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Functional Status among Recovered Sars Cov-2 Patients-An Observational Analytical Study

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Abstract: ***COVID-19 is caused by novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It is the current pandemic. Persisting symptoms with subsequent progression to poor functional status have been reported in a substantial proportion of these patients. The "Post-COVID-19 Functional Status (PCFS) Scale" is used as outcome measure to evaluate the consequences of COVID-19 and their effect on functional status. Aim of the study to find out the test-retest reliability of the post COVID-19 functional status (PCFS) scale and to find out the impact of SARS COV-2 on functional status. The study is carried out in 151 individuals with a recovered SARSCOV-2. People aged between 30-45 years are taken & PCFS scale has been given. Same group of people is again taken & given the same scale at 48hour interval. Data was analysed in SPSS version 20. The Mean age of participants was (37.226) with involvement of 38% males and 62% females. The test retest reliability of the PCFS was excellent ICC (0.939-0.779) and according to this data GRADE 1 involvement was maximum with 47 % and GRADE 0 & GRADE D involvement was minimum with no involvement. The study conclude post COVID-19 functional status (PCFS) scale is having excellent test retest reliability and functional status affection is one of the most common presenting complaints in individuals infected with SARS-CoV-2.***

Keywords: SARS-C0V-2, Functional status, Post COVID-19 functional status (PCFS) scale

1. Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS CoV-2) is the coronavirus that leads to coronavirus disease 2019 (COVID-19) and the current pandemic is the most critical ongoing global health care problem. [1] COVID-19 is caused by the novel severe acute respiratory syndrome corona virus 2 (SARS-CoV-2). COVID-19 first emerged in December 2019, when a cluster of patients with pneumonia of unknown cause was recognized in Wuhan, China. As of July 1, 2020, SARS-CoV-2 has affected more than 200 countries, resulting in more than 10 million identified cases with 508000 confirmed deaths. [2]

The pathogen responsible for these atypical infections was soon discovered to be a novel coronavirus belonging to the family Coronaviridae. The respiratory illness caused by this virus was termed as coronavirus disease 2019 or simply COVID-19 by the WHO, and the outbreak was considered to have started via a zoonotic spread from the seafood markets in Wuhan, China. Subsequently, human-to-human transmission was recognised to be responsible for the community spread of the disease, being reported in approximately 200 countries worldwide. The coronaviruses are made up of four structural proteins, namely, the spike (S), membrane (M), envelop (E) and nucleocapsid (N) proteins. ACE-2 has been identified as a functional receptor for SARS-CoV and is highly expressed on the pulmonary epithelial cells. The virus invades and enters the type 2 alveolar epithelial cells via the host receptor ACE-2 and starts to undergo replication to produce more viral Nucleocapsids. The virus-laden pneumocytes now release many different cytokines and inflammatory markers such as interleukins (IL-1, IL-6, IL-8, IL-120 and IL-12), tumour necrosis factor-α (TNF-α), IFN-λ and IFN-β, CXCL-10, monocyte chemoattractant protein-1 (MCP-1) and macrophage inflammatory protein-1α (MIP-1α). This 'cytokine storm' acts as a chemoattractant for neutrophils, CD4 helper T cells and CD8 cytotoxic T cells, which then begin to get sequestered in the lung tissue. [3]

Viral load in the upper respiratory tract appears to peak around the time of symptom onset and viral shedding begins approximately 2 to 3 days prior to the onset of symptoms. Asymptomatic and presymptomatic carriers can transmit SARS-CoV-2. Transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) occurs primarily via respiratory droplets from face-to-face contact and, to a lesser degree, via contaminated surfaces. Aerosol spread may occur, but the role of aerosol spread in humans remains unclear. An estimated 48% to 62% of transmission may occur via presymptomatic carriers. [4]

Common symptoms in hospitalized patients include fever (70%-90%), dry cough (60%-86%), shortness of breath (53%-80%), fatigue (38%), myalgias (15%-44%), nausea/vomiting or diarrhea (15%-39%), headache, weakness (25%), and rhinorrhea (7%). Anosmia or ageusia may be the sole presenting symptom in approximately 3% of individuals with COVID-19. Common radiographic findings of individuals with COVID-19 include bilateral, lower-lobe predominate infiltrates on chest radiographic imaging and bilateral, peripheral, lower-lobe ground-glass opacities and/or consolidation on chest computed tomographic imaging. [4]

A significant number of COVID-19 patients have been treated using invasive mechanical ventilation (IMV). Prolonged IMV increases the risk of developing secondary infection, sepsis, and multi-organ failure, which increases

patient susceptibility to short-and long-term medical issues. Moreover, many patients who survived COVID-19 infection will likely have short-and long-term health problems. [5] Acute respiratory distress syndrome (ARDS), prolonged hospitalization, and admission in an Intensive Care Unit (ICU) have been reported among COVID-19 infections in acute care settings. A wide range of pulmonary and extra-pulmonary manifestations have been reported in post-COVID-19 patients. Persisting symptoms with subsequent progression to poor functional status have been reported in a substantial proportion of these patients. The physical and mental health assessment in COVID-19 survivors with emphasis on post-acute care has been a recent global health concern. [6]

Klok and colleagues proposed the "PostCOVID-19 Functional Status (PCFS) Scale" to be used as a patient reported outcome measure to evaluate the consequences of COVID-19 and their effect on functional status. The PCFS Scale can be used both at the time of hospital discharge, and to monitor functional status post discharge. The scale was designed to cover the entire range of functional limitations from: grade 0, "No functional limitations" to grade 4, "Severe functional limitations" and grade 5, "Death". Notably, the scale was derived for measuring functional outcomes after venous thromboembolism (VTE), by use of a Delphi method among international VTE experts and patient focus groups. It was found to have good to excellent interobserver agreement between self-reported scale assessment and a structured interview by a trained physician. Since COVID-19 represents an acute cardiopulmonary disease, and has been shown to be frequently complicated by VTE, the scale was assumed to be relevant and useful in the clinical course of COVID-19 too. [7]As there is increasing number of subjects recovering from the infection of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the need for tools to measure and monitor the course of the disease and its impact on functional status has been raised as essential.

Therefore, this cross sectional analytic study is to find out the functional status in recovered SARS COV-2 patients and to check out the test-retest reliability of the post covid functional status scale (PCFS).

2. Methodology

- **Source of data**: Various hospitals at Ahmedabad & Gandhinagar
- **Study type:** Observational analytical study
- **Sample size:** 151
- **Study duration**: 4 weeks
- **Sampling technique:** Convenience sampling

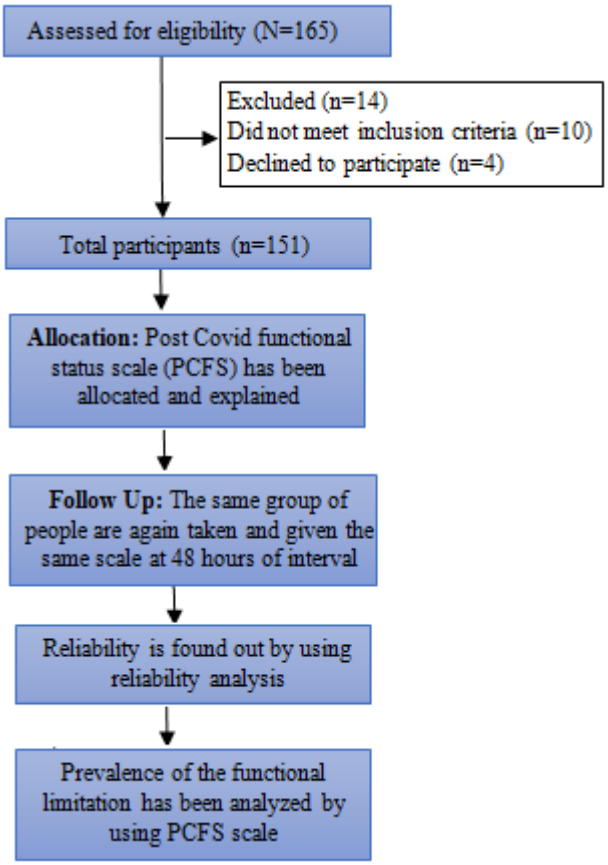
Inclusion Criteria

- Males & females of age between 30 to 45 years
- Being recovered after COVID-19
- Individuals with negative RT-PCR value
- Having education level of at least primary school

Exclusion Criteria

- Having an unstable clinical condition
- Having cognitive problem
- Not being able to fill the questionnaire

3. Procedure



- A goggle survey form was self generated and circulated through online mode via mail, WhatsApp, FB messenger, telegram among the recovered COVID-19 individuals. Informed consent was taken from the physiotherapist in the beginning of the questionnaire.
- Functional status was evaluated by the help of post COVID-19 functional status scale (PCFS).
- 151 people aged between 30-45 years are taken according to the inclusion and exclusion criteria & the demographic data has been taken and Post Covid-19 Functional Status scale has been given.
- The scale has been properly explained about mark the appropriate boxes and respond to all questions, Limitations or symptoms may vary over time, the measurement concerns the average situation of the past week to every participant and In case two grades seem to be appropriate, the patient will be assigned to the highest grade with the most limitations.
- Same group of people is again taken & given the same scale at 48 hours of interval.
- Reliability is found out using Reliability analysis.
- After that prevalence of functional status affection has been analyzed

Outcome Measure

Post COVID-19 functional status (PCFS) Scale

The post-COVID-19 functional status (PCFS) scale focuses on relevant aspects of daily life during follow-up after the infection. The scale is intended to help users becoming aware of current functional limitations in COVID-19 patients, whether or not as a result of the specific infection, and to objectively determine this degree of disability. The scale is ordinal, has 6 steps ranging from 0 (no symptoms) to 5 (death, D), and covers the entire range of functional outcomes by focusing on limitations in usual duties/ activities either at home or at work/study, as well as changes in lifestyle. The scale grades are intuitive and can easily be grasped by both clinicians and patients.

Grade 0 reflects the absence of any functional limitation. Grades 1 and 2 correspond to a condition for which usual duties/activities could be carried out, defined asany activity that patients undertake on a monthly basis or more frequently, either at home or at work/study. Importantly, this includes sports and social activities.

Specifically, Grade 1 is reserved for patients with some symptoms, which however do not prohibit or limit doing any usual activities.

Grade 2 is reserved for patients who are able to independently perform all usual activities but at a lower intensity, sometimes combined with mild limitations in participation in usual social roles.

Grade 3 accounts for moderate functional limitations that force patients to structurally modify usual activities, reflecting the inability to perform certain activities which, therefore, need to be taken over by others. Those patients may require assistance in instrumental activities of daily living (iADL), e.g. managing basic household chores, community mobility, shopping for groceries or necessities, or participation in usual social roles is restricted.

Grade 4 describes those patients with severe functional limitations who require assistance with activities of daily living (ADL), not necessarily administered by a certified nurse. It should be indicated that assistance with some ADL activities, e.g. using the toilet, managing routine daily hygiene and functional mobility, is essential. Participation in usual social roles is likely restricted.

The death of a patient is recorded in grade D, and is mainly relevant in the setting of clinical research and quality control.

4. Result

Data were analyzed using SPSS version 20 with level of significance 5%.

The Mean age of participants was (37.226 ± 4.27) with involvement of 38% males and 62% females. The test retest reliability of the PCFS was excellent ICC (0.939-0.779) and according to this data GRADE 1 involvement was maximum with 47 % and GRADE 0 & GRADE D involvement was minimum with no involvement. To found out reliability of the scale single measure ICC (Interclass correlation co-efficient) is used.

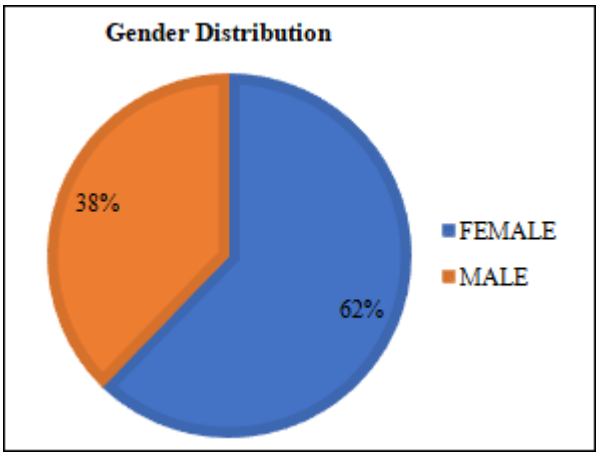


Figure 1: Shows gender distribution of total population

Table 1: Shows gender distribution of total population

Total	151 (100%)
Male	94 (38%)
Female	57 (62%)

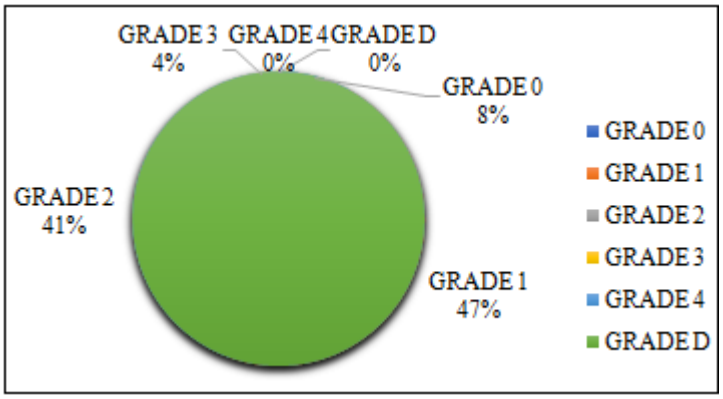


Figure 2: Functional status limitation among recovered COVID 19

GRADE 0 - No functional limitation
GRADE 1 - Negligible functional limitation
GRADE 2 - Slight functional limitation

GRADE 3 - Moderate functional limitation
GRADE 4 - Severe functional limitation
GRADE D-Death

Table 2: Shows prevalence of the functional limitation in total population

TOTAL	151 (100%)
GRADE 0	12 (8 %)
GRADE 1	71 (47 %)
GRADE 2	61 (41 %)
GRADE 3	6 (4 %)
GRADE 4	0 (0 %)
GRADE D	0 (0 %)

5. Discussion

There are very less study to describe the PCFS Scale in a large sample of adult hospitalized and non-hospitalized subjects with confirmed and presumed COVID-19. PCFS scale covers the full spectrum of functional outcomes and focuses on both limitations in usual duties/activities and lifestyle changes in five scale grades ranging from 0 to 4.

The results show that test retest reliability of the PCFS was excellent ICC (0.939-0.779). Based on the PCFS scale, we observed that during the post-COVID-19 recovery state after RT-PCR negative status, more than half of the patients (57%) reported having negligible functional limitations (PCFS grade 1) while the prevalence of slight degree of functional limitation (PCFS grade 2) was observed in (41%) patients. In our study the proportion of females with functional limitation is found to be higher as compare to males. This gender factor can be because of the more household responsibilities in females compare to males.

Our findings are in line with the other study that was done by **Pankaj Pant et al**. who find out Prevalence of Functional Limitation in COVID-19 Recovered Patients Using the Post COVID-19 Functional Status Scale & concluded that more than half of the patients (56.6%) reported having no functional limitation (grade 0), while the prevalence of some degree of functional limitation was observed in 46 (43.4%) patients (grade 1 to 4). Nearly one fourth (27.3%) of the patients had negligible functional limitation (PCFS grade 1). Slight functional limitation (PCFS grade 2) was seen in 13 (12.3%) patients. Moderate (PCFS grade 3) and severe functional limitations (PCFS grade 4) were observed in a minority of patients. They observed that more than 50% of our patients had no functional limitation with corresponding PCFS grade 0. [6] This could have been partly due to the inclusion of a higher number of younger patients in their study.

One of the study done by **M. M. Walle-Hansen et al**, who find out Health-related quality of life, functional decline, and long-term mortality in older patients following hospitalisation due to COVID-19 in which they found more than half of the study participants reported a clinically relevant decline in HR-QoL 6 months after hospitalisation due to COVID-19, compared to before hospital admission. One out of three patients reported decline in mobility and the ability to carry out activities of daily living because of the prolong hospitalisation which ultimately leads in poor functional status. [8]

Other studies in which the functional status is assessed by the use of the other scales are also suggestive of functional decline after the novel COVID 19 virus affection but all of that studies have the general scale which is used to assess the functional performance. There is no specific reliable tool to assess the functional status in all domains after COVID 19 therefore this study is intended to find the reliable tool to find the impact of the COVID 19 and prevalence of functional limitation after that.

In our study we found the more prevalence of females compare to the males this can be also because of the more household responsibilities. The result can be varying because of long term consequences of COVID-19 may vary extensively among patients with the different age groups and comorbid conditions.

We used this tool in our study as it is reliable measure and inexpensive and hence, could be specifically beneficial in resource poor health care settings.

6. Conclusion

We conclude that post covid functional status (PCFS) scale is having excellent test retest reliability and on the basis of that we found the high prevalence of the GRADE 1 functional status involvement. Early detection of functional decline with subsequent planning of rehabilitative measures is vital in post-acute care management of COVID-19 patients.

Hence, PCFS scale is a reliable measure in determining the prevalence of functional limitation in COVID-19 recovered patients in acute health care settings.

7. Limitation

1) Study has smaller sample size
2) Online survey study

8. Further Recommendation

- Study can be done with the larger sample size.
- Large cohort studies can be done.
- Longitudinal studies can be designed.

Conflict of Interest:
No conflicts of interest

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