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Original Article

Fatigue in healthcare workers with mild COVID-19 survivors in Indonesia

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Abstract

Persistent symptoms after the coronavirus disease 2019 (COVID-19, known as post-COVID syndrome (PCS), presented an ongoing health burden among COVID-19 survivors, including health workers. The existence of fatigue in mild COVID-19 survivors has not been widely reported. The aim of this study was to present the symptoms of fatigue in healthcare workers who experienced mild COVID-19 and the factors associated with fatigue. A cross-sectional study was conducted at H. Adam Malik General Hospital in Medan, Indonesia, from September to December 2022, included doctors, nurses, ancillary workers, and medical support workers who experienced mild COVID-19. Fatigue was measured by a fatigue assessment scale (FAS). The assessed possible risk factors were gender, age, vaccination history, comorbid, presence of PCS, duration of PCS symptoms, and number of PCS symptoms. The Chi-squared or Fisher's exact tests were used to assess the association between the incidence of fatigue and risk factors. A total of 100 healthcare workers of mild COVID-19 survivors were included. Most of them were nurses (58%), women (81%), and aged 19–30 years old (36%). The majority had incomplete vaccination history (64%), experienced PCS (71%), no comorbidities (61%), and experienced <3 months of PCS symptoms (55%). Mild to moderate fatigue was found in 23% of healthcare workers and only 1% experienced severe fatigue. No significant association was found between gender, vaccination history, and comorbidities with the incidence of fatigue. However, a significant association was observed between age (p=0.021), the presence of PCS (p=0.041), and the number of PCS symptoms (p=0.047) with fatigue incidence. Furthermore, there were significant associations between symptoms of PCS (confusion (p=0.004), insomnia (p=0.001), myalgia (p=0.035), arthralgia (p=0.028), throat pain (p=0.042), headache (p=0.042), and chest pain (p=0.011)) with fatigue. These findings can contribute to providing the necessary support for mild COVID-19 survivors and persistent fatigue.

Keywords: Mild COVID-19, long-COVID, post-COVID syndrome, fatigue, healthcare worker

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Introduction

The global coronavirus disease 2019 (COVID-19) pandemic has been affecting the lives of millions worldwide for more than three years. As of June 2023, there have been over 767 million confirmed cases of COVID-19 worldwide, with over 6.9 million deaths [1,2]. In Indonesia, there have been over 6.8 million confirmed cases [1,2]. The severity of COVID-19 was divided into four categories, including mild, moderate, severe, and critical cases [3]; evidence suggests that

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COVID-19 can cause long-term health complications even in patients with mild or asymptomatic infections [4,5]. The frequency of prolonged COVID-19 symptoms in patients after mild COVID-19 infection ranged between 10% to 35% [4,5]. Persistence symptoms after a mild COVID-19 infection can be distinguished into physical, mental, and social symptoms [4,5].

Post-COVID syndrome (PCS), or long COVID, is defined as the persistence of symptoms after viral clearance and the emergence of new symptoms after four weeks of recovering from COVID-19 [6,7]. PCS has two types based on the onset: post-acute COVID-19 syndrome (4–12 weeks) and post-chronic COVID-19 syndrome (≥12 weeks) [4,7]. PCS may present with respiratory symptoms such as dyspnea, cough, and chest pain. It extends to various symptoms from multiple organs, such as fatigue, myalgia, cognitive impairment, post-traumatic disorders, and palpitations with variations in prevalence and severity [7,8]. Recent studies have found the most common persistent symptoms after a mild COVID-19 infection were fatigue, dyspnea, cough, chest pain, headache, decreased cognitive status, and olfactory dysfunction [9-11]. Fatigue in post-infection was frequently found in many situations in both viral and non-viral diseases [12]. A study reported that the symptoms arising from COVID-19 increased disability negatively impacted physical function and quality of life and affected participation in general life activities and the ability to work [11]. It hypothesized that persistent symptoms after acute COVID-19 result from an immune-mediated disruption to the autonomic nervous system [13].

The impacts of COVID-19 have been predominantly experienced by healthcare workers. The World Health Organization (WHO) indicated that more than 14% of COVID-19 cases involve healthcare workers, with PCR-positive incidence ranging from 0.4% to 49.6%, and SARS-CoV-2 seropositive prevalence ranging from 1.6% to 31.6% [14]. Within Europe, healthcare workers constitute 10.7% (Italy) to 30.5% (United Kingdom) of the total number of COVID-19-positive cases. An increase in the incidence of COVID-19 among healthcare workers has the potential to cause a substantial decline in the quality of healthcare services, increasing the healthcare system's burden and leading to adverse health outcomes [15]. The aim of this study was to determine factors associated with the incidence of fatigue in healthcare workers who survived from mild COVID-19.

Methods

Study design, setting, and sampling strategy

A cross-sectional study was conducted at H. Adam Malik General Hospital, Medan, Indonesia, for four months (September-December 2022) among its employees. The hospital was a referral hospital for treating COVID-19 patients in the region. The Slovin formula was employed to determine the minimum number of samples required for the study [16]. The total population of healthcare workers confirmed to have mild COVID-19 history was 200 and the estimated minimum sample was 92 healthcare workers with a margin of error of 5%.

Participants

This study included employees of H. Adam Malik General Hospital with the following criteria: healthcare workers (doctors, nurses, ancillary workers, and medical support workers), above 18 years old, mild COVID-19 survivor, and ≥4 weeks since the first onset of COVID-19 symptoms. Ancillary workers were radiographers, laboratory technicians, medical record staff, dieticians, and physiotherapists. Healthcare workers who refused to be interviewed were excluded from the study.

Data collection

Data were collected through direct interviews with the healthcare workers in Bahasa Indonesia. The questionnaire consisted of three parts. The first part asked about the demographic characteristics such as age, gender, and type of healthcare workers. The second part questioned the healthcare workers regarding the clinical manifestations persisting in them, an example would be whether there were symptoms of fatigue and symptoms of other PCS besides fatigue. The third part sought on the history of vaccination, COVID-19 confirmed diagnosis, PCS, and comorbidities.

Fatigue was measured by the fatigue assessment scale (FAS) questionnaire, a subjective fatigue measurement instrument for chronic fatigue. The FAS questionnaire consists of ten questions that assess the aspects of physical and mental fatigue and their implications for motivation in carrying out activities. The FAS questionnaire uses a 5-point Likert scale: never (1), sometimes (2), regularly (3), often (4), and always (5). The FAS questionnaire was translated into Bahasa Indonesia and has been validated previously with a Cronbach's alpha of 0.812 [17]. The FAS score ranges from 10–50 and a score of <22 indicates no fatigue, 22–34 indicates mild to moderate fatigue, and a score of ≥35 is considered severe fatigue [18].

Study variables

The dependent variable of this study was the incidence of fatigue, and the independent variables were gender, age, vaccination history, comorbidity, the presence of PCS, duration of PCS symptoms, and the number of PCS symptoms. The age cut-off point of 50 years old was used to categorize individuals into the elderly group [19]. Vaccination history was categorized into complete for those who received three doses of COVID-19 vaccines and incomplete for those with less than three doses. History of PCS was categorized into acute PCS (4–12 weeks) and chronic PCS (≥12 weeks). Duration of PCS symptoms was divided into <3 months and ≥3 months. The number of PCS symptoms was classified into one symptom or more.

Statistical analysis

Quantitative variables were presented as means and standard deviations, and categorical variables were presented as frequencies and percentages. The Chi-squared test or Fisher's exact test was used to assess the association between independent variables (gender, age, vaccination history, comorbid history, presence of PCS, duration of the PCS symptoms, and the number of PCS symptoms) and the presence of fatigue. Statistical significance was considered at $p<0.05$. All statistical analysis was performed on SPSS version 20 for Windows (IBM, New York, USA).

Results

Characteristics of healthcare workers

A total of 100 healthcare workers of mild COVID-19 survivors were included in the study, as described in **Table 1**, the majority of the healthcare workers were nurses (58%) followed by doctors (38%). Most of the healthcare workers were female (81%) and aged between 19 and 30 years (36%). The majority of healthcare workers had received COVID-19 vaccinations either two or three doses, 36% respectively, and had no comorbidities. A total of 71 healthcare workers experienced PCS, 26 of them had acute PCS, and 45 had chronic PCS. Most had a duration of PCS symptoms for 1–3 months (36.6%) and eight had PCS for over 12 months (8.5%). Over half of the healthcare workers experienced more than two PCS symptoms.

Table 1. Characteristics of healthcare workers included in the study (n=100)

Characteristics	Frequency	Percentage
Gender		
Male	19	19.0
Female	81	81.0
Age (years)		
19–30	36	36.0
31–40	30	30.0
41–50	18	18.0
51–60	16	16.0
Type of healthcare worker		
Doctor	38	38.0
Nurse	58	58.0
Ancillary worker	2	2.0
Medical support worker	2	2.0
History of vaccination		
Never	23	23.0
1 dose	5	5.0
2 doses	36	36.0
3 doses (complete)	36	36.0

Characteristics	Frequency	Percentage
Comorbid history		
No	61	61.0
1 comorbid	37	37.0
>1 comorbid	2	2.0
History of PCS		
No history	29	29.0
Acute PCS	26	26.0
Chronic PCS	45	45.0
Duration of PCS symptoms (months), n=71		
1–3	26	36.6
3–6	22	31.0
7–12	17	23.9
>12	6	8.5
Number of PCS symptoms, n=71		
1	18	25.4
2	21	29.6
3	14	19.7
4	11	15.5
≥5	7	9.9

Fatigue assessment

A total of 24 healthcare workers experienced fatigue and 21 of them had a history of PCS. There were 23% had mild to moderate fatigue and 1% had severe fatigue. The average FAS score among the healthcare workers was 15.3±5.7, with a total score range of 10–35. The majority of them were female (87.5%) and all of them were above the age of 50. Physical fatigue was more dominant as compared to mental fatigue. An incomplete history of vaccination and having more than one PCS symptom were more likely to develop fatigue (**Table 2**).

Table 2. Fatigue assessment scale (FAS) score of healthcare workers (n=24)

Variables	Fatigue		FAS score total	Physical fatigue	Mental fatigue
	n	%	Mean±SD	Mean±SD	Mean±SD
Gender					
Male	3	12.5	13.6±5.3	7.4±3.6	6.2±2.0
Female	21	87.5	15.8±7.3	8.9±3.6	6.9±2.6
Age (years)					
>50	24	100	15.9±5.3	9.2±3.7	6.7±2.2
≤50	0	0.0	15.2±5.8	8.4±3.6	6.8±2.5
History of vaccination					
Incomplete	17	70.8	15.9±5.8	9.0±3.7	6.9±2.5
Complete	7	29.2	14.3±5.4	7.9±3.6	6.4±2.4
Comorbid					
Yes	11	54.2	15.8±6.1	8.9±3.9	6.9±2.8
No	13	45.8	15.1±5.5	8.4±3.5	6.7±2.3
History of post COVID syndrome (PCS)					
Yes	21	87.5	16.6±5.8	9.4±3.6	7.2±2.7
No	3	12.5	12.3±4.1	6.7±3.0	5.6±1.5
Duration of PCS symptoms					
≥3 months	12	50.0	16.8±5.5	9.9±3.5	6.9±2.2
<3 months	12	50.0	14.1±5.7	7.5±3.4	6.6±2.7
Number of PCS symptoms					
>2 symptom	16	66.7	18.6±5.3	10.6±3.3	8.0±2.5
≤2 symptom	8	33.3	13.7±5.2	7.6±3.4	6.1±2.2

Factors associated with fatigue incidence

The factors associated with the incidence of fatigue were measured, and our data revealed that an older age of >50 years (p=0.021) and the presence of PCS (p=0.041) were associated with fatigue incidence. Further analysis regarding PCS demonstrated that healthcare workers having more than one PCS symptom had a significant association (p=0.047) with the incidence of fatigue (**Table 3**).

Only three healthcare workers with fatigue did not experience PCS. The most frequent persistent symptoms among the healthcare workers with identified fatigue were tiredness (75.0%), confusion (45.8%), memory impairment (45.8%), dry or phlegmy cough (37.5%), and

insomnia (33.3%). The following symptoms were found significantly associated with fatigue: confusion (p=0.004), insomnia (p=0.001), myalgia (p=0.035), arthralgia (p=0.028), throat pain (p=0.042), headache (p=0.042), and chest pain (p=0.011) (**Table 4**).

Table 3. Factors associated with the incidence of fatigue (n=100)

Variables	Fatigue				p-value
	Yes		No		
	n	%	n	%	
Gender					0.551[a]
Male	3	3.0	16	16.0	
Female	21	21.0	60	60.0	
Age (years)					0.021[b]
>50	8	8.0	8	8.0	
≤50	16	16.0	68	68.0	
History of vaccination					0.424[b]
Incomplete	17	17.0	47	47.0	
Complete	7	7.0	29	29.0	
Comorbid					0.431[b]
Yes	11	11.0	28	28.0	
No	13	13.0	48	48.0	
History of PCS					0.041[a]
Yes	21	21.0	50	50.0	
No	3	3.0	26	26.0	
Duration of PCS symptoms, n=71					0.480[b]
≥3 months	12	16.8	33	46.5	
<3 months	9	12.7	17	24.0	
Number of PCS symptoms, n=71					0.047[a]
>1 symptom	19	26.8	34	47.9	
≤1 symptom	2	2.8	16	22.5	

[a] Analyzed using Fisher's exact test
[b] Analyzed using Chi-squared test

Table 4. Symptoms of post-COVID syndrome in healthcare workers with fatigue (n=24)

Symptom of post COVID-19 syndrome	Fatigue				p-value
	Yes		No		
	Frequency	%	Frequency	%	
Respiratory symptoms					
Dry or phlegmy coughing	9	37.5	15	62.5	0.234[a]
Dyspnea	3	12.5	21	87.5	0.445[b]
Throat pain	3	12.5	21	87.5	0.042[b]
Chest pain	2	8.3	22	91.7	0.011[a]
Rhinorrhea	2	8.3	22	91.7	0.591[b]
Non-respiratory symptoms					
Tiredness	18	75	6	25	0.068[a]
Confusion	11	45.8	13	54.2	0.004[a]
Memory impairment	11	45.8	13	54.2	0.096[a]
Insomnia	8	33.3	16	66.7	0.001[b]
Myalgia	6	25	18	75	0.035[b]
Arthralgia	4	16.7	20	83.3	0.028[b]
Headache	3	12.5	21	87.5	0.042[b]
Indolent	1	4.2	23	95.8	0.424[b]
Dizziness	1	4.2	23	95.8	0.240[b]
Anosmia	1	4.2	23	95.8	1.000[a]

[a] Analyzed using chi-squared test
[b] Analyzed using Fisher's exact test

Discussion

This study found that 23% of healthcare workers had no history of vaccination before being confirmed for COVID-19. A previous study conducted in Britain, which involved 66 post-COVID patients, found that healthcare workers were vaccinated and had improvement in their PCS symptoms, or revealed a reduction in worsening symptoms, compared with healthcare workers who were not vaccinated [20]. COVID-19 vaccination may potentially alleviate PCS symptoms by eradicating the viral reservoir or resetting a dysregulated immune response to the primary infection. Multiple studies have suggested that those suffering from PCS symptoms improve after

receiving the COVID-19 vaccine [21-23]. Various mechanisms have been suggested to induce prolonged symptoms after COVID-19, such as virus reservoirs, persistent inflammation, production of autoantibodies, and sequelae impairment of organs during infection [24]. Prolonged inflammation was observed in a subgroup of patients, and fatigue was associated with significant functional impairment [25].

There are multiple mechanisms through which COVID-19 infection is hypothesized to trigger or worsen persistent fatigue. Direct neurological damage may result from viral infections leading to wide inflammation in many organs and due to the mechanism of blood-brain barrier disruption, as well as pre-existing endothelial injury exacerbated by COVID-19 in the acute phase, resulting in sequelae [8,9]. This study did not find an association of comorbidities with fatigue in participants who experienced mild COVID-19. The mild infection itself may not have been severe enough to trigger the biological pathways, leading to lasting fatigue and exhaustion. The virus likely did not sustain enough damage or immune activation [26]. Individuals who swiftly clear the virus, even those with comorbidities, may not develop fatigue as there is minimal organ inflammation and dysfunction [27].

Healthcare workers of age >50 years were found associated with fatigue, and physical fatigue dominantly. This is appropriate with a previous study where physical aspects have a more significant impact on healthcare workers with older age, while mental aspects are more dominant at a younger age [9,18]. Studies have identified neuroanatomical changes, neurodegeneration, cerebral microvascular injury, and metabolic abnormalities. Hypometabolism in the brains of COVID-19 patients is suspected to be located in motivational regions, including the dorsolateral prefrontal cortex [9,18].

There are several hypotheses that are considered to explain the development of persistent fatigue symptoms, namely, the process of viral encephalitis that leads to neurological dysfunction, then the occurrence of inflammatory processes (possibly long-term), hypoxia, and the presence of cerebrovascular disease. This situation is consistent with the condition of severe acute respiratory syndrome (SARS) survivors, which has the potential to attack the peripheral and central nervous system [28]. Experienced fatigue is correlated with deterioration of non-motor functions within the basal ganglia, which in response adversely affects the striatal-thalamic-frontal cortical system. Likewise, individuals with multiple sclerosis (MS) have reported increased fatigue levels due to abnormalities in the striatum, thalamus, superior frontal gyrus, and inferior parietal gyrus. However, further studies are necessary to identify a specific fatigue network for individuals with post-COVID-19 [28,29].

Our study found that among 71 healthcare workers who had PCS, almost a third experienced fatigue, while healthcare workers without PCS were found to have a lower percentage of fatigue. Post-COVID-19 fatigue is defined as a decrease in physical and/or mental performance resulting from changes in central, psychological, and/or peripheral factors resulting from COVID-19 disease [30]. Fatigue is a gradual and cumulative process that results in a decrease in attention and performance ability, as well as related subjective states. It is a general psychophysiological condition that reduces the person's ability to undertake a certain task by affecting alertness and vigilance, as well as the motivational and subjective states that occur during this transition. As a result, there is a decrease in proficiency and motivation to cultivate or sustain goal-oriented actions geared towards satisfactory outcomes [18].

Furthermore, there are several symptoms of PCS associated with the presence of fatigue. Confusion, insomnia, myalgia, arthralgia, thoracic pain, headache, and chest pain have a significant association with fatigue. This study found that non-respiratory symptoms were dominant compared to respiratory symptoms. This is in accordance with previous studies highlighting the prevalence of neuromuscular symptoms after the acute phase of COVID-19 and the psychological impact on healthcare workers. It was proposed that the fatigue experienced by COVID-19 survivors was a consequence of the cumulative presence of symptoms, leading to disorders and alterations in the physical and mental performance of COVID-19 survivors [31,32].

Several limitations were found in this study. Firstly, the study was not designed to evaluate the FAS before the confirmation of COVID-19 and during the acute phase of COVID-19, so there was no comparison of demographic and clinical characteristics with post-COVID conditions. Secondly, the level of knowledge, social factors, and differentiation of treatment were not

presented in this study, so it omitted the evaluation of crucial medical predictors, socioenvironmental contributors, and therapeutic heterogeneity, which may profoundly modulate fatigue severity among survivors. Thirdly, mild COVID-19 treatment was conducted through independent isolation, although some healthcare workers were hospitalized, this variable was not included in the factors analyzed.

Conclusion

The results of this study indicated that age, presence of post-COVID syndrome, number of PCS symptoms, and symptoms of PCS such as confusion, insomnia, myalgia, arthralgia, sore throat, headache, and chest pain were significantly associated with fatigue. Consequently, the implementation of a holistic approach and integrated care pathways can provide appropriate support for COVID survivors with persistent fatigue, thereby better equipping physicians to manage patients at risk of developing fatigue after the acute phase of COVID-19.

Ethics approval

This study was approved by the Ethical Committee of Universitas Sumatera Utara on October 18, 2021 (Approval No: 127/KEP/USU/2021).

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Competing interests

The authors declare that there is no conflict of interest.

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Underlying data

Derived data supporting the findings of this study are available from the corresponding author on request.

How to cite

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