








Quality of life and functional aspects of post-Covid-19 patients submitted to pulmonary rehabilitation

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ABSTRACT

INTRODUCTION: patients who have Covid-19, regardless of the clinical spectrum of the disease, may present, after hospital discharge, persistent symptoms for up to 14 months. These patients have functional and quality of life impairments and, therefore, pulmonary rehabilitation for six consecutive weeks is indicated. This article evaluated the functional aspects and quality of life of post-Covid-19 patients treated in a pulmonary rehabilitation program. **METHODS:** this is a prospective clinical cohort study. Post-Covid-19 patients who joined a pulmonary rehabilitation program were evaluated concerning the variables functionality by the Barthel Index and the PCFS scale, and quality of life by the SF-36 at admission (T0) and after six weeks of rehabilitation treatment (T1). **RESULTS:** Eleven patients who participated in the study showed improved functionality both by the Barthel Index ($p < 0.01$) and the PCFS scale ($p < 0.01$) and also improved quality of life in the functional capacity domains ($p < 0.01$), limitation due to physical aspects ($p < 0.05$) and social aspects ($p < 0.01$) at T1 compared to T0. **CONCLUSION:** post-Covid-19 patients showed improved functionality and quality of life after a pulmonary rehabilitation program.

Keywords: Coronavirus, Rehabilitation, Activities of daily living.

INTRODUCTION

Coronavirus disease (Covid-19) is an infectious disease caused by the SARS-CoV-2 virus (coronavirus 2). It has a systemic character, such as thrombotic events, myocardial injury and renal failure, both associated with high morbidity and mortality¹. Symptoms such as dyspnea, cough, decreased ability to perform exercises, asthenia, myalgia, impaired performance of activities of temporary living (ADLs) are more common in those patients who develop the severe or critical form of the disease, although they may also be present in patients who develop mild or moderate forms².

Due to the long hospitalization period, systemic inflammation, mechanical respiration and sedation, 30% of these patients have post-intensive care syndrome (PICS) and persistent symptoms, which compromise activities of daily living (ADLs), functionality and quality of life^{3,4,5-9}.

Regarding functional impairment, a study with 22 post-COVID-19 patients using the PCFS scale found that 54.5% of patients had moderate

to severe limitations and that 40.9% of patients had mild limitations of everyday life³. Du et al.¹⁰ (2019), using the same scale, identified that in six months of pulmonary rehabilitation, 70.5% of post-Covid-19 patients did not present functional impairment.

The studies by Crema et al.³ (2022), Rass et al.¹¹ (2022), and Carvalho et al.¹² (2021) assessed the quality of life using the SF-36 and found that patients had compromised quality of life in at least one of the mental and physical domains, with physical aspects, functional capacity and social aspects being the most compromised.

Pulmonary rehabilitation is a well-established strategy indicated for these patients, although there is still no robust evidence and characteristics of specific protocols designed^{13, 14}.

Before joining a pulmonary rehabilitation program, post-Covid-19 patients must be periodically evaluated and reassessed using appropriate instruments to ensure the correct functional diagnosis, adequate therapeutic approach and measure the effectiveness of the rehabilitation protocol.

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The “National Institute for Health and Care Excellence” (NICE) recommends that pulmonary rehabilitation of post-COVID-19 patients should be initiated within the first 30 days after the critical phase to achieve greater efficiency in the recovery of physical, psychological and social conditions¹⁵.

In this sense, the objective of this study was to evaluate the functionality and quality of life of post-Covid-19 patients treated in a pulmonary rehabilitation program in the city of Gurupi-TO, at the Clinic-School of Physiotherapy at the University of Gurupi (UNIRG).

METHODS:

A longitudinal clinical cohort study was carried out at the Post-Covid-19 Rehabilitation Center of the University of Gurupi from April 2020 to May 2021 after authorization by the Human Research Ethics Committee, number 4,619,277.

Twenty-three patients over 18 years of age with up to eight weeks after hospital discharge, participated in the research after signing the informed consent form, in which sociodemographic and clinical data were collected regarding their gender, age group, variable expressed in \leq to 59 years old or \geq 60 years old and also BMI, adapted variable with a cutoff point of 30, with values greater than 30 representing the “Obesity” Score, waist-hip ratio (WHR), adapted variable with a cutoff point, greater than 1 for males and 0.85 for females with Score “high risk” for comorbidities. For the variables alcoholism and smoking, the expression “yes” was used when present, and “no”, when absent. The length of hospitalization variable was expressed considering the following periods: from 1 to 5 days, from 6 to 10 days, from 11 to 15 days and 16 or more days.

The sociodemographic and clinical data of the 23 patients in the study were analyzed using the Epi Info 7 program. They were dichotomized and a comparison was made between the group of patients admitted to the ICU (n=12) and the group of patients who were not admitted (n =11). The Odds Ratio (OR) was used to detect risk factors related to ICU admission.

Only 11 patients were assessed for functionality, using the Barthel Index and the Post Covid-19 Functional Scale (PCFS), and quality of life (QoL),

using the Short Form-36 scale (SF-36), during the period of admission for pulmonary rehabilitation (T0) and reassessment after six weeks of pulmonary rehabilitation (T1). To compare functionality and quality of life between T0 and T1, the Wilcoxon test was used.

The pulmonary rehabilitation program, twice a week, lasted 50 minutes each session for six consecutive weeks. It included aerobic activity interventions with light to moderate intensity and ventilator techniques, both adapted individually, prioritizing the safety of each patient.

The significance level adopted for all statistical tests was $p < 0.05$.

RESULTS

Of the 23 patients who participated in the sample, 78.26% were male and 21.74% were female. Twelve patients were hospitalized, 52.18% of whom were admitted to the ICU, staying for an average time of 12.82 days, with six patients having an indication for intubation. There were no deaths in the group of hospitalized patients.

Those patients who remained hospitalized in the ward (n=8) for more than 15 days were 6.3 times more likely to need to be admitted to the ICU. The other variables, sex, age, WHR, comorbidities, alcoholism and smoking showed no relationship with the worsening of the clinical condition and the ICU admission criteria (Table 1).

After admission (T0), only 11 patients (48%) were reassessed after six weeks of pulmonary rehabilitation (T1) in terms of functionality, using the Barthel Index and PCFS scale and quality of life, using the SF-36.

When functionality was compared using the Barthel Index, an average of 85.45 at T0 and 94.54 at T1 was observed, showing improvement in functionality in ADLs ($p < 0.0152$), as shown in Figure 1.

In the PCFS Index scale, an improvement in functionality was also observed, comparing the values of 3 with 1.27 ($p < 0.0117$) regarding T0 and T1, respectively (Figure 2).

Regarding the quality of life, assessed by the SF-36 scale, a significant improvement was also observed between T0 and T1 in the following domains: functional capacity, limitation due to

physical aspects, general health status, vitality, social aspects, limitations due to emotional aspects and mental health (Table 2).

There was no significant improvement in the general health, vitality, emotional aspects and mental health domains when comparing T1 to T0

Table 1

Sociodemographic data, comorbidities, clinical information and risk factors of post-Covid-19 patients who participated in a Pulmonary Rehabilitation program at the Post-Covid-19 Rehabilitation Center at the University of Gurupi/UnirG, from April to November 2021 (n=23)

Risk Factors	ICU admission				OR	CI	SL
	Yes		No				
	n	%	n	%			
Gender							
Male	8	66,67%	10	90,91%	0,20	0,02-2,16	0,159
Female	4	33,33%	1	9,09%			
Age group							
≥ 59 anos	11	91,67%	8	72,73%	4,1250	0,36-47,31	0,231
≤ 60 anos	1	8,33%	3	27,27%	0,2424	0,02-2,78	0,231
Obesity							
Yes	5	41,67%	2	18,18%	3,2143	0,47-21,80	0,221
No	7	58,33%	9	81,82%			
WHR - High Risk							
Yes	5	41,67%	7	36,37%	1,0714	0,19-5,91	0,937
No	4	58,33%	6	63,63%			
Comorbidities							
Yes	7	58,33%	5	45,45%	1,6800	0,32-8,76	0,537
No	5	41,67%	6	54,55%			
Length of hospitalization							
Up to 5 days	0	0,00%	2	18,18%	-	-	0,122
From 5 to 10 days	3	25,00%	4	45,46%	0,5000	0,08-3,08	0,452
From 11 to 15 days	1	8,33%	2	18,18%	0,4091	0,03-5,28	0,485
More than 16 days	8	66,67%	2	18,18%	6,3000	1,09-42,73	0,049
Alcoholic							
Yes	4	33,33%	3	27,27%	1,3333	0,22-7,98	0,752
No	8	66,67%	8	72,73%			
Smoker							
Yes	0	0,00%	0	0,00%	-	-	-
No	12	100,0%	11	100,0%	-	-	-

Legend: %: percentage, n: number, OR: Odds Ratio, CI: Confidence interval, SL: Significance level.

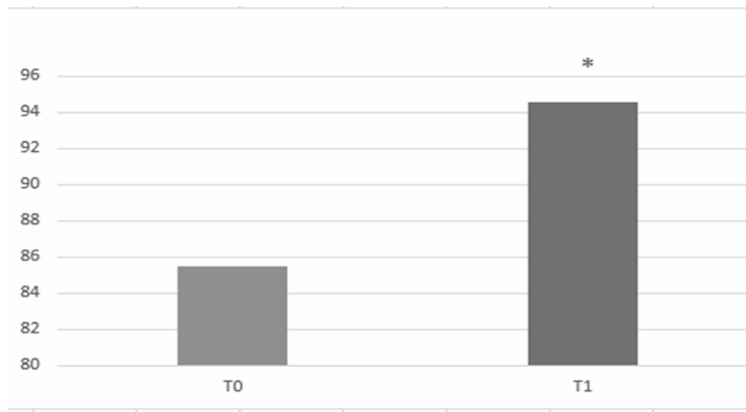


Figure 1. Comparison of Functionality in ADLs by the Barthel Index between T0 and T1 of post-Covid-19 patients who participated in the Pulmonary Rehabilitation program at the Post-Covid-19 Rehabilitation Center of the University of Gurupi/UnirG, Gurupi-TO, from April 2020 to May 2021 (n=11)

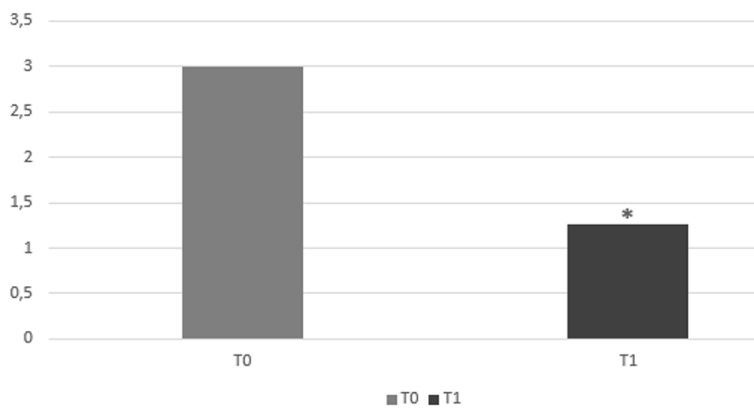


Figure 2. Evaluation of Functionality by PCFS between T0 and T1 of post-Covid-19 patients who participated in the Pulmonary Rehabilitation program at the Post-Covid-19 Rehabilitation Center of the University of Gurupi/UnirG, Gurupi-TO, from April 2020 to May 2021 (n=11)

Table 2

Comparison of quality of life by SF-36, on average, between T0 and T1, of post-Covid 19 patients who participated in the Pulmonary Rehabilitation program (n=11)

	T0	T1	SL
Functional Capacity	38,64	77,73	0,00125
Limitation Due to Physical Aspects	30,15	47,55	0,0431
Social Aspects	44,32	84,09	0,00129

DISCUSSION

This study shows that 52% of patients (n=12) hospitalized for a period longer than 16 days were 6.3 times more likely to be admitted to the ICU. The

variables gender, obesity, WHR, comorbidities were not determinants of greater severity and did not influence the length of hospitalization of patients in this group. It is possible to infer from these data that the low sample number was insufficient to prove the importance of comorbidities as determinants in the severe clinical spectrum of the presentation of Covid-19.

Our results corroborate the study by Nonaka et al.¹⁸ (2021), which identified an increase in the proportion of young adults without comorbidities hospitalized due to Covid-19.

Zampogna et al.⁶ (2021) in their study, reported that physical impairment in hospitalized patients may be associated with systemic inflammation, mechanical ventilation, sedation and prolonged immobilization in bed.

Muscle weakness acquired in the intensive care unit (ICU) is one of the most prevalent sequels, being present in up to 40% of survivors of the critical phase of the disease. It compromises simple conditions such as walking, bathing and dressing^{4-5, 20}.

In our study, it was observed that patients hospitalized for Covid-19 had a decrease in functionality on admission, scoring an average of 85.45 on the Barthel Index and 3 on the PCFS Scale. In addition, through the SF-36 scale, it was noticed that the quality of life was compromised in the domains of functional capacity, limitations due to physical aspects and social aspects.

Functional alterations may be present since hospital discharge and may remain for long post-discharge periods. According to Fraser et al.⁷ (2020), 30% of patients affected by acute respiratory syndromes develop persistent symptoms and lung abnormalities for months after the initial illness.

Belli and Prince et al.¹⁶ (2020) and Spruit et al.¹⁷ (2020) published the first studies that identified the low physical performance and impairment of post-Covid-19 patients at hospital discharge, similar to the results found in patients with chronic obstructive pulmonary disease (COPD) after exacerbation.

In our study, all 23 patients were admitted to the hospital due to Covid-19 and showed a decrease in functionality and quality of life upon admission to the post-discharge pulmonary rehabilitation program, corroborating the study by Crema et al. (2020).

Greenhalgh et al.¹⁹ (2020) showed in their study impairment of functionality, quality of life, and physical performance in patients who develop the severe or critical forms of Covid-19, although these findings are also present in those patients who developed moderate and mild forms of Covid-19.

Pulmonary rehabilitation is a strategy indicated and well-established as an important intervention after hospital discharge of post-Covid-19 patients^{9,21}.

The patients in the present study presented, according to the Barthel Index, a score of 85.45 in T0 and 94.54 points in T1, with evidence of improvement in the reassessment after six weeks of rehabilitation (T1).

Thus, it is verified that pulmonary rehabilitation for six consecutive weeks is effective in promoting the improvement of functionality according to the Barthel Index and the PCFS Scale, and also the quality of life according to the SF-36 in post-Covid-19

patients when compared the same variables in the period of admission of the patient (T0).

It is noteworthy that the Barthel Index is widely used for functional assessment of elderly, bedridden or even hospitalized patients, being used to measure the degree of activities of daily living (ADLs)²². Although it is not specific to Covid-19, the Barthel index was recommended by the WHO as an appropriate protocol for evaluating patients affected by the disease, as it makes it possible to understand the level of assistance that the individual needs for common activities and the impairment of functionality in post-Covid-19 patients. Even though the Barthel Index is not a specific instrument to assess functionality in post-Covid-19 patients, it has been shown to be efficient for measuring functionality in these patients.

For there to be progress in patient rehabilitation, Martins & Rios²⁴ (2020) report that the increase in the number of individual capacities is conditioned by the quality of care provided in an acute, subacute and chronic phases.

Still regarding functionality, the "European Respiratory Society" developed the "Post Covid Functional Scale" (PCFS), a specific instrument to assess functionality in post-Covid-19 patients. In the present study, it was possible to identify improvement in functionality using this instrument after six weeks of pulmonary rehabilitation (T1) in 11 post-Covid-19 patients. Klok et al.²⁵ (2010) recommend the applicability of this instrument in the face of clinical heterogeneity and sequelae caused by Covid-19 since it is an ordinal scale that assesses functional limitations, is reproducible and identifies the diversity of results, such as slow or incomplete recovery.

Both the Barthel Index, which is a non-specific instrument for post-Covid-19 functional assessment, and the PCFS scale, which is specific for evaluating these patients, it is possible to infer from the present study that both instruments can be applied to measure the functionality in the assessment and reassessment of post-Covid-19 patients who underwent a pulmonary rehabilitation program.

The study by Du et al.¹⁰ (2019) evaluated 95 patients who were discharged after hospitalization due to Covid-19 and who responded to the PCFS scale on admission and, after six months, in the reassessment. It was possible to identify that 70.5% of the patients had complete recovery of functionality in the reassessment.

Regards to quality of life, it is important to highlight that the SF-36 is an instrument widely used to assess patients with the most varied clinical impairments and that it also proved to be an adequate instrument to be applied to post-Covid-19 patients^{26,27,28}, considering that there was an improvement in the domains functional capacity, limitation due to physical aspects and social aspects after six weeks of pulmonary rehabilitation (T1) in the 11 patients who were reassessed.

This study has limitations due to being a cohort in a single center and having a small sample size, and this fact may be related to the validity of the research during the period of remission of the Covid-19 pandemic.

CONCLUSION

Patients who developed severe and critical forms of Covid-19 have more compromised functionality and quality of life when admitted to the rehabilitation program, with evidence of improvement after six weeks of pulmonary rehabilitation.

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Contributions:

JMS - Conception and design of the study

GBT, GLM, PHLB, AFC, RCA - Data Collection:

MGS - Statistical analysis:

JMS, GBT, GLM, PHLB, AFC - Article Writing:

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