*Indian Journal of Physiotherapy and Occupational Therapy*
*Volume 16 No. 3, July-September 2022*

# Gentle Respiratory Exercise vs Incentive Spirometry in Patients with COVID Pneumonia: An Observational Study

**Navajeevan Panthi[1], Sushila Kataria[2], Maninder Dhaliwal[3], Manish Singh[4], Veena Raghunathan[5]**

**[1]Senior Physiotherapist Department of Physiotherapy & Rehabilitation, Medanta, the Medicity, Sector 38, Gurugram, Haryana, India 122001. [2]Senior Director Internal Medicine Medanta, [3]Associate Director, Pediatrics, Medanta, [4]Senior Biostatician, Clinical Resarch, MIER Medanta, [5]Senior Consultant, Pediatrics, Medanta, the Medicity, Sector 38, Gurugram, Haryana, India 122001.**

**How to cite this article:** Navajeevan Panthi, Sushila Kataria, Maninder Dhaliwal. Gentle Respiratory Exercise vs Incentive Spirometry in Patients with COVID Pneumonia: An Observational Study. Indian Journal of Physiotherapy and Occupational Therapy 2022;16(3):49-53.

**Abstract**

**Background:** Respiratory therapy is an important component of care in patients with COVID and other infective causes of pneumonia with possible long term benefits. While various types of respiratory exercises can be done in this situation, studies comparing the various forms of chest physiotherapy are limited. It is important to identify a simple lung exercise which is tolerated well to ensure its regular practise.

**Aim:** To compare tolerability of gentle respiratory exercise and incentive spirometry in non- critical patients with COVID pneumonia.

**Methods:** An observational study was undertaken between May 2021 to June 2021 in patients admitted to ward with COVID pneumonia. Demographic and clinical details of the patients were noted. The number of attempts of both type of exercises and their tolerance were recorded and compared.

**Results:** 142 patients underwent gentle respiratory exercise and 57 patients underwent incentive spirometry. There was no difference in age, sex, comorbidities, oxygen requirement or HRCT score in either groups. The number of exercise attempts tolerated in gentle respiratory exercise group was significantly higher than the incentive spirometry group (p= 0.027).

**Conclusion:** Gentle respiratory exercises are tolerated better by patients with mild / moderate COVID-19 pneumonia compared to incentive spirometry.

**Keywords:** COVID pneumonia; chest physiotherapy; gentle respiratory exercise; incentive spirometry.

**Corresponding Author: Navajeevan Panthi**, Senior Physiotherapist, Department of Physiotherapy & Rehabilitation, Medanta, the Medicity, Sector 38, Gurugram, Haryana, India 122001.

**Mobile:** +919958449142

**E-Mail:** menawajeewan@hotmail.com

## Introduction

The first and second waves of COVID 19 infection caused disease which primarily affected the lungs. It lead to interstitial pneumonia which had the potential to cause severe hypoxemia and ARDS. Around 42% patients requiring hospitalisation in the first wave require oxygen supplementation.[1] Respiratory therapy is an integral element of multidisciplinary care required by these patients. Studies have demonstrated that physiotherapy team has an essential role in the recovery of hospitalised patients.[2] Physiotherapy can contribute to improved oxygenation and airway clearance in pneumonia. Specifically, a position statement paper described the role of exercise on improving immune function in COVID -19 patients.[3] While aggressive techniques of chest physiotherapy are considered to be detrimental in pneumonia, specific data demonstrating superiority of one method over the other, especially in mild/ moderate cases is lacking. We undertook this study to compare 2 techniques of chest physiotherapy in patients with mild and moderate COVID-19 infection in our hospital.

## Aim

To compare tolerability of gentle respiratory exercise and incentive spirometry in non- critical patients with COVID pneumonia

## Methods

This was observational study which enrolled all patients with COVID pneumonia with no or mild respiratory distress admitted to our hospital ward between May 2021- June 2021. Critical patients requiring ICU admission were excluded . The study was approved by the institutional ethics committee (Approval number: 1306/2021). The same team of chest physiotherapists attended to the admitted patients daily. Every patient was taught the techniques of gentle respiratory exercise and incentive spirometry at the first encounter. They were asked to choose to do either or both as part of their daily exercise regimen subsequently. Verbal consent of all patients was taken. Patients who refused to give consent for either form of exercise were excluded. Nebulisation and medications were similar in both groups as per the hospital COVID protocol. Mobilisation was carried out for both groups after the treating physician's permission if the patient was clinically stable (stable respiratory and hemodynamic function).

Gentle respiratory exercise consisted of a slow instructed deep breathing exercise done by the patient in either a sitting or supine position, with the head and back supported and shoulders and upper chest relaxed. The patient was asked to place a hand over the anterior abdomen to feel the rise and fall during inspiration and expiration respectively. Inspiration was slow up to the count of 4 and expiration was longer up to the count of 7. The counts were instructed by the physiotherapist. Both phases of respiration where gentle, with no forceful effort. A repetition of this breathing exercise 3 times in the day was carried out for improved respiratory function (gas exchange), increased lung volumes, better chest expansion and improving inspiratory muscle strength and endurance.

The other technique used consisted of incentive spirometry using a mouthpiece spirometer. The goal of the exercise was to rise the ball up to the pre-marked level and maintain it there during inspiration. This was followed by breath holding for 3-5 seconds and slow exhalation. This exercise was repeated 3 times in a day under supervision.

Either exercise was aborted if patient developed desaturation < 90%, excessive coughing, perspiration, nausea, vomiting, dizziness or developed subjective feeling of breathlessness or chest pain. Other signs indicating need to stop included heart rate > 120 beats/min or arrhythmias. These were recorded as signs of intolerance. Cumulative number of attempts in both groups and tolerance was noted.

The analysis included profiling of patients on demographic, nutritional, clinical and radiological parameters. Quantitative data were presented in terms of mean and standard deviation. Categorical data were presented in absolute number and percentage. Independent student t-test was used for testing of mean difference between two independent groups. Cross tables were generated and chi-square test was used for testing of association. All statistical analysis was done using SPSS Ver.23.0.p-value<0.05 was considered as statistically significant.

## Results

There were a total of 142 patients who underwent gentle respiratory exercise and 57 patients who underwent incentive spirometry. Both groups of patients were similar in demographic and clinical characteristics. There was no difference in age, sex, presence of comorbidities or body mass index in both groups. There was no difference in the body mass index, oxygen requirement, high-resolution computed tomography (HRCT) score in either groups. There was no difference in oxygen requirement, or hospital stay in both groups.

In the gentle respiratory exercise group, the total number of exercise attempts was 1663. Of these, 1280 exercise attempts were successfully tolerated. In the incentive spirometry group, the total number of exercise attempts was 797, of which 452 attempts were successfully tolerated. In the 728 attempts which were not tolerated in both groups, the causes were: excessive coughing in 38% (n=277), breathlessness in 25% (n= 182), dizziness/light headedness in 19% (n= 138), excessive perspiration in 16% (n=116) and transient desaturation in 2% (n= 15). On aborting the exercise, all symptoms were relieved and desaturation improved within few minutes. None of the patients developed any arrhythmias during the exercises. The ratio of number of exercise attempts tolerated/ total number of attempts in gentle respiratory exercise group ( 0.77 ±0.6 ) was significantly higher than the incentive spirometry group (0.57±0.2; p = 0.027) (Table 1).

Table 1: Comparison of clinical parameters between the two study groups

| | **Gentle respiratory exercise n=142** | **Incentive Spirometry n= 57** | **p - value** |
|---|---|---|---|
| HRCT score | 22.3±8.5 | 20.8±8.2 | 0.282 |
| Comorbidities | | | |
| Diabetes | 43(30.3%) | 17(29.8%) | 0.949 |
| Pre-Existing Chronic Lung Problems / Asthma | 3(2.1%) | 1(1.8%) | 0.871 |
| Hypertension | 49(34.5%) | 23(40.4%) | 0.438 |
| Oxygen requirement | | | |
| 0- 5 L | 114(81.4%) | 42(71.2%) | 0.448 |
| 6-10 L | 7(5%) | 6(10.1%) | |
| 11-15 L | 4(2.9%) | 3(5.4%) | |
| 15 L | 15(10.7%) | 8(14.3%) | |
| ICU shift | 20(14.1%) | 4(7%) | 0.644 |
| Number of days in hospital | 11.7±8.5 | 14±8.6 | 0.090 |
| Ratio of number of exercise attempts tolerated /total number of attempts) | 0.77±0.6 | .77±0.6 | 0.027* |

*p-value < 0.005, statistically significant

## Discussion

During COVID 19 infection, the virus enters the respiratory system and binds to angiotensin converting enzyme 2 (ACE2) in alveolar cells and damages them. This results in respiratory problems. The initial symptom is dry cough due to epithelial cell involvement, progressing to dyspnoea and in some cases mucous hypersecretion due to exudative consolidation. While chest physiotherapy has been used in various respiratory conditions, evidence is lacking on its effects in COVID-19, especially in the acute stage. This is due to the difference in nature of respiratory problems caused by COVID-19 compared to other respiratory conditions. Also, administering

chest physiotherapy to COVID -19 patients carries the risk of aerosol generation which is an additional concern. Use of protective gear and disinfection of the environment thus becomes of paramount importance when chest physiotherapy is being considered in such patients.

The role of chest physiotherapy especially in mild stages is unclear, as the argument against its use is based on the non-exudative nature of the early disease. However it may have an advantage of relieving dyspnoea and anxiety and prevent progression to severe disease (4). Evidence on the use of chest physiotherapy in acute stages are scarce and anecdotal. Our study was an attempt to evaluate the 2 simple techniques in mild / moderate COVID-19 pneumonia.

Incentive spirometry is lung expansion technique which uses sustained maximal inspiration. It can help to improve ventilation perfusion mismatch and optimize oxygenation via splinting and prevention of collapse of alveoli, hence can be considered as an intervention to treat patients with mild to moderate COVID 19 disease.[5] Research has found conflicting results on the effectiveness of using incentive spirometer compared with other lung strengthening techniques. Many of the studies looking at potential benefits were poorly designed and not organised. Theoretically, it may help with improving lung function, reducing mucus buildup, strengthening lungs during extended rest, lowering the chance of developing lung infections. A randomized controlled trial of 50 patients showed that incentive spirometry could be used to prevent pulmonary complications in rib fracture patients.[6] Studies comparing gentle respiratory exercise and incentive spirometry are few. A randomized control trial in post laparotomy by Tyson et al found both techniques to be similar.[7]

Gentle respiratory exercise, apart from its effect on lung expansion enhances autonomic and cerebral activities related to emotional control and psychological well-being.[8] These may have an additional beneficial effect in the patient in COVID -19 due to isolation induced mental stress in this disease. We found that our patients had significantly better tolerance to gentle respiratory exercise compared to incentive spirometry. Decrease in stress, promotion in relaxation and improvement in cardiovascular parameters may be some of the reasons which could explain its better tolerance.[9]

Our study was observational in nature, with a limited sample size. Further large scale studies are needed to understand the ideal chest physiotherapy technique in such patients and the long term implications. However it does appear that gentle respiratory exercise is tolerated well and probably has a positive impact on patients with mild/ moderate pneumonia faced with the additional stress of isolation. It is a technique which is easy to teach and due to better tolerance, repeated practise of the technique by the patient seems feasible. It is plausible that initiation and practise of gentle respiratory technique may help to maintain better lung function in the long run.

## Conclusion

Gentle respiratory exercises are tolerated better by patients with mild / moderate COVID-19 pneumonia compared to incentive spirometry. It is important to further scrutinize its role with respect to compliance, practise and long term benefits on lung function in patients with COVID-19 infection.

## Acknowledgements

Dr Pooja Sharma, Associate Director, Clinical Research, MIER Pooja.sharma@medanta.org

Dr.Padam Singh, Consultant, Clinical Research, MIER dr.padamsingh2013@gmail.com

**Competing Interests:** None

**Funding:** None

**Ethical Clearance:** Ethical community of Medanta institute of education and research Gurgaon Haryana 122201, MICR number: 1306/2021 Academic

## References

1. Guan W, Ni Z, Hu Y, Liang W, Ou C, He J et al. Clinical Characteristics of Coronavirus Disease 2019 in China. New England Journal of Medicine. 2020;382(18):1708-1720. doi:10.1056/NEJMoa2002032
2. Jang M, Shin M, Shin Y. Pulmonary and Physical Rehabilitation in Critically Ill Patients. Acute

and Critical Care. 2019;34(1):1-13. doi:10.4266/acc.2019.00444.

3. Simpson R, Robinson L. Rehabilitation After Critical Illness in People With COVID-19 Infection. American Journal of Physical Medicine & Rehabilitation. 2020;99(6):470-474. doi:10.1097/PHM.0000000000001443.
4. Thomas P, Baldwin C, Bissett B, Boden I, Gosselink R, Granger C et al. Physiotherapy management for COVID-19 in the acute hospital setting: clinical practice recommendations. Journal of Physiotherapy. 2020;66(2):73-82.doi: 10.1016/j.jphys.2020.03.011.
5. Seyller H, Gottlieb M, Colla J. A breath of fresh air: The role of incentive spirometry in the treatment of COVID-19. The American Journal of Emergency Medicine. 2021;48:369. doi:10.1016/j.ajem.2021.01.084.
6. Sum S, Peng Y, Yin S, Huang P, Wang Y, Chen T et al. Using an incentive spirometer reduces pulmonary complications in patients with traumatic rib fractures: a randomized controlled trial. Trials. 2019;20(1). doi: 10.1186/s13063-019-3943-x.
7. Tyson A, Kendig C, Mabedi C, Cairns B, Charles A. The Effect of Incentive Spirometry on Postoperative Pulmonary Function Following Laparotomy. JAMA Surgery. 2015;150(3):229. doi:10.1001/jamasurg.2014.1846.
8. Zaccaro A, Piarulli A, Laurino M, Garbella E, Menicucci D, Neri B et al. How Breath-Control Can Change Your Life: A Systematic Review on Psycho-Physiological Correlates of Slow Breathing. Frontiers in Human Neuroscience. 2018;12. doi:10.3389/fnhum.2018.00353.
9. Naik GS, Gaur GS, Pal GK. Effect of modified slow breathing exercise on perceived stress and basal cardiovascular parameters. International journal of yoga. 2018 Jan;11(1):53. doi:10.4103/ijoy.IJOY_41_16.