Health Statuses and Post-COVID-19 Conditions in Patients with Spinal Cord Injury: A Case Series

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ABSTRACT

Objectives: To describe the health status and post-COVID-19 condition experienced by patients with spinal cord injury (SCI).
Study design: Case series.
Setting: Sirindhorn National Medical Rehabilitation Institute.
Subjects: Patients with spinal cord injury infected with COVID-19.
Methods: Participants were recruited from SCI patients infected with COVID-19 who had been admitted to the Sirindhorn Science Home Field Hospital for Persons with Disabilities or the Home Isolation Unit of the Sirindhorn National Medical Rehabilitation Institute (SNMRI) and who had been followed up in the SCI clinic at SNMRI. All participants were interviewed by telephone regarding their COVID-19 infection signs, symptoms, treatment received, post-COVID-19 condition, their functional capacity as measured by the Spinal Cord Independence Measure (SCIM)-III Thai version, and their overall quality of life rated on a 0-100 scale.
Results: There were seven SCI patients in this series: four had mild COVID-19 symptoms, while the other three required oxygen therapy. During the six months after the initial infection, all experienced post-COVID-19 symptoms. The most common symptoms were fatigue, dyspnea, anxiety, insomnia, cough, and muscle pain. Among these symptoms, fatigue was reported as being the most severe with a numerical rating of 8 on a scale of 1 to 10. Two of the seven had sought medical advice for their post-COVID-19 condition. Only one patient had a lower
Spinal Cord Independence Measure (SCIM) score after being infected with COVID-19 due to a reduced ability to use a toilet. Two patients reported lower overall quality of life during the post-COVID-19 period due to symptoms of fatigue affecting their daily living activities.
Conclusions: In this series, all patients with spinal cord injuries experienced varying degrees of post-COVID-19 symptoms. Some also reported reduced functional capacity and quality of life resulting from their condition post-COVID-19.

Keywords: spinal cord injury, COVID-19, post-COVID-19 condition
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Introduction

COVID-19 is an emerging disease causing a pandemic. Until now (Jul 14, 2022), more than 500 million people have been infected, with more than six million deaths worldwide.[1] Apart from the direct respiratory symptoms, it can also create long-term effects on other organ systems. Post-COVID-19 condition is widely recognized as having long-term consequences in many body systems after the infection of SARS-CoV-2, which could be persistent symptoms from the initial illness or the new onset after recovery of an acute episode.[2]

The symptoms of the post-COVID-19 condition range from almost every organ system, e.g., respiratory, cardiovascular, neurocognitive, and gastrointestinal systems.[3] The most common symptoms were reported differently by many studies; however, the common and usually most severe symptoms included fatigue, dyspnea, and insomnia.[4-6] Although most studies described the period of post-COVID-19 condition between 3-6 months after the initial disease, there was a report in France with a significant number of patients experiencing persistent taste and smell disorders at seven months.[7] Some studies also reported the effect on physical activities and quality of life.[8,9] A study in the Netherlands re-assessed the physical activities from the walking time and reported a significantly lower capacity at six months after comparing to the pre-COVID-19 level.[8] In Spain, Taboada studied the quality of life of COVID-19 survivors six months after requiring intensive care unit treatment and discovered a significantly lower quality of life in all aspects of mobility, self-care, and usual activities.[9]

The pathophysiology of these multi-system manifestations of the post-COVID-19 condition remains unclear. However, there are postulations of the involvement of the immune system, the systemic inflammatory response, and gut dysbiosis.[3,10,11] As the mechanism is uncertain, the current management guideline in Thailand is tailored to the symptoms of post-COVID-19 conditions that patients experience, including physiotherapy, exercise, nutrition management, psychotherapy, and medication as needed.[12]

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Patients with spinal cord injury (SCI) are among the most vulnerable, with difficulty accessing healthcare services.[13] The pandemic rendered them at a far more marginalized edge of healthcare provision.[14,15] Moreover, many comorbidities accompanying SCI, e.g., the weakness of respiratory muscles, reduced lung capacity, and the inability to cough[16] could intensify the symptoms of COVID-19. Barman et al. reviewed the clinical condition of patients with spinal cord injury who were infected with COVID-19.[17] Among 11 studies reviewed; the largest report was from the United States, which found the mortality rate in SCI as high as 19% while it was only 7.7% in non-SCI.[18] It was also noticed that mild COVID-19 patients might not receive the COVID-19 screening in the United States. Therefore, SCI patients might presume that the mild viral infection symptoms were from other co-morbidities, e.g., urinary tract infections. Consequently, SCI patients might receive COVID-19 treatment at a late stage with more severe symptoms, resulting in the poorer result.[18]

There is still no clinical report regarding the post-COVID-19 condition in persons with SCI. Therefore, this study aims to explore the post-COVID-19 condition in this group of patients. Furthermore, as the health status of persons with disabilities does not lie only in body structure but also in activity and participation,[19] this study would explore these dimensions of SCI patients before and after the infection. Additionally, as COVID-19 also created stigmatization and discrimination problems among survivors,[20,21] the participation and quality of life concerning this issue will also be studied.

Methods

After the SNMRI ethic committee approved the research proposal, the participants were recruited, including SCI patients who were admitted to Sirindhorn Science Home Field Hospital for Persons with Disabilities or SNMRI home isolation unit or those who followed up in the SNMRI SCI clinic. Inclusion criteria were a history of COVID-19 infection during the past 12 months and able to communicate in Thai. Those with comorbidities that affected cognitive function or intellectual and communication skills were excluded. The participants were contacted via telephone in January 2022, and verbal consent was obtained before the telephone interview. The interview was performed solely by the author (DS) using a structured interview case record form. Data collection included demographic information, COVID-19 severity and treatment, post-COVID-19 condition, and severity on a scale of 0-10 according to the Department of Medical Services, Ministry of Public Health checklist. The post-COVID-19 condition was determined from the symptoms that occurred more than three times/day and occurred after or continuously after the discharge from hospital, or home isolation within six months. Information on patients' functional capacity was obtained using the SCIM-III Thai version.[22] The quality of life before and after COVID-19 infection was determined using a numerical rating scale of 0-100. Some additional participation aspects of health according to the International Classification of Functioning, Disability, and Health (ICF) were also interviewed comparing before and after being infected with COVID-19, e.g., the need for a personal assistant, the employment status, the leisure activities, the need to seek medical advice for post-COVID-19 condition. The patient's medical records were reviewed to verify the demographic information on the neurological level and completeness. All information was summarized and analyzed descriptively, using mean and standard deviation where appropriate.

Results

From the database of 650 patients admitted to Sirindhorn Science Home Field Hospital for Persons with Disabilities, there were four patients with SCI. Of 469 patients who received COVID-19 treatment from the SNMRI home isolation unit,

Table 1. Demographic data, history of COVID-19 infection and treatment

	Demographic					COVID-19 information				
	Diagnosis	sex	age	Duration of SCI (months)	Co-morbidity	Duration since COVID-19 discharge (days)	Treatment facility	Duration of admission (days)	COVID-19 severity	Treatment received
1	T10B	M	44	288	CTS	162	Field hospital	9	Mild	Favi
2	T11	F	45	246	-	173	Field hospital	14	Mild	-
3	C4D	M	29	90	-	147	Home isolation	14	Mild	Favi
4	T11	F	61	252	DM, HT, DLP	195	Field hospital	21	Moderate (Abnormal CXR)	Favi, steroid oxygen
5	T4	M	27	108		105	Field hospital	13	Mild	Favi
6	C6A	M	38	102	- -	188	General hospital	15	Moderate (Abnormal CXR)	Favi, oxygen
7	T12B	F	55	301	-	144	General hospital	18	Moderate (Abnormal CXR)	Favi, steroid, oxygen

CTS, carpal tunnel syndrome; DM, diabetes mellitus; HT, hypertension; DLP, dyslipidemia; CXR, chest x-ray; Favi, favipiravir

there was one tetraplegic patient. Another two patients in the SCI clinic got infected and were treated in hospitals elsewhere. Altogether, seven patients were contacted and recruited for this series. There were four males, five out of seven were paraplegic, and the average duration of SCI was 198.1 ± 93.9 months. The average age of all participants was 42.7 ± 12.6. At the time of the study, the patients were discharged from the COVID-19 treatment at an average of 159.1 ± 30.6 days. Most of them had mild symptoms; less than half needed oxygen therapy (Table 1).

All seven patients reported post-COVID-19 symptoms during six months after discharge. The most common symptom was fatigue, found in 5 patients. The second most common was dyspnea, anxiety, and insomnia, reported by four patients. Three patients recognized cough and muscle pain. Some other symptoms were also reported, as shown in Table 2.

The most severe reported symptoms of the post-COVID-19 condition were fatigue and dyspnea, rated by one patient on a scale of 8 out of 10. One patient reported spasticity at the level of 7 out of 10. Some other symptoms with severity from 4 to 6 were cough, tachycardia, dizziness, anxiety, insomnia,

Table 2. Post-COVID-19 conditions and health statuses of each patient

	Demographic			Post-COVID-19 condition			SCIM		QOL	
	Diagnosis	Sex	Age	Symptoms	Severity (0-10)	Treatment	Pre	Post	Pre	Post
1	T10B	M	44	Fatigue	3	Self-exercise (taught from the field hospital)	69	69	80	80
				Anxiety	6					
				Depress	6					
				Insomnia	5					
2	T11	F	45	Fatigue	1	Tele-consultation with physician (received advice to do home exercise)	67	66	90	80
				Dyspnea	1					
				Cough	1					
				Palpitation	1					
				Tachycardia	1					
				Chest pain	1					
				Insomnia	1					
				Hair loss	4					
				Muscle pain	1					
				Joint pain	1					
3	C4D	M	29	Spasticity	7	-	34	34	30	30
				Anosmia	1					
4	T11	F	61	Dizziness	1	-	38	38	80	80
				Hair loss	5					
				Muscle pain	1					
5	T4	M	27	Fatigue	5	Self-exercise	58	58	90	90
				Dyspnea	4					
				Cough	4					
				Brain fatigue	3					
				Memory	3					
				Anxiety	5					
				Fever, chill	1					
6	C6A	M	38	Fatigue	8	Followed up by physician at general hospital (had CXR), bought medicine from the pharmacy, self-exercise	29	29	65	65
				Dyspnea	8					
				Cough	6					
				Anxiety	4					
				Insomnia	5					
7	T12B	F	55	Fatigue	7	Physical therapy, self-exercise	52	52	95	85
				Dyspnea	6					
				Tachycardia	6					
				Dizziness	5					
				Anxiety	5					
				Insomnia	3					
				Dysphagia	2					
				Muscle pain	4					
				Joint pain	4					
				Fever, chill	1					
				Ageusia	1					

SCIM, spinal cord independence measure; QOL, quality of life

hair loss, muscle pain, and joint pain (Table 2). Two patients consulted with the physician about their post-COVID-19 condition, while three self-exercised at home. Only one patient with the highest severity of fatigue and dyspnea had bought some medicines from the pharmacy.

Regarding the SCIM-III assessment, six patients had the same functional score level comparing before and after the COVID-19 infection. Only one patient had a lower score after discharge from the field hospital due to the increasing difficulty in using a toilet. She had changed from totally independent status to using assisted rail in transferring due to the fatigue experienced after the COVID-19 infection.

In terms of quality of life, five out of seven patients reported the same level before and after the infection. Two patients had lower scores after the infection because of fatigue during performing activities of daily living. However, all seven patients stated there was no difference in the need for personal assistance, leisure activities participation, and employment status before and after the COVID-19 infection.

Discussion

Regarding the post-COVID-19 condition, all seven patients reported some symptoms six months after the infection. The most frequent symptoms were fatigue, dyspnea, anxiety, and insomnia. This finding does not differ from post-COVID-19 conditions reported in non-SCI individuals.[6]

Although the mechanism underlying post-COVID-19 condition is still unclear, the most common postulations are the disturbance of the immune system and the body's systemic inflammatory response.[3,10,11] It is proposed that SAR-CoV-2 might affect the permeability of the blood-brain barrier and facilitate neurological inflammation through the penetration of peripheral cytokines into the central nervous system.[3] There is also autopsy evidence of SARS-CoV-2 genes and pathologic immune activations in the brainstem of COVID-19 patients.[11] A study in Italy revealed the correlation between the systemic immune-inflammation index and neurocognitive symptoms at three months post-infection.[23] In this series, one participant reported a severe level of spasticity after the infection. Therefore, the systemic inflammatory response might play a role in motor neuron excitability. However, further investigation and long-term follow-up are still needed to ascertain the proposed mechanism.

The post-COVID-19 symptoms severity does not correlate with the severity of COVID-19 infection. The majority of patients in this series, 4 out of 7 (57.2%), had mild COVID-19 infection. This result aligns with the systematic review in 2020, which revealed that although 63% of patients had abnormal chest x-rays, 75% presented with mild symptoms.[24] However, those with mild COVID-19 symptoms had post-COVID spasticity at 7/10 and depression at 6/10. Huang et al. followed 1,733 COVID-19 patients for six months and found that the disease severity was not a significantly correlated factor to post-COVID-19 condition.[5] Regarding the severity of the post-COVID-19 symptoms, SCI patients do not differ from the general population.

Two patients rated a poorer quality of life after COVID-19 infection. These two patients reported the highest number of symptoms of the post-COVID-19 condition in the series, one of them also rated a relatively high degree of post-COVID-19 symptoms severity. The poorer quality of life could be due to the worsened health status. There was one patient with a lower SCIM-III score. This result was also possible from the lower physical activity during 14 days of admission in the field hospital. The post-COVID-19 condition also kept the patient at a lower activity level compared to the pre-infection state. In 2020, a survey in the Netherlands revealed that post-COVID-19 conditions could bring about lower physical activity even in non-disabled individuals.[8] A systematic review in 2022 also confirmed that lifestyle changes during COVID-19 could harm the level of physical activity and worsen the symptoms of people with neurological diseases.[25]

This case series has certain limitations. First, the number of participants might need to be more extensive for population inference. Second, the usage of SCIM-III in this study was not the self-report version of the SCIM, as the self-report version has yet to be translated and validated in Thai. This limitation could pose inaccuracy in the measurement of the patient's function. Third, there was an unavoidable bias regarding the recall nature of the interview. Moreover, because it was the follow-up of the infected patients in the middle of 2021, most of the COVID-19 strain in Thailand was delta. Therefore, the post-COVID-19 condition may differ from the strain widely spread afterward. However, the series could inform medical providers that post-COVID-19 condition is also common in patients with SCI and could affect the functional capacity and quality of life. Therefore, rehabilitation personnel taking care of SCI patients should be cautious and anticipate the conditions.

Conclusions

Every SCI patient in this series experienced post-COVID-19 conditions within six months after the infection. Some patients reported lower functional capacity and quality of life due to the condition. Therefore, medical professionals responsible for SCI patients should be aware of and prepared to care for this condition.

Disclosure

The author declares no conflict of interest.

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