International Journal of Community Medicine and Public Health
Nair NR et al. Int J Community Med Public Health. 2024 Mar;11(3):1173-1178
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20240615

Original Research Article

Assessment of functional outcomes, level of fatigue, and risk of sarcopenia in COVID-19 patients at discharge: A cross sectional study

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Received: 22 December 2023
Accepted: 24 January 2024

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ABSTRACT

Background: There is emerging evidence with regards to reduced physical performance in patients recovering from COVID- 19 at time of hospital discharge. Assessing various functional parameters at discharge would shed light on the multi-system affection that could be helpful in formulating rehabilitation goals for the patient. Objectives of the study were to assess the physical performance, functional capacity, muscular strength, level of fatigue, and risk of sarcopenia in COVID-19 patients at discharge using short physical performance battery test, 1 minute sit to stand test, grip strength, fatigue assessment scale, SARC-CalF Scale respectively.
Methods: This cross-sectional study comprised of 42 patients diagnosed with COVID-19 recruited from a tertiary care hospital. Demographic details and clinical variables were documented. Participants were assessed for physical performance, muscular strength, level of fatigue, functional capacity, and risk of sarcopenia. Data was analyzed using SPSS version 24.
Results: The study comprised of 42 participants including 71.43% males (N=30) and 28.57% females (N=12) having mean age of 49.86±15.83 years. Findings of the assessed parameters were as follows: SPPB=7.57±2.84, 1 MSST=13.17±5.79 repetitions, grip strength=19.44±8.38 kg, FAS=19.79±10.83, SARC-CalF score=5.19±4.83. There was a weak positive correlation found between CT severity score and level of fatigue (r=0.325, p=0.036).
Conclusions: This study provides a descriptive information about the functional outcomes of COVID -19 patients at discharge which can further be utilized for development of a tailor-made exercise program.

Keywords: COVID-19, Discharge, Functional outcomes, Fatigue, Sarcopenia

INTRODUCTION

The novel coronavirus disease (COVID -19) which is considered as a global health crisis has unleashed a worldwide shockwave throughout the health systems. In India the first case was reported on 30 January 2020.[1] However, as of 28 January 2022 worldwide there have been 36,41,91,494 confirmed cases of COVID-19 including 56,31,457 deaths, while in India there have been 4,06,22,709 confirmed cases of COVID 19 with 4,92,327 deaths.[2,3] It is a proven fact that COVID-19 is a respiratory infection with multisystem manifestation and wide spectrum of clinical symptoms which ranges in severity from asymptomatic infection to severe, fatal

illness and the presence of comorbidity makes the outcome even worse.[4–6] There is some emerging evidence with regards to medium and long-term problems experienced by the survivors of COVID-19 after discharge from hospital.[7,8] Data suggest that some patients fail to recover fully after acute COVID-19 infection and their symptoms like shortness of breath and reduced ability to work persist for weeks or months after acute illness which is commonly referred to as 'Long COVID' or 'COVID long-haulers'.[9,10] Studies have found that long COVID develops even in mild to moderate cases of patients discharged from the hospitals.[11,12]

A study done by Belli et al found that COVID-19 patients discharged after hospitalization exhibited very low physical functioning and impaired activities of daily living.[13] Another study done by Kara et al highlighted that lower hand grip strength can be considered as a predictor for the severity of COVID-19 and thus it can be considered as a reliable tool to predict overall muscle strength and functioning in COVID-19 patients.[14] El Sayed et al evidenced that post-COVID fatigue was common even after recovery from the disease.[15] Study done by Sousa et al concluded that sarcopenia is frequent among hospitalized patients.[16] whereas development of this post-COVID-19 related acute sarcopenia might adversely affect the course of the disease.[17] Thus, assessment of these parameters in patients after hospitalization should be necessary for estimating the functional consequences of COVID-19. However, despite having enough evidences on repercussion of COVID-19 there is still dearth of literature about the systemic parameters that needs to be assessed in patients during discharge. Thus, there is a need to conduct further studies to find out whether such repercussion translates to all patients and for that we need to have simple, feasible and quick clinical tools that could assess physical performance, muscular strength, functional capacity, level of fatigue, and risk of sarcopenia during hospital discharge. Moreover, the results of these assessment parameters can then further be used as a baseline to initiate physiotherapy rehabilitation post discharge. Therefore, the purpose of this study was to investigate the physical performance, muscular strength, functional capacity, level of fatigue, and risk of sarcopenia in COVID-19 patients at the time of discharge and to explore if there is any relationship between the length of hospital stay, disease severity and the assessed parameters.

METHODS

The present study is a cross-sectional study. Total 50 participants were screened from a single tertiary care hospital from June to August 2021 who were getting discharged after COVID-19. Out of which eight participants were excluded because of reasons such as being hemodynamically unstable, unable to perform the test, and did not volunteer to participate. Finally, 42 participants who were eligible for the study were explained about the purpose of the study and their written informed consent was taken. Before initiating the assessment following data was collected; age, gender, Computerized Tomography (CT) severity score, COVID-19 Reporting and Data System (CO-RADS) category, comorbidity, length of hospital stays, hospitalization days, oxygen support, ICU admission from hospital/medical records. Participants were then assessed for physical performance, muscular strength, functional capacity, level of fatigue, and risk of sarcopenia.

Physical performance

It was measured using short physical performance battery (SPPB) which is a battery of tests that characterizes lower extremity functional performance using timed measures for standing balance, gait speed (4-meter gait speed) and lower extremity strength (5 repetition sit to stand test). Each component was scored based on a subscale and the 3 sub scores were added to obtain the final score. Scores lower than or equal to 10 indicate mobility limitations.[18]

Muscular strength

It was measured in context of hand grip strength (HGS) using Jamar Hand Dynamometer, a valid and reliable instrument.[19] The participant was made to sit on a chair with fixed arm rest, back straight, the shoulders adducted, the elbows flexed to 90° and the forearm in neutral position and the wrist in 0-15° extension and 0-15° of ulnar deviation. The participant was instructed to squeeze the handle of the dynamometer as maximally as possible and release until the needle on the dynamometer dial stops rising. Three grip strength measurements were taken for dominant hand with a 1-minute rest period between each task to avoid muscle fatigue. The mean of three successive trials was noted.[20]

Functional capacity

It was measured using 1-Minute Sit to Stand Test (1 MSST). It was performed using a standard height (46 cm) chair without arm rests. Participants were asked to put their hands on their hips. Participant then had to stand up and sit down completely as many times as possible at self-paced (safe and comfortable) during one minute without using their arms as support. Number of completed repetitions was recorded.

Level of fatigue

It was assessed by using Fatigue Assessment Scale (FAS) which consists of 10 items; out of which five questions reflect physical fatigue and rest five reflect mental fatigue. [21] Each item of the FAS is answered using a 5-point Likert type scale ranging from 1 (never) to 5 (always). Items 4 and 10 are reversed score. Total scores range from 10 to 50 with 10 indicating the lowest level of fatigue and 50 denoting the highest. Scores less than 22 indicate absence of fatigue, those between 22-34 indicate

mild- moderate fatigue and score 35 or more indicate severe fatigue.

Risk of sarcopenia

It was assessed by using SARC-CalF Scale.[22] It comprises of 5 items of the SARC-F questionnaire, and an additional item being the calf circumference (CC) measured on the right calf in standing position at the point of greatest circumference. The cut off score used for CC was ≤33 cm for women and ≤34 cm for men. The CC item was scored 0 points if its value was above the cutoff point, and 10 if its value was below or equal to the cutoff point. The maximal score of the SARC-CalF is 20 points. A total score of ≥11 points indicate risk of sarcopenia.

Statistical analysis

Data was analyzed using statistical package for social sciences (SPSS) software (Version 24) Descriptive statistics was applied to describe patient characteristics like age, gender, comorbidity, ICU stay, hospitalization days, CT severity score, CO- RADS category, oxygen support and functional outcomes like physical performance, functional capacity, muscular strength, level of fatigue, and risk of sarcopenia. Continuous variables were summarized using mean with standard deviation (for normally distributed data) and median values with IQR (for free distributed data). Categorical variables were expressed in percentages. Normality of the data was checked using Shapiro Wilk test. According to the results obtained while running normality test, Spearman's rank-order correlation was used to determine the relationship between the length of hospital stay, disease severity and the outcome measures. Statistical level of significance was set at p≤0.05.

RESULTS

The study comprised of 42 participants having mean age of 49.86±15.83 years.

Table 1: Characteristics of participants.

Characteristics	Categories	N (%)	Mean±SD
Age (years)	Male	30 (71.43)	49.53±14.61
	Female	12 (28.57)	50.67±19.23
Comorbidity	Diabetes	22 (52.38)	-
	Hypertension	12 (28.57)	
Hospitalization days	12.60±7.76		
CT severity score	11.45±4.05		
CO-RADS category	4	8 (19.05)	-
	5	17 (40.48)	-
	6	17 (40.48)	-
Oxygen support	Yes	23 (54.76)	-
	No	19 (45.24)	-

Table 2: Results of functional outcomes, level of fatigue and sarcopenia of the participants.

Clinical variables	Mean±SD	Median (IQR)
Physical performance	7.57±2.84	-
Functional capacity (repetitions)	13.17±5.79	-
Muscular strength (kgs)	19.44±8.38	-
Level of fatigue	19.79±10.83	18 (10.75-23.25)*
Risk of sarcopenia	5.19±4.83	3 (1-10)*

*Level of fatigue and Risk of sarcopenia score were also presented as median and interquartile range due to its free distribution, IQR=Interquartile Range.

Table 3: Correlation analysis of hospitalization days, disease severity with the assessed parameters.

Parameters		SPPB	1 MSST	HGS	FAS	SARC-CalF
Hospitalization days	R value	0.058	-0.007	-0.048	-0.102	0.232
	P value	0.717	0.966	0.761	0.520	0.139
CT severity score	R value	-0.050	-0.019	-0.265	0.113	0.325*
	P value	0.752	0.903	0.090	0.477	0.036

*Indicates statistically significanct (p≤0.05), r=Correlation Coefficient.

Overall, 31 (73.81%) participants had comorbidities. Five (11.90%) participants had history of ICU stay. The other characteristics of participants is summarized in (Table 1) and scores of outcome measures is summarized in (Table 2). Thirty-four participants (80.95%) scored ≤10 in SPPB. 31 (73.81%) participants had no fatigue while 11 (26.19%) participants had mild to moderate fatigue. 7 (16.67%) participants had a risk of developing sarcopenia. Results of correlation statistics is presented in (Table 3) which showed a weak positive correlation between CT severity score and level of fatigue (r=0.325, p=0.036) (Table 3).

DISCUSSION

The aim of the present study was to assess the systemic parameters in COVID patients at discharge and to explore if there is any relationship between the length of hospital stay, disease severity and the assessed parameters. It investigated the physical performance using Short Physical Performance Battery Test, muscular strength using Jamar Hand Dynamometer, functional capacity using 1 minute sit to stand test, level of fatigue using Fatigue Assessment Scale, and risk of sarcopenia using SARC-CalF Scale in COVID patients at the time of discharge. Inspite of COVID-19 primarily affecting the respiratory system, the extra-pulmonary manifestations of the same, hold prime importance in order to ensure optimal recovery of all the involved systems. This study shows that COVID-19 has an adverse effect on the physical functioning, muscle strength, functional capacity, level of fatigue and risk of sarcopenia, at discharge and this was confirmed when on our study results were compared with the normative value or cut off score.[21-26]

The probable reason for such findings might be due to the hyperinflammatory response of the body, combined with the effects of severe acute respiratory syndrome on body-wide organs via angiotensin-converting enzyme-2.[27] Also, in order to curb and manage the pandemic effectively, emphasis was laid on isolation. Even though, it was an effective way to reduce the spread of the virus, it had its own disadvantages. Patients who were isolated for respiratory symptoms and fever, developed fatigue, muscle pain and had to remain bed-ridden for a long period which caused a reduction in muscle strength and physical performance [(28)]. According to a study by Tanriverdi et.al. poor physical performance is associated with low muscle strength.[29] Patients also experience a wide array of neurological and psychological complications which result in decreased functional capacity.[27]

The study also found few of the COVID-19 infected individuals were at risk of sarcopenia. COVID-19 causes severe acute inflammation which is a potentially harmful stimulus for the development of sarcopenia. Along with that, age-related changes in the mitochondria and mitochondrial pool add to the susceptibility to the development of sarcopenia.[17] Sarcopenia may largely impact patients' in-hospital prognosis as well as the vulnerability to the post-COVID-19 functional and physical deterioration exemplified by the inability to cope with the daily life tasks or development of the psychologic disturbances. The high degree of the inflammation creates a high potential for multi-organ damage, involving not only the lungs, where it leads to interstitial pneumonia and severe respiratory failure, but also the intestine, central nervous system, cardiovascular system, the kidneys and the muscle.[17] Support similar findings of other studies. The results of the study also demonstrate a low positive correlation between CT-score and the level of fatigue. This can be attributed to prolonged hospital stay of the patients along with the negative impact of COVID-19 on various systems of the body. Hospitalization being a stressful event, can contribute to functional decline, worsening disability and thereby reduce the overall physical performance.[30] In addition, impairments of the respiratory system due to COVID-19 cause fatigue and exertion which further has a negative effect on the functional capacity. This is in conjunction to a study by Tanriverdi et al which states that patients discharged after COVID-19 infection may have poor fitness and have breathing difficulties after exertion as well as muscle wasting (including of the respiratory and trunk muscles) and psychological disorders such as post-traumatic stress disorder. As a result, a rehabilitation program to restore fitness and reduce anxiety and depression following discharge becomes imperative.[29,30]

CONCLUSION

This study tried to explore the functional status of recovered COVID-19 patients at discharge thereby providing scientific evidence that the physical performance, muscular strength, functional capacity and level of fatigue were considerably affected and that they even possessed a risk of developing sarcopenia. Thus, it becomes essential to consider these assessed parameters for developing a tailor-made exercise program for post COVID-19 patients.

ACKNOWLEDGEMENTS

The authors wish to express their heart felt gratitude to all the study participants who actively participated in this study. Authors are extremely grateful to MGM Hospital and Research Center, Belapur, Navi Mumbai for allowing to do study and providing with necessary resources and constant support throughout the study period. Authors would also like to thank our MPT Scholars for their continuous assistance in record maintenance during the course of the study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Nair NR, Nair SP, Panhale VP, Ravi AI, Jangid KS, Kadam SSC. Assessment of functional outcomes, level of fatigue, and risk of sarcopenia in COVID-19 patients at discharge: A cross sectional study. Int J Community Med Public Health 2024;11:1173-8.