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IS THERE A PLACE FOR KINESITHERAPY IN THE TREATMENT OF PATIENTS WITH COVID - 19?

Chief Assist. Prof. Denitsa Vasileva, PhD
Department of Public Health and Social Work
University of Ruse "Angel Kanchev"
Phone: 0878 25 39 07
E-mail: ddecheva@uni-ruse.bg

***Abstract:** Covid - 19 is a disease affecting patients of all ages, whose clinical primary and most common symptoms are manifested by fever, rhinitis, cough, muscle pain, fatigue and severe manifestations of double bronchial pneumonia, the main problem in severe stages is respiratory failure. There is evidence in the scientific literature of a prophylactic focus of kinesitherapy on the complications of the disease. Also in a number of clinical studies the high efficiency of the application of respiratory kinesitherapy in mild forms of respiratory failure and the initial stages of pneumonia in different age groups of patients has been demonstrated. Respiratory kinesitherapy includes a range of rehabilitation techniques such as breathing exercises, vibration techniques, respiratory muscle training, percussion movements, postural drainage and more.*

***Keywords:** Kinesitherapy, Covid - 19, Respiratory kinesitherapy, Physiotherapy*

INTRODUCTION

Coronavirus disease (COVID-19) is an infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It was first reported on December 31, 2019, and although attempts have been made for almost a year to control the pandemic that caused it, it is still poorly studied and the understanding of this disease is still incomplete, especially regarding its causes, consequences and long-term results. In addition, very few has been written about the rehabilitation needs of patients with COVID-19 after discharge from the acute phase of the disease.

The aim of this article is to find scientific evidence for the role of respiratory physiotherapy (PT) in patients with pneumonia and respiratory difficulties and to determine whether it would be appropriate to be included in the overall treatment plan of patients diagnosed with Covid-19.

EXPOSITION

Until now, more than 100 scientific articles have been reviewed in the literature review, and after a thorough review of their content, very few of them were included, corresponding to the topic of search. Among them were those with a number of guidelines developed for the safe working conditions of physiotherapists and other medical professionals in the context of the pandemic, as well as described cases of kinesitherapy results in patients treated for Covid-19 and cured, but none was found, with data about the use of kinesitherapy in patients diagnosed with Covid -19 during their treatment.

According to current statistics, 70% of patients diagnosed with Covid -19 pass with only mild symptoms and patients recover without significant medical intervention, in 20% of cases the disease is severe and 10% require intensive treatment with need for mechanical ventilation, and in 2% - 4% of all cases are fatal. These data draw attention primarily to preventive measures and the mobilization of all opportunities to increase immunity and thus the likelihood of a milder course of the disease in the event of infection. (Blake E., 2020).

As a preventative measure, the World Health Organization (WHO) and the health audience recommend eating healthy, wholesome and balanced foods rich in vitamins and trace elements, as well as drinking plenty of fluids.

In case of possible infection, the recommendations include, in addition to proper nutrition, also regular air ventilation and cleaning of the home. (US Center for Disease, New Zealand Ministry of Health, Public Health Agency of Canada, 2020).

In mild cases, with the presence of mild shortness of breath, the performance of deep breathing exercises shows a significant improvement in the respiratory function of the lungs, which reduces the risk of complications. (Vitacca M., 2020).

Performing light to moderate aerobic exercise in infected patients during mild symptoms improves lung ventilation. These exercises also have a function that supports the immune system. Under appropriate conditions, long walks or jogging on the spot can improve the vital capacity of the lungs. (Medline Plus, 2020).

Respiratory muscle training is indicated as an extremely effective PT tool. As such, it can be defined as techniques that aim to improve the function of the respiratory muscles through specific exercises. It consists of a series of breathing or other exercises that increase the strength and endurance of the respiratory muscles and respectively improve respiration. Respiratory muscle training is usually used in patients with asthma, bronchitis, emphysema and COPD, but can be used successfully in other respiratory diseases. (Mindova S, 2015). According to the Global COPD Initiative (GOLD), people with chronic obstructive pulmonary disease are one of the most at risk groups in the Covid-19 pandemic. (Mindova S., 2020).

Usually respiratory muscle training consists of: 1. Inspiratory muscle training, 2. Expiratory muscle training or a combination of both. Resistive breathing exercises have been described in the literature as one of the most reliable in respiratory PT. Respiratory PT regulates the respiratory cycle, improves ventilation, aspirates secretions and normalizes the patient's basic condition. Respiratory PT techniques are an ideal tool for the treatment of children and adults with pulmonary problems. (Blake E., 2020). Another study found that respiratory and PT training were important additions to drug therapy. (Mereles D., 2006).

According to A. Diwate, kinesitherapy plays a vital role in the management of treatment in patients admitted to the intensive care unit. Cardio-respiratory physiotherapy is useful in the treatment of acute and chronic respiratory conditions, which improve the quality of life after an acute illness and reduce the stay in the intensive care unit, thus reducing morbidity and mortality. (Diwate A., 2020). He believes that kinesitherapy would be useful and effective in treating patients with COVID-19. (Diwate A., 2020).

D. Pozuelo - Carrascosa et al. conducted a number of studies which clearly found that multimodal respiratory PT significantly reduces hospital stay and mortality in intubated patients on mechanical ventilation with pneumonia. (Pozuelo - Carrascosa D., 2018).

L. Gupta et H. Gupta offer a method for mobilization of secretions with breathing exercises and subsequent postural drainage. Postural drainage consists of positional treatment of the patient by assisting gravity to drain a specific area / segment of the affected lung. The positioning is done in such a way that the most affected bronchus is the highest part of the chest, so that by the action of gravity the secretion can be drained from it to the central airways, which are then expelled by active coughing. The postural drainage technique also includes percussion, vibration and tapping. The technique for each lobe is repeated 2-3 times a day for 5-10 minutes each. If symptoms of hypoxemia, tachycardia, dyspnea or heart pain occur, the procedure is discontinued. Postural drainage is not performed in the event of hemoptysis. (Gupta L., Gupta H., 2018), (McConnell A., 2013).

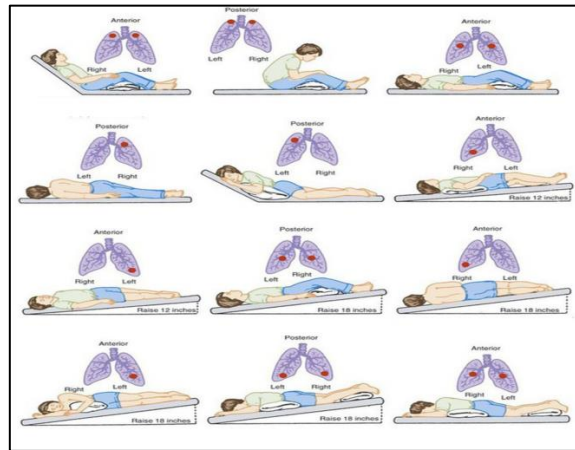


Fig.1 Postural Drainage Positions

R. Momosaci performed a retrospective analysis of studies on the effect of PT in adult patients with acute phase aspiration pneumonia. The conclusion of his study is that the inclusion of PT in the treatment of geriatric patients with aspiration pneumonia is effective and encouraging. (Momosaci R., 2017).

W. Abdelbasset et al. study the effect of PT in 50 children aged 29 days to 5 years, hospitalized for pneumonia. The patients were divided into two groups of 25 people who received the same medication, but one group received PT and the other did not. Based on the obtained results, they conclude that PT is a significant factor in the significant improvement of the condition and recovery of children with pneumonia. (Abdelbasset W., 2015).

R. Pattershetty and G. Gaude have also proven the effectiveness of multimodal respiratory kinesitherapy in patients with mechanical ventilation with pneumonia. They conducted a study with 101 patients on mechanical ventilation, and 50 of them performed kinesitherapy twice a day. At the end of the study, they concluded that patients receiving kinesitherapy had significantly better results and a significant reduction in mortality rates compared to intubated patients not receiving kinesitherapy. (Pattershetty P., 2010).

E. Clini is studying intensive care patients in need of pulmonary ventilation receiving kinesitherapy care such as pulmonary drainage, functional exercises and respiratory exercises involving the inspiratory muscles. In the end, he found that the earlier rehabilitation could begin, the greater the potential to reverse the effects of immobilization and prolonged bed rest. He concludes that these programs are important because of the growing number of patients being treated in intensive care units around the world. (Clini E., 2005).

H. Zeng et al. make a comparative feature between conventional respiratory kinesitherapy, including vibrational expectoration, manual pulmonary drainage, early functional exercise, and others in patients mechanically ventilated in intensive care units for pneumonia. They found that the extensive kinesitherapy program helps prevent mechanical ventilation, potential complications, and shortens the duration of mechanical ventilation and stay in the intensive care unit. It also helps patients recover faster. (Zeng H., 2019).

S. Shah et al. did a review and summarize the evidence regarding the supportive role of physical rehabilitation techniques in managing COVID-19-associated pneumonia. In the review, they also emphasize the use of rehabilitation techniques in the management of pneumonia in COVID-19-infected patients. Based on the evidence presented, they conclude that certain physical rehabilitation techniques and modalities could be of great support in managing COVID-19-associated pneumonia. A combination of physical rehabilitation and medical treatment would result in better treatment outcomes, quick recovery, and shorter hospital stays. Early rehabilitation is not recommended because of less tolerability; however if the patient's condition permits, and the benefits outweigh the risks, rehabilitation should be commenced early. Telerehabilitation should be considered in COVID-19 patients, which could offer less staff and patient exposure and more safety, as well as save personal protective equipment. (Shah S., 2020).

A. Gautam, R. Arena et al. developed physiotherapy programs for COVID-19 patients in different stages of disease with different symptoms. The authors of this correspondence hope that readers will find this proposed approach to be of value when considering how to alter the approach to pulmonary rehabilitation (PR). (Gautam A., 2020).

Proposed phase wise PR protocol depending on the severity of symptoms:	
(1) Asymptomatic patients (no or minimal V/Q mismatch)—Telerehabilitation	
Goal: Prevention of developing comorbidities and early recovery	
Improvement of immunity	Aerobic exercises, yoga and nutritional care
Improve lung compliance	Deep breathing, intercostal expansion and yoga
Respiratory muscle conditioning	IMT at moderate to high intensity using MIP to set intensity
Skeletal muscle conditioning	Aerobic and resistance training targeting larger muscles group. Train at moderate to high intensity using RPE and 10 RM for setting intensity
Oxygen supplementation will not be required and need for telemonitoring (vitals) will be minimal unless other pre-existing co-morbid conditions	
Activities log and telemonitoring can be done for improving compliance	
(2) Symptomatic patients not requiring mechanical ventilation (minimal to moderate V/Q mismatch)—Telerehabilitation	
Goal: Prevention of comorbidities and early recovery	
Improvement of immunity	Aerobic exercises, yoga and nutritional care
Improve lung compliance	Deep breathing and yoga
Improvement of alveolar ventilation/oxygenation	Postural drainage and autogenic drainage/active cycle of breathing techniques
Respiratory muscle conditioning	IMT at moderate intensity
Skeletal muscle conditioning	Aerobic and resistance training at moderate intensity targeting larger muscle group
Oxygen supplementation may be required during exercise training and need for telemonitoring (SpO₂ by pulse oximetry) will be mandatory whether other pre-existing co-morbid conditions are present	
Activities pacing training and self-symptoms monitoring must be incorporated	
Caution: No active exercise if fever and weakness are worsening	
(3) Symptomatic patients requiring mechanical ventilation (moderate to severe V/Q mismatch)—ICU rehabilitation protocols	
Goal: Improve pulmonary ventilation and prevent deconditioning	
Improvement of alveolar ventilation/oxygenation	Pneumonia: Airway clearance techniques—modified postural drainage regimen, suctioning—closed loop suctioning will be better than open suctioning
	ARDS: Prone positioning and frequent change in positions and

	appropriate mechanical ventilation strategies
Improvement of immunity	Nutritional care (protein-rich diet, zinc and vitamins)— enteral/parenteral route
Improve lung compliance	Ventilatory setting with appropriate PEEP adjusted
Weaning from mechanical ventilation	T-piece trials IMT (moderate intensity) through endotracheal /tracheostomy tube as tolerable
Skeletal muscle conditioning	Active/active assisted/passive exercises, cycle ergometry and electric muscle stimulation at the bedside may be considered approaches Early ambulation strategies as tolerated once vital signs stabilize Neuromuscular electrical stimulation
Need for telemonitoring (SpO₂ by pulse oximetry) will be mandatory during all the ICU rehabilitation phase whether other pre-existing co-morbid conditions are present	
N.B. (1) In addition, regular psychological counselling and rehabilitation should also go side by side in each phase of rehabilitation in all the affected patients (2) Special precautions must also be taken if pre-existing co-morbid conditions are also present	
(4) Post recovery period—(A) Supervised training, (B) Home/self-monitored training	
(A) Supervised training—Individualized exercise testing and prescription	
Goal: Improve cardiopulmonary and physical conditioning	
Improvement of alveolar ventilation/oxygenation	If pulmonary fibrosis is present, perform training with oxygen supplementation as needed If secretions are present, perform airway clearance techniques
Improvement of immunity	Aerobic exercises, yoga and nutritional care
Improve lung compliance	Deep breathing, intercostal expansion and yoga
Respiratory muscle conditioning	IMT at moderate to high intensity, using MIP to set intensity
Skeletal muscle conditioning	Aerobic and resistance training targeting larger muscles group at moderate to high intensity, using RPE and 10 RM for setting intensity
N.B. As patients will be non-contagious, rehabilitation still requires separate settings than the other patients. Proper precautionary and safety measures must be followed at rehabilitation settings as prescribed by regulatory bodies for prevention of COVID-19 spread. Make patients learn rehabilitation exercises and self-monitoring of vitals	
(B) Home/self-monitored training	
Goals and means are same as of supervised training	
Telerehabilitation can be used to improve compliance of the PR	
General: For non-infected people in the community	

Goal: Staying fit and prevention of comorbidities due to long-term home stay
Interventions: Aerobics, resistance and flexibility exercises such as meditation and yoga
Emphasize on activities easily done at home—aerobic dancing, leisure activities—skipping, cycling, stepping, stair climbing, etc. if treadmill is not available
COVID-19, coronavirus disease 2019; ICU, intensive care unit; IMT, inspiratory muscle training; MIP, maximal inspiratory pressure; PEEP, positive end-expiratory pressure; PR, pulmonary rehabilitation; RM, repetition maximum; RPE, rate of perceived exertion; V/Q, ventilation/perfusion.

Fig. 2 Proposed phase wise pulmonary rehabilitation protocol depending on the severity of symptoms

C. da Silva et al. conducted a study among patients infected with COVID-19 of pediatric and geriatric profile and found that COVID-19 causes low lung compliance and severe changes in lung function with hypoxemia and cardiovascular effects. These changes lead to the need for physiotherapy and management of oxygen therapy, and in some cases ventilation support (invasive and non-invasive) in these patients. (Da Silva C., 2020), (Sheehy LM., 2020).

T. Saeki et al. described a case report of a 65 - year man with COVID-19, who has been hospitalized with high temperature and put on mechanical ventilation 8 days later. They began rehabilitation therapy 6 days after admission to the hospital following established infection control procedures. When the patient was discharged, muscle weakness and exercise intolerance persisted, but his capacity to perform activities, required for daily living, improved to the level of independence at his home. One month after discharge, good recovery of physical function was observed. Therefore, mobilization in the acute phase is a necessary component of rehabilitation therapy for severely affected COVID-19 patients. They established that respiratory physiotherapies, including postural drainage, were performed in this case, but their benefit is unknown. Respiratory physiotherapy might be effective in patients with bacterial pneumonia and high levels of respiratory secretion. In the end of their study, they conclude that patients with severe COVID-19 symptoms, who need mechanical ventilation, will likely develop muscle weakness and exercise intolerance and this study showed that mobilization in the early stages of the disease, after the end of sedation, can be beneficial. (Saeki T., 2020).

CONCLUSION

Following a literature review, there was a lack of published results from the practical application of kinesiotherapy to patients diagnosed with COVID -19. Based on its proven effectiveness in different age groups as a means of prevention and high efficacy in the treatment of patients with acute respiratory diseases, pneumonia and respiratory failure requiring mechanical ventilation, it can be assumed that its inclusion in the treatment plan of patients with COVID -19 in all forms and stages, would improve the general condition of patients, reduce the risk of complications and would contribute to their faster recovery.

REFERENCES

Abdelbasset W., Tamer E. Elnegamy (2015). *Effect of Chest Physical Therapy on Pediatrics Hospitalized With Pneumonia*, Medicine, DOI:10.5455/IJHRS.000000092 Corpus ID: 59104799.

Blake E. et al; (2020) *Respiratory Health for Better COVID-19 Outcomes*; New England Complex Systems Institute March 2020;

https://static1.squarespace.com/static/5e7b914b3b5f9a42199b3337/t/5e8b51ed557b8b3687f2512a/1586188782349/respiratory-health_en.pdf .

Center for Disease Control and Prevention, (2020). <https://www.cdc.gov/>

Clini E., N. Ambrosino (2005). *Early physiotherapy in the respiratory intensive care unit*, Respiratory Medicine, Volume 99, Issue 9, September 2005, pp: 1096-1104, <https://doi.org/10.1016/j.rmed.2005.02.024>.

De Silva CM et al. (2020). *Evidence-based Physiotherapy and Functionality in Adult and Pediatric patients with COVID-19*; Journal of Growth and Human Development; Vol. 30 1(1), pp: 148 – 155; DOI: <http://doi.org/10.7322/jhgd.v30.100>.

Diwate A. (2020). *Novel Coronavirus Pneumonia Emergency Response Epidemiology Team; Vital surveillances: the epidemio-logical characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19) –China*. China CDC Weekly;2(8):113-22.

Diwate A. (2020). *Role of Physiotherapy in COVID-19 Patients*. VIMS J Physical Th. June; 2(1):1-2.

Gautam A., R. Arena et al. (2020). *Pulmonary rehabilitation in COVID-19 pandemic era: The need for a revised approach*; Respirology. Volume25, Issue12, December 2020, pp: 1320 – 1322, doi: 10.1111/resp.13946.

Gupta L., H, Gupta (2018). *Physiotherapy for Respiratory Conditions*; Adv Nursing Patient Care Int J 2018, 1(1): 180003.

McConnell A. (2013). *Methods of respiratory muscle training*. Chapter 5 in: Respiratory Muscle Training: Theory and Practice, Elsevier, 2013.

Mereles D. et al. (2006). *Exercise and Respiratory Training Improve Exercise Capacity and Quality of Life in Patients With Severe Chronic Pulmonary Hypertension*; Pubmed 114 (14), 1482 – 9.

Medline Plus (2020). <https://medlineplus.gov/>.

Mindova S. (2020). *Chronic Obstructive Pulmonary Disease – The Silent Threath of Modernity* (**Оригинално заглавие:** Миндова С. (2020), Хронична Обструктивна Белодробна Болест – Тихата Заплаха на Съвременето) стр. 99-100, ISBN: 978-954-712-819-4.

Mindova S., I. Stefanova, I. Karaganova (2015). *Physiotherapy at exacerbatons of COPD*, Notifications 2015, pp: 111-115 (**Оригинално заглавие:** С. Миндова, И. Стефанова, И. Караганова; (2015). *Кинезитерапевтично поведение при екзацербация на ХОББ*, Известия 2015, стр. 111 – 115.

Momosaci R. (2017). *Rehabilitative management for aspiration pneumonia in elderly patients*, Journal of General and Family Medicine, 2017 Volume 18, Issue 1, pp: 12 – 15 <https://doi.org/10.1002/jgf2.25>.

New Zeland Ministry of Health, (2020). <https://www.health.govt.nz/>.

Saeki T. et al. (2020). *Rehabilitation Therapy for A COVID-19 Patient who Received Mechanical Ventilation in Japan: A Case Report*, American Journal of Physical Medicine Rehabilitation, 2020 July, 10.1097/PHM.0000000000001545.

Shah S. et al. (2020). *Scaling the Need, Benefits, and Risks Associated with COVID-19 Acute and Postacute Care Rehabilitation: A Review*; Rehabilitation Research and Practice, Volume 2020 |Article ID 3642143 | <https://doi.org/10.1155/2020/3642143>.

Sheehy LM. (2020). *Considerations for Postacute Rehabilitation for Survivors of COVID-19* JMIR Public Health Surveill 2020;6(2):e19462, DOI: 10.2196/19462.

Pattanshetty RB, G. S. Gaude (2010). *Effect of multimodality chest physiotherapy in prevention of ventilator-associated pneumonia: A randomized clinical trial*; Indian J Crit Care Med. 2010 Apr-Jun; 14(2): 70–76; doi: 10.4103/0972-5229.68218.

Public Health Agency of Canada (2020). <https://www.canada.ca/en/public-health.html>.

Pozuelo – Carrascosa D. et al. (2018). *Multimodality respiratory physiotherapy reduces mortality but may not prevent ventilator-associated pneumonia or reduce length of stay in the*

intensive care unit: a systematic review; Journal of Physiotherapy; Vol. 64, Issue 4, October 2018, pp: 222-228.

Vitacca M. et al.; (2020); *Joint statement on the role of respiratory rehabilitation in the COVID-19 crisis: the Italian position paper*; Respiration 2020; Issue: 99 pp:493–499; <https://doi.org/10.1159/000508399>.

World Health Organisation; <https://www.who.int/>.

World Physiotherapy Europeun Region; <https://www.erwcpt.eu/>.

Zeng H., Meng-YangWangBS, LeiPanMD, Xiao-JuanHuMD (2019). *Chest physiotherapy for the prevention of ventilator-associated pneumonia: A meta-analysis*; American Journal of Infection Control; Volume 47, Issue 7, July 2019, pp: 755-760; doi.org/10.1016/j.ajic.2018.12.015.