

ORIGINAL ARTICLE

EFFECTS OF POSTURAL DRAINAGE AND DEEP BREATHING EXERCISES ON DYSPNEA, OXYGEN SATURATION AND LEVEL OF EXERTION IN ELDERLY POST COVID-19 PATIENTS

Dr. Sidra Ashrafⁱ, Dr. Zainab Hassanⁱⁱ, Prof. Dr. Shakil Ur Rehmanⁱⁱⁱ

Correspondence

Dr. Zainab Hassanⁱⁱ

ABSTRACT

Background and Aim: Elderly patients have reduced lung capacity and decrease respiratory functions due to aging process. Different positioning techniques contribute in airway clearance of patients and increase in oxygen saturation level. Therefore, this study aims to find out best intervention to improve dyspnea, level of exertion and quality of life of post COVID elderly group of patients.

Methodology: Study Design & Sampling technique: Randomized clinical trial and non-probability convenient sampling technique with sealed envelope Randomization.

Study Setting & Participants: National Hospital and Medical Centre-DHA Lahore and 48 patients. The sample size of 48 patients was taken in this study to find the effect of postural drainage and deep breathing exercises. Patients were divided into two groups. Steam was given to both groups as a common treatment. Group A was treated with postural drainage and steam while Group B was treated with deep breathing exercises and steam. Modified Borg's Dyspnea, pulse oximetry and RPE scale is used for scoring. Intervention or data collection tools: Postural drainage and deep breathing exercises in 2 groups. Pulse oximetry. The Modified Borg Dyspnea Scale and Perceived exertion scale were tools. Outcome measures: oxygen level, severity of dyspnea and level of exertion.

Results: Mean±S.D of patients in Postural drainage was 58.96±6.24 and in deep breathing 59.33±6.38. pulse oximetry pre value 3.50±0.51, 3.25±0.61 in postural drainage and deep breathing respectively while post values were 1.50±0.59 and 2.25±0.68. For MBD scale pre value was 7.33±0.92, 6.92±1.14 in postural drainage and deep breathing respectively while post values were 1.75±1.03 and 4.84±0.82 and PES pre value was 6.87±0.81, 4.42±1.10 in postural drainage and deep breathing respectively while post values were 2.42±1.10 and 2.54±1.32

Conclusion: Postural drainage was more effective than deep breathing exercises on dyspnea, oxygen saturation and level of exertion in elderly of post covid-19 patients.

The Ziauddin University is on the list of I4OA
(link <https://i4 oa.org/>)

This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY) 4.0 <https://creativecommons.org/licenses/by/4.0/>

Conflict of Interest: The author (s) have no conflict of interest regarding any of the activity perform by PJR.

Key words: *Breathing exercise, COVID-19, dyspnea, anaerobic threshold, postural drainage, muscle pain.*

Introduction

A new pandemic sickness was confronted globally in 2019 known as Covid-19. The lack of proper treatment and an effective vaccine leads the number of cases and deaths to rise^[1]. Individuals infected with COVID-19 can develop an influenza-like illness and respiratory tract infection, with symptoms such as fever, cough, fatigue, sputum production and shortness of breath^[2]. According to current reports, 80% of cases are asymptomatic or mild, 15% are severe (requiring oxygen), and 5% are critical (requiring breathing and life support)^{1,3}. Physiotherapists and other clinicians frequently have direct contact with patients, making them vulnerable to infectious illness transmission. Physical therapist and other health professionals must use their professional judgment to decide when, how, and when not to provide care, keeping in mind that this isn't always the ideal arrangement for everyone involved⁴.

In COVID-19 Survivors many health issues are seen particularly related to physical health, patients are not only affected by physical health but emotional, cognitive health also. In physical health body aches are very prominent, muscle pain, bone pain, increase in fatigue level with mild activity, shortness of breath were prevalent. Also cognitive issues, prevalence of depression, anxiety of getting affected again, memory and learning issues and cardiopulmonary issue as well. Physical activity, like many other health issues, can assist to decrease its worse effects and settle down the symptoms. Deep breathing exercises can be especially beneficial in the case of COVID-19^{5,6}. The COVID-19 epidemic has both physical and emotional effects, and a consistent deep breathing regimen can assist to alleviate both. Pulmonary rehabilitation is a combination of education and activity aimed at raising lungs and disease awareness. Deep breathing can encourage the contraction and expansion of muscles. It takes no time, needs no equipment, and (is) very cost-effective⁷. It relieve Shortness of breath, or dyspnea. It helps to coordinate Breathing with medication allows you to get the best dose and keep your airways open⁸. In Hubei (China), 27 cases of pneumonia with an unknown origin were reported in December 2019⁹. Tina J. Wang, MD et al 2020 conducted the research how postural drainage and deep breathing exercises affected airway clearance, respiratory efficiency, and secretion elimination in post-COVID-19 patients. Deep breathing exercises were found more effective¹⁰. According to a retrospective study, severe COPD patients participated in a three-week in-house Pulmonary Rehabilitation program that included airway drainage, initiation of long-term oxygen therapy, endurance and strength training, high-intensity inspiratory muscle training, and respiratory physiotherapy for breathlessness. This resulted in a significant improvement ($p < 0.001$) of 6MWT, modified Medical Research Council Dyspnea (mMRC) Score, and FEV1 scores¹¹. The pulmonary rehabilitation improve respiratory complications and symptoms like shortness of breath, cough, sputum, quality of life, psychological stress, and sability to work Clinically relevant changes during rehabilitation were also demonstrated for various lung function parameters, the 6MWD test¹². Presently, nobody knew the long term findings of any interventions related to physical, mental and emotional health of post covid patients, researches are processed to know the long term and permanent effects of physical therapy interventions. Nevertheless, In past in the outbreak of SARS, evidences found especially in middle east respiratory syndrome H1N1 and influenza A epidemics, regarding the long term reduction in health status of the victims including physical health, cardiopulmonary functions, cognitive functions as well as quality of life. this study was done to deliver recent information to all the physical therapy community in managing hospital admitted and home care post covid patients with latest and most effective interventions. Those Physical Therapist who are working in providing primary health care facilities they are at frontline role of managing COVID-19 patients and patients will get benefit from respiratory assessments, interventions^[13]. The purpose of respiratory rehabilitation within the hospital is to enhance the signs and symptoms of dyspnea, relieve anxiety, and maximize function. However, the rehabilitation should be carried beyond the hospital stay within the community to ensure there is retention and improvement in the high-quality of life.

Material and Method

Study design

It was a Randomized clinical trial RCT.

Study setting

Data was collected from National Hospital and Medical Centre-DHA Lahore and permission was taken before collecting the data.

Study duration

Study was conducted from August 2020 to June 2021.

Sample Size: 48 Sample size was calculated by using epi-tool¹⁴.

Sampling technique

Non-Probability convenient sampling technique was used.

Blinding technique.

Randomization

To divide participants in two groups randomization was done by sealed envelope method.

Ethical consent

Research ethical committee, Riphah International University Lahore campus approved the study

Inclusion criteria

Patients of both genders with Age 50-70 years were recruited for the study.

Patients with post COVID 2 weeks' time duration and Patients with post COVID-19 weak respiratory muscles and impaired breathing were a part of this study. ^[15]

Exclusion Criteria: Patient with pulmonary tuberculosis, cystic fibrosis bronchiectasis and those having a thoracic deformity or rib fracture as a result of an orthopedic ailment were excluded from the study.

Outcome measuring tools

- Modified Borg's dyspnea scale was used for dyspnea scoring. 0.84 is validity and 0.87 reliability¹⁶.
- Pulse oximetry used for to check oxygen saturation. Its validity is more than 0.70 and reliability is 0.85¹⁷.
- The Perceived Exertion Scale is numerical score used to measure the level of exertion, its validity is 0.92 and reliability is 0.93¹⁸.

Interventions

Group A: Received 3 sessions per week and total 6 weeks of Postural Drainage and Steam. Patient assumes different gravity assisted positions that allow secretions from the bronchial airway to flow towards the trachea and enforced to cough up more easily. Percussion and vibration were two methods for manipulating the thorax from the outside¹⁹.

Group B: Received 3 sessions per week on alternate days for up to 6 weeks of Deep Breathing Exercises and Steam. The patient lie down on a chair with legs bent and shoulders, head, and neck relaxed. They were asked to put hand on stomach with slow inhalation through nose, then to tighten muscles after exhalation with repetition for a total 5 minutes. The treatment lasted 20-30 minutes, with Pre-interventional readings were taken at baseline & post interventional readings at 6th week²⁰.

Data analysis

Normality distribution of data was checked by Shapiro-wilk test which showed significant results, non-parametric tests were applied for statistical analysis. Man Whitney was used to measure difference between groups while Wilcoxon was applied to measure difference in pre-post values of groups.

Result

Histogram of Age: This histogram of age shows mean age of the participant 59.15 years and standard deviation is 6.25.

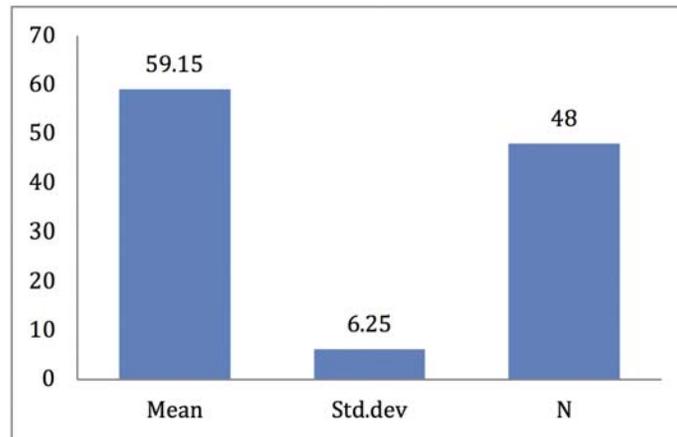


Figure 1

Table 2: Total 48 patients, 24 in Postural Drainage technique group and 11 in Deep Breathing exercise group. In group 1, the patients mean age were 58.96 years and in group 2, mean age were 59.33 years.

Descriptive Statistic This table shows mean and standard deviation of all three outcome measuring tools at pretreatment and post treatment level.

Treatment groups	mean±SD
Postural Drainage Technique	58.96±6.24
Deep Breathing Exercises	59.33±6.38

Table 1

	Mean	Std. Deviation
Pre -Treatment Pulse Oximeter	3.375	0.56962
Post -Treatment Pulse Oximeter	1.875	0.73296
Pre -Treatment BDS	7.125	1.04423
Post -Treatment BDS	3.2917	1.80965
Postural Drainage And Deep Breathing Exercises	1.5	0.50529

Table 2

		Postural Drainage Mean±SD	Deep Breathing Mean±SD	P-value
Pulse Oximetry	Pre	3.50±0.51	3.25±0.61	0.001
	Post	1.50±0.59	2.25±0.68	
	Z-value	-4.48	-4.06	
Modified Borg dyspnea Scale	Pre	7.33±0.92	6.92±1.14	0.003
	Post	1.75±1.03	4.84±0.82	
	Z-value	-4.33	-4.18	
Perceived Exertion Scale	Pre	6.87±0.81	4.42±1.10	0.055
	Post	2.42±1.10	2.54±1.32	
	Z-value	-4.31	-4.18	

Table 3

In Postural Drainage technique pre-treatment Mean±SD of Pulse oximetry was 3.50±0.51 while in post-treatment it was 1.50±0.59. In Deep Breathing exercises, pre-treatment Mean±SD of Pulse oximetry was 3.25±0.61 while in post-treatment was 2.25±0.68. P-value was less than 0.05 that showed significant results. In Postural Drainage technique pre-treatment Mean±SD of MBS Scale

was 7.33 ± 0.92 while in post-treatment was 1.75 ± 1.03 . In Deep Breathing exercises, pre-treatment Mean \pm SD of MBS Scale was 6.92 ± 1.14 while in post-treatment was 4.84 ± 0.82 . P-value was significant on between groups and within group comparison. Postural Drainage technique pre-treatment Mean \pm SD of RPE Scale was 2.42 ± 1.10 while in post-treatment it was 6.87 ± 0.81 . In Deep Breathing exercises, pre-treatment Mean \pm SD of RPE Scale was 2.54 ± 1.32 while in post-treatment it was 2.54 ± 1.32 . P Value was found significant.

Discussion

The goal of this study was to see how well Postural drainage and Deep Breathing exercises affected dyspnea, oxygen saturation, and level of exertion in older COVID-19 patients. Denise Battaglini et al 2020 published a research to determine the effects of chest physical therapy intervention on COVID -19 patients, Chest physiotherapy was found effective in improvement of respiratory complications e.g exertion, dyspnea, fatigue etc. That shows chest physiotherapy is effective in reducing respiratory complications^{21,22}. In current study postural drainage and deep breathing exercises were used to treat post COVID-19 patients, this study showed on Pulse oximetry that oxygen saturation level was more raised in group of patients who received postural drainage and steam. P value was less than 0.05.

Another study conducted by Auwal Abdullahi concluded that all type of chest physiotherapy interventions e.g breathing exercises, stretching techniques, diaphragmatic breathing exercises, postural drainage and many other interventions were found very effective in improvement of quality of life in covid-19 survivors. It improved not only quality of life but health status including fatigue, exertion were also improved¹¹. Current study is supported by this study, quality of life and health status of covid-19 survivors is improved by the help of postural drainage exercises and deep breathing exercises.

Pulmonary rehabilitation develops more functional exercise capacity, reduces episodes and intensity of dyspnea and increase quality of life in Post Covid Patients. Exercise tolerance level is increased^{23, 24}. Dyspnea and quality of life may be sustained in people with Idiopathic Pulmonary Fibrosis^{25, 26}. In current study Modified Borg 's dyspnea scale shows reduction in mean value of score from 7.33 to 1.75 in postural drainage group and P value also showed statistically significant results.

Narges Shakerian et. all conducted another study on covid-19 survivors and it was concluded that different Respiratory physical therapy interventions particularly active breathing exercises were found helpful in airway clearance and increasing the lung capacity of the participants with decrease in breathing effort applied during respiration. However, there is also decrease in disabilities that results from hospital acquired infections as well as prolong stay in hospitals²⁵.

Severe COVID-19 symptoms in Patients needed mechanical ventilation that develops exercise intolerance and muscle weakness. Mobilization in early stage of Covid can be beneficial. In this study it was concluded that patients get more improvement in physical function when pulmonary rehabilitation is provided in acute phase²⁶ but infection control is on priority. Rehabilitation therapy was provided in isolation areas and better results were found²⁷. In current study results showed that exertion level was decreased after application of chest physiotherapy. With-in group both treatment groups showed effective results on perceived exertion scale but more significant results were found in postural drainage group. Physical Medicine & Rehabilitation involved physicians and rehabilitation team to play an important contribution in normalizing the physical function and reducing the level of disability in this pandemic. PM&R interventions and Pulmonary Rehabilitation included basic nutrition, airway clearance, and proper posture, and maximum oxygen supplementation, different breathing exercises, stretching of muscles, manual therapy for mobilization of joints, and an increase in physical activity. It increased quality of Life in Post COVID patients^{10,25}. In Current study it was found that oxygen saturation level was increased, dyspnea's was reduced with the help of different gravity assisted postural drainage exercises as well as deep breathing exercises.

In a systemic review most often techniques which were being practiced on Post Covid Patients included Vibro-compressor, hyper-inflation, postural drainage, tracheal suction & motor mobilization. All of these techniques were efficient bronchial hygiene maneuvers²⁸ In current study postural drainage showed effective results increasing oxygen saturation and perceived level of exertion was decreased after the treatment of 6 weeks.

Conclusion

It was concluded that postural drainage and breathing exercises both are effective in improving dyspnea, oxygen saturation and level of exertion in elderly of post COVID-19 patients. Furthermore, the study should be conducted in multicenter setups as well on large sample size.

Reference

- [1] Russell, C.D., J.E. Millar, and J.K. Baillie, Clinical evidence does not support corticosteroid treatment for 2019-nCoV lung injury. *The Lancet*, 2020. 395(10223): p. 473-475.
- [2] Cullen, D.L. and B. Rodak, Clinical utility of measures of breathlessness. *Respiratory care*, 2002. 47(9): p. 986-993.
- [3] Covid, C., et al., Severe outcomes among patients with coronavirus disease 2019 (COVID-19)—United States, February 12–March 16, 2020. *Morbidity and mortality weekly report*, 2020. 69(12): p. 343.
- [4] Lalwani, L., et al., Chest Physiotherapy in Patients Admitted to the Intensive Care Unit With COVID-19: A Review. *The Open Public Health Journal*, 2021. 14(1).
- [5] Sun, P., et al., Understanding of COVID-19 based on current evidence. *Journal of medical virology*, 2020. 92(6): p. 548-551.
- [6] Padroni, M., et al., Guillain-Barré syndrome following COVID-19: new infection, old complication? *Journal of neurology*, 2020. 267(7): p. 1877-1879.
- [7] McDermott, A., Pulmonary rehabilitation for patients with COPD. *Professional nurse (London, England)*, 2002. 17(9): p. 553-556.
- [8] Wu, Z. and J.M. McGoogan, Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention. *Jama*, 2020. 323(13): p. 1239-1242.
- [9] Guan, W.-j., et al., Clinical characteristics of coronavirus disease 2019 in China. *New England journal of medicine*, 2020. 382(18): p. 1708-1720.
- [10] Wang, T.J., et al., PM&R and pulmonary rehabilitation for COVID-19. *American journal of physical medicine & rehabilitation*, 2020.
- [11] Abdullahi, A., Safety and efficacy of chest physiotherapy in patients with COVID-19: a critical review. *Frontiers in medicine*, 2020. 7: p. 454.
- [12] Schultz, K., et al., In-Patient Pulmonary Rehabilitation to Improve Asthma Control: A Randomized Controlled Study (EPRA, Effectiveness of Pulmonary Rehabilitation for Patients with Asthma). *Deutsches Ärzteblatt International*, 2021. 118(3): p. 23.
- [13] Kalirathinam, D., R. Guruchandran, and P. Subramani, Comprehensive physiotherapy management in covid-19—a narrative review. *Scientia Medica*, 2020. 30(1): p. e38030-e38030.
- [14] Prabawa, I.M.Y., et al., Chest therapy and breathing exercise in COVID-19 patient: a case report.

- [15] Xia, J.-G., et al., Non-invasive respiratory support for patients with novel coronavirus pneumonia: clinical efficacy and reduction in risk of infection transmission. *Chinese medical journal*, 2020. 133(9): p. 1109.
- [16] Uronis, H.E., et al., Assessment of the psychometric properties of an English version of the cancer dyspnea scale in people with advanced lung cancer. *Journal of pain and symptom management*, 2012. 44(5): p. 741-749.
- [17] Losa-Iglesias, M.E., R. Becerro-de-Bengoa-Vallejo, and K.R. Becerro-de-Bengoa-Losa, Reliability and concurrent validity of a peripheral pulse oximeter and health-app system for the quantification of heart rate in healthy adults. *Health informatics journal*, 2016. 22(2): p. 151-159.
- [18] Barkley, J.E. and J.N. Roemmich, Validity of the CALER and OMNI-bike ratings of perceived exertion. *Medicine and Science in sports and exercise*, 2008. 40(4): p. 760-766.
- [19] Siroya, V., L. Fernandes, and O.C. Wadhokar, A Pioneering Physiotherapeutic Approach to the Treatment of a COVID Affected Patient—A Case Report. *Journal of Pharmaceutical Research International*, 2021: p. 17-24.
- [20] Nanjappan, D. and J. Jeya Amutha, PULMONARY REHABILITATION FOR COVID 19. 2021.
- [21] Ahmad, Z., et al., A report on COVID-19 epidemic in Pakistan using SEIR fractional model. *Scientific Reports*, 2020. 10(1): p. 1-14.
- [22] Lajwanti, L., et al., Chest physiotherapy in patients admitted to the intensive care unit with COVID-19: a review.(Special Issue: COVID-19 one health approach.). *The Open Public Health Journal*, 2021: p. 145-148.
- [23] Spielmanns, M., et al., Effects of a Comprehensive Pulmonary Rehabilitation in Severe Post-COVID-19 Patients. *International Journal of Environmental Research and Public Health*, 2021. 18(5): p. 2695.
- [24] AWETO, H.A. and R.A. ADEDOYIN, THE ROLES OF CHEST PHYSIOTHERAPY IN THE MANAGEMENT OF PATIENTS WITH COVID-19 ROLURILE FIZIOTERAPIEI RESPIRATORII ÎN MANAGEMENTUL PACIENTULUI CU COVID-19.
- [25] Shakerian, N., et al., Potential prophylactic and therapeutic effects of respiratory physiotherapy for COVID-19. *Acta Bio Medica: Atenei Parmensis*, 2021. 92(1).
- [26] Dowman, L., et al., Pulmonary rehabilitation for interstitial lung disease. *Cochrane Database of Systematic Reviews*, 2021(1).
- [27] Saeki, T., et al., Rehabilitation Therapy for A COVID-19 Patient who Received Mechanical Ventilation in Japan: A Case Report. *American journal of physical medicine & rehabilitation*, 2020.
- [28] Arora, M., H. Jain, and S. Khare, Symptomatic Respiratory Physiotherapy Management Strategies for COVID-19 Patients. Hardika and Khare, Shivank, Symptomatic Respiratory Physiotherapy Management Strategies for COVID-19 Patients (May 15, 2020), 2020.

ⁱLecturer RCRS & AHS Riphah International University Lahore (0000-0002-7217-7011)ⁱⁱSenior Lecturer RCRS & AHS Riphah International University Lahore (0000-0003-3668-5614)ⁱⁱⁱProfessor and Director RCRS & AHS Riphah International University Lahore (0000-0002-6682-9896)