Evolution of mobility in Covid-19 hospitalised patients in the south of Brazil: a longitudinal study

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Abstract. Covid-19 is an acute respiratory infection caused by SARS-CoV-2, from the coronavirus family. It is responsible for a systemic impact, with various symptoms, manifested in the acute, sub-acute, and / or chronic phases of the disease. It may present in a severe form requiring hospitalisation and possible admission in the Intensive Care Unit (ICU) for complications associated with pneumonia and / or acute respiratory distress syndrome. Hospitalized patients may suffer impairments in their mobility due to characteristics of the disease itself or given complications from hospitalization. These repercussions can manifest during hospital stay and last for months after discharge. The purpose of this study is to investigate the impact of Covid-19 on the mobility of individuals after hospitalization. This paper is an analytical longitudinal study that analysed the data of individuals hospitalized due to Covid-19, in two hospitals in the south of Brazil, between July 2020 and March 2022. The scales and questionnaires used in the gathering were the ICU Mobility Scale and WHODAS 2.0 (Mobility Domain). The investigated variables were mobility in five different periods - rehospitalisation, 30, 90 and 180 days after discharge - age, sex, total length of stay and length of stay in the ICU. That investigation was carried out from a descriptive perspective with measures of central tendency and dispersion. The Shapiro-Wilk test observed the normality of the data. Considering the abnormality of the data, the Friedman test with peer comparison was used. It was found that mobility was compromised at the time of hospital discharge of surviving hospitalised patients infected with COVID-19, where individuals required assistance from 1 or were more people or even unable to walk, and the functional mobility status remained compromised even three months after hospital discharge.

Keywords: Mobility Limitation. Hospitalisation. Coronavirus.

1. Introduction

In the last few years, the term Coronavirus became worldly know and is now present in the popular vocabulary, it arose and expanded itself, bringing with it a devastating amount of losses [1]. With varied and potentially serious symptoms, COVID-19 is an acute respiratory infection caused by SARS-CoV-2, which is responsible for a complex scenario in patient health. It manifests itself in symptomatic patients usually in the first 12 days of infection, with symptoms such as cough, anosmia and/or dysgeusia, dyspnea, myalgias [2], and severe cases may develop pneumonia and acute respiratory distress syndrome (ARDS), the latter being the cases with the worst prognosis and requiring hospitalisation and invasive treatment [2].

Even with the resolution of the acute form of the illness, individuals may present some sequelae. Know as Long Covid or Post-Covid syndrome and characterised by the persistence or appearance of symptoms after infection with SARS-CoV-2 that cannot be explained by an alternative diagnosis [3]. Such as the clinical picture of the disease in its acute form, has a varied symptomatology [4], among which can be highlighted: fatigue, myalgia, dyspnea, pain in the joints, muscle weakness, balance and gait problems, affecting directly the patient's mobility [5].

Often, this reduced mobility can also suffer influence from the existence of preexisting diseases, such as diabetes, systemic arterial hypertension, and chronic respiratory diseases [6]. Along with complications directly related to hospitalisation, since impediments in mobility and physical aspects are common in the long term in patients who have gone through a clinical picture of ARDS [7, 8]. Among these complications, Post Intensive Care

Syndrome (PICS)[9] and Muscle Weakness Acquired in the Intensive Care Unit (ICUAW) [10] can be pointed out. Both are responsible for aggravating or generating a series of motor, cognitive and emotional deficiencies and are related to time on Mechanical Ventilation, use of neuromuscular blockers and sedatives, as well as immobility in bed, and their prolonged use and application directly compromise the functionality of these patients [9, 10].

Covid-19 is a disease with diverse symptomatology and a wide range of clinical and psychosocial repercussions [2] and with major impacts on the mobility of those infected, Huang et al portrayed a good physical and functional recovery of individuals hospitalized for Covid-19 in the 12-month follow-up, but with impairment when compared to the pre-infection period. Analyzing the repercussions of the disease and hospitalization allows for the anticipation of results and planning of actions relevant to patient care, however there is a shortage of studies on the coronavirus that relate hospitalization and mobility. Therefore, an important question arises: what is the evolution of mobility of patients hospitalized with Covid-19 from a longitudinal perspective (from before hospitalization to 180 days after discharge)?

2. Methods

2.1 Study design and recruitment

This prospective observational study was conducted with people who survived COVID-19 and were discharged from two hospitals in the south of Santa Catarina state, Brazil. The study were admitted to the ward and Intensive Care Unit (ICU) and ward due to a diagnosis of COVID-19 at between July 2020 and March 2022. The hospitals are located in the extreme south of Santa Catarina, a Southern State of Brazil, and are considered a reference in low and medium complexity care. We included individuals over 18 years of age, diagnosed with COVID-19 during hospitalization, who progressed to hospital discharge and agreed to participate in the study. Deceased patients and those who requested to leave the investigation were excluded.

2.2 Methods of Assessment

After hospital admission, the individual or guardian was contacted to participate in the research. Participants who agreed to participate were interviewed via telephone through contact with the individual who was hospitalized and/or legally responsible. The structured interview began during hospitalisation (referring to the pre-admission period) and continued for 30, 90 and 180 days after hospital discharge.

Sociodemographic data and clinical history were collected from electronic medical records. Data collected were sex, age group, race/colour, schooling, marital status, total and ICU length of stay, body mass index, smoking, presence of comorbidities such as systemic arterial hypertension, diabetes mellitus, chronic obstructive pulmonary disease, asthma, kidney disease, and severity of COVID-19.

The level of mobility before hospitalisation and after hospital discharge mobility was evaluated using the WHODAS 2.0 (World Health Organisation Disability Assessment Schedule). The WHODAS 2.0 aims to assess the perceived disability associated with the health condition in the 30 days prior to its application. In the study, the mobility domain (5 items) was evaluated through a telephone call, where the degree of difficulty that the individual had to carry out their activities was asked. For the calculation, the complex score was used, where the values range from 0 (no difficulty) to 100 (extreme difficulty or unable to perform). Calls were made during hospitalization and after, in the 30, 90 and 180 days since discharge, all referring to the previous 30 days.

The Intensive Care Unit Mobility Scale (ICU) is a scale that objectively measures the mobility of patients admitted to the ICU. It has a score that varies between 0 and 10, in a single domain [11]. Mobility information was taken from the patient's medical records at the time of hospital discharge through the hospital's information provided by the physiotherapy service itself, all participants were classified by the same evaluator based on this information.

3. Results

During the study period, 347 people were hospitalized with COVID-19, of whom 105 were contacted to participate. The final sample included 99 individuals who answered the SF-36 questionnaire in the four assessment periods. The study sample consisted mainly of men (54.50%) with a mean age of 53.53%±16.69 years, white (88.89%), married (68.69%) and with comorbidities such as diabetes mellitus (58.59%). Among the participants, 56 (56.57%) presented severe COVID-19 according to the ATS criteria.

Pre-hospitalization mobility presented a score of 0 points, evidencing the absence of incapacity for functional mobility. Friedman's test indicated that there was a statistically significant difference between all evaluated periods [$X2(2)=99.69 p<0.001$], with the exception being between the period before hospitalization and in the 180 days post discharge (Figure 1).

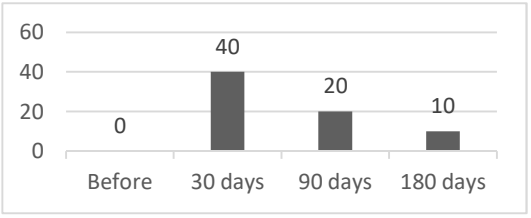

Fig. 1 – Comparison of the periods analysed by the WHODAS 2.0 mobility domain

Tab. 1 – Demographic and clinical characteristics of the 99 patients hospitalised with COVID-19

	N	%
Age Group		
18 - 39 years	19	19,20
40 - 59 years	41	41,41
60 years or more	39	39,39
Gender		
Female	45	45,50
Male	54	54,50
Race/Color		
White	88	88,89
Black	7	7,07
Brown	4	4,04
Marital Status		
Single	23	23,23
Married	68	68,69
Divorced	3	3,03
Widower	5	5,05
Total Hospitalization		
1 - 15 days	80	80,81
16 - 30 days	13	13,13
31 days or more	6	6,06
ICU Hospitalization	24	24,25
Body Mass Index		
Normal	7	7,07
Overweight	18	18,18
Obesity I	56	56,57
Obesity II	13	13,13
Obesity III	5	5,05
Severe	56	56,57
Smoking	12	12,12
Hypertension	48	48,49
Diabetes Mellitus	58	58,59

The period of greatest disability in the mobility domain of the WHODAS 2.0 questionnaire was in the 30 days after hospital discharge with 40 (25-60) points, which was statistically longer compared to the pre-hospitalization period ($p<0.001$). In the 90-day period after hospital discharge, despite the reduction in disability, impairment of mobility was still verified with 20 (5-40) points and this value was statistically different from those found in the other periods ($p<0.001$ for comparisons in pairs). In the 180 days after hospital discharge it was found a reduction in impairment in the mobility with 10 (0-30) points, when compared with the periods of 30 and 90 days post discharge.

Tab. 2 – Results from the Intensive Care Unit Mobility Scale (ICU)

Score	Participants (%)
1 (sitting in bed)	1 (1,1%)
2 (passively moved to chair)	1 (1,1%)
3 (sitting in the edge of bed)	5 (5,5%)
4 (standing)	3 (3,3%)
5 (transferring bed to chair)	5 (5,5%)
6 (marching on spot)	16 (16,2%)
7 (walking with assistance of >2)	4 (4,4%)
8 (walking with assistance of 1)	27 (27,3%)
9 (walking with a gait aid)	23 (23,2%)
10 (walking independently)	14 (14,1%)
Total:	**99 (100%)**

The most recurrent scores at hospital discharge were (Table 1): walking with the aid of a person, 9 independent walking with the aid of a walking device and stationary walking, On the contrary, the lower scores, where the patient was restricted to the bed or who was passively transferred to the, there was only 1 participant in each.

4. Discussion

The present work aimed to investigate the impact of Covid-19 on the mobility of individuals post hospitalization The sample consisted predominantly of men (53.53%), – albeit by a small margin – aged 30-59 years and with comorbidities, which agrees with studies that characterise the profile of hospitalized individuals diagnosed with COVID-19. 19 [12]. Baqui et al. [13] conducted an observational study with people hospitalised for COVID-19 in Brazil (n=11,321). Among the individuals who would be classified in the centre-south region (n=9,278), according to Baqui's division, the sample consisted mainly of men, white, whose common comorbidities were cardiovascular diseases, diabetes, lung diseases, kidney disease, and obesity.

In the present study, more than half of the participants (55.55%) were classified as severe according to the criteria [14]. The time that the participants were hospitalized was on average 11.87±10 days. Most were non-smokers (83.84%). What is corroborated by a study conducted by Guan et al. [15] who evaluated 1099 individuals hospitalized for COVID-19 between December 2019 and January 2020, with a mean hospitalization rate of 12 days. In the aforementioned study, 173 people were classified as having a severe condition using the ATS / IDSA criteria, and as in the present study, most of the participants were non-smokers (85.4%).

In the present study, we observed an expressive variation in scores over time in the mobility domain, and physical problems were the most affected three months after hospital discharge. Physical functioning refers to the individual's ability to perform activities of daily living, such as bathing,

dressing, eating, and performing instrumental activities of daily living, such as cooking, cleaning the house, and going to purchases [16]. Limitations due to physical problems refer to difficulties in performing work and life activities due to physical health.

The bedridden patient, due to hypo or inactivity in bed, predisposes to a reduction in the capacity to perform aerobic exercises and a decrease in tolerance to efforts. In general, immobilization of patients during acute diseases causes physical disability, impacting the performance of activities of daily living (ADL) [16], as observed in posthospitalisation patients for COVID-19 evaluated in the study. A retrospective study [16] evaluated physical conditioning and life activities in patients infected with COVID-19 before and 30 days after hospital discharge. In the end, 33.3% of the patients had values below the average in the Standing and Sitting test, while more than 70% of the patients had low or moderate scores in the Short Physical Performance Battery (SPPB). They concluded that the physical conditioning was significantly impaired after infection and hospitalization by COVID-19.

Regarding post-discharge complications, Long Covid can be pointed out as a relevant consequence of SARS-CoV-2, it is defined as the pertinence of the symptoms of the infection for weeks or months after the onset of the disease, directly affecting the quality of life and functionality of those infected, being an important factor to be considered in the prognosis of patients. In a study carried out with 646 individuals treated at two hospitals in Belo Horizonte [17] for 14 months, 50.2% had Long Covid, with the most prevalent symptoms being fatigue (35.6%), persistent cough (34%) and dyspnea (26.5%).

Núñez-Seisdedos et al. [10] conducted a prospective cohort study seeking to identify the incidence of Intensive Care Unit-Acquired Muscle Weakness (ICUAW) at ICU discharge – which was observed in 65.7% of patients – and of gait dependence at hospital discharge – 54, 3% of those evaluated, and not all of those who showed dependence on walking, had ICUAW - in patients undergoing Mechanical Ventilation due to complications of Covid-19. Some factors associated with functional sequelae were the use of neuromuscular blockers and the duration of mechanical ventilation.

However, in a longitudinal cohort study [5] with 1276 individuals after hospitalisation due to SARS-CoV-2, there was good physical and functional recovery of the individuals at 12 months of follow-up, allowing the return to activities of Daily Living (ADL), although still below the results found in the control group.

5. Conclusion

The study provided preliminary information on the functional mobility status of hospitalized patients infected with COVID-19 and showed that it is compromised even three months after hospital discharge. It was also observed that in the vast majority of the analyzed participants, mobility was compromised at the time of hospital discharge, requiring assistance from 1 or more people or even being unable to walk, even with assistance, for at least 5 meters. However, the number of bedridden patients (up to a score of 3) was only 7.6%.

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