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Association of Post-COVID Fatigue, Dyspnea, and Functional State with Sociodemographic Variable among the COVID-19 Sufferer of an Urban Section in Northeast India

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Abstract

Coronavirus disease-19 (COVID-19), produced by the severe acute respiratory syndrome coronavirus 2 a global pandemic, has many non-respiratory symptoms which persist for several months after the initial infection. The presence of post-COVID-19 conditions may affect the functional state and quality of life in COVID-19 patients who were recovered in either home isolation or acute care hospital settings. The present study is a community-based cross-sectional survey undertaken during the devastating second wave of COVID-19 and the subjects recruited were ≥ 18 years with more than 3 weeks of post-COVID state selected from the municipality areas of Guwahati Urban, Northeast India. All the participants were screened for their sociodemographic characteristics, fatigue with Chalder fatigue scale (CFS), dyspnea, and functional state with MRC dyspnea grade and post-COVID functional scale (PCFS). Descriptive statistics and Pearson product-moment correlation coefficient analysis were used for statistical analysis where the fatigue total score and variable such as smoking status ($P = 0.050$) and time since symptom onset of COVID-19 ($P = 0.046$) in weeks showing a statistical significant relationship. There is a significant association between CFS and MRC grade with PCFS with $P = 0.000$ and 0.008, respectively. The study concluded that post-COVID conditions such as fatigue are more prevalent among the all individuals irrespective of their COVID-19 management in either home isolation or acute hospital care settings.

Keywords: Coronavirus disease-19, Dyspnea, Fatigue, Functional capacity, Post-COVID conditions

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Introduction

Coronavirus disease-19 (COVID-19), produced by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) a global pandemic, has posed significant threats to health globally. COVID-19 infection has other manifestations beyond the respiratory illness, including cardiac injury, thrombotic complications, renal, gastrointestinal, neurologic, and many others.[1,2] Moreover, non-respiratory symptoms such as fatigue, tiredness, malaise, sleepiness, and headache were more common in acute phases of COVID-19 but may persist several months after the initial infection. The prevalence of post-COVID-19 symptoms hypothetically depends on many factors: The demographic profile, comorbidities, and the severity of acute COVID-19 infection.[3,4]

There is considerable literature pertaining to post-COVID-19 disease and its trigger to post-viral fatigue syndromes and a breathlessness issues.[5,6] Halpin *et al*. in a cross-sectional study reported that new illness-related fatigue, breathlessness, and psychological distress were commonly reported at 7 weeks after discharge from hospital with a clinically significant drop in the quality of life of many individuals.[3] Garg *et al*. studied patients with mild COVID-19 with persistent fatigue to identify possible modifiable risk factors and concluded that the most patients recover uneventfully by 2 ½ months post-infection and patients presenting with persistent fatigue after the resolution of COVID-19 should be evaluated for underlying abnormalities.[7] A meta-analysis shows that post-COVID-19 symptoms are present in more than 60% of patients infected by SARS-CoV-2 and among them fatigue and dyspnea were the most prevalent post-COVID-19 symptoms, particularly 60 and ≥90 days after.[8]

Categorizing fatigue into recent fatigue, prolonged fatigue, and chronic fatigue, according to the time of evolution (less than 1 month, more than 1 month, and more than 6 month, respectively),[9] seems to be important to rule out its causation and for implicating multidimensional health-care measures for its remedial. However, since the outbreak of COVID-19 pandemic, most attention has focused on prevention of transmission of the SARS-CoV-2 and addressing the management of moderately and severely affected patients in acute care settings.

Single studies support the presence of several post-COVID-19 symptoms, but there is limited information regarding relationship of symptoms such as fatigue, breathlessness, and reduced functional capacity in COVID-19 patients who were recovered in home isolation or acute care hospital settings. Therefore, it is necessities to assess the prevalence of fatigue, breathlessness, and functional state in post-COVID-19 state. In this current study of SARS-CoV-2-infected individuals surveyed at 3 weeks after diagnosis, we aimed to determine the prevalence of fatigue, dyspnea, and functional state in hospitalized and non-hospitalized subjects in an urban society of Northeast India, on average 3 weeks after COVID-19 infection, and to correlate the post-COVID-19

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fatigue, breathlessness, and level of functional capacity with the demographic profiles of the infected individuals.

Materials and Methods

A community-based cross-sectional survey was undertaken during the time period of devastating second wave of COVID-19 in India and the subjects aged ≥18 years were recruited from municipality areas of Guwahati Urban, the largest city of Northeast India. Snowball sampling, a non-probability sampling technique, was used to recruit the subject affected by COVID-19 during the period of April–July 2021. Due to the second wave of COVID-19 conflict environment, the construction of sampling frame seems to be difficult. Therefore, we adopted the measure to recruit subject by recruitment technique where existing participants recruit future subjects from among their acquaintances. All the participants were contacted by phone and confirmed their willingness to participate for the study. Following which the participant's were screened for the inclusion and exclusion selection criteria.

Inclusion Criteria

People aged ≥18 years of either gender tested positive for COVID-19 disease with reverse transcription polymerase chain reaction test during the second wave of COVID-19 and should be in post-recovery state of at least 3 weeks duration and who had sufficient language skills to understand and to respond to questionnaire.

Exclusion Criteria

Not willing to participate, residing outside the catchment area, individuals with second attack of COVID-19, and incomplete or non-response to questionnaire.

Till July 31, 2021, we identified 120 individuals post-COVID-19 state, treated/managed their diseased state in home isolation and hospital settings. Near about 62 subjects were excluded because of their refusal for participating and non-response to questionnaire. All of them were screened for their sociodemographic characteristics, assessment of fatigue, breathlessness, and functioning state with e-mail.

Sociodemographic baseline characteristics contained background information on marital status, education, smoking history, number of comorbidities, COVID-19 vaccination, presence of dyspnea during COVID-19 state, time since first symptom onset in days, and place of management of COVID-19 state – either in home isolation or hospital.

Assessment of Fatigue

Fatigue was assessed using the Chalder fatigue scale (CFQ-11).[10] It contains 11 items on an ordinal 0–3 scale, which are summed to a total score (range 0–33; 33 denote maximal symptoms) and two subscales: Physical fatigue (seven items, range 0–21) and mental fatigue (four items, range 0–12). It can be scored in "Likert" style 0, 1, 2, and 3 with a range from 0 to 33. Conventionally, fatigue case status (fatigued vs. non-fatigued) is defined using this scale with a cutoff at <4 versus ≥4.

Assessment of Breathlessness

The MRC dyspnea scale[11] used to screen for breathlessness that consists of five statements about perceived breathlessness: Grade 1, "not troubled by breathlessness except on strenuous exercise" and Grade 5, "too breathless to leave the house, or breathless when undressing."

Assessment of Functional State

Functional state was screened using self-reported "Post-COVID-19 functional state" (PCFS)[12], an ordinal scale assessing the entire range of functional limitations, including changes in lifestyle, sports, and social activities; to capture the heterogeneity of post-COVID-19 outcomes. This ordinal scales consist of Grade 0 (no functional limitations) to Grade 4 (severe functional limitations) and the participants have to response to its grade. However, in case two, grades seem to be appropriate, always choose the highest grade with the most limitations.

Statistical Analysis

SPSS 21 was used to analyze the data. Descriptive statistics are presented as means and standard deviations for continuous variables and sociodemographic variables which were expressed as numbers and percentage. Pearson product-moment correlation coefficient analysis was carried out to assess the association between the sociodemographic variable and CFQ-11, MRC dyspnea, PCFS score, and also between CFQ-11, MRC dyspnea, and PCFS grade. $P < 0.05$ was considered statistically significant. All tests were two tailed.

Results

In total, 58 participants with a mean age of 39.26 ± 13.24 were enrolled in the study where 58.6% were female. The present study recruited the subjects in between 3 and 9 weeks time since symptom onset of COVID-19 disease with a mean of 5.37 ± 1.65. Most of the participants were managed for their diseased state in home isolation with 63.8% and only 27.6% had symptoms of dyspnea during their COVID-19 diseased state. About 8.6% (5) were with more than 2 number of comorbidities and 27.6% (16) completed their COVID-19 vaccination before COVID-19 diseased state [Table 1].

Pearson product-moment correlation coefficient ratio [Table 2] between the covariance of two variables and the product of their standard deviations showed that with Chalder fatigue scale (CFS) total score and variable such as smoking status ($P = 0.050$), time since symptom onset in weeks ($P = 0.046$) were statistically significant. Variable such as age with $P = 0.019$ and 0.001 showing statistically significant association with MRC grade and PCFS (post-COVID functional scale), respectively. PCFS and variable such as presence of dyspnea during COVID-19 state ($P = 0.006$) were also associated with significant relationship whereas all other sociodemographic variable showed with no association.

Table 3 shows Pearson correlation coefficient analysis between CFS, MRC grade, and PCFS with a statistical significant association of CFS score, $P = 0.000$ with PCFS and MRC grade with PCFS, $P = 0.008$. A non-significant statistical relationship shown between CFS and MRC grade with $P = 0.379$. The current study

Table 1: Baseline characteristics of the study participants

Variable	*Range*	*Mean ± SD*
Age (in years)	21–75	39.26 ± 13.24
Time since symptom onset (in weeks)	3–9	5.37 ± 1.65
Sociodemographic variable	*In n (%)*	
Gender	Male	24 (41.4)
	Female	34 (58.6)
Marital status	Single	16 (27.6)
	Married	41 (70.7)
	Divorced	1 (1.7)
Education level	Primary	2 (3.4)
	Secondary	13 (22.4)
	University	43 (74.1)
Smoking status	Never smoke	40 (69.0)
	Former smoker	13 (22.4)
	Current smoker	5 (8.6)
COVID-19 vaccination	1st dose	13 (22.4)
	2nd dose	16 (27.6)
	None	29 (50.0)
Number of comorbidities	0	39 (67.2)
	1	14 (24.1)
	More than 2	5 (8.6)
Presence of dyspnea during COVID-19 state	Yes	16 (27.6)
	No	42 (72.4)
Place of management	Home isolation	37 (63.8)
	Hospitalization	21 (36.2)

Mean ± SD, mean and standard deviation; n (%), number and percentage

Table 2: Pearson correlation test of sociodemographic variable with CFS, MRC grade, and PCFS

Variable	*CFS*	*MRC Grade*	*PCFS*
Age			
Pearson correlation	0.085	0.308	0.428
Sig. (two tailed)	0.524	0.019*	0.001*
Gender			
Pearson correlation	0.051	0.010	−0.086
Sig. (two tailed)	0.702	0.940	0.522
Marital status			
Pearson correlation	0.031	0.182	0.157
Sig. (two tailed)	0.819	0.171	0.238
Education level			
Pearson correlation	−0.131	0.106	0.040
Sig. (two tailed)	0.329	0.429	0.765
Smoking status			
Pearson correlation	−0.253	−0.168	−0.073
Sig. (two tailed)	0.050*	0.208	0.586
COVID-19 vaccination			
Pearson correlation	−0.083	−0.077	0.032
Sig. (two tailed)	0.537	0.569	0.815
Number of comorbidities			
Pearson correlation	−0.024	0.173	0.194
Sig. (two tailed)	0.858	0.195	0.144
Presence of dyspnea during COVID-19 state			
Pearson correlation	−0.208	−0.231	−0.357
Sig. (two tailed)	0.118	0.081	0.006*
Time since symptoms onset			
Pearson correlation	0.263	0.084	−0.007
Sig. (two ntailed)	0.046*	0.529	0.958
Place of management			
Pearson correlation	0.118	0.074	0.223
Sig. (two tailed)	0.379	0.581	0.093

CFS: Chalder fatigue scale; MRC grade: Medical Research Council breathlessness' grade; PCFS: Post-COVID functional scale; *P*<0.05, *significant

scores of fatigue of the participants were shown as bar diagram in terms of score and percentage in Figures 1-3, respectively.

Table 3: Pearson correlation test of CFS, MRC grade, and PCFS

Correlations	*MRC*	*PCFS*
CFS		
Pearson correlation	0.118	0.480
Sig. (two tailed)	0.379	0.000*
MRC		
Pearson correlation	-	0.347
Sig. (two tailed)		0.008*

CFS: Chalder fatigue scale; MRC grade: Medical Research Council breathlessness' grade; PCFS: Post-COVID functional scale; *P*<0.05, *significant

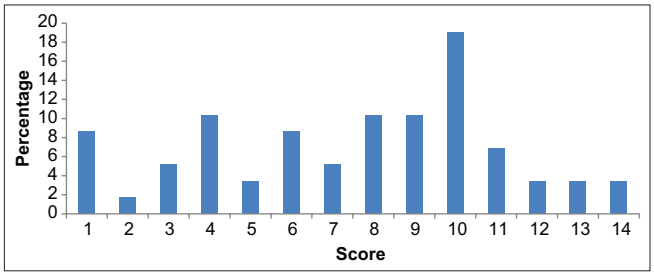

Figure 1: Physical fatigue score and Chalder fatigue scale-11 of the study participants

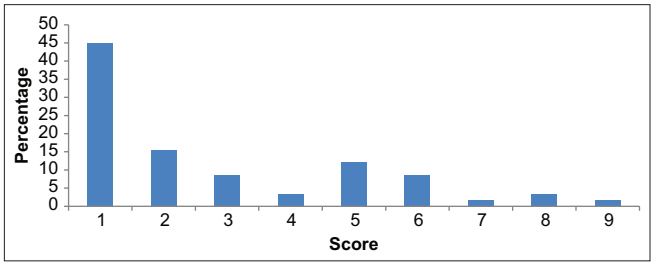

Figure 2: Mental fatigue score And Chalder fatigue scale-11 of the study participants

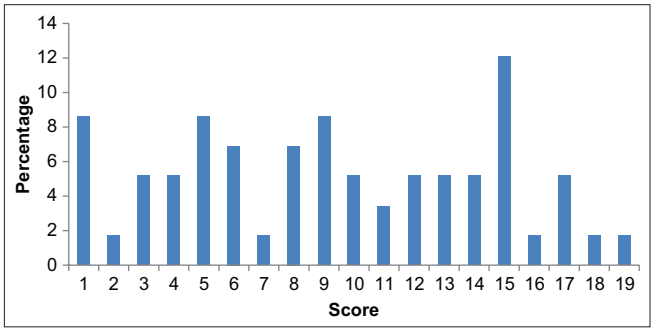

Figure 3: Total fatigue score and Chalder fatigue scale-11 of the study participants

Discussion

Enormous numbers of patients recovering from SARS-CoV-2 worldwide since the last year 2019. However, many recovered patients face persistent physical, cognitive, and psychological symptoms well past the acute phase.[13] Although the mortality rate is lower in COVID-19, it has been compared to SARS due to their similar symptomatology.[14] Persistent fatigue was apparent in SARS patients, even up to 1 year after their initial infection,[15] while in COVID-19, a new disease, the similar literature is limited.

Therefore, in our present study, we focus to assess the prevalence of post-COVID-19 condition state such as fatigue, level of breathlessness, and functional capacity and its association with sociodemographic variable for a greater insight of the post-infective state.

In our study, we recruited COVID-19 patient who managed their diseased state either in home isolation or hospitalization and their assessment of fatigue, dyspnea, and functional state was taken in their post-COVID-19 state, with at least 3 weeks time from the onset of symptoms. All the patients were between 3 and 9 weeks post-COVID-19 with a mean of 5.37 ± 1.65 weeks, where majority of the participants were with university degree 74.1% and 50.0% of them were non-vaccinated for COVID-19. Most of the participants were middle aged and 72.4% have not reported any symptoms of dyspnea during their COVID-19 disease state.

The current study showed that 20% of the participants had physical fatigue with a score of 10, whereas mental fatigue was minimal with only 2% of the studied population. This reflects physical fatigue predominant in post-COVID-19 state. With total score of Chalder fatigue scale computation, nearer to 84% of the participants reported fatigue in their post-diseased state. A study by Townsend *et al*., 2020, on persistent fatigue following SARS-CoV-2 demonstrated symptoms consistent with severe fatigue a median of 10 weeks after their initial illness and fatigue were not associated with initial disease severity, while almost one-third of those previously employed had not returned to work in their post-COVID state.[16] The rates of post-COVID fatigue appear much higher than those previously reported following EBV, Q fever, or RRV infection at a similar interval.[17] Our study findings would suggest that all patients diagnosed with SARS-CoV-2 will require screening for fatigue and periodical follow-up for its remedial measures. Continued breathlessness and fatigue even after months of onset of COVID-19 disease are common and this overwhelming phenomenon has not been well defined and has been called "post-COVID syndrome" or "long-COVID."[18] There are striking similarities to myalgic encephalomyelitis also called chronic fatigue syndrome linked to a viral and autoimmune pathogenesis.[19]

With correlation analysis, we found sociodemographic variable such as smoking and screening of fatigue, time since symptom onset of COVID-19 had an influence on total fatigue score. There were established literature stating that increased pack-years of smoking are associated with worse walking ability, depression, fatigue, and health-related quality of life levels.[20] With consideration of reports of fatigue symptoms, a study reported by 60–70% on average 48 days after hospital discharge[3] and by 53% of hospitalized patients on average 36 days after discharge (60 days after symptom start).[21] In our study, we found symptoms of fatigue at an very early post-COVID state irrespective of home isolation and hospitalization management indicating fatigue being the most prevalent symptoms in post-COVID-19 diseased state.

Level of dyspnea measured with MRC dyspnea scale and functional state post-COVID-19 showed a significant association with age factor, indicating age stands as a non-modifiable risk factor both for infectivity state and for post-diseased state recovery. Presence of dyspnea during the COVID-19 disease state may also affect the functional state and may impair the quality of life in post-infective or disease state, which is another finding with this current study. Approximately half of the patients reported dyspnea on exertion 3 months after hospital admission for COVID-19 in a Norwegian study, where majority of them had lung volumes within the reference limits.[22] Another aspect where our study result showed that issues of breathlessness and fatigue may impair the functional state of a person in their post-COVID-19 diseased state by showing a significant statistical relationship with Pearson correlation analysis, whereas physical and mental fatigue score is not associated with any level of dyspnea in our study. Although COVID-19 has clinically distinct manifestations, it is notable that associations between dyspnea and fatigue and the pulmonary physiologic impact of these symptoms were also reported in the SARS and the Middle East respiratory syndrome infection.[23] Early post-acute evaluation of symptoms and their impact on functional state is necessary to plan for a holistic approaches for its management in COVID-19.

Post-COVID condition symptoms such as fatigue, dyspnea, post-exertional malaise, joint pain, headache, cough, sleep problems, difficulty thinking, or concentrating had an effect of on patient's general health and well-being, functional state, ability to return to work, and their quality of life. Therefore in post-COVID-19 infection state, screening and evaluation for general health issues and its impact are must requisite for to minimize the detrimental effect of an infectious disease.

There were several limitations in our study. The overall response rate was about less than 50%, which we consider good for a population-based study in a conflict environment during the second wave pandemic. Second, we recruited sample only from a single and confined region of the state and no consideration was given to the rural population for the study. Furthermore, self-reported perceived fatigue, dyspnea, and functional state in post-acute diseased state may sometimes subjected to bias (recall of activities performed in the past, social desirability bias). However, so far, it has been the only way to obtain information for the different symptom domains at low cost and in a conflict pandemic state. Despite with the above limitation, this study delivers a reliable and relevant data on the correlates of fatigue, dyspnea, and functional state in post-COVID-19 state for whom there had been a very little information at a population level in India so far. Future studies require more emphasis on long-term follow-up of post-COVID conditions in a larger sample and from a wider geographical region of the country. Further studies were also required for categorizing fatigue and its impact on quality of life in post-COVID-19 state.

Regular and periodical screening, multidimensional health approaches, and rehabilitation or specific interventions may influence the development of these symptoms in post-COVID-19 state. Those with persistent fatigue, breathlessness issues, or other symptoms may possibly benefit from a tailored based health-care program with follow-up and support.

Conclusions

This study has shown that post-COVID conditions such as fatigue are more common among the majority of individuals irrespective of their COVID-19 management in either home isolation or hospital care settings. The finding suggests that physical fatigue is more predominant and overall fatigue may directly affect the functional state in their post-COVID state. A longitudinal study in a larger geographical region should be investigated for post-COVID conditions to plan for effective remedial measures.

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