FUNCTIONALITY BEFORE AND AFTER PHYSIOTHERAPY IN POST-COVID-19 PATIENTS

ABSTRACT

Introduction: COVID-19 is a disease that since its emergence in 2019 has represented a challenge for healthcare services. The sequelae result from impaired quality of life, fatigue, dyspnea and joint pain. Objective. To compare physical, respiratory, cognitive and functional independence functional parameters in post-COVID-19 patients with respiratory sequelae before and after a respiratory physical and occupational therapy program. Methods: A comparative, quasi-experimental, prospective study was conducted in outpatients discharged from hospitalization for COVID-19 in a 3rd level of care Hospital of the Mexican Institute of Social Security in Puebla, Mexico during 2020-2021. Scales were applied before and after the rehabilitation program. Analytical statistics were used. Results. We included 116 patients, 57.7% men, mean age 47.32 years (min. 20, max. 79); 77 (66.3%) patients presented moderate symptoms in hospitalization. A significant p-value was obtained (p <0.001). Conclusion: Significant improvement is observed in post-COVID-19 patients after receiving respiratory physical and occupational therapy.

KEYWORDS: SARS-CoV-2; Occupational Therapy; Physical Therapy Modalities. (Source: MESH-NLM)

RESUMEN

Introducción: El COVID-19 es una enfermedad que desde su aparición en 2019 ha representado un reto para los servicios sanitarios. Las secuelas son consecuencia de un deterioro de la calidad de vida, fatiga, disnea y dolor articular. Objetivo: Comparar parámetros funcionales físicos, respiratorios, cognitivos y de independencia funcional en pacientes post COVID-19, con secuelas respiratorias antes y después de un programa de terapia física y ocupacional respiratoria. Métodos: Se realizó un estudio comparativo, cuasiexperimental, prospectivo en pacientes ambulatorios egresados de hospitalización por COVID-19 en un Hospital de 3er nivel de atención del Instituto Mexicano del Seguro Social en Puebla, México durante 2020-2021. Se aplicaron escalas antes y después del programa de rehabilitación. Se utilizó estadística analítica. Resultados: Se incluyeron 116 pacientes, 57.7% hombres, edad media de 47.32 años (min. 20, máx. 79); 77 (66.3%) pacientes presentaron síntomas moderados en hospitalización. Se obtuvo un valor de p significativa (p <0.001). Conclusión: Se observa una mejoría significativa en los pacientes post COVID-19 tras recibir terapia física y ocupacional respiratoria.

PALABRAS CLAVE: SARS-CoV-2; Terapia ocupacional; Modalidades de Terapia Física. (Fuente: DeCS-BIREME)
INTRODUCTION
The global pandemic of COVID-19 in 2020 originated by the SARS-CoV virus affected considerably the different health and medical care systems, it is estimated that this respiratory disease until August 2023 has affected a total number of 770,085,713 patients, including 6,956,173 reported deaths and an incidence of new cases per week of 9,787 worldwide.

COVID-19 infection represents a multisystemic disease, with a broad spectrum of acute, subacute, and long-term manifestations. Symptoms of acute infection with this pathogen include cough, fever, fatigue, pneumonia, and dyspnea. Severe symptoms can lead to acute respiratory distress syndrome (ARDS) with urgent need for invasive ventilation. These patients are susceptible to a wide variety of post-infectious complications such as post-intubation dysphagia, muscle weakness, general physical unfitness, myopathy, neuropathy and musculoskeletal dysfunction. These long-term complications significantly diminish the patient’s quality of life, with outstanding repercussions on general and emotional health.

Post-acute COVID-19 syndrome presents with persistence of symptoms and late complications over a period of more than four weeks from the onset of symptoms; it is estimated that more than one third of patients develop this syndrome post-infection. The main symptoms include fatigue (35-63%), pain (5-27%), dyspnea (11-43%) and chest pain (5-22%). According to the World Health Organization (WHO), from July 31 to August 27, 2023, more than 1.4 million COVID-19 cases were reported worldwide, with 1800 deaths. This represents 38% more cases and 50% fewer deaths than the previous 28 days. According to the World Health Organization (WHO), from July 31 to August 27, 2023, more than 1.4 million COVID-19 cases were reported worldwide, with 1800 deaths. This represents 38% more cases and 50% fewer deaths than the previous 28 days. As of August 2023, 7,649,199 cases have been confirmed in Mexico, 334,472 deaths, with a cumulative case incidence of 5,828.8 per 100,000 population, with 53.7% women and a median age of 38 years.

The multidisciplinary participation of the entire health care team, especially rehabilitation and post-acute care. The aim was to reduce symptoms, improve exercise tolerance and quality of life.
A rating is assigned according to the time spent and the need for assistance, with a final score from 0 (maximum dependence) to 100 (maximum independence). The results can be: independent: 100 points (95 in wheelchair), mild dependent: 91-99, moderate dependent: 61-90, severe dependent: 21-60, or total dependent: 0-20.

3. Modified Borg Scale (Borg). It evaluates the individual's subjective perception of exercise exertion. Values range from 0 (total rest) to 10 (maximum effort).

4. 6-minute walk test (6WT). It evaluates functional capacity and the distance covered in meters during 6 minutes. It is performed in patients with moderate or severe exercise limitation of respiratory or cardiac etiology. It is considered to have a good prognosis for life if the distance covered is greater than 350 meters.

5. The Lowenstein Occupational Therapy Cognitive Assessment Battery 1st edition (LOTCA). It is an instrument for cognitive assessment in patients with neurological disorders. It consists of five domains: orientation, perception, visual-motor organization, rational operations, categorization, and attention and concentration. It is scored from 1 to 4 according to the patient's capacity and maintenance of attention.

6. Dynamometer. It measures the prehensile strength of the hands, according to gender, age and weight. The normal value in women aged 20 to 69 years in dominant hand is 20.2-26.3 kg and non-dominant is 20.9-24.4 kg, and in men aged 20 to 69 years in dominant hand is 30.6-40.3 kg and non-dominant: 27.6-39.6 kg. Three attempts were made with dominant and non-dominant hands, with a 20-second rest between each measurement.

Procedure.

The different exercises applied in this physical and occupational rehabilitation protocol are described in detail in the annex to this document.

Statistical analysis
Analytical statistics were performed. The Kolmogorov-Smirnov test was used to verify the normality of the data distribution. For comparison of parametric quantitative variables, Student’s t test for related samples was used. For related nonparametric and ordinal qualitative variables, the Wilcoxon test was used. A p≤0.05 was considered significant.

Ethical aspects
The present study was approved by the Local Health Research Committee No. 2101 of the Mexican Social Security Institute. All patients signed a letter of informed consent. All information was handled with strict confidentiality and was used exclusively for research purposes. No conflicts of interest were reported.

RESULTS
A total of 133 patients were recruited, of whom 116 successfully completed treatment and 17 did not (13 patients dropped out or lost continuity of treatment and 4 patients due to comorbidities (depression, cancer and uncontrolled systemic arterial hypertension), 67 (57.7%) men and 49 (42.2%) women. The mean age was 47.32 years, minimum age 20 years and maximum age 79 years. Twenty-four (20.6%) patients had mild manifestations in confinement, 77 (66.3%) patients had moderate symptoms in hospitalization and 15 (12.9%) patients required assisted mechanical ventilation (Table 1).
The averages and medians of the scales applied are shown in Table 2. In the MCR scale, an initial median of 48 points was obtained, indicating weakness acquired in intensive care, and a final median of 57, indicating progress in terms of upper and lower limb mobility and strength. The Barthel index showed an initial mean of 95 with mild dependence and a final mean of 98 (Table 2).

Table 2. Analysis of the initial and final statistics of the scales applied in patients with post-COVID-19.

<table>
<thead>
<tr>
<th>Scala</th>
<th>Application</th>
<th>Media</th>
<th>Median</th>
<th>Standard Dev</th>
<th>Min.</th>
<th>Max.</th>
<th>Range</th>
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<td>MRC</td>
<td>Initial</td>
<td>46.44</td>
<td>48.00</td>
<td>± 6.92</td>
<td>24.00</td>
<td>59.00</td>
<td>35.00</td>
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<td>Final</td>
<td>55.67</td>
<td>57.00</td>
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<td>36.00</td>
<td>60.00</td>
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<td>Barthel</td>
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<td>± .1033</td>
<td>0.44</td>
<td>0.66</td>
<td>0.56</td>
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<tr>
<td></td>
<td>Final</td>
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<td>1.00</td>
<td>± .0460</td>
<td>1.00</td>
<td>1.00</td>
<td>0.34</td>
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<td>Modified Borg</td>
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<td>± 1.79</td>
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<td>Final</td>
<td>1.59</td>
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<td>± 1.41</td>
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<td>6WT</td>
<td>Initial</td>
<td>334.50</td>
<td>300.32</td>
<td>± 146.92</td>
<td>17.00</td>
<td>585.00</td>
<td>568.00</td>
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<td></td>
<td>Final</td>
<td>433.50</td>
<td>414.99</td>
<td>± 109.96</td>
<td>34.00</td>
<td>684.00</td>
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<td>84.00</td>
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<tr>
<td></td>
<td>Final</td>
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<td>± 0.0</td>
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<td>Left dynamometer</td>
<td>Initial</td>
<td>20.98</td>
<td>20.25</td>
<td>± 10.72</td>
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<td></td>
<td>Final</td>
<td>26.957</td>
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<td>± 13.01</td>
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<td>92.00</td>
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<td>Right dynamometer</td>
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<td>27.05</td>
<td>± 12.21</td>
<td>1.50</td>
<td>52.60</td>
<td>51.10</td>
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</table>

All differences recorded p=0.001. Abbreviations: MRC: Medical Research Council, 6WT: 6-minute walk test, LOTCA: Lowenstein Occupational Therapy Cognitive Assessment. * Non-normal distribution ((Kolmogórov-Smirnov p<0.05).

** Normal distribution (Kolmogórov-Smirnov p>0.05).

In the modified Borg scale we obtained an initial median of 5.00 (strong effort) and a final median of 1.00 (little effort) Table 2. The 6-minute walk test (6WT) considers it ideal for patients to walk over 350 meters. During this test, an initial mean of 334.50 meters was obtained and a final mean after treatment of 433.5 meters (Table 2). In the LOTCA battery all patients scored 84 points before and after treatment (Table 2).

Manual strength was measured with a dynamometer in the right and left hand at the beginning and end of the treatment.
The results were measured in kilograms (kg). In the left hand an initial mean of 20.98 kg and a final mean of 26.95 kg was obtained and in the right hand an initial mean of 21.41 kg and a final mean of 27.06 kg was obtained (Table 2). The variable that showed normal distribution was muscle strength, both in the left and right limbs. The difference in means was significant by Student’s t-test with a p value <0.001. The other tests also proved to be highly significant by Wilcoxon test with a value of p <0.001.

DISCUSSION
Coronavirus disease caused by SARS-CoV2 is the cause of ARDS20,21. This disease also presents with symptoms such as palpitations, dyspnea at rest or on exertion, and chest pain following infection22. Benefits of pulmonary rehabilitation are observed in post COVID-19 patients, in which independence, balance and agility improve significantly, favoring the reintegration of function and autonomy17. This study coincides with what has been reported; 46.4 points are observed on the MCR scale at the beginning and 55.7 points at the end, indicating an improvement in the mobility and strength of the upper and lower limbs.

Fatigue and dyspnea remained persistent in post COVID-19 patients affecting mobility and activities of daily living18, in addition severe acute respiratory syndrome (SARS) was frequently observed19. This is consistent with what was found in this study, since Borg at baseline patients were at 5, at the beginning of the 6-minute walk test reported 334.5 meters and the dynamometer in the right thoracic limb 21.4 kg and left 20.9 kg. Post COVID-19 patients manifest impaired diffusing capacity16 with persistence of symptoms after the acute phase23. The percentage reported in this study on the Borg scale reports that at the end of therapy the patient’s strength went from 5 to 1 (little effort). The sequelae were compared in hospitalized and non-hospitalized patients during one year and showed dyspnea and fatigue as acute symptoms in hospitalized patients and after one year of cognitive difficulties (memory and concentration)22. Contrary to the results of this study, when applying the LOTCA test, no cognitive alterations were reported at the beginning or at the end of the evaluation.

Physical therapy interventions use breathing exercises to promote clearance of secretions, increase chest mobility, relaxation, control dyspnea, and increase pulmonary ventilation23. The 6-minute walk assesses functional exercise capacity in the management of post-critically ill patients24. In this study a before and after assessment was made, where before patients walked approximately 334.5 meters in 6 minutes, upon receiving therapy, patients increased to 433.5 meters. The six-minute walk showed a better outcome in those who had a significant range related to the distance walked21,24. A relatively small sample size and the absence of a control group to evaluate the effect of therapeutic intervention are areas of opportunity in the present study. Although the natural history of the disease is to improvement, Physical Medicine and Rehabilitation intervention can shorten the evolution and improve the symptomatology of patients.

CONCLUSION
The results of the study suggest that post COVID-19 patients show significant improvement with physical and occupational respiratory therapy.

Authors contribution: The authors participated in the elaboration of the idea, project design, data collection, interpretation, analysis of results, and preparation of the manuscript of this research work.

Conflict of interest: The authors declared that they had no conflicts of interest.

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REFERENCES


