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Functional Limitation Among COVID-19 Recovered Health Care Workers – A Cross-Sectional Study

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ABSTRAC T

The COVID-19 pandemic has affected a large number of people across the globe, and the effects of the infection post-recovery remain a question mark. To throw light on this area, this study aims to study the functional limitations of Health Care Workers (HCWs) recovered from COVID-19 infection. Data was collected through a self-administered questionnaire from 100 healthcare workers in Coimbatore Medical College and Hospital, and their functional limitations were graded using a Post Covid-19 Functional Status scale (PCFS). The association of developing limitations and various risk factors like increasing age, gender, nature of employment, symptoms during infection, comorbidities, lung involvement, vaccination status, etc. were analyzed. 59% of our participants did not develop limitations (grade 0), 25% had grade 1, 13% grade 2 and 3% grade 3 limitations. Significant associations were found between increased functional limitations and increasing age (p=0.004), female gender(p=0.046), nurses and post-graduates(p=0.003), breathlessness during infection(p=0.002), treatment at home(p=0.014), increased lung involvement (p=0.044), not being vaccinated(p=0.028) and time since finishing isolation (p=0.000). Logistic regression was done using these variables, and significance was seen only in post-graduate occupation (adjusted OR 6.716, 95% CI 1.910 – 23.615, p=0.003) and time since finishing isolation (adjusted OR 0.993, 95% CI 0.987 – 0.998, p=0.009). We conclude that a significant proportion of COVID-19 survivors (amongst HCWs) suffer functional limitations, hence appropriate and timely rehabilitation measures targeting vulnerable groups should be undertaken to reduce the healthcare burden, and also to have a healthy workforce.

INTRODUCTION

The COVID-19 pandemic was declared as a global health emergency on 30th January 2020 by the World Health Organization (WHO) [1]. The SARS-COV2 outbreak has put overbearing pressure on the world's health care system, particularly in lower and middle-income countries such as India. It causes chronic symptoms which leads to poor functional status in a substantial proportion of patients. Health care workers who are involved in the care of COVID- 19 patients are at higher risk of getting the severe disease as well as chronic morbidity [2,3]. In addition, studies have shown that healthcare workers being subjected to quarantine at any point in time are more prone to make errors, show irritability, and are likely to resign[4]. Post-Infection periods are characterized by anhedonia and fatigue along with myalgia, arthralgia, and weakness [5]. All these factors are detrimental to functional capabilities. Hence, it is necessary to follow up with those affected health care workers and provide necessary rehabilitation to ensure a speedy recovery, post-infection [3]. This study is particularly important to understand the disease and to prepare for potential outbreaks in the future. Hence this study aims to estimate the magnitude of functional limitation among health care workers recovered from COVID-19 disease.

METHODOLOGY

This is a single-centered, cross-sectional study conducted in Coimbatore Medical College and Hospital, Tamil Nadu. After obtaining clearance from the Institutional Human Ethics Committee, this study was carried out from June to October 2021. Each healthcare worker was contacted by phone. The study was explained to them and after obtaining verbal consent, data were collected through a self-reported questionnaire, distributed via Google forms.

The health care workers included in our study are people who had tested RT-PCR positive and recovered from COVID-19 infection. Healthcare workers who were already suffering from any kind of debilitating disease, or other critical illness were excluded from our study. With the proportion of patients with functional limitation as 43.4% [6], confidence interval of 95%, and absolute precision of 10%, the sample size was calculated to be 95. Data were collected from a total of 100 participants, using the convenience sampling technique.

The self-administered questionnaire contained questions about demographics, hospital admission/quarantine and symptoms during an attack, vaccination, and 'The Post-COVID-19

Functional Status Scale'. The PCFS scale is a novel method developed by F.A.Klok *et al* [7]. The PCFS scale has 4 grades (shown in table 1) of post-COVID functional limitations and the final stage is death.

TABLE 1: GRADES OF PCFS SCALE

PCFS scale grade	Interpretation	Description
0	No functional limitations	No symptoms, pain, depression or anxiety
1	Negligible functional limitations	All usual duties/activities at home or work can be carried out at the same level of intensity, despite some symptoms, pain, depression, or anxiety
2	Slight functional limitations	Usual duties/activities at home or work can be carried out at a lower level of intensity or are occasionally avoided due to symptoms, pain, depression, or anxiety
3	Moderate functional limitations	Usual duties/activities at home or work have been structurally modified (reduced) due to symptoms, pain, depression, or anxiety
4	Severe functional limitations	Assistance needed in activities of daily living due to symptoms, pain, depression, or anxiety: nursing care and attention is required
D	Death	

The collected data were tabulated in Microsoft Excel and kept confidential. Data were analyzed using SPSS 21.0 Version. Data were categorized as counts with percentages. Descriptive statistics like Mean and Standard deviation were calculated for continuous variables and proportion for categorical variables. Chi-square/Fisher test was used for finding out the association between categorical variables and Mann Whitney U test for continuous variables. Regression analysis was done to estimate the relationship between Functional Limitations and

significant independent variables. For all the tests, a p-value less than 0.05 was considered to be statistically significant.

RESULTS

A total of 100 responses were collected. All the subjects who participated in the study were between 18 to 57 years of age, and their mean age was 28.17 years. There was almost an equal representation of males (51%) and females (49%). A majority of the participants were doctors (including postgraduates – 65%), and the rest were interns (14%), medical students (12%), and nurses (9%). Only 11% of participants presented had comorbidities like hypertension, diabetes mellitus, asthma, pregnancy, thyroid dysfunction, and Mitral Valve Prolapse (MVP) while all others were healthy before being affected by COVID. Of all the participants, 85% developed symptomatic illness, while the remaining 15% had an asymptomatic illness. The various symptoms experienced were sore throat, chest pain, fever, cold, cough, ageusia, anosmia, headache, and myalgia.

TABLE 2: DEMOGRAPHICS AND OTHER DATA COLLECTED

		Frequency	Percent (%)
Gender	Male	51	51.0
	Female	49	49.0
Nature of employment	Doctor	38	38.0
	Intern	14	14.0
	Medical student	12	12.0
	Nurse	9	9.0
	Post-graduate	27	27.0
Comorbidity	Asthma	3	3
	MVP	1	1
	Pregnancy	1	1
	Hypothyroid	3	3
	HTN	4	4
	DM	1	1

Symptoms	Sore throat	3	3
	Chest pain	1	1
	Headache	28	28
	Myalgia	63	63
	Anosmia	49	49
	Loss of taste	40	40
	Diarrhea	13	13
	Breathlessness	6	6
	Cough	39	39
	Fever	67	67
	Cold	36	36
Place of stay	Home	37	37
	Ward with O2	3	3
	Ward without O2	60	60
Lung involvement	Present	26	26
	Absent	74	74
Vaccination status	Vaccinated	85	85
	Not vaccinated	15	15
PCFS Grade	Grade 0	59	59.0
	Grade 1	25	25.0
	Grade 2	13	13.0
	Grade 3	3	3.0
	Grade 4	0	0

59% of people did not develop any post-COVID functional limitations, while the remaining 41% developed various grades of functional limitations. Tables 2 and 3 show the data collected from 100 healthcare workers.

TABLE 3: AGE AND DURATION OF STAY

	N	Minimum	Maximum	Mean	Std. Deviation
Age	100	18.0	57.0	28.170	8.0253
Duration from finishing isolation to date of data entry	100	5.0	365.0	136.54	120.8717
Duration of hospital stay	100	.0	14.0	4.010	3.6722
Duration of home quarantine	100	7.0	40.0	16.410	5.8966

Tests of significance (Chi-square/Fisher test/Mann Whitney U) were done between all variables for which data were collected and the presence of post-COVID functional limitations. For better analysis, grades 1, 2, 3, and 4 were grouped as 'Functional limitations present' and grade 0 as 'Functional limitations absent.'In the tertiary care center that this study was conducted in, there was no mortality among HCWs due to COVID-19. This eliminates potential bias that could arise due to dead people not filling up questionnaires.

The presence of functional limitations was more in women when compared to men (p value=0.046). Nurses (p=0.030) and post-graduates (0.011) were found to have higher functional limitations when compared to other healthcare workers. More people who were admitted to hospitals were found to have no functional limitations (p value= 0.014) while people who received treatment at home developed higher grades of limitations. Tables 4 and 5 show the results of the Chi-square/Fisher's/Mann Whitney U test between different variables and functional limitations.

TABLE 4: ASSOCIATION BETWEEN INDEPENDENT VARIABLES AND FUNCTIONAL LIMITATIONS (CHI-SQUARE/FISHER TEST)

		FUNCTIONAL LIMITATIONS				p value
		PRESENT		ABSENT		
		N	N %	N	N %	
Gender						
Male		16	31.4%	35	68.6%	**.046**
Female		25	51.0%	24	49.0%	
Nature of employment						
Doctor		11	28.9%	27	71.1%	**.063**
Intern		3	21.4%	11	78.6%	**.146**
Medical student		3	25.0%	9	75.0%	**.350**
Nurse		7	77.8%	2	22.2%	**.030**
Post-graduate		17	63.0%	10	37.0%	**.011**
Comorbidities						
Mvp	Yes	1	100.0%	0	0.0%	**.410**
	No	40	40.4%	59	59.6%	
Pregnancy	Yes	1	100.0%	0	0.0%	**.410**
	No	40	40.4%	59	59.6%	
Hypothyroid	Yes	2	66.7%	1	33.3%	**.566**
	No	39	40.2%	58	59.8%	
Htn	Yes	3	75.0%	1	25.0%	**.302**
	No	38	39.6%	58	60.4%	
Dm	Yes	1	100.0%	0	0.0%	**.410**
	No	40	40.4%	59	59.6%	
Asthma	Yes	2	66.7%	1	33.3%	**.566**
	No	39	40.2%	58	59.8%	
Symptoms						
Sore throat	Yes	2	66.7%	1	33.3%	**.566**

	No	39	40.2%	58	59.8%	
Chest pain	Yes	1	100.0%	0	0.0%	**.410**
	No	40	40.4%	59	59.6%	
Headache	Yes	15	53.6%	13	46.4%	**.120**
	No	26	36.1%	46	63.9%	
Myalgia	Yes	28	44.4%	35	55.6%	**.405**
	No	13	35.1%	24	64.9%	
Anosmia	Yes	22	44.9%	27	55.1%	**.542**
	No	19	37.3%	32	62.7%	
Loss of taste	Yes	18	45.0%	22	55.0%	**.539**
	No	23	38.3%	37	61.7%	
Diarrhoea	Yes	6	46.2%	7	53.8%	**.766**
	No	35	40.2%	52	59.8%	
Breathlessness	Yes	6	100.0%	0	0.0%	**.004**
	No	35	37.2%	59	62.8%	
Cough	Yes	14	35.9%	25	64.1%	**.532**
	No	27	44.3%	34	55.7%	
Fever	Yes	31	46.3%	36	53.7%	**.138**
	No	10	30.3%	23	69.7%	
Cold	Yes	18	50.0%	18	50.0%	**.206**
	No	23	35.9%	41	64.1%	
Hospital admission						
Yes		20	31.7%	43	68.3%	**.014**
No		21	56.8%	16	43.2%	
Lung involvement						
Present		15	57.7%	11	42.3%	**0.044**
Absent		26	35.1%	48	64.9%	
Vaccination status						
Vaccinated		31	36.5%	54	63.5%	**0.028**

Not vaccinated	10	66.7%	5	33.3%	
Duration from finishing isolation					
</=2 months	27	61.4%	17	38.6%	**0.001**
2 to 6 Months	6	35.3%	11	64.7%	
>6 months	8	20.5%	31	79.5%	
Total	41	41.0%	59	59.0%	

TABLE 5: ASSOCIATION BETWEEN INDEPENDENT CONTINUOUS VARIABLES AND FUNCTIONAL LIMITATIONS (MANN WHITNEY U TEST)

	FUNCTIONAL LIMITATIONS		p value
	PRESENT	ABSENT	
	Median	Median	
Age	28.0	24.0	0.004
Duration from finishing isolation	33.5	190.5	0.000
Total duration of hospital admission	5.0	7.0	0.353
Total duration of home quarantine	14.0	15.0	0.235

Mann Whitney U test was done on the continuous variables (Table 5). It was found that functional limitations were more in older ages (p value= 0.004) and among people who recently finished isolation (p value=0.000). To further confirm this finding, the subjects were divided into three categories (people who finished isolation less than 2 months back, 2-6 months back, and more than 6 months back) and a chi-square test was done between these categories and functional limitations. The association was significant (p value=0.001). The presence of breathlessness (p value=0.002) and lung involvement (p value=0.044) during the COVID attack was significantly associated with developing post-COVID functional limitations. The majority of the unvaccinated people developed functional limitations when compared to vaccinated people (p value= 0.028). People who developed symptomatic illness had more functional limitations but the association was not found to be statistically significant. (p value=0.073)

TABLE 6: LOGISTIC REGRESSION ANALYSIS

VARIABLES	B	P-VALUE	ADJUSTED ODDS RATIO	95% C.I.FOR EXP(B)	
				LOWER	UPPER
Gender(male)	-.570	.306	.566	.190	1.683
Hospital admission(yes)	-.955	.134	.385	.110	1.340
Lung involvement(present)	1.079	.116	2.942	.767	11.294
Vaccination status(vaccinated)	-1.415	.082	.243	.049	1.194
Occupation - nurse	2.317	.067	10.148	.850	121.120
Occupation - post graduate	1.904	**.003**	6.716	1.910	23.615
Age	.034	.343	1.035	.964	1.110
Duration from finishing Isolation to date	-.007	**.009**	.993	.987	.998
Constant	.622	.640	1.863		

Variables that were significant in the univariate analysis were included in logistic regression (as shown in table 6). Variables that were significant in the regression analysis were post-graduate by occupation and duration from isolation to date. Nagelkerke R Square value was 0.491 indicates that 49.1% of the variability of the dependent variable (Functional limitation) was explained by the variables in the model.

DISCUSSION

The understanding of the effect of COVID-19 infection on survivors concerning their recovery, clinical sequelae, and functional outcomes is limited. This study aims to assess the functional limitations during the 'post-infection stage' using the Post-COVID-19 functional status (PCFS) scale developed by Klok FA *et al* [7]. Corresponding to PCFS-0, 59% of the study population did not develop any functional limitations. This could be due to the inclusion of a large number of young subjects with no comorbidities. A similar study by Pant *et al*, also found that the younger population faces lesser functional limitations [6].

A study conducted in Wuhan, China observed that 87.3% of older patients were critically ill, whereas only 39.9% of the younger patients suffered from the severe disease [8]. Immuno-senescence as described by Stahl *et al* refers to age-associated changes in the innate and adaptive immune system. It can cause a chronic state of inflammation, lessen the ability of the body to fight novel infections, and result in poor disease prognosis [9, 10]. This is consistent with our study findings that increasing the age of the subjects makes them more susceptible to post-infection functional limitations.

Proal *et al* has previously indicated that women are more likely to report persistent symptoms post-infection [11]. This factor may have influenced our study's findings that the female population has greater functional limitations. A study by Takahashi *et al* has indicated that the interplay of factors such as T-cell response and innate immune cytokines, can determine disease progression in both sexes [12]. Hence, the gender-specific response to the COVID-19 infection has to be further investigated. This will allow the development of an individualized, sex-based treatment approach.

The pandemic may have increased the workload of nurses and postgraduates. A survey conducted in Brazil by Cortin *et al* observed that nurses reported a greater workload than physicians and dentists [13]. Although significant burnout rates were observed among all HCWs, they were higher in Nurses [14]. Burnout can worsen mental health, may promote substance abuse, and even fracture personal relationships. This may indicate why nurses and post-graduates suffer from greater limitations. Lack of exercise, proper sleep and not being able to consume proper meals (lack of functional foods can implicate a poorly nourished immune system) due to extended working hours might have negatively affected host immunity [15].

Many symptoms of COVID-19 are found to continue even after acute infection which may contribute to increased functional limitations. In a study by Carfi *et al* on the Italian population, symptoms like fatigue (53.1%) and dyspnea(43.4%) are found to persist even during follow-up (mean of 60.3 days after onset of the first symptom). Worsened quality of life was found in 44.1% of patients after evaluation by the EuroQol Visual Analog Scale [16]. Hence symptomatic patients tend to place greater on the PCFS Scale, as found in our study. Studies by both Goertz *et al* and Carfi *et al* have concluded 'fatigue' is the symptom that has persisted in the largest number of subjects, but we have not used it to assess musculoskeletal symptoms [16,17].

In parallel with our findings that lung involvement and dyspnoea are associated with significant functional limitations, Ngai *et al* have observed in their study that 52% of SARS Survivors had persistent impairment in DLco. Those subjects suffered from decreased exercise capacity and health status even at 24-months post-illness, in comparison to normal controls of the same age group [18].

Strict quarantine measures have been imposed in countries across the world to curtail the spread of the virus. But such radical procedures have had a profound impact on mobility and the psychological wellbeing of people. During the 2003 SARS outbreak in Canada, 'perceived longer time in Quarantine' and 'HCW status' was associated with increased PTSD(Post Traumatic Stress Disorder) symptoms as measured by higher IES-R scores (Impact of Events Scale-Revised). Health care workers are more likely to suffer from anxiety and stigmatization, as they have worked closely with a large number of infected patients. Moreover, after isolation, HCWs tend to engage in avoidance behaviors such as not reporting to work, minimizing patient contact, vigilant hand washing, and avoiding crowded places. Knowing the severe end in the clinical spectrum of diseased patients could potentially aggravate stress and instigate emotions like depression [19,20]. In a qualitative description by Cava *et al*, many people have taken a few months to return to normalcy, after isolation [21]. This supports our study findings that the HCWs who completed quarantine recently (<2 months) were found to suffer from more functional limitations.

Most studies have indicated that hospital admission results in poor functional outcomes. Due to strict isolation measures, patient mobility is reduced to near nil. As a result, patients have low physical functioning and impairment of ADLs (Activities of Daily Living) post-discharge [22]. Patients have also faced psychological distress, anxiety, and depression. But our study presents otherwise, that hospitalized COVID-19 patients with mild infection suffered from less functional limitations than patients isolated at home. Most studies have been directed towards outcomes of hospitalized patients suffering from severe COVID-19. Yet, young adults (majority of our study population is young, mean age-28.17years) with non-hospitalized COVID-19 illness can have prolonged illness and persistent symptoms. Studies have indicated that 1 in 5 young adults (18-34 years) without any comorbidities did not return to their usual health 14-21 days after testing. There have been incidents of prolonged convalescence and absence from work [23]. Hospitals

also have a controlled diet regimen, timely administration of medications, and continuous monitoring of vitals which may have contributed to our study findings that hospitalized people suffered lesser functional limitations. More investigation is necessary about non-hospitalized COVID-19 illness in the young.

Vaccines have been deployed in various countries to control the COVID-19 pandemic. Most of the HCWs included in this study have been inoculated with COVISHIELD and COVAXIN; both vaccines are known to elicit good immune responses [24]. The (COVISHIELD) ChAdOx1 nCoV-19 vaccine (AZD1222) has an estimated overall efficacy of 74.0% and is efficacious in preventing severe and symptomatic infection in a diverse population [25]. Hence, the vaccinated suffered from less functional limitations than the unvaccinated as found in our study.

A considerable proportion of people continue to suffer from post-COVID-19 sequelae. It is important to administer appropriate rehabilitative measures in the acute phase and after discharge, to aid in complete recovery. More investigation needs to be done regarding rehabilitation of non-severe patients and usage of techniques such as telemedicine and telerehabilitation for the above category [26]. It is vital that HCWs can return to baseline functional status post–ARDS so that the health care system prevails and functions smoothly.

The main limitations of our study are that the sample size is small; hence a follow-up study with a greater sample size might be necessary. As the questionnaire is self-reported, it may be subject to reporting bias.

CONCLUSION

We conclude that COVID-19 survivors suffer from significant post-COVID functional limitations. The most vulnerable groups, as evident from our study are the female gender, older people, post-graduates and nurses, people who experienced breathlessness during COVID attack, people with increased lung involvement, people who quarantined at home, people who recently finished isolation and unvaccinated survivors. Appropriate rehabilitation measures should be aimed at these vulnerable groups to reduce long-term impacts on the healthcare system. Respiratory exercises like yoga, pranayama related activities should be studied, and if proven appropriate, could be used as effective rehabilitation tools. Nutrition and psychological

counseling can also be useful. Cost-effective measures must be developed, that can particularly prove useful in resource poor situations and help us tackle the pandemic in an effective manner.

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REFERENCES

1. Timeline: WHO's COVID-19 response. Who.int. Last update: 25th Jan 2021. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/interactive-timeline (8th Nov 2021).
2. Meije Y, Duarte-Borges A, Sanz X, Clemente M, Ribera A, Ortega L *et al*. Long-term outcomes of patients following hospitalization for coronavirus disease 2019: a prospective observational study. CMI. 2021;27(8):1151-1157.
3. Simpson R, Robinson L. Rehabilitation After Critical Illness in People With COVID-19 Infection. Am J Phys Med Rehabil. 2020;99(6):470-474.
4. Brooks S, Webster R, Smith L, Woodland L, Wessely S, Greenberg N *et al*. The psychological impact of quarantine and how to reduce it: a rapid review of the evidence. The Lancet. 2020;395(10227):912-920.
5. El Sayed S, Shokry D, Gomaa S. Post COVID-19 fatigue and anhedonia: A cross sectional study and their correlation to the post recovery period. Neuropsychopharmacol. Rep. 2020;41(1):50-55.
6. Pant P, Joshi A, Basnet B, Shrestha B, Bista N, Bam N *et al*. Prevalence of Functional Limitation in COVID-19 Recovered Patients Using the Post COVID-19 Functional Status Scale. JNMA J Nepal Med Assoc. 2021;59(233).
7. Klok F, Boon G, Barco S, Endres M, Geelhoed J, Knauss S *et al*. The Post-COVID-19 Functional Status scale: a tool to measure functional status over time after COVID-19. Eur. Clin. Respir. J.. 2020;56(1):2001494.
8. Chen T, Dai Z, Mo P, Li X, Ma Z, Song S *et al*. Clinical Characteristics and Outcomes of Older Patients with Coronavirus Disease 2019 (COVID-19) in Wuhan, China: A Single-Centered, Retrospective Study. J. Gerontol. A Biol. Sci. Med. Sci. . 2020;75(9):1788-1795.
9. Bajaj V, Gadi N, Spihlman A, Wu S, Choi C, Moulton V. Aging, Immunity, and COVID-19: How Age Influences the Host Immune Response to Coronavirus Infections?. Frontiers in Physiology. 2021;11.
10. Stahl E, Brown B. Cell Therapy Strategies to Combat Immunosenescence. Organogenesis. 2015;11(4):159-172.
11. Proal A, VanElzakker M. Long COVID or Post-acute Sequelae of COVID-19 (PASC): An Overview of Biological Factors That May Contribute to Persistent Symptoms. Front. Microbiol.. 2021;12.
12. Takahashi T, Ellingson M, Wong P, Israelow B, Lucas C, Klein J *et al*. Sex differences in immune responses that underlie COVID-19 disease outcomes. Nature. 2020;588(7837):315-320.
13. Cotrin P, Moura W, Gambardela-Tkacz C, Pelloso F, Santos L, Carvalho M *et al*. Healthcare Workers in Brazil during the COVID-19 Pandemic: A Cross-Sectional Online Survey. Inquiry. 2020;57:004695802096371.
14. Zhang X, Song Y, Jiang T, Ding N, Shi T. Interventions to reduce burnout of physicians and nurses. Medicine. 2020;99(26):e20992.
15. Alkhatib A. Antiviral Functional Foods and Exercise Lifestyle Prevention of Coronavirus. Nutrients. 2020;12(9):2633.
16. Carfì A, Bernabei R, Landi F. Persistent Symptoms in Patients After Acute COVID-19. JAMA. 2020;324(6):603.
17. Goërtz Y, Van Herck M, Delbressine J, Vaes A, Meys R, Machado F *et al*. Persistent symptoms 3 months after a SARS-CoV-2 infection: the post-COVID-19 syndrome?. ERJ Open Research. 2020;6(4):00542-2020.

18. Ngai J, Ko F, Ng S, To K, Tong M, Hui D. The long-term impact of severe acute respiratory syndrome on pulmonary function, exercise capacity and health status. Respirology. 2010;15(3):543-550.
19. Reynolds D, Garay J, Deamond S, Moran M, Gold W, Styra R. Understanding, compliance and psychological impact of the SARS quarantine experience. Epidemiol. Infect.. 2007;136(7):997-1007.
20. Brooks S, Webster R, Smith L, Woodland L, Wessely S, Greenberg N *et al*. The psychological impact of quarantine and how to reduce it: a rapid review of the evidence. The Lancet. 2020;395(10227):912-920.
21. Cava M, Fay K, Beanlands H, McCay E, Wignall R. The Experience of Quarantine for Individuals Affected by SARS in Toronto. Public Health Nursing. 2005;22(5):398-406.
22. Belli S, Balbi B, Prince I, Cattaneo D, Masocco F, Zaccaria S *et al*. Low physical functioning and impaired performance of activities of daily life in COVID-19 patients who survived hospitalization. Eur. Respir. J 2020;56(4):200-209.
23. Tenforde MW, Kim SS, Lindsell CJ, Billig Rose E, Shapiro NI, Files DC, *et al*. Symptom duration and risk factors for delayed return to usual health among outpatients with covid-19 in a Multistate Health Care Systems Network — United States, March–June 2020. MMWR 2020;69(30):993–8.
24. Singh AK, Phatak SR, Singh R, Bhattacharjee K, Singh NK, Gupta A, *et al*. Antibody response after first and second-dose of chadox1-ncov (covishieldtm®) and BBV-152 (covaxintm®) among health care workers in India: The final results of cross-sectional coronavirus vaccine-induced antibody titre (COVAT) study. Vaccine. 2021;39(44):492–509.
25. Falsey A, Sobieszczyk M, Hirsch I, Sproule S, Robb M, Corey L *et al*. Phase 3 Safety and Efficacy of AZD1222 (ChAdOx1 nCoV-19) Covid-19 Vaccine. NEJM. 2021.
26. Ambrosino P, Papa A, Maniscalco M, Di Minno M. COVID-19 and functional disability: current insights and rehabilitation strategies. Postgrad. Med. J. 2020;97(1149):138-227.
27. Balachandar V, Mahalaxmi I, Subramaniam M, Kaavya J, Senthil Kumar N, Laldinmawii G *et al*. Follow-up studies in COVID-19 recovered patients - is it mandatory?. Sci. Total Environ. 2020;729
28. Johnson K, Harris C, Cain J, Hummer C, Goyal H, Perisetti A. Pulmonary and Extra-Pulmonary Clinical Manifestations of COVID-19. Front. Med. 2020;7.
29. Petrosillo N, Viceconte G, Ergonul O, Ippolito G, Petersen E. COVID-19, SARS and MERS: are they closely related?. CMI. 2020;26(6):729-734.
30. Tansey C. One-Year Outcomes and Health Care Utilization in Survivors of Severe Acute Respiratory Syndrome. Arch. Intern. Med.. 2007;167(12)

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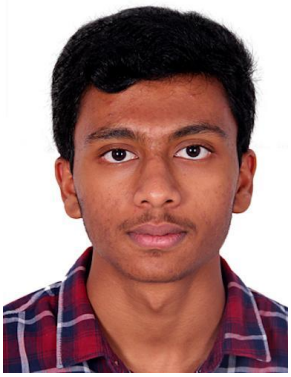	***Vishwajit G. V,*** *First year MBBS,* *Coimbatore Medical College,* *Coimbatore*
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