Original Article

Persisting and New Onset Symptomatology and Determinants of Functional Limitation of Post Acute COVID-19 Syndrome Cases- A Study from a Northern District of Kerala

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Abstract

Background: COVID-19 disease has a wide range of persisting and new onset clinical manifestations even long after the acute phase. This study was conducted to identify the persisting and new onset symptomatology of post-COVID-19 syndrome patients from clinics in urban and peri-urban Kozhikode, South India, as well as to grade their functional limitation; assess the determinants and predictors. **Material and Methods:** A cross-sectional study was conducted among 938 subjects attending the post-COVID clinics. Symptom profile, functional assessment, and limitation grading were done using the Post-COVID-19 Functional Status (PCFS) scale. Statistical analyses were done using the SPSS ver.20. **Results:** Mean age was 41.50 ± 16.90 years. Fever, anosmia, dysgeusia, headache, and myalgia were the common acute COVID-19 symptoms (505,54%; 433,46.3%; 420,44.9%; 323,34.4%; 252,26.9%, respectively). Post-COVID-19, common persisting symptoms were myalgia (167,17.8%), fatigue (149,15.9%), dyspnea (113,12%), and headache (85,9.1%); the common new onset symptoms were shortness of breath and fatigue (228,24.3% and 220,23.4%, respectively). A total of 91 cases (9.7%) had post-COVID sleep disturbances; 16 (1.7%) had symptoms of anxiety and depressive thoughts. PCFS grading showed that 552 (63.8%) had negligible limitations (Grade I). Only one person had Grade IV limitation. Significant association ($p < 0.05$) was found between functional impairment grading by PCFS and age, gender, locality, type of family, duration of hospitalization, duration of unemployment following illness, source of infection, diabetes mellitus, and hypertension. Male gender, married status, CAD, and smoking had significant higher risks; urban locality and hospitalization decreased the risk. **Conclusions:** SARS-CoV-2 cases have persistent and new onset symptoms and some degree of functional impairment post-COVID. Significant association was identified for various sociodemographic and clinical variables with the PCFS functional impairment grading.

Keywords: Functional impairment, new onset & persisting symptoms, PCFS scale, post-acute covid-19

Introduction

Paul Garner, a professor of epidemiology at Liverpool School of Tropical Medicine, UK, wrote on the 95th day after the onset of symptoms that "I am unable to be out of bed for more than three hours at a stretch, my arms and legs are permanently fizzing as if injected with Szechuan peppercorns, I have ringing in the ears, intermittent brain fog, palpitations, and dramatic mood swings."[1]

Many affected individuals have symptoms lasting for several weeks to months post-COVID, producing significant functional impairment.[2] Post-COVID-19 syndrome is defined as post–acute-COVID-19 as extending beyond 3 weeks from the onset of first symptoms and chronic COVID-19 (otherwise called as "Long COVID" or post–COVID "Long Haulers" or "Long Haul COVID") as extending beyond 12 weeks.[3] PCS has a prevalence of 10–35%[4] among those managed as home-isolated cases or in outpatient clinics and 80% among hospitalized cases. The mechanisms underlying the long-term consequences can be immunological or caused by new or relapsing inflammation, ongoing infection, or side effects of

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immunomodulatory treatment.[5,6] Only a few studies have thus far reported the symptom profile and functional grade assessment of such cases, which is essential for identifying the burden of the disease.

The commonest reported symptoms are fatigue, dyspnea, cough, arthralgia, and chest pain.[7] Cough is seen to persist even beyond eight weeks in several cases. Pulmonary fibrosis may develop causing shortness of breath and limits the ability to be physically active. Less common and potentially severe complications include myocardial inflammation,[8] ventricular arrhythmias, and pulmonary function abnormalities.[9] COVID-19 is known to cause arrhythmias and sudden cardiac arrest. One of the predominant cardiac presenting symptoms of COVID-19 in patients without a fever or cough has been observed to be heart palpitations.[10] Psychiatric manifestations like depression, anxiety, and mood swings are also reported among post-COVID-19 cases.[11]

Post-COVID-19 Functional Status Scoring (PCFS)[12] is used for tracking functional status of cases over time as well as for research purposes. PCFS scale stratification is composed of five scale grades, 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 objectives of the study were to identify the persisting and new onset symptomatology of post-COVID-19 syndrome patients from clinics in urban and peri-urban Kozhikode, South India, as well as to grade their functional limitation and assess its determinants and predictors.

Materials and Methods

A cross-sectional study was conducted over a period of two weeks from July 15, 2021 (approval number: C2/7427/21 dated 28/06/2021). All the patients who attended the post-COVID-19 clinics organized by the National Health Mission Kozhikode in the urban and peri-urban areas with symptoms extending beyond 3 weeks from the onset of first symptoms (Post-acute) or extending beyond 12 weeks (Long COVID-19) were included in the study. Patients with incomplete history were excluded.

Minimum sample size was estimated using the formula: Sample size (n) = $Z\alpha^2$ pq/d^2; $Z\alpha$ = 1.96; p = 10% (Pavli *et al*.); d = 20% of p[13] which is 864 [where p = prevalence q = 100 – p; d = clinically allowable error of 20% of prevalence; $Z\alpha$ = 1.96]. A total of 938 subjects were included in the study.

Sociodemographic details include age, gender, marital status, type of family, locality, occupation-pre-COVID-19, and current duration of unemployment following COVID-19. Clinical data including comorbidities, source of infection, acute COVID-19 symptoms, Post-COVID-19 symptoms and duration, treatment details including duration of hospitalization during COVID-19, etc., were collected from the clinical data using a semi-structured questionnaire. PCS is diagnosed in individuals with a history of probable or confirmed SARS-CoV-2 infection, with symptoms extending beyond 3 weeks from the onset of first symptoms and/or extending beyond 12 weeks and cannot be explained by an alternative diagnosis.[3] Symptoms may be new onset within 3 months following initial recovery from an acute COVID-19 episode or persist from the initial illness or fluctuate or relapse over time.[14]

Functional assessment was performed in the clinics using the Post-COVID-19 Functional Status grading system (PCFS)[15] and documented in the medical records. The PCFS scale used is a self-report method administered to the patients with (a) flowchart and (b) patient questionnaire[12] [Figure 1]. PCFS scale stratification is composed of five scale grades: 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).

Data were compiled and analyzed using Microsoft Excel and IBM SPSS Statistics version 20 (SPSS Inc., Chicago, IL, USA). Categorical data were presented as numbers and percentages, while continuous data were reported as means ± SD and/or median (min-max) and tested for normality using the Shapiro–Wilk test. Associations for different variables with PCFS score categories were found with the Pearson's Chi-square test. In all statistical tests, p value <0.05 was considered statistically significant.

Results

Symptom profile was assessed in 938 patients, and PCFS grading was done for functional limitations in 865 patients.

The mean age was 41.50 (± 16.90) years. Majority were males (489,56.6%); 671 (80.4%) were from urban and 10.3% from coastal areas, 458 (53.01%) had been employed before COVID-19; 394 (33.6%) were currently employed, and 649 (77.4%) were married.

A total of 308 (43.9%) patients were in home isolation for a mean duration of 11.67 ± 4.79 days, and 307 (43.7%) were admitted in COVID-19 First-Line Treatment Center (CFLTC) and 11.69% in COVID hospitals. Mean duration of admission was 10.10 ± 2.32 days and 9.13 ± 4.19 days, respectively. [Table 1]

Fever, anosmia, dysgeusia, headache, and myalgia were the most common symptoms (505,54%; 433,46.3%; 420,44.9%; 323,34.4%; 252,26.9%, respectively) during acute Covid infection.

Post-COVID, common persisting symptoms were myalgia (167,17.8%), fatigue (149,15.9%), shortness of breath (113,12%), and headache (85,9.1%). Among 178 patients with shortness of breath during acute Covid-19 infection, nearly two-thirds (63.5%) of them continued to have the difficulty during post-COVID also. Shortness of breath, fatigue, and arthralgia were the most common (228,24.3%; 220,23.4%; and 82,8.7%, respectively) new onset symptoms post-Covid.

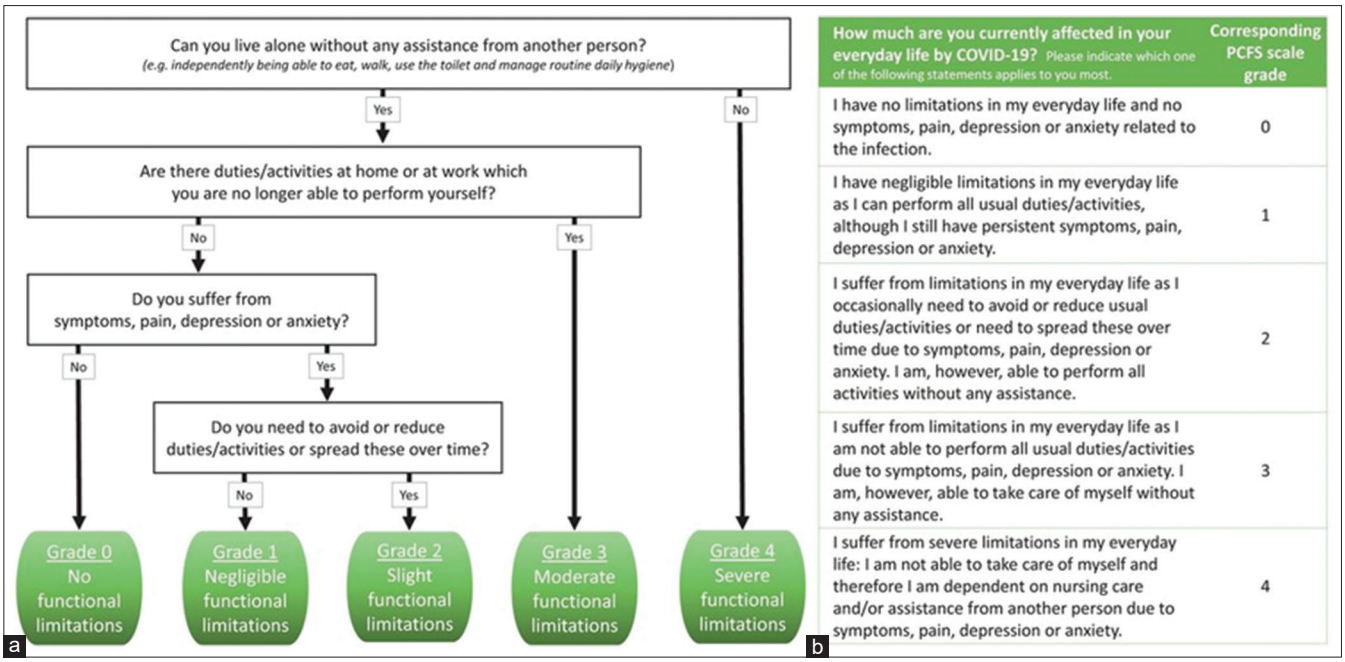

Figure 1: Self-report methods for the post-COVID-19 Functional Status (PCFS) Scale. Note: (a) flowchart, (b) patient questionnaire[15]

Anxiety was seen in 69 (7.4%) cases during COVID and persisted in 3 (0.32%) cases. New onset anxiety symptoms were reported in 9 (1%) and depressive thoughts in 4 (0.4%). Sleep disturbance was seen in 206 (19.42%) acute-COVID patients, persisted in 40 (4.3%) and appeared newly in 51 (5.4%) cases. Cough persisted in 52 (5.5%) and first appeared post-COVID in 47 (5.0%). [Table 2]

Post-COVID Functional Status Scoring showed Negligible functional limitation among 553 (66.11%) study population, No limitations in 276 (33.05%), Mild limitation in 34 (4.07%), and Moderate limitation in 2 (0.24%). Only 1 individual had Severe functional limitation (PCFS-4). [Figure 2]

Statistically significant association ($p < 0.05$) was found between functional impairment grading by PCFS and the age, gender, locality, type of family, duration of hospitalization, duration of unemployment following illness, source of infection, and comorbidities like diabetes mellitus and hypertension [Table 3].

Majority of the cases in the age-group between 0 and 10 had no functional limitation (PCFS 0). Between 20 and 80 years of age, most of the respondents had negligible functional limitation (PCFS-1). Only a 72-year-old male from urban Kozhikode had severe limitation (PCFS-4). None of the cases from rural locality had moderate or severe limitation. Majority of the patients (68.3%) from the nuclear family had a negligible limitation, whereas moderate-to-severe limitations were noticed only among cases from joint families. Out of the 60 cases who were unemployed following illness, 61.67% remained unemployed for more than 10 months post-COVID. 3.7% of travelers and 0.2% of cases who had a known contact as source of infection had moderate functional limitation.

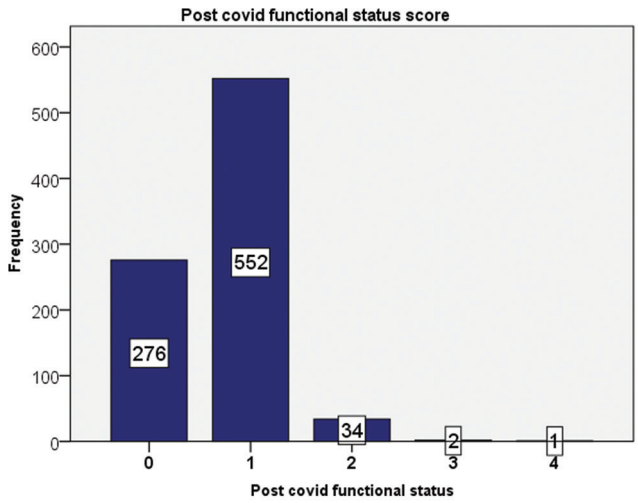

Figure 2: Post covid functional status score

Higher proportion of patients with diabetes mellitus (8,8.9%), hypertension (13,16%), coronary artery disease (7,25%), and bronchial asthma (5,15.6%) had mild-to-severe functional limitation compared to those without the comorbidities. Similarly, higher proportion of patients who were hospitalized for more than 10 days (5,16.13%) presented with mild-to-severe post-COVID functional limitation compared to those with less duration of hospitalization (7,11.11%).

Ordinal regression done had a significant model fitting (p-0.000), and the explained variation in the dependent variable based on our model is 64% (Nagelkerke coefficient-0.64)

Male gender, married status, history of CAD, and smoking had significant higher risk for post-COVID functional status limitation and urban locality and hospitalization had lower risk [Table 4].

Table 1: Demographic features of the study population

Parameters	Values *n* (%)
Patient's characteristics (*n*=865)	
Age	41.50±16.90 years*
Male	489 (56.6)
Female	376 (43.4)
Locality (*n*=865)	
Urban locality	671 (80.4)
Rural locality	78 (9.3)
Coastal locality	86 (10.3)
Type of Family (*n*=835)	
Nuclear	527
Joint	306
Extended	2
Marital Status (*n*=838)	
Married	649 (77.4)
Unmarried	186 (22.2)
Separated	3 (0.4)
Previous employment status (*n*=864)	
Professional	14 (1.6)
Semi-professional	12 (1.4)
Clerical/Shop/Farm	124 (14.4)
Skilled	71 (8.2)
Semi-skilled	138 (16)
Unskilled	99 (11.5)
Unemployed	406 (46.9)
Currently employment status among working population (*n*=684)	
Employed	394 (57.6)
Source of infection (*n*=850)	
Contact	658 (77.4)
Traveler	27 (3.2)
Unknown source	165 (19.4)
Linked to super spreader events (*n*=865)	141 (16.3)
Main Comorbidities (*n*=917)	
Diabetes mellitus	92 (10.1)
Hypertension	84 (9.1)
Coronary artery disease	30 (3.27)
Chronic lung disease	38 (4.14)
Acute COVID-19 Treatment details (*n*=701)	
Home isolation	308 (43.9)
First-Line Treatment Centers	307 (43.7)
Second-Line Treatment Centers	4 (0.5)
COVID hospital	82 (11.69)
Duration of admission in days	
Home	11.67±4.79*
First-Line Treatment Centers	10.10±2.32*
Second-Line Treatment Centers	1.25±0.5*
COVID hospital	9.13±4.19*

*Mean±SD

Table 2: Distribution of acute COVID-19 and post-COVID-19 symptoms

Symptom Status *n*=938	Acute Covid *n* (%)	Post-Covid		
		Persisting *n* (%)	New Onset *n* (%)	Total (%)
Sleep disturbance	206 (22.0)	40 (4.3)	51 (5.4)	91 (9.70)
Anxiety	69 (7.4)	3 (0.32)	9 (1)	12 (1.28)
Depressive thoughts	48 (5.1)	0 (0)	4 (0.4)	4 (0.43)
Chest pain	38 (4.1)	9 (1)	21 (2.2)	30 (3.2)
Shortness of breath	178 (19.0)	113 (12)	228 (24.3)	341 (36.35)
Arthralgia	89 (9.5)	29 (3.1)	82 (8.7)	111 (11.83)
Headache	323 (34.4)	85 (9.1)	37 (3.9)	122 (13.01)
Myalgia	252 (26.9)	167 (17.8)	86 (9.2)	253 (26.97)
Fatigue	229 (24.4)	149 (15.9)	220 (23.4)	369 (39.34)
Palpitation	55 (5.9)	7 (0.75)	13 (1.4)	20 (2.13)
Fever	505 (54)	32 (3.4)	15 (1.6)	47 (5.01)
Rhinitis	243 (26)	32 (3.4)	31 (3.3)	63 (6.72)
Sore throat	238 (25.4)	23 (2.4)	35 (3.7)	58 (6.18)
Cough	223 (23.8)	52 (5.5)	47 (5.0)	99 (10.55)
Loss of smell	433 (46.3)	23 (2.4)	8 (0.9)	31 (3.30)
Loss of taste	420 (44.9)	20 (2.1)	1 (0.1)	21 (2.24)
Loose stools	122 (13)	3 (0.3)	6 (0.6)	9 (0.96)
Vomiting	53 (5.7)	2 (0.2)	6 (0.6)	8 (0.85)
Red eye	26 (2.8)	0 (0)	7 (0.7)	7 (0.75)

Discussion

A previous study with 60-day follow-up[7] reported that 87% of COVID-19 patients discharged from hospital were still experiencing at least one symptom, and 44% of then had worsened their quality of life. The most common persistent symptoms in several other studies were fatigue and loss of sense of smell or taste[16]; fatigue and dyspnea followed by joint pain and chest pain[17]; fatigue (55%), dyspnea (42%), loss of memory (34%), concentration and sleep disorders (28% and 30.8%, respectively)[18]; fatigue or muscle weakness (63%, 1038 of 1655), sleep difficulties (26%, 437 of 1655), and anxiety or depression (23%, 367 of 1617).[19] The most common cardiovascular symptoms in post-COVID syndrome are chest pain or tightness, palpitations, dizziness, and an increase in resting heart rate.[20] Headache, vertigo, and chemosensory impairment are the most prevalent long-term neurologic effects after COVID-19. Up to 3 months following the commencement of the illness, major mood swings and "brain fog" have been described.[21] The symptom profile in the present study was consistent with these preceding studies.

Specific organ dysfunction, primarily affecting the heart, lungs, and brain, has been reported post-COVID-19. This could be the result of direct virus tissue invasion (possibly mediated by the presence of angiotensin-converting enzyme 2 receptor), severe inflammation and cytokine storm, immune system damage, the hypercoagulable state described in association with severe COVID-19, or a combination of these factors.[22] Neurosensory dysfunction is attributed to a chronic low-level brain inflammation, as well as a reduced ability to respond to new antigens and an accumulation of memory T cells, dysfunctional lymphatic drainage from the circumventricular organ, viral invasion in the extracellular spaces of the olfactory epithelium, and passive diffusion and axonal transport through the olfactory complex.[23]

Table 3: Association of PCFS with various factors

Demographic features	PCFS-0	PCFS-1	PCFS-2	PCFS-3	PCFS-4	*P*
Age						
0-10	26 (81.3)	5 (15.6)	1 (3.1)	0 (0.0)	0 (0.0)	x^2=18.65;
10-20	35 (53.8)	29 (44.6)	1 (1.5)	0 (0)	0 (0.0)	*P* -0.001
20-30	52 (43.0)	69 (57.0)	0 (.0)	0 (0)	0 (.0)	
30-40	56 (35.4)	97 (61.4)	5 (3.2)	0 (0)	0 (.0)	
40-50	49 (25.3)	137 (70.6)	8 (4.1)	0 (0)	0 (.0)	
50-60	21 (13.8)	122 (80.3)	8 (5.3)	1 (.7)	0 (0)	
60-70	29 (27.9)	71 (68.3)	4 (3.8)	0 (.0)	0 (.0)	
70-80	2 (6.9)	20 (69.0)	5 (17.2)	1 (3.4)	1 (3.4)	
More than 80 years	1 (50.0)	1 (50.0)	0(.0)	0 (0)	0 (0)	
Gender						
Male (*n*=489)	181 (37)	283 (57.9)	22 (4.5)	2 (0.4)	1 (0.)	x^2=18.65;
Female (*n*=376)	95 (25.3)	269 (71.5)	12 (3.2)	0	0	*P* -0.001
Area						
Urban locality (*n*=671)	218 (32.5)	433 (64.5)	18 (2.7)	1 (0.1)	1 (0.1)	x^2=25.496;
Rural locality (*n*=78)	23 (29.5)	50 (64.1)	5 (6.4)	0	0	*P* -0.000
Coastal locality (*n*=86)	16 (18.6)	59 (16.6)	10 (11.6)	1 (1.2)	0	
Type of family						
Nuclear	149 (28.3%)	360 (68.3)	18 (3.4)	0	0	x^2=23.844;
Joint	116 (37.9)	174 (56.9)	13 (4.2)	2 (0.7)	1 (0.3)	*P* -0.007
Extended	0	2 (100)	0	0	0	
Previous employment status						
Professional	3 (21.4)	11 (78.6)	0 (0.0)	0 (0.0)	0 (0.0)	x^2=24.528;
Semi-professional	5 (41.7)	7 (58.3)	0 (0.0)	0 (0.0)	0 (0.0)	*P*-0.653
Clerical/Shop/Farm	28 (22.6)	90 (72.6)	5 (4.0)	1(.8)	0 (0.0)	
Skilled	21 (29.6)	43 (60.6	7 (9.9)	0 (0.0)	0 (0.0)	
Semi-skilled	39 (28.3)	94 (68.1)	5 (3.6)	0 (0.0)	0 (0.0)	
Unskilled	38 (38.4)	57 (57.6)	4 (4.0)	0 (0.0)	0 (0.0)	
Unemployed	141 (34.8)	249 (61.5)	13 (3.2)	1 (0.2)	1 (0.2)	
Current employment status						
Working (*n*=394)	117 (29.7)	262 (66.5)	15 (3.8)	0	0	x^2-3.506; *P* -0.47
Not working (*n*=290)	85 (29.3)	188 (64.8)	15 (5.2)	1 (0.3)	1 (0.3)	
Duration of unemployment following illness						
Less than 1 month (*n*=9)	3 (33.3)	4 (44.4)	2 (22.2)	0	0	x^2=2.5;
1-5 months (*n*=18)	2 (11.1)	14 (77.8)	2 (11.1)	0	0	*P* -0.033
6-9 months (*n*=5)	0	4 (80)	1 (20)	0	0	
10-13 months (*n*=2)	0	1 (50)	0	1 (50)	0	
14-16 months (*n*=0)	0	0	0	0	0	
>16 months (*n*=35)	5 (14.3)	24 (68.6)	5 (14.3)	1 (2.9)	0	
Source of infection						
Contact (*n*=658)	214 (32.5)	418 (63.5)	25 (3.8)	1 (0.2)	0	x^2=27.82;
Traveler (*n*=27)	7 (25.9)	15 (55.6)	4 (14.8)	1 (3.7)	0	*P*-0.001
Unknown source (*n*=165)	50 (30.3)	109 (66.1)	5 (3)	0	1 (0.6)	
Relationship with source						
Household (*n*=389)	116 (29.8)	255 (65.6)	17 (4.4)	1 (0.3)	0	x^2=11.95;
Workplace (*n*=222)	83 (37.4)	133 (59.9)	6 (2.7)	0	0	*P*-0.153
Others (*n*=153)	40 (26.1)	104 (68)	7 (4.6)	1 (0.7)	1 (0.7)	
Link to super spreader events						
Yes (*n*=141)	44 (31.2)	86 (61)	10 (7.1)	1 (0.7)	0	x^2-6.38;
No (*n*=724)	232 (32)	466 (64.4)	24 (3.3)	1 (0.1)	1 (0.1)	*P* -0.173
Marital Status						
Married (*n*=649)	158 (24.3)	460 (70.9)	28 (4.3)	2 (0.3)	1 (0.2)	x^2=72.36;
Single (*n*=186)	102 (54.8)	82 (44.1)	2 (1.1)	0	0	*P*-0.000
Separated (*n*=3)	0	2 (66.7)	1 (33)	0	0	

Contd...

Table 3: Contd...

Demographic features	PCFS-0	PCFS-1	PCFS-2	PCFS-3	PCFS-4	*P*
Diabetes mellitus						
YES (*n*=90)	16 (17.8)	66 (73.3)	7 (7.8)	0 (0)	1 (1.1)	x^2=20.33;
NO (*n*=775)	260 (33.5)	486 (62.7)	27 (3.5)	2 (0.3)	0 (0)	*P*-0.000
Hypertension						
YES (*n*=81)	16 (19.8)	52 (64.2)	11 (13.6)	1 (1.2)	1 (1.2)	x^2=38.8;
NO (*n*=784)	260 (33.2)	500 (63.8)	23 (2.9)	1 (0.1)	0 (0)	*P* -0.000
Coronary artery disease						
YES (*n*=28)	9 (32.1)	12 (42.9)	6 (21.4)	0 (0)	1 (3.6)	x^2=54.4; *P*=0.000
NO (*n*=837)	267 (31.9)	540 (64.5)	28 (3.3)	2 (0.2)	0 (0)	
Asthma						
YES (*n*=32)	5 (15.6)	22 (68.8)	4 (12.5)	1 (3.1)	0 (0)	x^2=21.1; *P*=0.000
NO (*n*=833)	271 (32.5)	530 (63.6)	30 (3.6)	1 (0.1)	1 (0.1)	
Duration of COVID Hospital Admission (*n*=94)						
< 5 days (*n*=20)	2 (10.0)	17 (85)	1 (5)	0 (0)	0 (0)	x^2=28.20;
6-10 days (*n*=43)	8 (18.6)	29 (67.4)	5 (11.6)	1 (2.3)	0 (0)	*P*=0.005
11-15 days (*n*=27)	2 (7.4)	21 (27.8)	4 (14.8)	0 (0)	0 (0)	
16-20 days (*n*=4)	0 (0)	3 (75)	0 (0)	0 (0)	1 (25)	

Table 4: Predictors of Post-Covid Functional Status

Variable	Wald	Std. Error	Sig	Odds Ratio (Exp_B)	Lower	Upper
Age	3.20	0.04	0.07	0.92	0.83	1.01
Male gender	3.94	0.97	0.05	6.85	1.03	45.78
Locality						
Urban	8.21	1.72	0.00	0.01	0.00	0.21
Rural	0.31	4.43	0.58	0.08	0.00	492.34
Source of infection						
Contact	0.12	1.55	0.73	1.72	0.08	36.10
Travel	2.55	2.11	0.11	29.11	0.46	1827.84
Relationship						
Household contact	0.27	1.53	0.60	0.45	0.02	9.01
Workplace contact	0.00	1.58	0.98	0.95	0.04	21.13
Whether linked to super spreader events	0.14	1.23	0.71	1.58	0.14	17.57
Occupation						
Professional	1.37	4.62	0.24	221.10	0.03	1870.0
Semi-professional	0.60	2.44	0.44	0.15	0.00	17.85
Clerical/shop	0.03	1.81	0.86	1.39	0.04	48.07
Skilled	0.95	2.51	0.33	11.47	0.08	1558.26
Semiskilled	0.59	1.87	0.44	0.24	0.01	9.27
Unskilled	0.68	1.90	0.41	0.21	0.00	8.67
Currently employed	1.16	1.72	0.28	0.16	0.01	4.59
Married	7.98	1.71	0.00	125.93	4.39	3610.16
Nuclear family	0.47	0.88	0.49	1.83	0.33	10.23
Duration of hospital stay						
Up to 5 days	4.50	1.99	0.03	0.01	0.00	0.73
6-10 days	5.64	2.05	0.02	0.01	0.00	0.43
11-15 days	3.93	2.00	0.05	0.02	0.00	0.95
Comorbidities						
Coronary artery disease	8.56	1.85	0.00	224.12	5.97	8420.52
Smoker	5.04	2.59	0.02	333.51	2.09	5318.63
Hypertensive	0.05	1.14	0.82	1.29	0.14	12.14
Diabetic		1.18	0.37	2.90	0.28	29.54

Pathogenesis as reported includes enhanced cellular receptor angiotensin-converting enzyme-2, CNS hypoxia due to COVID-19-induced respiratory failure, thrombotic microangiopathy, and an indirect consequence of the

robust inflammatory response with widespread cytokine activation.[24] Alternatively, COVID-19's peripheral effects on the vasculature and other organ systems may disrupt central feedback loops, resulting in somatic symptoms that contribute to neuropsychiatric symptomatology.[25] COVID-19 physical distancing and quarantine guidelines have been associated with feelings of isolation and loneliness.[26] In this perspective, the current study's psychiatric manifestations, such as sleep difficulties, anxiety, and depressive thoughts, are explained.

COVID-19 survivors must have their functional limitations assessed in order to quantify the illness's long-term impact.[27] In the present study, 397 (57.6%) cases previously employed persons could not return to work post-COVID, 35 (8.8%) of them remained unemployed even after 16 months post-COVID. According to previous surveys, 7 (47%) had returned to work and 1 (7%) had retired voluntarily. New disabilities, such as dyspnea, were reported as having an influence on employability; a small proportion of patients stated that COVID-19 job restrictions prevented them from returning to work.

Chronic Fatigue Syndrome/Myalgic Encephalomyelitis (CFS/ME) symptomatology such as persistent fatigue, diffuse myalgia, depressive symptoms, and non-restorative sleep are likely in SARS-CoV-2, just as they were in SARS, where healthcare workers developed a CFS/ME like illness that prevented them from returning to work nearly 20 months later.[28,29] Fatigue, dyspnea, chest pain, cognitive difficulties, arthralgia, and a deterioration in quality of life have all been linked to SARS-CoV-2 infection in studies. (Huang *et al*., 2021).[19]

According to a study by Chopra V *et al*.,[30] 58 patients reported having new or worsening difficulty completing everyday chores, 78 patients who were employed prior to their hospitalization were unable to return to work, and 30 patients reported restricted hours or modified duties due to health concerns. Nearly half of the patients (238 of 488) were emotionally affected by their health, and 28 sought mental health treatment after discharge. In this study, 107 (11.40%) reported having some form of mental health issues. Prospective longitudinal studies involving objective parameters such as pulmonary function testing, the 6-minute walk test, quality of life, and the detection of depression, anxiety, and post-traumatic stress disorder will add to our knowledge of the overall long-term outcomes of SARS-CoV-2 infection.[27]

In the current study, 94 patients had history of hospitalization with a mean duration of 9.13 ± 4.19 days, of which 12 (12.77%) had mild to severe functional limitations. Thirty-five (4.05%) cases in the current study had mild-to-severe functional limitations, and 3 (8.57%) of them with moderate and severe limitation were above 50 years of age. Age and duration of hospital admission had significant association with post-COVID functional status. In a previous study, two hundred and two patients were discharged from hospital with a median (IR) hospital stay of 10 (7–17) days. Age and length of hospital stay was associated with higher risk of limitations in the functional status (grade II–IV of the PCFS).[27]

To conclude with, SARS-CoV-2-infected cases have persistent and new onset symptoms, and some degree of functional impairment post-COVID. Significant association was identified for various sociodemographic and clinical variables with the PCFS functional impairment grading. Age more than 50 years; male gender; urban locality; comorbidities such as diabetes, asthma, hypertension, coronary artery disease, and hospital stay more than 9 days were significant determinants of post-COVID functional limitation; also, male gender, married status, hospitalization, history of CAD, and smoking were significant predictors for post-COVID functional status limitation, while urban locality and hospitalization had a protective effect on PCF limitation. More epidemiological studies are required in this regard to identify impact for further interventions enabling quality post-COVID healthcare services.

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Conflicts of interest

There are no conflicts of interest.

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