Original Article

Assessment of Functional Status and Mental Health in Post-COVID-19 Patients in a Dedicated COVID-19 Hospital in Maharashtra: A Cross-sectional Study

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Abstract

Introduction: The COVID-19 pandemic has resulted in prolonged health challenges for many survivors, often termed long COVID-19. These challenges include persistent physical symptoms such as fatigue and breathlessness, alongside mental health issues such as depression, anxiety, and stress. **Materials and Methods:** A cross-sectional study was conducted among 114 post-COVID-19 patients admitted to a dedicated COVID-19 hospital in Mumbai. Functional limitations were evaluated using the Post-COVID-19 Functional Status scale, while the Depression, Anxiety, and Stress Scale measured mental health outcomes. Data analysis was done using Chi-square tests and multiple linear regressions to explore the relationship between functional and mental health metrics. **Results:** The study found that 16.7% of patients had no functional limitations, while 42.1% experienced minimal limitations. Severe functional limitations were reported by 13.2% of patients. Mental health analysis showed that 23.68% had mild-to-severe depression, with anxiety and stress affecting 21.1% and 14.04%, respectively. Regression analysis revealed significant associations between functional limitations and mental health, with depression ($P < 0.001$) having the most substantial impact, followed by anxiety and stress. **Conclusion:** Post-COVID-19 patients in Maharashtra face significant functional and psychological challenges, with depression being the most influential factor in delaying recovery. These findings highlight the need for integrated physical and mental health interventions in post-COVID-19 care.

Keywords: Anxiety, depression, post-COVID-19 functional scale, stress

Introduction

The COVID-19 pandemic, driven by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has led to a sharp rise in pneumonia cases and multi-organ complications, posing significant challenges to healthcare systems worldwide, particularly in acute care hospitals, emergency departments, and intensive care units (ICUs).[1] Studies indicate that approximately 60% of COVID-19 survivors experience post-COVID-19 symptoms within the first 6 months postinfection, with fatigue and breathlessness being the most prevalent.[2] However, many patients report persistent physical symptoms without evidence of lasting physiological damage.[3] Following recovery, the severity of functional limitations among survivor's ranges from mild to severe, influenced by factors such as age, gender, symptom duration, and comorbidities.[4] COVID-19 symptoms can persist for up to 35 days, adversely affecting quality of life as well as physical and mental health.[5,6] Survivors often experience moderate-to-severe physical impairments and psychological challenges, including depression, anxiety, and posttraumatic stress disorder.[7,8] In India, morbidity and mortality rates from COVID-19 have been strongly associated with comorbid conditions such as diabetes, hypertension, and cardiovascular disease.[9-11] Among older adults, post-COVID-19 recovery

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is often linked to heightened risks of anxiety and depression, although many return to their preinfection functional status within 90 days.[12] Rehabilitation is essential in aiding older patients to regain functional abilities.[13] The Post-COVID-19 Functional Status (PCFS) Scale serves as a crucial tool for evaluating functional limitations in survivors, particularly in acute healthcare settings, and informs rehabilitation planning.[14] Beyond physical issues, survivors frequently face social isolation, anxiety, and stigma, exacerbating mental health struggles.[15] These challenges contribute to reduced functional status, including difficulties in daily activities, mobility, and social or occupational engagement.[16,17] Long COVID-19, also known as post-COVID-19 condition, refers to a range of symptoms that persist or develop after the acute phase of a SARS-CoV-2 infection. According to the World Health Organization (WHO), it is characterized by symptoms that continue or emerge 3 months after the initial infection, lasting for at least 2 months without an alternative explanation.[18] Thus, there is an urgent need for robust research and clinical interventions aimed at rehabilitating functional status, coupled with enhanced communication across healthcare sectors to support autonomy and well-being in COVID-19 survivors.[19]

Materials and Methods

Study design

This was a cross-sectional study aimed at assessing the functional and mental health status of post-COVID-19 patients. The PCFS scale[14] was used to evaluate functional limitations, while the Depression, Anxiety, and Stress Scale (DASS-21)[20] was employed to measure mental health outcomes, including anxiety, depression, and stress levels. Study Setting – The study was conducted in a dedicated COVID-19 hospital located in Mumbai, Maharashtra. Participants were selected from patients who had been admitted to the hospital during the COVID-19 pandemic. Recruitment focused on ensuring diverse representation from various socioeconomic and demographic backgrounds within the hospital's patient population. Sample Size – The required sample size was calculated using Cochrane's formula, assuming a prevalence rate of 30%,[21] a margin of error of 10%, and a confidence interval (CI) of 95%. This resulted in a sample size of 114 participants. Participants were recruited using purposive sampling, and all individuals provided written informed consent. Only patients aged 18 years and older, previously admitted for COVID-19 treatment, and willing to participate were included. Exclusion criteria comprised patients with severe clinical presentations requiring ICU admission, antenatal and postnatal women, and individuals under 18 years of age. The procedure followed a systematic approach to recruit participants, collect data, and analyze the findings which were as follows:-

Participant recruitment

Eligible participants were identified from hospital records of patients previously admitted for COVID-19 treatment. Patients meeting the inclusion criteria were contacted and invited to participate. Informed consent was obtained from all participants after explaining the study objectives, procedures, and confidentiality measures.

Data collection

Demographic and Clinical Data: Each participant provided details such as age, gender, socioeconomic status, comorbidities, and severity of COVID-19 illness. Functional Health Assessment: The PCFS scale was administered to assess functional limitations. Participants were classified into different levels based on their ability to perform daily activities. Mental Health Assessment: The DASS-21 was used to measure psychological distress, including symptoms of depression, anxiety, and stress. Participants responded to a self-reported questionnaire. The assessments were conducted through telephonic interview setting, ensuring privacy and minimizing external influences.

Ethical considerations

The study was approved by the Hospital's Ethics Committee. Participation was voluntary, and participants had the right to withdraw at any stage without consequences. Confidentiality was maintained by anonymizing data and securely storing records.

Statistical analysis

Data were analyzed using SPSS software (version 20) (IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequencies and percentages, were used to summarize demographic characteristics. To assess differences in functional status categories measured by the PCFS scale,[14] a Chi-square test was performed. For mental health outcomes assessed using the DASS-21,[21] the prevalence of depression, anxiety, and stress was categorized into different severity levels. Chi-square tests were conducted to evaluate the significance of these distributions.

To explore the relationship between PCFS and mental health outcomes, a stepwise multiple linear regression analysis was conducted.

Results

The study had an equal gender representation, with 50% male and 50% female participants [Table 1]. The majority of respondents, 41 (37%), were aged between 20 and 30 years [Table 1]. Among the participants, 66 (57.9%) were married, and 47 (41.2%) had completed formal education

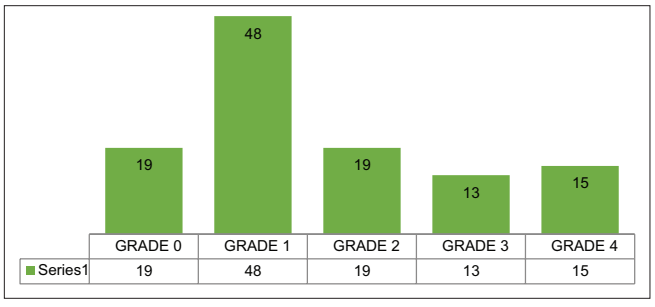

Figure 1: Distribution according to post-COVID-19 functional status scale

up to high school. Most participants, 57 (50%), belonged to the upper-middle class, according to the Kuppuswamy socioeconomic scale. In addition, 40 (35%) of the participants were professionals.

Patients were graded from 0 to 4 on the PCFS scale [Table 2]. Of the participants, 19 (16.7%) had no functional limitations and scored 0, indicating no symptoms, pain, depression, or anxiety related to their infection. A total of 48 (42.1%) were graded as 1, with negligible functional limitations; they reported persistent symptoms but could perform all usual activities. Grade 2 was assigned to 19 (16.7%) participants who occasionally needed to reduce or spread out their activities due to symptoms, indicating slight limitations. Grade 3 included 13 (11.4%) participants who could not perform all usual duties independently, showing moderate limitations. Finally, 15 (13.2%) were graded 4, indicating severe functional limitations, requiring assistance or nursing care [Figure 1]. A Chi-square test indicated a significant distribution difference across PCFS grades ($\chi^2 = 36.0$, $P = 0.00$).

Table 1: Demographic details

	n (%)
Age group (years)	
20–30	41 (37)
31–40	52 (47)
41–50	21 (18.4)
Sex	
Male	57 (50)
Female	57 (50)
Marital status	
Married	66 (57.9)
Unmarried	48 (42.1)
Education	
High school	47 (41.2)
Graduate	32 (28.1)
Postgraduate	35 (30.7)
Occupation	
Professional	40 (35)
Semi-professional	23 (20.17)
Clerical	6 (5.2)
Skilled	2 (1.75)
Unskilled	3 (2.63)
Unemployed/retired	40 (35)
Socioeconomic Scale	
Upper	3 (2.63)
Upper middle	57 (50)
Lower middle	31 (27.19)
Upper lower	21 (18.4)
Lower	2 (1.7)

According to the DASS-21 scale [Table 3], 70 (61.4%) participants showed no depression postdischarge. However, 27 (23.68%) had mild, 10 (8.7%) moderate, 2 (1.75%) severe, and 5 (4.38%) extremely severe depression. Symptoms included feelings of worthlessness, lack of enthusiasm, and life being meaningless. For anxiety, 90 (78.9%) participants reported no symptoms, while 11 (9.64%) had mild, 8 (7.01%) moderate, 1 (0.87%) severe, and 4 (3.50%) extremely severe anxiety [Figure 2]. Participants reported physical symptoms such as dry mouth, rapid heartbeat, and panic. Regarding stress, 98 (85.96%) participants had no symptoms, while 9 (7.89%) had mild, 3 (2.63%) moderate, 3 (2.63%) severe, and 1 (0.87%) extremely severe stress, reporting difficulty in relaxation and overreacting to situations. The findings reveal a significant prevalence of mild-to-severe depression, anxiety, and stress ($P = 0.00$).

A stepwise multiple linear regression analysis [Table 4] found PCFS to be significantly associated with stress ($B = 0.559$, CI: 0.211–0.908, $P = 0.002$), anxiety ($B = 0.407$, CI: 0.148–0.667, $P < 0.001$), and depression ($B = 0.637$, CI: 0.363–0.910, $P < 0.001$). Depression accounted for 16% of the variance in functional status, followed by stress (8.3%) and anxiety (7.9%), as indicated by the adjusted R^2 values.

Table 2: Post-COVID-19 Functional Scale[14]

How much are you currently affected in your everyday life by COVID-19 (please indicate which one of the following statements applies to the most)	Corresponding PCFS scale	Interpretation	Distribution of population, *n* (%)	*P*	χ^2
I have no limitations in my everyday life and no symptoms, pain, depression, or anxiety related to the infection	0	No functional limitations	19 (16.67)	0.00	36.0
I have negligible limitations in my everyday life as I can perform all usual duties/activities, although I still have persistent symptoms, pain, depression, or anxiety	1	Negligible functional limitations	48 (42.1)		
I suffer from limitations in my everyday life as I occasionally need to avoid or reduce usual duties/activities or need to spread this over time due to symptoms, pain, depression, or anxiety. I am, however, able to perform all activities without any assistance	2	Slight functional limitations	19 (16.7)		
I suffer from limitations in my everyday life as I am not able to perform all usual duties/activities due to symptoms, pain, depression, or anxiety. I am, however, able to take care of myself without any assistance	3	Moderate functional limitations	13 (11.4)		
I suffer from severe limitations in my everyday life: I am not able to take care of myself and, therefore, I am dependent on nursing care and/or assistance from another person due to symptoms, pain, depression, or anxiety	4	Severe functional limitations	15 (13.2)		

PCFS: Post-COVID-19 Functional Status

Discussion

The PCFS scale, developed by Klok *et al*.,[14] is a straightforward tool for tracking symptoms and their impact on functional status in COVID-19 survivors. It encompasses a broad range of functional outcomes, categorizing limitations and lifestyle changes into five grades (0–4). In our study, 19 participants (16.67%) reported no functional limitations post-COVID-19 recovery, while 48 (42.1%) had negligible functional limitations. These findings align with Pant *et al*.,[22] where over half of the patients (56.6%) had no functional limitations (grade 0), with 43.4% showing some level of limitation (grades: 1–4). However, our results differ from Sepulveda-Loyola *et al*.,[23] who observed higher functional limitations, likely due to different study settings and populations.

Regarding mental health, 98 participants (85.96%) reported no stress symptoms, 90 (78.9%) had no anxiety, and 70 (61.4%) reported no depression on the DASS-21 scale. These results are consistent with Datar and Shetty[24] and Raza *et al*.[25] where mild depression and anxiety were prevalent, but stress was negligible. Conversely, Swami *et al*.[26] found higher frequencies of anxiety (50.9%), stress (37.3%), and depression (27.2%) in a larger sample. Differences in findings could stem from variations in population characteristics, as noted by Lusida *et al*.,[27] who reported shifts in mental health symptoms pre- and postquarantine.

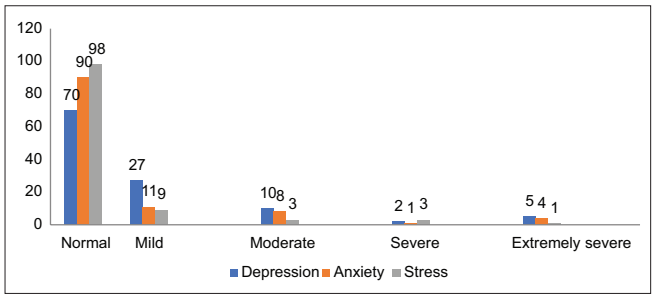

Figure 2: Distribution according to Depression, Anxiety, and Stress Scale

Table 3: Depression, Anxiety, and Stress Scale-21 to assess depression, anxiety, and stress[20]

Category	Depression, *n* (%)	Anxiety, *n* (%)	Stress, *n* (%)	χ^2	*P*
Normal	70 (61.4)	90 (78.9)	98 (85.96)	24.58	0.00
Mild	27 (23.68)	11 (9.6)	9 (7.89)		
Moderate	10 (8.7)	8 (7.01)	3 (2.63)		
Severe	2 (1.75)	1 (0.87)	3 (2.63)		
Extremely severe	5 (4.38)	4 (3.5)	1 (0.87)		

Our linear regression analysis revealed a significant positive association between PCFS and mental health parameters (stress, depression, and anxiety). This aligns with Wang *et al*.,[28] who highlighted the role of psychological factors in post-COVID-19 conditions and daily life impairments. Similarly, Uygur and Uygur[29] identified female gender and high DASS-21 scores as predictors of post-COVID-19 fatigue. Seighali *et al*.[21] found a 23% prevalence of depression and anxiety among post-COVID-19 patients in a systematic review. Comparatively, Xiong *et al*.[30] reported elevated rates of psychological distress during the pandemic and influenced by factors such as unemployment and media exposure. Gasnier *et al*.[31] observed that patients with psychiatric disorders reported longer COVID-19 symptoms, including higher suicide risk. These variations may result from differences in geographical and study settings. A notable limitation of our study was the constrained timeline, which required accommodating participants' work and family commitments.

Conclusion

Stress, anxiety, and depression all play a significant role in predicting PCFS, with depression emerging as the most influential factor. It accounts for a larger share of the variance (16.0%) compared to stress (8.3%) and anxiety (7.9%) and has the highest standardized coefficient (B = 0.637). This indicates that depression exerts a more profound effect on post-COVID-19 functional recovery than the other psychological factors. Therefore, early detection and tailored mental health interventions are essential for improving functional outcomes in individuals recovering from COVID-19.

Ethical approval

The study was conducted in accordance with the ethical

Table 4: Multiple linear regression between Post-COVID Functional Scale and Depression, Anxiety, and Stress Scale-21

Dependent variable	Predictor	Unstandardized coefficients (*B*)	SE	Standardized coefficients	*T*	Significant	95% CI for *B*	R^2	Adjusted R^2
PCFS	Model 1: Stress								
	Constant	0.691	0.143	-	4.840	<0.001	0.408–0.974		
	Stress	0.559	0.176	0.288	3.178	0.002	0.211–0.908	0.083	0.075
	Model 2: Anxiety								
	Constant	0.644	0.149	-	4.326	<0.001	0.349–0.939		
	Anxiety	0.407	0.131	0.282	3.107	0.002	0.148–0.667	0.079	0.071
	Model 3: Depression								
	Constant	0.593	0.140	-	4.243	<0.001	0.316–0.870		
	Depression	0.637	0.138	0.400	4.614	<0.001	0.363–0.910	0.160	0.152

CI: Confidence interval, SE: Standard error, PCFS: Post-COVID-19 Functional Status

standards outlined in the Declaration of Helsinki. Approval was obtained from the Institutional Ethics Committee (IEC) before the commencement of the study, ensuring that all procedures adhered to the guidelines for medical research involving human subjects. Letter number IEC/Pharm/RP/627/OCT/2021.

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Conflicts of interest

There are no conflicts of interest.

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