



# Examining the health status of patients with COVID-19 hospitalized in Hajar(S) Shahrekord Medical Education Center after discharge

Somayeh Mokhtari<sup>1</sup> , Zahra Ayazi<sup>1</sup> , Shahriar Salehi Tali<sup>2</sup> , Sadegh Eskandari<sup>1</sup> , Sahar Mokhtari<sup>3</sup> 

<sup>1</sup>Department of Nursing, Shahrekord University of Medical Sciences, Shahrekord, Iran

<sup>2</sup>Department of Nursing, School of Nursing, Shahrekord University of Medical Sciences, Shahrekord, Iran

<sup>3</sup>Department of Psychology, Islamic Azad University of Tehran, Tehran, Iran

## Abstract

**Background and aims:** The emergence of some medium—and long-term outcomes following the acute phase of the disease, known as “long COVID-19,” poses a challenge to medical science. This study aimed to determine the health status of COVID-19 patients after discharge.

**Methods:** This is a descriptive-analytical cross-sectional study. The research population included all COVID-19 patients hospitalized at Hajar Educational and Medical Center in Shahrekord over three months. The data collection tool was a questionnaire assessing the health status of patients six weeks after discharge. Data analysis was performed using SPSS23 software and descriptive and analytical statistical tests, including Fisher's exact test and independent t-test.

**Results:** The total number of hospitalized patients was 160. Among them, 21 patients had died, and 72 patients either did not respond to the phone call or provided unreliable information. Ultimately, data were collected from 67 patients. In examining the complications of COVID-19, 34.4% of the study samples reported weakness and fatigue, 13.4% cough, 8.9% dyspnea, and 1.4% skin complications. A significant correlation was observed between the gender variable with dyspnea and cough variable ( $P=0.001$ ) and between the gender variable with weakness and lethargy variable ( $P=0.05$ ). In the correlation analysis between the variables of hypertension, diabetes, lung diseases, overweight, brain diseases, and remdesivir drug injection, a significant relationship was observed with COVID complications.

**Conclusion:** The COVID-19 pandemic is not over, and many sufferers suffer from prolonged covid. Gender and underlying diseases are some of the most important underlying factors in the long-term COVID-19. Creating post-COVID care systems for these patients is highly needed and recommended.

**Keywords:** Long-COVID, Health status, Underlying disease, Discharge

## \*Corresponding Author:

Somayeh Mokhtari,  
Email: [somayhmokhtari@yahoo.com](mailto:somayhmokhtari@yahoo.com)

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## Introduction

Coronaviruses are a large family of viruses first identified in the 1960s. This family is named “Corona” due to its crown-like appearance (1). SARS-CoV, MERS-CoV, and SARS-CoV-2 are three types of coronaviruses that infect humans and are associated with severe respiratory infections and mortality (2). SARS-CoV-2 is a new type of this family that was introduced to the world at the end of 2019, and the associated disease was named COVID-19 (2,3). Due to its various biological and epidemiological characteristics, COVID-19 is more contagious than SARS and MERS coronaviruses (4). The World Health Organization declared the COVID-19 outbreak the sixth global public health emergency and, in February 2020, declared it a pandemic (5). This disease has been of significant concern from the beginning due to the high number of infections and deaths.

COVID-19 typically resolves entirely within a few weeks

for most patients; however, some individuals may continue to experience symptoms even after the initial phase of the disease has ended (6). This condition was first identified in the summer of 2020, a few weeks after the pandemic began, when some patients reported persistent symptoms several weeks after the onset of the acute phase of the disease (7). The term “long COVID” describes symptoms and signs that arise after the acute phase of COVID-19 (8-10). There is no single definition of long COVID, with various definitions based on symptoms, duration, or a combination. The Centers for Disease Control and Prevention (CDC) defines long COVID as a post-COVID condition with a wide range of new or returning health problems occurring four weeks or more after the initial infection with the COVID-19 virus (11). In general, long COVID is described as a delay in recovery from SARS-CoV-2 infection and is characterized by lasting effects of the infection, persistent unexplained symptoms, or even

the onset of new chronic diseases (12).

The number of people living with long COVID worldwide is unknown (13). This condition affects patients to varying degrees and may be diagnosed late (14). Persistent symptoms can severely impact an individual's ability to perform work activities and significantly affect their quality of life (12,15), potentially leading to lifelong disability (16).

Several studies have been conducted to examine the long-term complications of COVID-19. One such study is the systematic review by O'Mahoney et al in 2023, which reviewed 194 studies with 735 006 participants from Europe and Asia using electronic data from databases such as MEDLINE, Cochrane, and Scopus. The follow-up period for patients ranged from 28 to 387 days after infection. The results showed that, on average, 45% of COVID-19 survivors had at least one long-term symptom, regardless of hospitalization status. The prevalence of symptoms was higher among hospitalized patients than non-hospitalized patients (13). Another study by Arjun in 2022 in India aimed to examine the characteristics and predictive factors of long-term COVID-19. This study included 509 hospitalized and non-hospitalized patients who tested positive for COVID-19 by the polymerase chain reaction (PCR). Patients were followed up via phone calls at 4 weeks and 6 months. The results showed that the incidence of long COVID at the 4-week follow-up was 23% among patients with mild/moderate disease and 62% among those with severe/critical disease. At the 6-month follow-up, the incidence of long COVID was 7% among patients with mild/moderate disease and 23% among those with severe/critical disease (17).

Additionally, a prospective cohort study by Larijani et al in Iran aimed to assess the incidence of long COVID-19 syndrome and identify associated risk factors. This study evaluated 254 COVID-19 patients over 18 with positive PCR tests through in-person and telephone assessments. The results showed that 64% of patients reported at least one symptom after the acute phase (12). Other studies, such as the systematic review by Han et al in 2022 (18) and the study by Halpin et al in 2020 in the United Kingdom (19), the study by van der Sar-van der Brugge et al in 2021 (20) and the study by van den Borst in 2020 in the Netherlands (21), the study by Zhao et al in 2020 in China (2), and the review study by Mirzaei et al in 2020 in Iran (22), have also confirmed the occurrence of various complications, including respiratory, gastrointestinal, renal, cardiac, and neurological diseases, among others.

Examining the results of studies on the health status of patients after COVID-19 infection indicates the existence of medium- and long-term outcomes post-infection. However, the details of these outcomes and factors, such as the risk factors, type, prevalence, duration, and severity of symptoms after recovery from COVID-19, still need to be precisely determined, necessitating further investigations (8). Researchers worldwide strive to uncover these hidden aspects of long COVID (6) to the extent that this issue

has been included in the World Health Organization's list of research priorities (23). Given the lack of studies on the health status of COVID-19 patients after discharge from the hospital in Iran, this study aimed to examine the health status of COVID-19 patients hospitalized at Hajar Educational and Medical Center in Shahrekord six weeks after discharge in 2022.

### Materials and Methods

The present study is a descriptive-analytical cross-sectional study aimed at determining the health status of COVID-19 patients hospitalized at Hajar Educational and Medical Center in Shahrekord six weeks after discharge. The research population included COVID-19 patients hospitalized at Hajar Educational and Medical Center, the main hospital of Shahrekord University of Medical Sciences for COVID-19 treatment, who were included in the study by census method according to the inclusion criteria. Patients under 18 years old were excluded from this study. All hospitalized patients were included in the study within three months, from 23.7.2022 to 23.10.2022.

The data collection tool was a questionnaire assessing the health status of patients. The questionnaire included demographic information, age, gender, and questions about pre-existing conditions, medications, and overweight status before COVID-19 infection, length of hospitalization, and medication treatment during hospitalization. It also included questions about complications mentioned in previous studies, such as weakness and fatigue, cough, dyspnea, skin and lung complications, olfactory and taste disorders, cardiac, renal, neurological disorders, etc., six weeks after discharge. Responses to the questionnaire were recorded as yes or no. Content validity methods were used to determine the validity of the designed tool (24). The questionnaire was provided to five faculty members of the Medical School of Shahrekord with experience and expertise in this field. They were asked to provide feedback on the questionnaire and its appearance. For each question, the percentage of entirely relevant, the percentage of completely clear, and the percentage of simple and understandable were calculated. If any criterion's acceptable percentage was below 96%, it was reviewed and re-evaluated until the acceptable percentage was achieved. The reliability of the questionnaire was assessed through inter-researcher reliability by having two researchers independently and simultaneously assess the health status of 15 patients under the same conditions. The correlation of the scores was then determined. A reliability coefficient above 0.70 was considered acceptable (24). In this study, Cronbach's alpha was 0.920.

The total number of COVID-19 hospitalizations during the specified period was identified by referring to the head of the Hajar Educational and Medical Center admissions unit. The patients' electronic records were then reviewed, and the necessary study information, such as medical history and treatment plans, was examined.

The health status of the patients was assessed through a detailed telephone interview six weeks after discharge, with verbal consent obtained, using the patient health status questionnaire. Finally, the reliable information of 67 patients was statistically analyzed. Data analysis was performed using SPSS23 software and descriptive and analytical statistical tests, including Fisher's exact test and independent t-test.

## Results

The sample size was 160 adult patients. In the follow-up 6 weeks after discharge, the number of 160 patients, 21 patients had died, and 72 patients either did not respond to the phone call or provided unusable information. Cases of non-response, inaccurate information, and deceased individuals were excluded from the study. Out of the 67 patients, 34 were women and 33 were men. The average age of hospitalized was  $67 \pm 18.69$  years. The average duration of hospitalization for patients was  $4.8 \pm 3.76$  days, and 47.4% of the patients were treated with remdesivir.

Underlying conditions were examined, and 70% of the patients had underlying diseases: 58% had hypertension, 25% had diabetes, 17% had respiratory diseases, 19% were overweight, and 6% had a history of neurological problems. Additionally, 28% of the patients had a history of two underlying conditions. Regarding COVID-19 complications, 34.4% reported weakness and fatigue, 13.4% cough, 8.9% dyspnea, and 1.4% skin complications.

In the correlation analysis between variables such

as gender, hypertension, diabetes, respiratory disease, overweight, neurological disease, and the use of remdesivir with disease complications, Fisher's exact test showed a significant correlation between gender variable and dyspnea variable ( $P=0.001$ ), between gender variable and cough variable ( $P=0.001$ ) and between gender variable and weakness and lethargy variable ( $P=0.05$ ) (Table 1). There is a significant relationship. Dyspnea in male patients and weakness, lethargy, and cough in female patients were significant. Regarding correlation analysis between hypertension variable, diabetes, lung disease, overweight, brain disease, and remdesivir drug with disease complications, Fisher's exact test showed that between hypertension variable and cough variables ( $P=0.001$ ), dyspnea ( $P=0.036$ ) and weakness and lethargy ( $P=0.001$ ) significant correlation were observed. Also, a significant relationship was observed between the variable of diabetes and the variables of cough ( $P=0.001$ ), dyspnea ( $P=0.032$ ), and weakness and lethargy ( $P=0.001$ ). The variable of lung disease also had a significant relationship with the variables of cough ( $P=0.001$ ) and weakness and lethargy ( $P=0.001$ ). A significant correlation was observed between the variables of overweight and cough ( $P=0.001$ ), weakness and lethargy ( $P=0.001$ ), and dyspnea ( $P=0.001$ ). A significant correlation was observed between the variable of remdesivir injection and the variables of cough ( $P=0.028$ ) and dyspnea ( $P=0.001$ ) (Table 2).

## Discussion

This study aimed to determine the health status of patients

**Table 1.** Relationship between qualitative variables and complications of Covid with Fisher's exact test

Variable	Complications									
	Cough		P value	Dyspnea		P value	Weakness lethargy		P value	
	Yes	No		Yes	No		Yes	No		
Gender	Male	3	31	0.001	5	29	0.001	8	26	0.005
		34%	53%		83%	47%		34%	59%	
	Female	6	27		1	32		15	18	
		66%	47%		17%	52%		66%	41%	
Sum	9	58		6	61		23	44		
Hypertension	Yes	6	33	0.001	6	33	0.036	14	25	0.001
		66%	56%		100%	54%		60%	56%	
	No	3	25		0	28		9	19	
		34%	34%		0	36%		40%	44%	
Sum	9	58		6	61		23	44		
Diabetes	Yes	3	14	0.001	4	13	0.032	5	12	0.001
		33%	24%		66%	21%		21%	27%	
	No	6	44		2	48		18	32	
		67%	76%		34%	78%		79%	73%	
Sum	9	58		6	61		23	44		
Lung disease	Yes	2	10	0.001	3	9	0.066	6	6	0.001
		22%	17%		50%	14%		26%	14%	
	No	7	48		3	52		17	38	
		78%	83%		50%	76%		74%	86%	
Sum	9	58		6	61		23	44		

**Table 2.** Relationship between qualitative variables and complications of Covid with Fisher's exact test

Variable	Complications									
	Cough			Dyspnea			Weakness lethargy			
	Yes	No	P value	Yes	No	P value	Yes	No	P value	
Over weight	Yes	3	10	0.001	2	11	0.001	3	10	0.001
		33%	17%		33%	18%		13%	22%	
	No	6	48		4	50		20	34	
Sum		9	58		6	61		23	44	
Brain diseases	Yes	1	3	1.000	0	4	1.000	2	2	0.001
		11%	5%		50%	50%		9%	5%	
	No	8	55		6	57		21	42	
Sum		9	58		6	61		23	44	
Remdesivir injection	Yes	8	27	0.028	4	31	0.001	16	19	0.070
		88%	46%		66%	51%		69%	43%	
	No	1	31		2	30		7	25	
Sum		9	58		6	61		23	44	

with COVID 6 weeks after discharge. The results showed that in examining the complications of COVID-19, the studied samples reported 34.4% weakness and fatigue, 13.4% cough, 9.8% dyspnea, and 1.4% skin complications. The studies by Lippi et al (25), O'Mahoney et al (13), Bagheri Lankarani et al (26) in 2023, and Halpin et al (19) in 2021 align with the results of the present study. In these studies, weakness, fatigue, and dyspnea were common complications after contracting covid. Also, the studies by Arjun et al (17) and Zhao et al (2) in 2022 align with the current study, reporting fatigue, dyspnea, and cough as the most common complications following COVID-19. These three complications are mentioned as the most common symptoms in the results of most studies (23,25-28). It seems that COVID affects almost all body systems. The most common complications reported in studies include respiratory, cardiovascular, neurological, cognitive, metabolic, and other disorders (17).

The average age of hospitalized female patients was 67 years, and the average age of hospitalized male patients was 66 years. With increasing age, physiological functions decrease, and the function of organs, including the respiratory system, is disturbed. As a result, there is a problem with the exit of mucous secretions and destroyed micro-organisms in the mucus. The aging process alters lung physiology, pathology, and function during pulmonary infections, which affects the response and tolerance of elderly patients (29). Older age may impair the immune system's response to pathogens and organ function (30,31). It appears that age is a risk factor for contracting severe COVID-19 and hospitalization due to COVID-19, but as a risk factor for long-term COVID-19, further studies are needed (32).

In examining the correlation between gender and disease complications, A significant relationship between

gender and dyspnea, weakness, lethargy, and cough was observed. Dyspnea was significant in male patients, while weakness, fatigue, and cough were significant in female patients. In studies similar to the present one, such as Fernández and colleagues' study in Spain in 2022 (33) and Halpin and colleagues' study (19), fatigue was found to be more common in women. In Notarte and colleagues' systematic review study, the female gender had a significant relationship with long-term COVID-19 symptoms (32). Female gender appears to be a potential risk factor for some post-Covid symptoms, such as fatigue. Regarding other symptoms such as dyspnea and cough, differences between the two sexes in different studies, such as Notarte and colleagues' study (32), showed more dyspnea in women, unlike the present study. The presence of gender differences in the occurrence of long COVID symptoms may be rooted in biological disparities (hormones and immune responses), sociocultural factors (health-related behaviors, psychological factors), and socioeconomic and ethnic factors (32-34).

In the examination of underlying diseases, 70% of the study samples had a history of one underlying disease, while 28% had a history of two underlying diseases. The results of Notarte and colleagues' systematic review in 2022 in the United States, which analyzed 37 reputable research articles on long-term COVID-19, indicate that underlying diseases predispose individuals to experiencing long-term COVID-19 symptoms (32). Similarly, in Maleki and colleagues' study in 2021 in Tehran, 79% of deceased COVID patients had underlying diseases (35). Akhavadegan and colleagues' study also found that elderly individuals with COVID had a higher prevalence of underlying diseases, higher rates of hospitalization in intensive care units, and higher mortality rates (36). Given the prevalence of underlying diseases in the study



sample and the vulnerability of the elderly population, it appears that elderly individuals with underlying diseases are at a higher risk of developing severe COVID (4).

In the assessment of underlying diseases, 58% of the study participants reported hypertension, 25% had diabetes, 17% reported respiratory diseases, 19% were classified as overweight, and 6% had a history of neurological problems. Consistent with the present study, hypertension, diabetes, and heart issues were the most prevalent underlying conditions among COVID-19 patients in the studies by Maleki et al (35), Hadinejad et al (29), Vaseie et al (37), and Zhao et al (2). Additionally, in Paudel's systematic review study, which was conducted in 2020 by reviewing 7 valid research articles from PubMed, the most common underlying diseases in COVID-19 patients were hypertension, followed by other cardiovascular diseases, cerebrovascular diseases, diabetes, chronic lung diseases, and others (38).

The study's results showed a significant correlation between the underlying disease variables and disease complications in most cases (Table 2). Sigfrid et al conducted a study in England in 2021 to examine long-term COVID in 2630 adult patients three months after discharge, showed a significant difference in fatigue, disability, and poorer health status in patients with underlying diseases (39).

The results of the study on the correlation between the hypertension variable and disease complications showed that there is a correlation between the hypertension variable and cough ( $P=0.001$ ), dyspnea ( $P=0.036$ ), and weakness and lethargy ( $P=0.001$ ). In the electronic search of the current study, no study was found that investigated the relationship between hypertension and long-term complications. However, in Asgari's study, hypertension was directly related to the consequences of COVID-19 (40). The results of the studies by Akhavadegan et al (36) and Vaseie et al (37) also showed that high hypertension worsens the prognosis of covid disease. Sun and colleagues' study, which examined 3327 COVID-19 patients, showed that high blood pressure increases the risk of severe COVID-19 infection (41). Raesi et al also showed that the chance of contracting COVID-19 in patients with high blood pressure is 4.53 times compared to non-sufferers (42). Probably, suffering from cardiovascular diseases and high hypertension can cause malfunctions in the body's immune system and increase the expression of angiotensin-converting enzyme receptor 2, as a result of which the severity of COVID-19 increases (43).

A significant relationship was observed. Regarding the correlation between the variable of diabetes and the variables of cough ( $P=0.001$ ), dyspnea ( $P=0.032$ ), and weakness and lethargy ( $P=0.001$ ), a significant correlation was observed. In Bagheri Lankarani and colleagues' study in 2023 in Iran, a significant relationship between diabetes and the long-term was observed, which is in line with the results of the present study (26). In Sun and colleagues' study, diabetes was a serious risk

factor for acute respiratory failure and severe infection in COVID-19 patients (41). The main findings of the Raesi and colleagues' study revealed that the risk of contracting COVID-19 was 2.48 times higher in patients with diabetes compared to non-diabetic individuals (42). It seems that being affected by the immune system of people with diabetes due to chronic high blood sugar and severe fluctuations in blood glucose levels is one of the influential factors in reducing the rehabilitation and response to COVID-19 treatment of patients (44).

A significant correlation was observed between the variables of lung disease with the variables of cough ( $P=0.001$ ) and weakness and lethargy ( $P=0.001$ ). In the electronic search of the current study, no study was found that investigated the relationship between lung disease and long-term complications. However, in some studies, such as Vaseie and colleagues' study, no significant relationship between lung diseases and poor prognosis was observed (37). In another study, lung disease had a significant relationship with the poor prognosis of COVID-19 (45).

A significant correlation was observed between the variables of overweight and cough ( $P=0.001$ ), weakness and lethargy ( $P=0.001$ ), and dyspnea ( $P=0.001$ ). In Haghghi and colleagues' study in Iran, which aimed to examine the health status of COVID-19 patients hospitalized in special care units, 54% of patients were overweight (46). According to Rubio Herrera and Bretón Lesmes' study results, biological and social factors related to obesity increase the risk of COVID-19 infection and hospitalization and increase the severity of the disease (47).

A significant correlation was observed between the variable of remdesivir injection with the variables of cough ( $P=0.028$ ) and shortness of breath ( $P=0.001$ ). In the clinical trial study by Nevalainen conducted in Finland in 2022 with the participation of 208 adult patients, no convincing evidence was found regarding the effect of remdesivir on long-term COVID-19 outcomes (48). Additionally, in the study by Mozaffari et al in the United States in 2024, patients treated with remdesivir had 40% less need for hospital readmission within 30 days after discharge (49). However, further studies are needed to determine the effect of remdesivir on long-term COVID-19 outcomes.

## Conclusion

The COVID-19 pandemic is over, and many sufferers suffer from prolonged covid. Gender and underlying diseases such as hypertension and diabetes are some of the most important underlying factors of long-term COVID-19. Control of underlying diseases and more care for people with COVID-19 who have underlying diseases by establishing post-COVID care systems is highly needed and recommended.

## Limitations and suggestions

In this study, due to the lack of in-person access to

the patients, their health conditions were checked by telephone and self-report. It is suggested that the study be conducted by following up with the patients in person and for more extended periods after discharge.

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#### Authors' Contribution

**Conceptualization:** Somayeh Mokhtari, Zahra Ayazi.

**Data curation:** Somayeh Mokhtari, Zahra Ayazi, Sadegh Eskandari.

**Formal Analysis:** Somayeh Mokhtari, Shahriar Salehi Tali.

**Funding acquisition:** Somayeh Mokhtari.

**Investigation:** Somayeh Mokhtari.

**Methodology:** Somayeh Mokhtari.

**Project administration:** Somayeh Mokhtari.

**Resources:** Somayeh Mokhtari, Sadegh Eskandari.

**Software:** Somayeh Mokhtari, Shahriar Salehi Tali.

**Supervision:** Somayeh Mokhtari.

**Validation:** Somayeh Mokhtari.

**Visualization:** Somayeh Mokhtari.

**Writing—original draft:** Somayeh Mokhtari, Sahar Mokhtari.

**Writing—review & editing:** Somayeh Mokhtari, Sahar Mokhtari.

#### Competing Interests

The authors declare that there is no conflict of interest.

#### Ethical Approval

This article is based on the Health services research (HSR) project with ethical code IR.SKUMS.REC.1400.067, approved by the Vice-Chancellor for Research and Technology of Shahrekord University of Medical Sciences and implemented in 2022. We provided all interviewees with sufficient information about the purpose and process of our research and their rights. At the same time, verbal consent about voluntary participation in this study and permission for access to their hospital data were also obtained from each participant and obtaining written consent from the participants.

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