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## Fatigue, perceived stigma, self-reported cognitive deficits and psychological morbidity in patients recovered from COVID-19 infection

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### ABSTRACT

**Background:** Few studies have highlighted multiple psychosocial and physical outcomes in patients with COVID-19 infection after recovery. However, the data from developing countries is limited.

**Aim:** To evaluate psychological morbidity, post-traumatic stress disorder (PTSD), fatigue, and perceived stigma among patients with COVID-19 after recovery from the acute phase of COVID-19 infection.

**Methods:** In a cross-sectional online survey, 206 adult patients (age > 18 years), recovered from COVID-19 infection completed the Patient Health Questionnaire-4 (PHQ-4), the Impact of Events Scale-Revised (IES-R), Fatigue Severity Scale (FSS), 4 items self-designed questionnaire evaluating cognitive deficits and self-designed questionnaire to evaluate perceived stigma. Additionally, they completed the information about demographic and clinical information.

**Results:** The prevalence of anxiety, depressive symptoms, and PTSD in the study sample was 24.8 %, 23.8 %, and 30 % respectively. About three-fifths of the participants (61.2 %) had at least one fatigue symptom as per the FSS with the mean FSS score being  $32.10 \pm 15.28$ . About one-fourth of the participants (23.7 %) reported “feeling confused and always feeling mentally foggy”, and 38 % of patients reported experiencing at least one cognitive problem. The level of felt stigma related to self was seen in 31.1 %, 20 % reported stigma related to family, and 50 % reported stigma in relation to neighbors and society. Those reporting higher PTSD scores had higher anxiety and depressive scores, reported more fatigue and stigma, and had a higher level of cognitive deficits. A higher fatigue score was also associated with higher anxiety, depression, and cognitive deficits.

**Conclusions:** Our study reveals that a significant proportion of patients after recovery from COVID-19 experience psychological morbidities, fatigue, cognitive problems, and stigma. Efforts should be made to take care of these issues in routine post-COVID follow-up care.

### 1. Introduction

COVID-19 pandemic has emerged as a severe crisis, involving multiple domains such as unemployment, financial crisis, severe health sector crisis, deaths of family members, and multiple long-standing post-COVID physical consequences. Many studies have shown that the survivors of COVID-19 infection have a higher prevalence of psychological morbidities (Rogers et al., 2020; Taquet et al., 2021), neurological complications (Taquet et al., 2021), fatigue (Garg et al., 2021; Stavem et al., 2021; Townsend et al., 2020), cognitive deficits or ‘mental slowing’/‘Brain Fog’ (Landau, 2021; Zhou et al., 2020) and stigma (Bagchi,

2020; Villa et al., 2020).

Data from a large scale study (n = 236,379) of patients diagnosed with COVID-19 infection revealed the estimated incidence of a neurological or psychiatric diagnosis in the 6 months follow up period to be 33.62 % and those admitted to an intensive care unit (ICU) had an incidence rate of 46.42 % (Taquet et al., 2021). Psychiatric diagnosis specific outcome as reported by the study suggested incidences of 0.67 % for dementia, 17.39 % for anxiety disorder, and 1.4 % for psychotic disorder with higher rates in those admitted in ICU during the acute illness (Taquet et al., 2021). Data also suggests the prevalence of post-traumatic stress symptoms (PTSS) or post-traumatic stress disorder

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(PTSD) in 20 %–96 % of the recovered patients (Bonazza et al., 2021; Castelli et al., 2020; Chew et al., 2020). Depressive symptoms during the recovery period have also been reported in 17–29 % of the participants (Chew et al., 2020; Vindegaard and Benros, 2020), with a higher rate among the healthcare workers.

The high prevalence of psychiatric morbidity has been attributed to the direct effect of the virus on the brain, and the psychosocial factors. The emerging data also provides evidence for the direct effect of the SARS-CoV-2 on the human central nervous system leading to neuropsychiatric sequelae such as mood changes, psychosis, and neuromuscular dysfunction during the recovery period (Troyer et al., 2020).

Among the physical outcomes of COVID-19, fatigue has received significant attention. Available data suggest a high prevalence of fatigue (ranging from 46 to 53 %) in the COVID-19 survivors (Qi et al., 2020; Stavem et al., 2021). The fatigue has been reported to be independent of the severity of the initial infection (Townsend et al., 2020). In terms of factors associated with fatigue emerging data indicate a higher prevalence of fatigue among females, those having pre-existing depression/anxiety, Vitamin D deficiency, hypothyroidism, polycythemia, iron deficiency anemia, and Vitamin B12 deficiency (Garg et al., 2021; Townsend et al., 2020). Further, there has been emerging data suggesting evidence for cognitive deficits and dementia in the patients recovered from COVID-19 infection (Beaud et al., 2020; Zhou et al., 2020).

Among the social outcomes, stigma has received some attention and it is considered to a significant contributor to poor mental health during the recovery period. Patients with COVID-19 have been the victims of severe social stigmatization during the acute phase of illness, during the quarantine period, and also during the recovery period (Bagcchi, 2020). Being labeled as “super-spreader”, “infecting the community” etc. further adds to the agony of the COVID-19 survivors (Bhattacharya et al., 2020). Patients with COVID-19 during their hospital stay report significant self-stigma, anticipatory stigma from family, and neighbors/society (Sahoo et al., 2020). However, stigma although is expected to affect the individual during the recovery period is not yet been explored in detail, and data in this regard is the form of viewpoints and perspectives (Baldassarre et al., 2020; Villa et al., 2020).

The data on the psychological morbidities, fatigue and reported stigma among patients with COVID-19 after recovery from the acute infection from the developing countries is limited. The psychosocial factors contributing to these outcomes can be quite different in developing countries compared to the Western countries. Therefore, the current study was planned with an aim to evaluate psychological morbidity, PTSD, fatigue, cognitive deficits and perceived stigma among patients with COVID-19 after recovery from the acute phase of COVID-19 infection.

## 2. Methodology

It was a cross-sectional online survey that included 206 adult patients (age > 18 years) who had recovered from COVID-19 infection. As a part of post-COVID follow-up, the patients admitted to our setup, are assessed for any psychological morbidity after 4–6 weeks of discharge. The study sample comprised of recovered patients (admitted to our setup), and we also followed a snowball sampling technique by asking the patients to circulate the survey link to their known contacts who had recovered from COVID-19 infection.

The study questionnaire included self-designed questions to collect information about the demographic factors, COVID-19 infection (days since recovery, number of days admitted inwards/ICUs, etc.), psychological morbidity, PTSD, stigma, cognitive deficits, and fatigue.

The depressive and anxiety symptoms were assessed by using the Patient Health Questionnaire-4 (PHQ-4) (Kroenke et al., 2009), which is a self-administered, ultra-brief screening instrument to detect both depression and anxiety. It has 2 items each from PHQ-9 and Generalized Anxiety Questionnaire-7. The PTSD was assessed by using the Impact of

Events Scale-Revised (IES-R), which is a self-reported 22 items scale. This is a validated scale that has been used in many studies (Weiss and Marmar, 2004). Fatigue was evaluated by using the Fatigue Severity Scale, which is a 9-item self-reported questionnaire developed to assess fatigue in patients with systemic lupus erythematosus, multiple sclerosis, etc (Krupp et al., 1989). Perceived stigma was assessed by using a self-designed questionnaire to assess the overall experience of self-stigma, stigma related to family, and society/neighbors. Each item was rated on a 5 point scale (0–4, with a higher score indicating higher stigma). The cognitive symptoms were assessed by using a 4 item self-designed questionnaire evaluating problems faced by the patients in the domains of attention/concentration and in performing the daily tasks. Each item was rated on a 4 point scale (0–3, with a higher score indicating higher dysfunction).

An online survey link was generated using the Google form consisting of all the above-mentioned questionnaires and was circulated through Whatsapp. The study was approved by the Institute’s Ethics committee. The survey cover letter explicitly mentioned that completion of the survey implied informed consent and non-participation in the survey would have no consequences and the recipients can ignore the survey link. Additionally, the cover letter also mentioned responding only if the subject had suffered from COVID-19 infection and ignoring if they had not. We took care of duplicate entries by screening the IP addresses of the responses.

The data so collected were analyzed using SPSS software, version 20.0. Descriptive statistics were applied. Pearson’s /Spearman’s correlation coefficient was used to evaluate the association between different variables.

## 3. Results

During the study period 6th May to 2nd June 2021, 206 persons recovered from COVID-19 infection completed the survey and formed the study sample.

The mean age of the participants was 36.08 (SD-13.12) years (range-18–72 years), with 8% of participants aged more than 60 years. More than half of the participants were males (53.9 %) and married (56.3 %). The majority of the participants were educated with graduate or post-graduate qualifications and one-third of respondents were doctors (36.9 %). About two-thirds of the participants were admitted to COVID wards during the acute phase infection with only 8% being admitted to ICUs. The majority of the participants were admitted alone (57.3 %) and were infected alone in their families (58.7 %). The mean duration of hospital stay was around 11.3 (SD-6.52) days and the mean duration of ICU stay for those required ICU care was 10.7 (SD-4.39) days. Further, about one-fifth (22.8 %) reported having seen someone dying during their hospital stay in ICU/wards. The mean duration of days since discharge from the hospital or having recovered from the acute stage was 33.72 (SD-49.52) days at the time of completing the survey. About one-fourth of the participants had comorbid medical conditions (27.7 %) (Table 1).

On PHQ-4, the mean anxiety score was 1.55 (SD-1.63) and the mean depressive score was 1.43 (1.68). The prevalence of anxiety and depression was found to be 10.2 % and 9.2 % respectively, with an overall prevalence of both anxiety and depression being 14.6 %. The mean IES-R score was 18.51 (SD-16.04) with 30 % of the participants reporting PTSS like symptoms. Partial PTSD and probable PTSD were found in 12 % and 2.9 % participants respectively, and 15 % of the participants reported definite PTSD as per the cut-off score of IES-R (Table 2).

## 4. Prevalence of Fatigue in recovered patients

Fatigue was evaluated on the FSS and as revealed from the specific items scores (Table 3), about 43 % agreed of having low motivation when fatigued (FSS-item 1), and reported exercise brings on fatigue (FSS-item 2). About two-fifths agreed that they are easily fatigued (FSS-

**Table 1**  
Demographic and clinical details of the study participants (n = 206).

Variables	Frequency (%) / Mean (SD) (n = 206)
Age	36.08 (13.12) Range: 18–72
No of patients age $\geq$ 60 years	18 (8.7 %)
Gender : Male /Female	111 (53.9 %)/95(46.1 %)
<b>Marital status :</b>	
Single	90 (43.7 %)
Married and living with spouse	103 (50.0 %)
Married and living away from spouse	13 (6.3 %)
<b>Educational qualifications</b>	
Less than 10	4 (1.9 %)
Matriculation	6 (2.9 %)
10 + 2	15 (7.3 %)
Graduate	98 (47.6 %)
Postgraduate	83 (40.3 %)
<b>Healthcare worker status : Yes</b>	90 (43.7 %)
<b>Profession/Occupation</b>	
Doctor	76 (36.9 %)
Nurse	11 (5.3 %)
Hospital attendant	3 (1.5 %)
Businessman	13 (6.3 %)
Lawyer	6 (2.9 %)
Farmer	3 (1.5 %)
Engineer	6 (2.9 %)
Bureaucrat	4 (1.9 %)
Professional	34 (16.5 %)
Student	18 (8.7 %)
Homemaker/Housewife	11 (5.3 %)
Retired	4 (1.9 %)
Others	17 (8.3 %)
<b>Place of stay during COVID-19 infection</b>	
Home isolation	70 (34.0 %)
Admitted in COVID ward but did not required oxygen	92 (44.7 %)
Admitted in COVID ward and required oxygen support	27 (13.1 %)
Admitted in COVID ward but later shifted to ICU	17 (8.3 %)
<b>Duration of hospital stay (in days) for those admitted in hospital (n = 136)</b>	11.30 (6.52); Range: 2–40 Median:10.0
<b>Were you admitted in COVID-ICU : Yes</b>	17 (8.3 %)
<b>Number of days in COVID –ICU for those admitted to ICUs (n = 17)</b>	10.70 (4.39); Range: 2–20 Median -11.0
<b>Seen anyone dying while admitted in ICU/COVID wards : Yes</b>	47 (22.8 %)
<b>Were you admitted alone or with any of your family members in COVID wards?</b>	
Admitted alone	118 (57.3 %)
Admitted with family members	18 (8.7 %)
Not admitted	70 (34.0 %)
<b>Were you infected alone in your family or other family members were also infected?</b>	
Infected alone	121(58.7 %)
Infected with family members too	85 (41.3 %)
<b>Number of days since discharge or recovery from illness (i.e. duration between recovery and day of filling the survey)</b>	33.72 (49.52) Range: 1–300
<b>Co-morbid conditions</b>	
No medical illness	149 (72.3 %)
Bronchial asthma	4 (1.9 %)
Malignancy	1 (0.5 %)
Hypertension	18 (8.7 %)
Hypothyroidism	6 (2.9 %)
Diabetes mellitus	26 (12.6 %)
Arthritis	2 (1.0 %)

item 3), 44 % reported fatigue to be interfering with their physical functioning (FSS-item 4) and 36 % reported fatigue preventing them from sustained physical functioning (FSS-item 6). About 35 % reported fatigue to be causing frequent problems for them (FSS-item 5) and fatigue interfering with carrying out duties and responsibilities (FSS-item 7). About one-third agreed that fatigue was among the three most disabling symptoms (FSS-item 8) and 35 % agreed to it to interfere with work, family, and social life (FSS-item 9). The mean FSS score was 32.1 (SD-15.28) and the mean global fatigue level was 5.93 (SD-2.90) (Table 3).

## 5. Prevalence of self-reported cognitive deficits in recovered patients

The participants were asked to rate their cognitive functions on a 4 item Likert scale (ranging from 0 to 3), specifically designed to tap cognitive deficits (Table 4). About one-fourth of the participants (23.7 %) reported “feeling confused and always feeling mentally foggy”, and 31.5 % reported having a “lack of attention and concentration”, 22.3 % reported “forgetting recent things” and 18.4 % reported “forgetting past events”. The mean cognitive score was 1.43 (SD-2.45) (Table 4).

When enquired about felt stigma, overall, the level of felt stigma related to self was seen in 31.1 % (i.e., reported stigma on at least one of the items related to self), 20 % reported stigma related to family (i.e., reported stigma in at least one of the items related to family) and 50 %

**Table 2**  
Anxiety, depressive symptoms and PTSD in the recovered patients (n = 206).

PHQ-4 Over the last 2 weeks,	Not at all Frequency (%) (0)	Several days Frequency (%) (1)	More than half the days Frequency (%) (2)	Nearly everyday Frequency (%) (3)
<b>Anxiety domains</b>				
1. How often have you been bothered by feeling nervous, anxious or on edge?	94 (45.6 %)	67 (32.5 %)	26 (12.6 %)	19 (9.2 %)
2. How often have you been bothered by not being able to stop or control worrying?	111 (53.9 %)	56 (27.2 %)	29 (14.1 %)	10 (4.9 %)
<b>Depression domains</b>				
1. How often have you been bothered by little interest or pleasure in doing things?	109 (52.9 %)	59 (28.6 %)	28 (13.6 %)	10 (4.9 %)
2. How often have you been bothered by feeling down, depressed, or hopeless?	111 (53.9 %)	53 (25.7 %)	29 (14.1 %)	13 (6.3 %)
Mean total PHQ-4 Anxiety domain	1.55 (1.63); Range: 0–6; Median:1.0			
Anxiety : Present (cut off score≥3)	51 (24.8 %)			
Mean total PHQ-4 Depression domain	1.43 (1.68); Range: 0–6; Median:1.0			
Depression : Present (Cut off ≥3)	49 (23.8 %)			
Mean total PHQ-4 score	2.98 (3.03); Range : 0–12; Median:2.0			
<b>Severity of depression and anxiety as per PHQ-4</b>				
Normal (0–2)	106 (51.5 %)			
Mild (3–5)	58 (28.2 %)			
Moderate (6–8)	29 (14.1 %)			
Severe (9–12)	13 (6.3 %)			
<b>Overall prevalence</b>				
% of patients reporting PHQ-4 anxiety score ≥3	51 (24.8 %)			
% of patients reporting PHQ-4 depression score≥3	49 (23.8 %)			
% of patients reporting only anxiety but no depression	21 (10.2 %)			
% of patients reporting only depression but no anxiety	19 (9.2 %)			
% of patients reporting both anxiety and depression	30 (14.6 %)			
<b>Impact of Events Scale-Revised</b>				
Intrusion subscale	6.83 (6.43)			
Avoidance subscale	6.39 (5.74)			
Hyperarousal subscale	5.28 (4.90)			
Total IES-R score	18.51 (16.04); Range: 0–67; Median :15.0			
<b>Grading</b>				
No PTSD (Total IES-R score <24)	143 (69.4 %)			
Partial PTSD (Total IES-R score 24–32)	25 (12.1 %)			
Probable PTSD (Total IES-R score 33–36)	6 (2.9 %)			
PTSD (Total IES-R score>37)	32 (15.5 %)			

reported stigma in relation to neighbors and society (i.e., reported stigma on at least one of the items related to neighbors/society) (Table 5).

Age, gender, marital status, presence/absence of physical illness, total duration of hospital stay, duration of ICU stay, and days since discharge/recovery were not found to have any significant association with anxiety, depression, PTSD, fatigue, felt stigma, and cognitive deficits. Those reporting higher PTSD scores had higher anxiety and depressive scores, reported more fatigue, reported higher level of and

stigma and had a higher level of cognitive deficits (Table 6). A higher fatigue score was also associated with higher anxiety, depression, and cognitive deficits. Stigma was more strongly associated with PTSD, anxiety, and depression (Table 6).

## 6. Discussion

The data on the psychosocial and physical outcomes in patients with COVID-19 following recovery from COVID-19, infection is emerging.

**Table 3**  
Prevalence of fatigue as reported in the Fatigue severity scale (FSS) in recovered patients (n = 206).

Variables	Strongly disagree Frequency (%) (1)	Slightly disagree Frequency (%) (2)	Disagree Frequency (%) (3)	Neutral Frequency (%) (4)	Agree Frequency (%) (5)	Agree to some extent Frequency (%) (6)	Strongly agree Frequency (%) (7)
1. My motivation is lower when I am fatigued	41 (19.9)	24 (11.7)	23 (11.2)	28 (13.6)	55 (26.7)	19 (9.2)	16 (7.8)
2. Exercise brings on my fatigue	43 (20.9)	30 (14.6)	21 (10.2)	24 (11.7)	51 (24.8)	16 (7.8)	21 (10.2)
3. I am easily fatigued	48 (31.6)	27 (13.1)	25 (12.1)	22 (10.7)	54 (26.2)	15 (7.3)	15 (7.3)
4. Fatigue interferes with my physical functioning	43 (20.9)	30 (14.6)	19 (9.2)	23 (11.2)	58 (28.2)	16 (7.8)	17 (8.3)
5. Fatigue causes frequent problems for me	47 (22.8)	27 (13.1)	29 (14.1)	31 (15.0)	43 (20.9)	15 (7.3)	14 (6.8)
6. My fatigue prevents sustained physical functioning	43 (20.9)	32 (15.5)	23 (11.2)	33 (16.0)	44 (21.4)	20 (9.7)	11 (5.3)
7. Fatigue interferes with carrying out certain duties and responsibilities.	51 (24.8)	25 (12.1)	26 (12.6)	32 (15.5)	44 (21.4)	13 (6.3)	15 (7.3)
8. Fatigue is among my three most disabling symptoms	47 (22.8)	28 (13.6)	31 (15.0)	31 (15.0)	30 (14.6)	19 (9.2)	20 (9.7)
9. Fatigue interferes with my work, family, or social life	45 (21.8)	26 (12.6)	33 (16.0)	29 (14.1)	43 (20.9)	16 (7.8)	14 (6.8)
Mean FSS score (SD)	32.10 (15.28) Range : 9–63 Median – 35.0						
Rate your level of fatigue /global fatigue on the scale from 0 to 10 ; “0” being worst and “10” being normal.	5.93 (2.90) Median -6.0						
Number of patients reporting at least one fatigue symptom (agree/agree to some extent/strongly agree)	126 (61.2)						



**Table 4**  
Cognitive deficits as reported (n = 206).

Variables	Same as before or Not much change Frequency (%) (0)	Agree Frequency (%) (1)	Agree to some extent Frequency (%) (2)	Strongly agree Frequency (%) (3)
I feel confused and mentally foggy always	157 (76.2)	33 (16.0)	11 (5.3)	5 (2.4)
I have lack of attention and concentration nowadays	142 (68.9)	33 (16.0)	23 (11.2)	8 (3.9)
I forget recent things nowadays	161 (78.2)	30 (14.6)	9 (4.4)	6 (2.9)
I forget past events nowadays	169 (82.0)	22 (10.7)	11 (5.3)	4 (1.9)
Mean Cog score (SD)	1.43 (2.45)			
Number of patients reporting at least one self-reported cognitive deficit/symptom (agree/agree to some extent/strongly agree)	79 (38.3)			

Long term psychological and neurological sequelae are being reported from different parts of the globe (Hao et al., 2020; Nalleballe et al., 2020; Rogers et al., 2020; Taquet et al., 2021; Varatharaj et al., 2020). Additionally, studies suggest a bidirectional relationship between COVID-19 and the development of psychiatric disorders (Taquet et al., 2020; Wang et al., 2021). However, the research on specific psychosocial outcomes is limited. In this regard, the current study findings add to the data on psychosocial and physical outcomes.

As evident from the study findings, the prevalence of anxiety, depression and PTSD in the study sample was 24.8 %, 23.8 %, and 30 %, respectively. Overall prevalence of concomitant anxiety and depression was found to be 14.6 % and definite PTSD (as per IES-R) to be 15 %. The study findings are in line with existing literature for anxiety, depression, and PTSD in recovered persons with COVID-19 infection (Bonazza et al., 2021; Castelli et al., 2020; Chew et al., 2020; Taquet et al., 2021). Available studies have reported female gender, receiving more negative news reports, higher exposure to traumatic experiences and low perceived social support to be the predictors of PTSD in patients hospitalized with COVID-19 and the general population (Chen et al., 2021; Liu et al., 2020). However, the present study did not find any specific predictor for the development of PTSD, although we considered

variables like the duration of hospital stay, having seen anyone dying in ICU, admission to ICU, being admitted alone, etc. Similar findings have been reported by an Italian study suggesting no significant correlation/association between duration of hospitalization, the severity of disease, or ICU care with psychological outcomes and PTSD (Bonazza et al., 2021). These findings are in sharp contrast with the literature available during the pre-COVID era, where admission to an ICU set up, type of treatment being provided (such as administration of sedatives) and different ICU clinical factors (such as ICU delirium) to be contributing to the development of post-ICU PTSD (Davydow et al., 2008; Kwek et al., 2006).

Fatigue has been reported to be one of the significant presenting complaints during the acute phase of COVID-19 infection (44–70 %) (Huang et al., 2020; Wang et al., 2020) and also had now been recognized to be quite prevalent (46–53%) in the post-recovery period (Stavem et al., 2021; Townsend et al., 2020). The present study also found about three-fifths of the participants (61.2 %) having at least one fatigue symptom as per the FSS. More particularly, about two-fifths (40 %) reported feeling easily fatigued (FSS-item 3), and about one-third agreed that fatigue was among the three most disabling symptoms (FSS-item 8). These findings suggest that there is a high prevalence of fatigue after

**Table 5**  
Felt Stigma faced by the patients recovered from COVID-19 (n = 206).

How would you describe your current view about COVID-19 status in relation to others and the society	Never Frequency (%) (0)	Sometimes Frequency (%) (1)	Often Frequency (%) (2)	Usually Frequency (%) (3)
<b>Related to self</b>				
Are you worried that others will come to know that you suffered from COVID-19	156 (75.7)	35 (17.0)	11 (5.3)	4 (1.9)
Are you trying to hide, about your COVID-19 infection from others	175 (85.0)	21 (10.2)	6 (2.9)	4 (1.9)
You are feeling ashamed because you tested positive for COVID-19 infections	183 (88.8)	16 (7.8)	6 (2.9)	1 (0.5)
You are feeling embarrassed because you tested positive for COVID-19 infections	183 (88.8)	19 (9.2)	2 (1.0)	2 (1.0)
Number of patients reporting stigma (sometime/often/usually) in at least one of the items	64 (31.1)			
<b>Related to family</b>				
People in your family are avoiding you	184 (72.3)	15 (7.3)	6 (2.9)	1 (0.5)
People in your family are unkind to you	183 (88.8)	18(8.7)	3 (1.5)	2 (1.0)
People in your family are uncomfortable with you	191 (92.7)	10 (4.9)	4 (1.9)	1 (0.5)
People in your family are afraid of you, because of your COVID-19 positive status in the past	185 (89.8)	15 (7.3)	4 (1.9)	2 (1.0)
People in your family avoid touching you, because of your COVID-19 positive status in the past	180 (87.4)	16 (7.8)	7 (3.4)	3 (1.5)
Number of patients reporting stigma (sometime/often/usually) in at least one of the items	43 (20.9)			
<b>Related to Related to neighbors/society neighbors/society</b>				
People are making you feel that, you were infected because of your fault	149 (72.3)	39 (18.9)	8 (3.9)	10 (4.9)
People in your neighbourhood are uncomfortable with you	137 (66.5)	58 (28.2)	3 (1.5)	8 (3.9)
People in your neighbourhood are unkind to you	145 (70.4)	48 (23.3)	6 (2.9)	7 (3.4)
People in your neighbourhood are afraid of you, because of your COVID-19 positive status in the past	172 (83.5)	23 (11.2)	8 (3.9)	3 (1.5)
People in your neighbourhood are avoiding you	146 (70.9)	45 (21.8)	11 (5.3)	4 (1.9)
People in your neighbourhood avoid touching you, because of your COVID-19 positive status in the past	155 (75.2)	38 (18.4)	7 (3.4)	6 (2.9)
You have been hurt emotionally be people's reaction towards you, because of your COVID-19 positive status in the past	158 (76.7)	34 (16.5)	10 (4.9)	4 (1.9)
Number of patients reporting stigma (sometime/often/usually) in at least one of the items	103 (50.0)			
Mean self stigma score (SD)	0.84 (1.66); Range 0–12; Median -0			
Mean stigma related to family score (SD)	0.72 (1.88); Range 0–13; Median -0			
Mean stigma score (neighbourhood/society) (SD)	2.58 (3.73); Range 0–21; Median-1.0			
Total mean stigma score (SD)	4.15 (6.13); Range 0–42; Median-2.0			

**Table 6**  
Association between PTSD, Anxiety, depression with fatigue, cognitive deficits, stigma and other clinical variables.

Variables	Total IES-R	PHQ-4 anxiety score	PHQ-4 depression score	Total PHQ-4 score	Total FSS score	Cognitive score	Total stigma score
Age	-0.10 (0.152)	-0.117 (0.095) <sup>#</sup>	-0.055 (0.429) <sup>#</sup>	-0.055 (0.429) <sup>#</sup>	-0.035 (0.622)	-0.127 (0.07) <sup>#</sup>	0.118 (0.092) <sup>#</sup>
Duration of hospital stay	0.006 (0.936)	0.015 (0.835) <sup>#</sup>	-0.125 (0.073) <sup>#</sup>	-0.057 (0.417) <sup>#</sup>	-0.052 (0.460) <sup>#</sup>	0.079 (0.26) <sup>#</sup>	0.109 (0.120) <sup>#</sup>
No of days in ICU	-0.008 (0.919)	0.019 (0.819) <sup>#</sup>	0.043 (0.596) <sup>#</sup>	0.045 (0.579) <sup>#</sup>	0.04 (0.622) <sup>#</sup>	-0.015 (0.850) <sup>#</sup>	0.054 (0.509) <sup>#</sup>
Days since discharge or recovery from illness	-0.015 (0.829)	0.049 (0.480) <sup>#</sup>	0.0001 (0.999) <sup>#</sup>	0.037 (0.593) <sup>#</sup>	-0.032 (0.649) <sup>#</sup>	0.015 (0.836) <sup>#</sup>	-0.014 (0.844) <sup>#</sup>
PHQ-4 anxiety score	0.359 (<0.001) <sup>***#</sup>	XX	XX	XX	XX	XX	XX
PHQ-4 depression score	0.476 (<0.001) <sup>***#</sup>	0.662 (<0.001) <sup>***#</sup>	XX	XX	XX	XX	XX
Total PHQ-4 score	0.461 (<0.001) <sup>***#</sup>	0.914 (<0.001) <sup>***#</sup>	0.90 (<0.001) <sup>***#</sup>	XX	XX	XX	XX
Total FSS score	0.321 (<0.001) <sup>***#</sup>	0.433 (<0.001) <sup>***#</sup>	0.425 (<0.001) <sup>***#</sup>	0.482 (<0.001) <sup>***#</sup>	XX	XX	XX
Total Cognitive score	0.254 (<0.001) <sup>***#</sup>	0.430 (<0.001) <sup>***#</sup>	0.322 (<0.001) <sup>***#</sup>	0.418 (<0.001) <sup>***#</sup>	0.565 (<0.001) <sup>***#</sup>	XX	XX
Total stigma score	0.242 (<0.001) <sup>***#</sup>	0.184 (0.008) <sup>#</sup>	0.174 (0.012) <sup>#</sup>	0.204 (0.003) <sup>#</sup>	0.079 (0.259) <sup>#</sup>	0.065 (0.351) <sup>#</sup>	XX

<sup>#</sup> - spearman's correlation co-efficient.

recovery from COVID-19 infection which is linked with greater psychological morbidity. Previous studies have reported female gender, being single, high symptom load and confusion during the acute COVID-19 infection, and pre-existing diagnosis of depression/anxiety, presence of co-morbid hypothyroidism and anemia to be strongly associated with fatigue post-COVID (Garg et al., 2021; Stavem et al., 2021; Townsend et al., 2020) and no association of fatigue with severity of COVID-19 infection (ICU admission, oxygen requirement), and routine laboratory inflammatory marker levels (Townsend et al., 2020). In contrast to these findings, our study did not find any significant association of fatigue with any of the acute COVID-19 infection-related variables (duration of hospital stay, duration of ICU stay, days since recovery, age, gender, marital status, presence of medical co-morbidities) and fatigue post-COVID (although we did not have data about inflammatory markers). Depression is a mediator of chronic fatigue and PTSS symptoms in MERS survivors (Lee et al., 2019). The present study also revealed a strong association between anxiety and depressive symptoms and fatigue post-COVID-19, suggesting mediating effects of depression/anxiety in experiencing post-COVID fatigue. There has been an increasing concern that COVID-19 can trigger various post-viral fatigue syndromes shortly (Wilson, 2020; Wong and Weitzer, 2021). Therefore, mental health morbidities' evaluation is of utmost importance to address and treat fatigue post COVID.

Another important outcome in the post-COVID period reported in some of the studies includes cognitive deficits or mental confusion (Zhou et al., 2020). The spectrum of cognitive deficits can range from mild cognitive dysfunction/impairment to severe dementia (Di Pietro et al., 2021; Vanderlind et al., 2021). Self-reporting of cognitive deficits is considered as one of the early intervention strategies to detect mild cognitive impairment and dementia in the community (Kasai et al., 2021). Therefore, using a self-reported cognitive symptom questionnaire can be regarded as a useful strategy to screen cognitive deficits in individuals who have recovered from COVID-19. In the present study, about two-fifths (38.3 %) of the participants had at least one self-reported cognitive symptom. However, as previous studies have not reported on the prevalence of cognitive deficits, it isn't easy to compare the findings with the existing literature. Therefore, the study's findings should be considered preliminary, which calls for a detailed evaluation of cognitive function in future studies. However, the exact course of cognitive sequelae is limited by the lack of longitudinal studies on the cognitive profile of recovered patients. Hence in the future, more studies with the use of clinical and neuropsychological tests with longitudinal study design will be beneficial to tap the exact prevalence and course of cognitive deficits in recovered patients in the community.

Stigma can be regarded as one of the greatest social consequences of COVID-19 infection. There have been reports of significant discrimination of healthcare workers on COVID-19 duties (Bagchi, 2020; Bhat-tacharya et al., 2020), stigma against colleagues (Grover et al., 2020), and anticipatory stigma from the society in the hospitalized patients with COVID-19 infection (Sahoo et al., 2020). The present study suggests that a significant proportion of patients have self-stigma (31 %), stigma related to family members (20.9 %), and high felt stigma related to other members of the society (at least one item -50 %). These findings highlight the widespread prevalence of stigma in public for COVID-19, which requires urgent attention and awareness at a global level.

We are well aware of our limitations. Some of these include a web-based cross-sectional survey on a limited number of patients, the use of screening questionnaires to assess psychological morbidity, and relying on self-reported responses by the participants. Future studies with a longitudinal study design on a larger sample would help estimate the prevalence, course, and outcome of psychological morbidities, fatigue, cognitive deficits, and stigma in a better way.

To conclude, the present study reveals that a significant proportion of patients after recovery from COVID-19 experience psychological morbidities (anxiety -24.8 %, depression-23.8 % and PTSD-30 %), 60 % experience at least one fatigue symptom, and 38 % experience cognitive

deficit in at least one of the domains. Further, the study found the existence of a significant amount of felt/perceived stigma, mostly in relation to society/neighborhood in patients recovered from COVID-19 infection.

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## Declaration of Competing Interest

All authors have no conflicts of interest to declare.

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