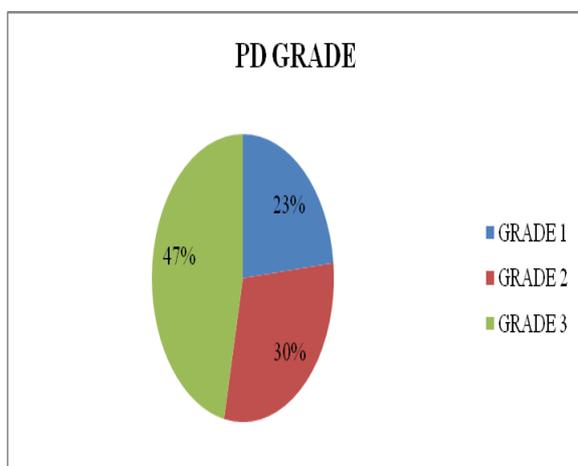
The 30 subjects were explained about the role of inspiratory muscle training in Parkinson's patients and the procedure was explained to them. All the 30 subjects were assessed using Inspiratory muscle training (IMT) device and Lindop Parkinson's assessment (LPA) scale and Maximum Inspiratory Pressure (MIP) was noted. All subjects were trained 5 days per week for 15 minutes per session for 1 month using Inspiratory muscle training device.

After the completion of the treatment, the patients were assessed again using Inspiratory muscle training device and Lindop Parkinson's assessment scale. The pre and post score of LPA scale were compared.

RESULTS

Table No. 1: Graphical representation for Grades of Parkinson's disease.

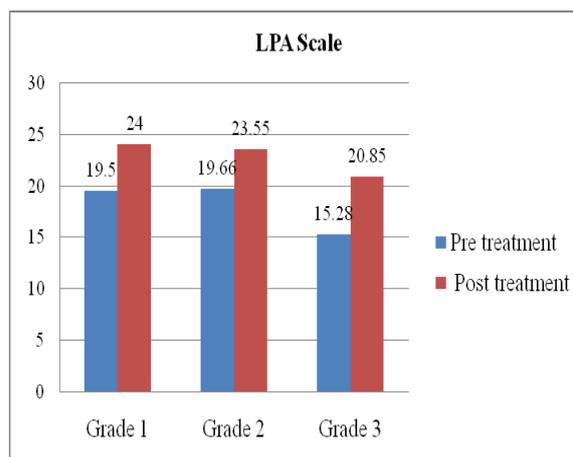
Grade Of PD	Patients
Grade 1	7
Grade 2	9
Grade 3	14



Interpretation: Out of 30 patients, 7 patients were in Grade 1 of PD, 9 patients were in grade 2 of PD and 14 were in Grade 3 of PD.

Table No. 2: Graphical representation for the score of LPA scale in Grade 1, 2 and 3 of Modified Hoehn and Yahr classification disability.

Grade of PD	Treatment	Mean ± SD	P value
Grade 1	Pre treatment	19.5±2.87	0.0118
	Post treatment	24±2.70	
Grade 2	Pre treatment	19.66±3.90	0.0272
	Post treatment	23.55±2.78	
Grade 3	Pre treatment	15.28±3.38	<0.0001
	Post treatment	20.85±2.77	



Interpretation: The difference of LPA scale between the pre and post treatment in grade 1 is 4.5 and the p value is 0.0118, Grade 2 is 3.8 and the p value is 0.0272 and Grade 3 is 5.5 and the p value is <0.0001.

DISCUSSION

Parkinson's disease (PD) is a progressive neurologic disorder characterized by a large number of motor and non-motor features that can have a variable degree impact on the functions. There is degeneration of dopaminergic neurons in the substantia nigra and pars compacta. [1]

Parkinson's signs and symptoms may include tremors, slowed movement (bradykinesia), rigid muscles, impaired posture and balance, loss of automatic movements, speech and writing changes.

Parkinson's disease is often accompanied by these following complications, which may be treatable: thinking difficulties, depression and emotional change, swallowing problems, sleep problems and sleep disorders, bladder problems, constipation, blood pressure changes, smell dysfunction, fatigue pain and sexual dysfunction

The aim of this study was to find out the effect of Inspiratory Muscle Training on functional mobility in Parkinson's patients. The sample size was taken from hospitals in and around Pune. Every individual's consent was taken by filling up the consent form. Men and women both were investigated for the study, but the incidence

of Parkinson's disease in men was greater as compared to women.

In this study, 30 samples were taken according to the inclusion and exclusion criteria. The inclusion criteria was individual of age between 50-80years as the incidence of Parkinson's disease is common in this age group because during aging there is a decline in the function of organelles that are responsible for clearing up and removing damaged proteins in neurons. Also, over time, there is a build-up of the alpha-synuclein protein which forms Lewy bodies that damage neurons. Both men and women were included in the study to avoid bias.

The patients in 1st 2nd and 3rd grade of Modified Hoehn-Yahr classification of disability as ambulatory patients were required for assessing gait mobility in the Lindop Parkinson's assessment scale before and after the IMT. The other inclusion criteria was patients in "drug on" period to avoid shuffling gait, festination and freezing during the assessment.

The exclusion criteria were patients in 4th and 5th grade of Hoehn and Yahr classification of disability because these patients are bed ridden/wheelchair bound and won't be able to perform gait mobility in LA scale. The other exclusion criteria were any previously diagnosed cardiorespiratory conditions and patients with cognitive impairment to avoid bias in this study.

In our study, the age group (65.46±7.57) were included. Out of total 30 patients, 23 patients were men and 7 patients were female. Hence the incidence of Parkinson's disease in men is more than in female patients.

Among 30 patients, 8 patients were in the duration of 1-3 years of PD, 8 patients were in the duration of 4-6 years of PD, 5 patients were in the duration of 7-9 years of PD, 8 patients in the duration of 10-12 years of PD and 1 patient in 13-15.

Out of total 30 patients, 7 patients were in grade 1 of Hoehn-Yahr classification of disability, 9 patients were

in grade 2 of Hoehn-Yahr classification of disability and 14 patients were in grade 3 of Hoehn-Yahr classification of disability as shown in Table No.1.

The score of LPA scale pre-treatment in Grade 1 was 19.5 and post-treatment was 24 out of total 30 score and the p value is 0.0118, pre-treatment in Grade 2 was 19.66 and post-treatment was 23.55 and the p value is 0.0272 and pre-treatment in Grade 3 was 15.28 and post-treatment was 20.85 and the p value is <0.0001 which is extremely significant as shown in Table No.2.

A research was done by Walter G. Vincken, Serge G. Gauthier et al on Involvement of upper-airway muscles in extrapyramidal disorders - A cause of airflow limitation. The aim was to identify the site and cause of airflow limitation in patients with Parkinsonism. The study concluded that the upper-airway musculature is frequently involved in extrapyramidal disorders. This causes upper-airway dysfunction that can be severe enough to limit airflow. [6]

A research was done by RivkaInzelberg, Nana Peleg et al on Inspiratory muscle training and the perception of dyspnea in Parkinson's disease. There was a close correlation between the increase in the inspiratory muscle performance and the decrease in the perception of dyspnea. The study concluded that the inspiratory muscle performance may be improved by specific inspiratory muscle training in patients with PD. This improvement is associated with a significant decrease in their perception of dyspnea. [2]

A research was done by Carol Ewing Garber et al on Effects of fatigue on physical activity and function in patients with Parkinson's disease. The objective was to characterize the relationships between symptoms of fatigue, physical activity, physical function, and functional capacity in patients with idiopathic PD. The study concluded that PD patients with more severe fatigue are more sedentary and have poorer

functional capacity and physical function compared with patients with less fatigue. [3]

Individuals with mild to moderate Parkinson's disease have the potential to maintain normal exercise capacity with regular aerobic exercise. [7]

A research was done by Bela Agarwal et al on Effect of Inspiratory Muscle Training in Individuals with Parkinson's Disorder. Objective of the study was to investigate effect of inspiratory muscle strength training on Maximum inspiratory pressure (MIP) and Maximum expiratory pressure (MEP) in people with Parkinson's disease. The study concluded that Inspiratory muscle strength training for 6 months resulted in improved MIP and MEP values in people with Parkinson's disease. Rehabilitation program for patients with Parkinson's disease should include IMST to improve respiratory muscle strength. [15]

The impact of lung disease on daily living activities in Parkinson disease patients is higher in patients with restrictive pulmonary dysfunctions (Schwab-England test and turning in bed and adjusting falling, bedclothes, walking, and freezing when walking items of UPDRS) and airway obstructions (handling utensils, dressing and hygiene items of UPDRS). Airway obstructions or restrictive pulmonary dysfunctions present a high prevalence in Parkinson disease, contributing as a main factor for Daily Living Activities dysfunctions. [5]

The difference of LPA scale between the pre and post treatment in grade 1 is 4.5 and the p value is 0.0118, Grade 2 is 3.8 and the p value is 0.0272 and Grade 3 is 5.5 and the p value is <0.0001, which is extremely significant as compared to the p value in Grade 1 and 2.

CONCLUSION

We conclude that Inspiratory Muscle Training improves functional mobility in Parkinson's patients.

REFERENCES

1. Professor Jankovic J. Parkinson's disease: clinical features and diagnosis. *Journal of neurology, neurosurgery & psychiatry*. 14 March 2008; 79 (4), 368-376.
2. Garber C.E. Effects of fatigue on physical activity and function in patients with Parkinson's disease. *Neurology journals*. 08 April 2003; 60 (7), 1119-1124.
3. Falvo M.J. Six-minute walk distance in persons with Parkinson's disease: A Hierarchical regression model. *Achieves of Physical Medicine and Rehabilitation*. [Internet]. 2009. Available from: <http://www.archives-pmr.org/article>.
4. Polatli M. Pulmonary function tests in Parkinson's disease. *European journal of neurology*. 21 December 2001; 8 (4), 341-345.
5. Magdalena Sabate MD. Obstructive and restrictive pulmonary dysfunction increases disability in Parkinson's disease. *Archives of physical medicine and rehabilitation*. January 1996; 77(1), 29-34.
6. Vincken W.G, Gauthier S.G. Involvement of upper-airway muscles in extrapyramidal disorders - A cause of airflow limitation. *The New England Journal of Medicine*. 16 Aug 1984; 311(7), 438-42.
7. Leland E.D. High-intensity resistance training amplifies muscle hypertrophy and functional gains in persons with Parkinson's disease. *Movement disorder Society*. 21 Sep 2006; 21 (9), 1444-52.
8. Inzelberg R. Inspiratory muscle training and the perception of dyspnea in Parkinson's disease. *Canadian journal of neurological sciences*. 02 December 2014; 32 (2), 213-217.
9. Saleem, Ahmad F. Respiratory muscle strength training: Treatment and response duration in a patient with early idiopathic Parkinson's disease. *Neurorehabilitation journal*. 26 December 2005; 20 (4), 323-333.
10. Canning CG. Parkinson's disease: an investigation of exercise capacity, respiratory function, and gait. *Archives of Physical Medicine and Rehabilitation*. 1997 Feb; 78 (2), 199-207.
11. Steffen T. Test-retest reliability and minimal detectable change on balance and ambulation test in PD. *Physical Therapy*. 2008; 88 (6), 733-46.

12. Huckabee ML. A pilot study of respiration and swallowing integration in Parkinson's disease: "on" and "off" levodopa. Springer Open Journal. March 2008; 23 (1), 76- 81.
13. Guillaume B. Early occurrence of inspiratory muscle weakness in Parkinson's disease. PLoS one Journal. January 12 2018; 13 (1).
14. Saleem A. F. Respiratory muscle strength training: treatment and response duration in a patient with early idiopathic Parkinson's disease. 2005; 20 (4), 323-333.
15. Agarwal B. Effect of inspiratory muscle training in individuals with Parkinson's disease. International Journal of health science and research. 2017; 7 (6), 178-185.
16. Pearson MJT. Validity and inter-rater reliability of the Lindop Parkinson's disease mobility assessment: a preliminary study. 2009; 95 (2), 126-133.

How to cite this article: Pawar P, Yeole U, Mogali P. Effects of inspiratory muscle training on functional mobility in Parkinson's patients. International Journal of Science & Healthcare Research. 2018; 3(4): 111-116.
