

## ORIGINAL ARTICLE

## Limitation of Functional Status after COVID 19 Infection: A Cross-Sectional Study

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DOI: <https://doi.org/10.62848/bjpain.v2i2.2286>

Received 09 August 2022

Accepted 10 November 2022

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### Abstract

**Background:** The whole world has been struggling with the COVID 19 pandemic since 2019 and has become a global health problem. Various extent of long term effects have been reported. A substantial proportion of patients suffered from functional impairment after recovery from COVID 19 infection. The objective of this study was to determine the degree of functional limitation in patients recovered from COVID 19.

**Methods:** A cross sectional study was conducted in the Department of Anaesthesia, Analgesia and Intensive Care Medicine, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh. Patients aging  $\geq 18$  years with RT-PCR for COVID-19 positive were included in this study. Post-COVID-19 Functional Status scale (PCFS) was used to assess patients with functional limitation. All statistical analysis were performed using the Statistical Package for Social Sciences version 23.0 for Windows.

**Results:** A total of 76 patients were enrolled in this study. The mean PCFS score was  $1.9 \pm 1.0$ . The majority of patients 30 (39.5%) had PCFS score one (negligible functional limitation), 26(34.2%) patients had PCFS score two (slight functional limitation), 11(14.5%) patients had PCFS score three (moderate functional limitation), 7(9.2%) patients had PCFS score four (severe functional limitation).

**Conclusion:** This study demonstrated limited functional status after recovery from COVID-19. A comprehensive management strategy is needed to improve functional limitation in the post COVID 19 period.

**Keywords:** COVID 19, Functional limitation, Post COVID condition, PCFS

**Citation:** Hossain MM, Kamal MM, Islam MA, Akter E, Hossain MB, Bhuiyan MAT, Khan MJ, Rajib SJ, Akhtaruzzaman AKM. Limitation of Functional Status after COVID 19 Infection: A Cross-Sectional Study. Bangladesh J. Pain 2022; 2(2): 28-33.  
doi:10.62848/bjpain.v2i2.2286

## Introduction

The COVID-19 pandemic has catastrophic effect around the globe since 2019<sup>1</sup>. Different clinical parameter along with severity of the disease is portrayed among different demographic and geographical population. Though attention and policies are concentrated towards the acute outcome, but emerging consequences have been reported after recovering from COVID-19. Although most patients infected with SARS-CoV-2 recover within a few weeks, some experience post COVID-19 conditions<sup>2,3</sup>.

There are a wide range of new, returning, or ongoing health problems people can experience four or more weeks after first being infected with the virus that causes COVID-19<sup>4</sup>. Even people who did not have COVID-19 symptoms in the days or weeks after they were infected can have post-COVID conditions<sup>5</sup>. COVID-19 survivors are likely to have sustained a prolonged period of immobilization, sedation, and ventilation, putting them at high risk of associated ICU-acquired weakness (ICUAW). Commonly manifesting as any combination of critical illness myopathy (CIM), critical illness polyneuropathy (CIN), and muscle atrophy, known risk factors include the use of neuromuscular block and corticosteroids, the presence of sepsis and multi-organ dysfunction, and prolonged mechanical ventilation<sup>3,6</sup>.

In a comprehensive tele rehabilitation program, the prevalence of disability rates after COVID-19 was found to be higher, predominantly in elder population<sup>7</sup>. The independence for activities of daily living (ADL) was found to be lower in the group admitted to the ICU than the ward group. Need for gait assistance devices was about 39.8% with feeling of numbness or tingling in 20.2%<sup>7</sup>.

The most impaired functions were: fatigability and energy drive (98–99%); higher cognitive functions (74–94%); sleep functions (98%); muscle functions (93%); respiratory functions (92%); heart functions (82%); emotional functions (80%); sexual functions (77%); pain problems (56–90%); and thermoregulatory functions (68%). The most frequent limitations were: handling stressful situations (98%);

remunerative employment (95%); recreation and leisure (94%); climbing the stairs (94%); doing housework (84%); and informal socializing (64%)<sup>8</sup>.

There were no specific tools to assess the functional status of patients recovered from COVID-19 infection. Machado et al. (2021)<sup>9</sup> assessed the construct validity of the Post-COVID-19 Functional Status (PCFS) Scale among adults suffering from COVID-19 infection and demonstrated the construct validity of the PCFS Scale. The fact that the PCFS Scale can be easily used is a major advantage of the scale, potentially facilitating its widespread implementation<sup>9</sup>.

The most frequent degrees of impairment/ limitations were light and moderate, except for severe-complete for fatigue, higher cognitive functions, multitasking, handling stressful situations; and recreation and leisure activities<sup>8</sup>. The tremendous suffering of recovered COVID-19 patients living with functional limitation and their caretakers is consistent<sup>7,8,9</sup>. Therefore, the aim of this study was to assess the degree of functional limitation among patients recovered from COVID-19 infection.

## Methods

### Study place, participants and design

This cross sectional study was carried out at Pain Medicine Outpatient Unit, Department of Anaesthesia, Analgesia and Intensive Care Medicine, Bangabandhu Sheikh Mujib Medical University, Dhaka from July 2021 to June 2022. All adult patients aging  $\geq 18$  years who were RT-PCR for COVID-19 positive, recovered from COVID-19 at least 14 days prior to the study were included in this study. Patients with cognitive dysfunction, psychological disease and neuromuscular disease were excluded from this study. Patients were offered a comprehensive medical assessment with detailed history and physical examination. In particular, patients with functional limitation were identified and potentially correlated with Post-COVID-19 Functional Status scale (PCFS).

### Study measures

A structured questionnaire was used for data collection. The questionnaire had two parts,

demographic characteristics and assessment functional limitation. The functional limitation was evaluated by using Post COVID-19 Functional status scale (PCFS).

**Post-COVID-19 Functional Status scale (PCFS):** It is an ordinal tool, proposed to measure the full spectrum of functional outcomes following COVID-19<sup>10</sup>. This “Post-COVID-19 Functional Status (PCFS) Scale” can be used for tracking functional status over time as well as for research purposes. It can be used as a patient-reported outcome measure to evaluate the consequences of COVID-19 and their effect on functional status<sup>9</sup>. The PCFS Scale can be used both at the time of hospital discharge, and to monitor functional status after discharge. The PCFS Scale stratification is composed of five scale grades<sup>11,12</sup>:

- Grade 0 (No functional limitations);
  - Grade 1 (Negligible functional limitations);
  - Grade 2 (Slight functional limitations);
  - Grade 3 (Moderate functional limitations)
- and
- Grade 4 (Severe functional limitations).

The final scale grade 5 ‘death’, which is required to be able to use the scale as outcome measure in clinical trials. However, one of the strong points of the scale is that it intentionally does not specify why patients are functionally impaired, i.e. if the impairment is caused by dyspnoea, fatigue, pain, anxiety or otherwise. This is crucial for the scale to be useful in a condition that may cause symptoms in many organ systems. The manual to the scale describes the possibility to assess pre-COVID-19 functional status, which would allow for determination of the causality of functional impairment after recovering from COVID-19<sup>10</sup>.

### Statistical analysis

Statistical analysis were carried out by using the Statistical Package for Social Sciences version 23.0 for Windows (SPSS Inc., Chicago, Illinois, USA). A descriptive analysis was performed for all data. The mean values were calculated for continuous variables. The quantitative observations were indicated by frequencies and percentages. Unpaired t-test was used to analyze the continuous variables, shown with mean and standard deviation. P values <0.05 was considered as statistically significant.

## Results

During the study period, total 225 patients were assessed. Among them, 76 patients were included according to selection criteria. The mean age of patients was  $46.8 \pm 14.3$  years, Median (IQR) age was 46.5 ranging from 37 to 55 years. Forty three (56.6%) patients were male, 33(43.4%) patients were female. Most of the patients 27(35.5%) were service holder then 21(27.6%) were housewife, 11(14.5%) were Retired, 8(10.5%) were Businessman. About 43(56.6%) patients had BMI within normal range (18.5-24.9) and 28(36.8%) patents were overweight (25-29.9) and Mean BMI was  $24.2 \pm 3.3$  kg/m<sup>2</sup>. Demographic characteristics were shown in table I.

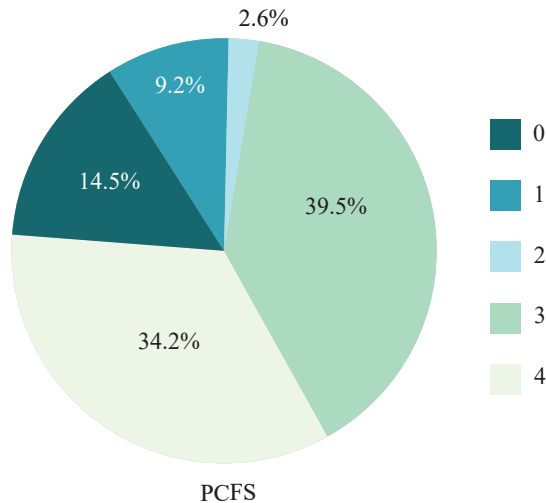
**Table I:** Demographic characteristics of the study population (n=76)

| Variables                     | Number          | (%)         |
|-------------------------------|-----------------|-------------|
| <b>Age (years)</b>            |                 |             |
| 21-40                         | 30              | (39.5%)     |
| 41-60                         | 34              | (44.7%)     |
| >60                           | 12              | (15.8%)     |
| Mean $\pm$ SD                 | 46.8 $\pm$ 14.3 |             |
| Median (IQR)                  | 46.5            | (37-55)     |
| <b>Gender</b>                 |                 |             |
| Male                          | 43              | (56.6%)     |
| Female                        | 33              | (43.4%)     |
| <b>Occupational status</b>    |                 |             |
| Student                       | 2               | (2.6%)      |
| Farmer                        | 2               | (2.6%)      |
| Housewife                     | 21              | (27.6%)     |
| Businessman                   | 8               | (10.5%)     |
| Service holder                | 27              | (35.5%)     |
| Retired                       | 11              | (14.5%)     |
| Others                        | 5               | (6.6%)      |
| <b>BMI (kg/m<sup>2</sup>)</b> |                 |             |
| <18.5                         | 3               | (3.9%)      |
| 18.5-24.9                     | 43              | (56.6%)     |
| 25.0-29.9                     | 28              | (36.8%)     |
| $\geq 30.0$                   | 2               | (2.6%)      |
| Mean $\pm$ SD                 | 24.2 $\pm$ 3.3  | (22.3-26.6) |
| Median (IQR)                  | 23.8            |             |
| <b>Smoker</b>                 |                 |             |
| Yes                           | 20              | (26.3%)     |
| No                            | 44              | (57.9%)     |
| Post-smoker                   | 12              | (15.8%)     |

Values are expressed as mean $\pm$ SD or in frequency. Within parenthesis are percentages per column total

Figure I showed that the majority 30(39.5%) patients had PCFS score one (negligible functional limitation), 26(34.2%) patients had PCFS score two (slight functional limitation, 11(14.5%) patients had

PCFS score three (moderate functional limitation), 7(9.2%) patients had PCFS score four (severe functional limitation) and 2(2.6%) patients had PCFS score zero (No functional limitation). The mean PCFS score was  $1.9 \pm 1.0$ .



**Figure I:** Pie chart showing PCFS of the study patients (n=76)

Table II showed that mean PCFS were significantly higher in hospitalized or ICU admitted patients and severe or critical COVID-19 patients.

**Table II:** PCFS difference of the study population (n=76)

| Variables            | Number of patients | PCFS Mean $\pm$ SD | P value |
|----------------------|--------------------|--------------------|---------|
| Hospitalization      |                    |                    |         |
| Yes                  | 38                 | 2.3 $\pm$ 1.0      | a0.001  |
| No                   | 38                 | 1.4 $\pm$ 0.8      |         |
| Treatment received   |                    |                    |         |
| Home                 | 38                 | 1.4 $\pm$ 0.8      | b0.001  |
| Hospital.            | 30                 | 2.1 $\pm$ 0.9      |         |
| ICU                  | 8                  | 3.3 $\pm$ 0.9      |         |
| Severity of COVID-19 |                    |                    |         |
| Mild                 | 31                 | 1.2 $\pm$ 0.7      | b0.001  |
| Moderate             | 31                 | 2.2 $\pm$ 0.8      |         |
| Severe               | 11                 | 2.5 $\pm$ 0.8      |         |
| Critical             | 3                  | 4.0 $\pm$ 0.0      |         |

Values are expressed as mean $\pm$ SD. a = P value reached from unpaired t-test and b = P value reached from ANOVA test. P value (P<0.05) is considered as statistically significant.

## Discussion

The Coronavirus Disease 2019 pandemic has become a global health threat<sup>1</sup>. The main sources of infection spread are droplets and direct contact<sup>13</sup>. Most patients experienced symptoms for 1 to 2 weeks with complete resolution, although some required hospitalization. The mortality rate of COVID-19 is on the order of 1% according to estimates published by the Centre for Evidence-Based Medicine<sup>14</sup>. This pandemic has, therefore, provided an unprecedented opportunity to further understand the effect of a global event on the function and quality of life (QoL) of patients with COVID-19<sup>15</sup>.

In this study, the mean age of the study population was lower than the other western studies. This is probably due to the sociocultural background of Bangladesh, where the proportion of the elderly population (5%) is lower than that in Western world (North America, 16%; Europe, 21%)<sup>16,17</sup>. The number of male respondents were more than female which is similar to the other studies done in Bangladesh in Post COVID syndrome<sup>6,18</sup>.

In the current study, 74 out of 76 patients had functional limitation. Most of the participants had negligible (grade 1) functional limitation in activities after recovery from COVID 19, followed by slight and moderate functional limitation they had. Very small proportion of the study patients had severe functional limitation.

A cross sectional study done by Norrefalk et al. (2021)<sup>8</sup> found that the most frequent degrees of impairment/limitations were light and moderate, except for severe-complete for fatigue, higher cognitive functions, multitasking, handling stressful situations; and recreation and leisure activities. They also found, Post-COVID syndrome following a mild COVID-19 infection can result in impaired body functions and activities. Another study done by Leite et al. (2021)<sup>7</sup> showed higher rates of functional limitation after COVID-19. Hussein et al. (2020)<sup>19</sup> also found that majority of respondents have negligible (grade 1) functional limitation after recovery from COVID 19.

In our study, we also have found that patient who got treatment in hospital and ICU, they have more

functional limitation. This result is also similar to the study done by Norrefalk et al., (2021)<sup>8</sup>. According to Gustafson et al. (2018)<sup>20</sup>, Post-ICU population have significant weakness and they have growing evidence of motor and sensory disruption. Sustained a prolonged period of immobilisation, sedation, and ventilation, in ICU putting COVID-19 survivors at high risk of associated ICU-acquired weakness (ICUAW)<sup>21</sup>.

## Conclusion

We observed variable degree of limited functional status after recovery from COVID-19. This functional impairment can cause tremendous suffering and reduction of quality of life. The association between different risk factors and comorbidities with post COVID functional impairment needs to be estimated in a larger scale.

## Declaration

### Ethics approval

The study was approved by the Institutional Review Board of Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh. Informed written consent was taken from the participants before inclusion.

### Author contributions

Conception and development of the idea *MMH, MMK, AKMA*

Writing *MMH, MMK*

Data analysis *MMH, MMK, MATB*

Data collection *SA, EA, MBH*

Review and Editing *MMK, AKMA*

**Funding** This study was funded by a research grant provided by Bangabandhu Sheikh Mujib Medical University, Dhaka-1000, Bangladesh.

**Conflict of interests** None

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