ORIGINAL ARTICLE

https://doi.org/10.1590/1806-9282.20211336

Telematics program of breathing exercises and mindfulness for post-coronavirus disease 2019 patients

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SUMMARY

OBJECTIVE: The coronavirus disease 2019 pandemic is an economic, social, and health challenge. During the coronavirus disease 2019 lockdown, a telematics platform for respiratory physiotherapy and mindfulness was created, aiming to reduce dyspnea and anxiety and to increase quality of life in post-coronavirus disease 2019 patient.

METHODS: A quasi-experimental study was performed on post-coronavirus disease 2019 patients, with breathing exercises and mindfulness with remote supervision by a respiratory physiotherapist. Dyspnea on exertion (Mahler Scale), quality of life (EuroQol-5D score), and anxiety (State-Trait Anxiety Inventory questionnaire) were measured before and after the rehabilitation program.

RESULTS: A total of 20 subjects completed the program, with a significant decrease in the measures of dyspnea on exertion ($p<0.001$), state anxiety ($p=0.004$), and trait anxiety ($p=0.001$) and a significant increase in quality of life ($p=0.016$).

CONCLUSIONS: Coronavirus disease 2019 should be treated using a multidisciplinary approach that includes respiratory rehabilitation. At present, there are few studies on respiratory rehabilitation and mindfulness in post-coronavirus disease 2019 patients. The results of this study showed that the implementation of breathing exercises and mindfulness with remote supervision was effective in decreasing dyspnea and anxiety and in increasing quality of life in post-coronavirus disease 2019 patients during confinement.

KEYWORDS: COVID-19. Coronavirus. SARS-Cov-2. Mindfulness. Breathing exercises. Telerehabilitation.

INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic is an economic, social, and health challenge. The mobility restrictions have affected millions of people around the world, the high level of contagiousness and sanitary collapse has driven new sanitary realities to control the pandemic, and telehealth has been recommended by the post-COVID-19 patient rehabilitation guidelines[1].

Severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2) is a complex virus, with 10% of the cases requiring hospitalization. SARS-Cov-2 combines high transmissibility with high morbidity and mortality, showing a highly variable course between asymptomatic and fulminant lethal cases. Scientific evidence shows that 80% of infected patients present complications and sequelae after overcoming the acute period of illness. Among the most important sequelae are fatigue (58%), dyspnea (24%), headaches (44%), attention disorder (27%), anxiety (13%), depression (12%), and many other symptoms[2].

The most severe forms of COVID-19 can leave sequelae of pulmonary fibrosis in 5% of patients who have presented bilateral pneumonias[3]. A significant number of patients who have suffered COVID-19 require rehabilitation, with the severity of the disease being a key factor that determines the type of rehabilitation. To treat COVID-19 patients, multidisciplinary rehabilitation teams should perform cardiopulmonary rehabilitation, musculoskeletal rehabilitation, neurorehabilitation, and psychological rehabilitation[4].

As respiratory function can be altered, dyspnea is a common symptom[5]. We also found decreased tidal volume and compliance, ventilatory imbalance, alveolar collapse, decreased respiratory muscle strength, increased airway resistance, and decreased coughing ability[6]. Chest physiotherapy helps to restore the patient's lung function and improve ventilation, efficiency of the respiratory muscles, and readaptation to exertion[7]. With few exceptions, patients do not require bronchial lavage techniques, but respiratory muscle training will be important if they are assisted by a ventilator in order to increase the success of weaning if the patient is hospitalized in the acute phase in the intensive care unit (ICU)[8].

Previous studies on the sequelae of SARS showed a decrease in lung function with restrictive patterns, muscle

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Conflicts of interest: the authors declare there is no conflicts of interest. Funding: none.
Received on December 29, 2021. Accepted on March 03, 2022.

weakness, cardiorespiratory deficit, and decreased musculoskeletal performance as sequelae[9], which are similar to the COVID-19 sequelae[2].

Few studies on post-acute COVID-19 syndrome recommend slow and deep breathing, rib cage expansions, abdominal breathing, pursed-lip exhalations, and drainage of secretions if necessary[10]. In addition to breathing, stretching techniques, progressive muscle relaxation, and mindfulness session are also recommended. The use of breathing techniques may help control the anxiety levels[11], and mindfulness stimulates the parasympathetic nervous system, thereby altering neuronal function in specific areas of the brain and reducing the release of stress chemicals[12].

Mindfulness is also effective in improving many biopsychosocial conditions, including depression, anxiety, stress, insomnia, addiction, psychosis, pain, hypertension, and weight control. Mindfulness has been proposed as potentially effective in alleviating mental health problems related to the COVID-19[13].

During the COVID-19 lockdown in Spain, a telematics platform of respiratory physiotherapy and mindfulness for post-COVID-19 patients was launched as an altruistic initiative. The aim of the program was to improve the patient's dyspnea sensation, anxiety, and quality of life in the recovery phase of COVID-19.

METHODS

Study design and participants

This quasi-experimental study was performed on April 2020. On April 6, 2020, the program was launched through social networks, and people interested in participating in the study contacted the physiotherapist.

Inclusion criteria to participate in the study were as follows: a positive PCR test result for the COVID-19 virus, more than 10 days having passed since the initial diagnosis, no fever, hemodynamically stable, patients with dyspnea, and being able to remain seated for 1 h.

Ethical considerations

This study was conducted under the guidance of the Helsinki ethical statements. All the participants read the study criteria and signed the informed consent form.

Measurements

Before starting the rehabilitation program, and after completion of the intervention, each patient filled the following questionnaires: EuroQol-5D quality-of-life score[14], Mahler dyspnea index[15], and State-Trait Anxiety Inventory (STAI) anxiety questionnaire[16], through the Google Forms platform.

Intervention

Ten sessions were remotely supervised through a digital platform by a physiotherapist trained in chest physiotherapy and mindfulness. This program was based on respiratory physiotherapy guidelines[10].

The program consisted of 10 sessions of respiratory physiotherapy with remote supervision, carried out three times a week, each session lasting 45 min. Before the session, the patient's dyspnea was monitored with the Borg scale[17]; patients who increased their dyspnea during the exercises by more than 3 points stopped the session.

The sessions consisted of (1) 10 abdomino-diaphragmatic respirations: The rhythm of each breath was slow, inhaling to high lung volume[1]; (2) 10 costal expansion exercises with upper limb flexion and abduction; (3) three self-passive stretching of the rib cage and accessory respiratory neck muscles, aiming to increase the flexibility of the muscles to improve vital capacity; (4) progressive Jacobson's relaxation contracting according to the procedure recommended by Bernstein and Borkovec[18]; and (5) final mindfulness, focusing on breathing instructions during 10 min, based on the study by Arch and Craske[12].

Statistical analysis

The frequencies of the categorical variables were expressed as absolute numbers and percentages. The quantitative variables that were non-normally distributed were summarized as median and interquartile range (IQR) using the Shapiro-Wilk test. For the comparison of the data corresponding to the quantitative variables measured before and after the physical therapy sessions, the Wilcoxon signed-rank test was used. The significance level was set at alpha <0.05. Data analysis was performed using the IBM SPSS Statistics for Windows, version 23.0 (IBM Corp., Armonk, NY, USA).

RESULTS

A total of 20 patients participated in the study, and all of them completed the 10 sessions of respiratory physiotherapy. The mean age was 48.5 years (IQR 39.2–60.5), 50% were female, and the median body mass index (BMI) was 23.9 kg/m^2 (IQR 22.7–26.4).

Table 1 shows the clinical characteristics of the patients. Most of them reported having had or having fever (85%)

and/or cough (75%), and 75% had been diagnosed with pneumonia. Notably, 60% of the patients had been hospitalized due to the COVID-19 infection, but none of them required ICU admission. Also, 35% (7 patients) had required oxygen therapy.

A comparative analysis of the measures assessed before and after the chest physiotherapy and mindfulness virtual intervention is shown in Table 2. A significant decrease in state anxiety (p=0.004), trait anxiety (p=0.001), and dyspnea was achieved after the intervention (p<0.001), and a significant increase in quality of life was found (p=0.016) after the intervention.

DISCUSSION

The results of the virtual physiotherapy program met the objectives of improving dyspnea and quality of life and decreasing anxiety in post-COVID-19 patients. The exercises used were based on consensus and expert guidelines that promote the application of pulmonary rehabilitation[17].

Coronavirus disease 2019 impedes gas exchange due to exudate in the alveolar space. The virtual respiratory rehabilitation program consisted of different types of breathing, such as abdomino-diaphragmatic respirations, costal expansion exercises, stretching, progressive muscle relaxation, and final mindfulness. The participants improved their dyspnea symptoms, so it could be an effective strategy to improve gas exchange due to increased ventilation of the deep lung[19]. The effects of Jacobson's progressive muscle relaxation exercises as well as mindfulness on dyspnea and fatigue have been successfully tested in people with lung disease[20].

There are currently few studies on respiratory rehabilitation in COVID-19, with the first study being that by Liu et al.[21], in which a 6-week respiratory physiotherapy program consisting of respiratory muscle training, cough exercises, diaphragmatic training, stretching exercises, and home exercises showed improved spirometric parameters, the 6-min walk test score, and quality of life of the participants.

Due to the variability of the sample, the program was based on breathing exercises that were adaptable to most of the patients. As described above, a safety limit was established in order to carry out the exercises in the most controlled way possible, since not all the subjects had measurement systems, and the telematics route could be a limitation to maintain safety.

A previous study, similar to this research, used telerehabilitation in the acute phase in patients with mild or moderate symptomatology. The intervention lasted for 1 week, thus improving the 6-min walk test score, the dyspnea, and the functionality of the experimental group[22]. Although more trials are needed, telerehabilitation seems an adequate approach during the COVID-19 pandemic.

Table 1. Characteristics of the participants.

Variables	n=20
Fever	17 (85%)
Cough	15 (75%)
Anosmia	9 (45%)
Ageusia	9 (45%)
Pneumonia	15 (75%)
Currently with pneumonia	6 (30%)
Previously hospitalized COVID-19	12 (60%)
Currently hospitalized COVID-19	2 (10%)
Days of hospitalization, median (IQR)	9 (5.7–12.2)
Oxygen therapy during illness	7 (35%)
Admission to ICU	0
Previous respiratory pathology	4 (20%)
Asthma	1 (5%)
Bronchiectasis	3 (15%)

Table 2. Pre- and post-intervention comparative analysis.

	Pre-intervention Median (IQR)	Post-intervention Median (IQR)	p
Anxiety status	19.5 (13.3–19.3)	17.5 (10.3–22.5)	0.004*
Anxiety trait	17 (10.5–23.5)	14 (8.5–21.5)	0.001*
Quality of life	0.8 (0.7–1)	1 (0.8–1)	0.016*
Dyspnea	8 (2–11)	11.5 (10–12)	<0.001*

*Significance of p<0.05 was considered. The Wilcoxon signed-rank test was used.

CONCLUSION

Remotely supervised respiratory physiotherapy seems to be an effective approach for post-COVID-19 patients to decrease the sensation of dyspnea and anxiety and to increase the quality of life.

AUTHORS' CONTRIBUTIONS

MPSF: Investigation, Methodology, Writing. **MBM:** Writing-review and editing. **GGPS:** Approval final version. **ÁGF:** Writing-review and editing. **CRM:** Data curation, Project administration. MRA: Formal Analysis, Validation.

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