



ISSN : 2350-0743

www.ijramr.com



International Journal of Recent Advances in Multidisciplinary Research

Vol. 10, Issue 11, pp.9223-9226, November, 2023

## RESEARCH ARTICLE

### EFFECT OF RESPIRATORY PHYSIOTHERAPY ON LUNG FUNCTION IN PATIENTS WITH PARKINSON'S DISEASE SYSTEMATIC REVIEW OF THE SCIENTIFIC LITERATURE

**1\*Fabiola Gómez Hernández, 2Natalia Casales Castro, 3Diana Jazmín Estrada López and 4Félix Guillermo Márquez Celedonio**

<sup>1</sup>Degree in Physiotherapy, Faculty of Physiotherapy, Universidad del Valle de México, Veracruz, México; <sup>2</sup>Bachelor's Degree Intern in Physical Therapy. Faculty of Physiotherapy, Universidad del Valle de México, Veracruz, México; <sup>3</sup>Master's Degree in Physiotherapy, Faculty of Physiotherapy, Universidad del Valle de México, Veracruz, Mexico; <sup>4</sup>Master's Degree in Clinical Research. "Dr. Porfirio Sosa Zárate" School of Medicine, Universidad del Valle de México, Veracruz, México

#### ARTICLE INFO

##### Article History:

Received 17<sup>th</sup> August, 2023

Received in revised form

19<sup>th</sup> September, 2023

Accepted 20<sup>th</sup> October, 2023

Published online 30<sup>th</sup> November, 2023

##### Key Words:

Parkinson Disease, Idiopathic Parkinson Disease, Physiotherapy, Respiratory Muscles, Respiratory Therapy.

#### ABSTRACT

**Introduction:** Parkinson's disease is a chronic and progressive condition with motor and non-motor clinical manifestations due to dopamine deficiency. The respiratory system is affected by alterations in respiratory mechanics and pulmonary ventilation that can be addressed with physiotherapeutic techniques. **Objective:** To identify the respiratory physiotherapy techniques used in Parkinson's disease, their clinical efficacy, and effects on lung function through a systematic review of the scientific literature. **Material and methods:** Systematic review of the scientific literature on physiotherapeutic techniques in Parkinson's disease. A strategic search of the information was carried out in the bibliographic databases PEDro, Pubmed, SciELO, Medline, Redalyc, Elsevier, Wiley, Dialnet and ResearchGate and the articles were selected according to the selection criteria established following the PRISMA methodology and a qualitative synthesis of the results and conclusions was made. **Results:** A total of 132 articles were identified, of which 66 were discarded in the first phase, 42 in the second, and of the remaining 24, 8 met the selection criteria and were included for analysis. The studies included muscle training techniques, deep breathing programmes, breath stacking, and BS and IS spirometer incentive that improved respiratory function compared to control groups. **Conclusions:** Physiotherapy techniques improve respiratory function, are useful in a comprehensive approach plan for Parkinson's disease and improve the patient's health-related quality of life.

#### INTRODUCTION

Parkinson's disease (PD) is defined as a chronic and progressive neurodegenerative disorder that affects the nigrostriatal dopaminergic neurons producing dopamine deficiency and motor and non-motor alterations including tremor, bradykinesia, muscle rigidity, alterations of postural reflexes, flexion posture and freezing gait phenomenon. From the point of view of its epidemiology, in developed countries the prevalence of PD increases with age and its prevalence is 14 cases per 100,000 people per year, with the group aged 55 years and over having the highest frequency. PD has a significant impact on the patient's health-related quality of life (HRQoL) due to the motor and cognitive impairments associated with it that impact the biological, psychological, and social dimensions of their health. (Reyes 2019). PD affects a large number of the world's population, the repercussions it causes in the different systems of the human body make it a disease with significant importance for its care by health services and being progressive, disabling and without effective

treatment, it also has an impact on the well-being of the caregiver who has to invest time for its care and its physical well-being is affected. social and emotional related to varying degrees of overload. (Graziano & Ramaswamy, 2020). Medications can relieve most of the symptoms of PD with varying effectiveness; However, it should be noted that medication does not cure or prevent its progression and cannot eliminate its cause. Parkinson's sufferers must take their medication for life, adjust them frequently and supplement them with physiotherapeutic rehabilitation measures. The diverse types of medications that are recommended are based on the contribution of dopamine or dopamine agonists, amantadine, and anticholinergic medications. (Cano, Macías, Crespo, & Morales, 2004). On the other hand, the respiratory system is an anatomical set in which the lungs, airways, parts of the central nervous system, the respiratory muscles and the rib cage participate. Its main function is gas exchange, although it also contributes to the maintenance of acid-base balance, phonation, defense against harmful agents in the ambient air and various metabolic functions. The structures of the respiratory system have a design perfectly suited to the function they perform and can be affected in the patient with PD (Barberá, 2005).

**\*Corresponding author: Fabiola Gómez Hernández,**  
Degree in Physiotherapy, Faculty of Physiotherapy, Universidad del Valle de México, Veracruz, México.

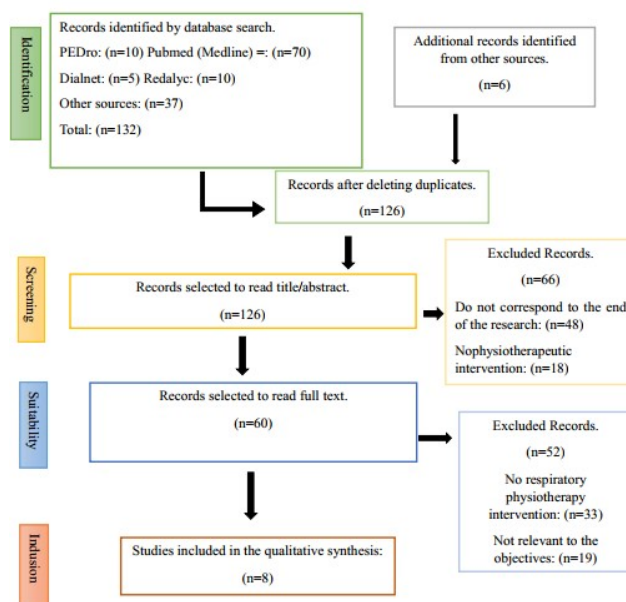
Respiratory physiotherapy is a necessary intervention in patients with PD, its application in this disease aims to improve quality of life by improving the function of respiratory muscles and pulmonary ventilation through the application of physical techniques. Respiratory muscle training through physiotherapy reduces dyspnea and increased respiratory function in patients with PD. Respiratory physiotherapy in PD includes the set of physical techniques that allow the airways to be waterproofed, the respiratory muscles to be relaxed and the patient to be re-educated for a better performance of this function. (López & Morant, 2004) (Güell, Díez, & Sanchis, 2008). Therefore, it is necessary to conduct a review of the scientific literature through the application of a methodology of selection and systematic analysis of published articles on respiratory physiotherapy techniques that allows us to determine the most frequently used techniques and their effects on the indicators of lung function in patients with PD.

## MATERIALS AND METHODS

During 2022 and 2023, a systematic review of the scientific literature was carried out that addresses the respiratory physiotherapy techniques applied in patients with PD and their effects on respiratory function. For this purpose, we included articles that addressed the topic through the application of observational or experimental research designs and that had been published in the last 10 years in English, Spanish or Portuguese. For the strategic search of the articles to be selected, the keywords and thesauri MeSH Parkinson Disease, idiopathic Parkinson Disease, Primary Parkinsonism, Physical Therapy Modalities, Physiotherapy, Therapy Physical Techniques, Respiratory Muscles, Respiratory Therapy were established, and the Boolean operators AND, OR or NOT were used as connectors of the search terms that required their location. Finally, for the identification of the articles, the bibliographic databases PEDro, Pubmed (Medline), Redalyc, Dialnet and other sources (Elsevier, SciELO, Wiley and ResearchGate) were explored. The description of the process of selection and discrimination of the publications was carried out through the application of the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) methodology, where the articles identified, those that were excluded based on the established criteria and those selected for qualitative analysis were represented. The selected articles were evaluated using the criteria of the McMaster, CASP, CONSORT and STROBE guidelines and a qualitative synthesis of the information related to the type of research, the studied population of patients with PD, the physiotherapeutic techniques used, and the results obtained was carried out.

## RESULTS

A total of 132 scientific articles were identified, of which six were duplicated, and 126 publications went to the second or screening phase where 66 were excluded, 48 because they did not correspond to the precise terms of the inclusion criteria and 18 did not have physiotherapeutic intervention. Finally, in the suitability phase, 52 were excluded, of which 33 did not present respiratory physiotherapy intervention and 19 were not relevant to the objectives, and a total of eight articles remained to be included in the qualitative synthesis. (Fig.1). Of the eight studies selected, four are randomized clinical trials, two more are mentioned as experimental studies, one of them with cross-intervention between research groups, and two are systematic reviews; randomized clinical trials include a total of 225 PD



PRISMA diagram of the review process showing the search levels of relevant articles, selected for review of their reviews.

Fig. 1. PRISMA Diagram

patients studied. The quality of the studies was considered moderate and high given that they met the methodological requirements of the established research designs and statistical analysis. We found sufficient scientific evidence of respiratory physiotherapy in the comprehensive management of patients diagnosed with PD with positive effects on lung function. One of the articles highlights the diversity in the type of pulmonary dysfunction in PD where restrictive, obstructive, and mixed cases can be found, this related to the decrease in the respiratory musculature, mainly diaphragm and external intercostals, which causes increased rigidity of the chest wall with compromise of pulmonary ventilation. It is established that the greater the severity of the disease, the greater the physical inactivity of the patient, the appearance of ventilatory disorders and it is highlighted that deep breathing exercises have favorable effects on respiratory function and fatigue.

Specifically, Reyes C., (2019) through a clinical trial identified in 80 participants a reduction of the restrictive component that is due to the loss of respiratory muscle strength and the increase in thoracic stiffness suffered by patients with PD. Reyes A et al., in 2018, also showed a moderate effect of muscle training on peak expiratory pressure and peak flow, while slow vital capacity and forced vital capacity had small improvement effects compared to the control group. In contrast, the breathing stacking and incentive spirometer BS and IS techniques applied in a randomized clinical trial conducted by Ribeiro R et al., in 2018 shows a significant increase in total volume and minute ventilation. In the same way, experimental studies carried out by Santos J et al., in 2016, Genc A et al., in 2012 and Frazao M et al., (2014) show improvements in the pulmonary parameters of patients who received physiotherapeutic care application of a 12-week deep breathing program (DBE) by which they obtained an increase in the forced expiratory volume in 1 second (FEV1) of the forced vital capacity (FVC) of peak expiratory flow (PEF) and maximal voluntary ventilation, with statistically significant differences. (Table 1)

**Table 1. Qualitative synthesis of information from eight studies on respiratory physiotherapy in Parkinson's disease included in the systematic review**

Article	Author	Year	Type of study	N° of participants	Intervention	Results	Degree
1	Kings C	2019	Single-blind, randomized, controlled clinical trial.	80 participants.	Respiratory physiotherapy in the specific approach to respiratory conditions in Parkinson's patients: research project.	The restrictive component is related to reduced respiratory muscle strength and increased chest wall stiffness and that lung involvement	High.
2	Reyes A, Castillo A, Castillo J, Cornejo I.	2018	Randomized controlled study.	40 participants.	The Effects of Respiratory Muscle Training on Peak Cough Flow in Patients with Parkinson's Disease: A Randomized Controlled Study	The magnitude of the increase in peak expiratory pressure ( $d = 1.40$ ) and voluntary peak cough flow ( $d = 0.89$ ) was greater for the expiratory muscle training group compared to the control group. Peak reflex cough flow had a moderate effect ( $d = 0.27$ ) in the expiratory group compared to the control group. Slow vital capacity ( $d = 0.13$ ) and forced vital capacity ( $d = 0.02$ ) had trivial effects in the expiratory versus control group.	High.
3	Ribeiro R, Brandão D, Noronha J, Lime C, Fregonezi G, Resqueti V, Dornelas A.	2018	Randomized controlled trial.	14 participants.	Incentive Spirometry and Breath Accumulation in Parkinson's Disease: Randomized Crossover Clinical Trial	Volume (VT) and minute ventilation (MV) increased significantly after BS and IS techniques. There was greater involvement of the pulmonary and abdominal compartments afterwards	Moderate.
4	O'Callaghan A, Walker R.	2018	Systematic review	22 studios 63 patients	A review of pulmonary function in Parkinson's disease	Specific training of inspiratory muscles and evaluation of different generalized whole-body exercise regimens, including aerobic, resistance, mixed, and high-intensity interval training.	High.
5	Santos J, Olmedo L, Santos F, Magnani K, Tarso P, Cristofolletti G.	2016	Mixed experimental study with longitudinal follow-up and cross-over analysis.	37 patients.	Patients with Parkinson's disease under physiotherapeutic care have better pulmonary parameters than sedentary controls	Physiotherapeutic care presented better pulmonary parameters than sedentary subjects.	High.
6	Genc A, Donmez B, Kara B, Cakmur R.	2012	Experimental study.	24 patients.	Evaluating the Effects of Home Deep Breathing Exercises in Patients with Parkinson's Disease	After a 12-week BDE program, an increase in expiratory volume in 1 second (FEV1), forced vital capacity (FVC), expiratory peak flow rate (PEF) and maximum voluntary ventilation (MW) ( $p < 0.05$ ). There was a Decreased fatigue levels in patients after breathing exercises ( $p < 0.05$ ).	Moderate.
7	Frazao M, Cabral E, Lima I, Resqueti R, Florencio R, Aliverti A, Fregonezi G.	2014	Controlled clinical trial.	30 patients.	Assessment of the acute effects of different PEP levels on respiratory pattern and operational volumes in patients with Parkinson's disease	There was an intergroup difference in the rate of shortening rate of the abdominal muscles, diaphragm, and inspiratory muscles of the rib cage at all levels of PEP ( $p < 0.01$ ).	High.
8	Rodríguez M, Crespo I, Valle M, Olmedillas H.	2019	Systematic review of randomised controlled trials.	6 databases.	Should respiratory muscle training be part of the treatment of Parkinson's disease? A systematic review of randomized controlled trials	Statistically positive results were found in maximum inspiratory pressure ( $P < 0.05$ and $d = 0.76$ ), peak expiratory pressure ( $P < 0.01$ and $d = 1.40$ ), perception of dyspnea ( $P < 0.01$ ), swallowing function ( $d = 0.55$ ) and phonatory. no significant differences in spirometric indices.	High.

## DISCUSSION

The findings of our research showed that the physiotherapeutic techniques used in patients with PD included aerobic, resistance and mixed exercises with the purpose of reducing the deterioration of the respiratory musculature and improving ventilatory parameters. Different physiotherapeutic techniques were addressed in the selected publications that, applied in a comprehensive management plan for patients with PD, pursue the same objective of mitigating the chronic and progressive effects of the disease on the physical condition, particularly respiratory, and the health-related quality of life of patients and demonstrate the importance of this area of therapy and its techniques in achieving management goals. We also consider that the application of respiratory physiotherapy constitutes an area of opportunity for observational or interventional research and clinical studies to have more detailed evaluations of its effects on the indicators of lung function of patients with PD and their clinical course and to establish a management program accompanied by the different areas of rehabilitation and multidisciplinary management that provides better treatment in PD.

## CONCLUSION

The exploration of articles on respiratory physiotherapy techniques in the management of patients with PD, their effects on respiratory function and their clinical efficacy showed that it is a vital component of their comprehensive management. Eight articles were identified that highlight the findings and benefits of respiratory therapy and agree that it is necessary to consider lung function and make constant evaluations in the management of patients with PD. The included studies also show that there are significant favorable changes in patients who had respiratory rehabilitation compared to those who did not.

**CONFLICT OF INTEREST:** The authors declare that they have no conflict of interest with public or private institutions.

**FUNDING STATEMENT:** The study was not externally funded and was carried out with the authors' own resources and participating institutions

## ABBREVIATIONS

**BS:** Breathing Stacking  
**CASP:** Critical Appraisal Skills Programme  
**CONSORT:** Consolidated Standards of Reporting Trials  
**DBE:** Deep Breathing Program  
**FEV1:** Forced Expiratory Volume in 1 second  
**FVC:** Forced Vital Capacity  
**HRQoL:** Health-Related Quality of Life  
**IS:** Incentive Spirometer  
**PD:** Parkinson's Disease  
**PEF:** Peak Expiratory Flow  
**PRISMA:** Preferred Reporting Items for Systematic Reviews and Meta-Analyses  
**STROBE:** Strengthening the Reporting of Observational studies in Epidemiology

## REFERERNCES

- Cano, R., Macías, A., Crespo, V., & Morales, M. 2004. Assessment scales and physiotherapy treatment in Parkinson's disease. *Pubmed*, 19-28.
- Barberá, J. 2005. Physiology of the respiratory system. In J. Tresguerres, C. Ariznavarreta, V. Cachofeiro, D. Cardinali, E. Escrich, P. Gil, . . . J. Tamargo, *Human Physiology*. (pp. 586-673). Spain.: McGraw-Hill Interamericana .
- Frazao, M., Cabral, E., Lima, I., Resqueti, R., Florencio, R., Aliverti, A., & Fregonezi, G. 2014. Assessment of the acute effects of different PEP levels on respiratory pattern and operational volumes in patients with parkinson's disease. *PubMed*, 42-47.
- Genc, A., Donmez, B., Kara, B., & Cakmur, R. 2012. Evaluation of the effects of deep breathing exercises at home in patients with Parkinson's disease. . *ResearchGate*, 59-62.
- Graziano, M., & Ramaswamy, B. 2020. Physical therapy for people with Parkinson's during and after the COVID-19 pandemic. *ELSEVIER*, 3.
- Güell, M., Díez, L., & Sanchis, J. 2008. Respiratory rehabilitation and respiratory physiotherapy: a good time for your boost. . *Servei Català de la Salut.*, 35-40.
- Lopez, J., & Morant, P. 2004. Respiratory physiotherapy: indications and technique. *UPDATING TECHNIQUES*, PP. 49-52.
- O'callaghan, A., & Walker, R. 2018. A review of pulmonary function in parkinson's disease. *PubMed*, 13-23.
- Reyes, A., Castillo, A., Castillo, J., & Cornejo, I. 2018. The Effects of Respiratory Muscle Training on Peak Cough Flow in Parkinson's Disease Patients: A Randomized Controlled Study. *PubMed*, 1-11.
- Kings, C. 2019. Respiratory physiotherapy in the specific approach to respiratory conditions in Parkinson's patients: research project. *PubMed*, 1-67.
- Ribeiro, R., Brandao, D., Noronha, J., Lime, C., Fregonezi, G., Resqueti, V., & Dornelas, A. 2018. Incentive spirometry and breath accumulation in Parkinson's disease: a randomized crossover clinical trial. *Pub Med*, 1-25.
- Rodríguez, M., Crespo, I., Valle, M., & Olmedillas, H. 2019. Should respiratory muscle training be part of the treatment of Parkinson's disease? A systematic review of randomized controlled trials. *PubMed*, 1-9.
- Santos, J., Olmedo, L., Santos, F., Magnani, K., Tarso, P., & Cristofolletti, G. 2016. Patients with Parkinson's disease under physiotherapeutic care have better pulmonary parameters than sedentary controls. . *SciELO*, 30-37.

\*\*\*\*\*