Updates in
Emergency Medicine

Research Article

Complications after COVID-19 Recovery in Patients Discharged from Intensive Care Unit: A Case Series Study

Majid Vatankhah[1], Zahra Ghasemof[2], Mehdi Hassaniazad[3], Ehsan Ramezanian Nik[4*], Ali Mouseli[5]

1 Associated Professor, Anesthesiology, Critical Care and Pain Management Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, Iran.
2 Anesthesiology resident, Anesthesiology, Critical Care and Pain Management Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, Iran.
3 Associate Professor of Infectious Disease, Hormozgan University of medical sciences, Bandar Abbas, Iran.
4 Assistant Professor of Pulmonology, Internal medicine department, Faculty of Medicine, Hormozgan University of medical sciences, Bandar Abbas, Iran.
5 Associate Professor, Social Determinants in Health Promotion Research Center, Hormozgan Health Institute, Hormozgan University of Medical Sciences, Bandar Abbas, Iran.

* **Correspondence**: Ehsan Ramezanian Nik. Assistant Professor of Pulmonology, Internal medicine department, Faculty of Medicine, Hormozgan University of medical sciences, Bandar Abbas, Iran. Email: ehsan.nick@gmail.com

Abstract:

Introduction: COVID-19 complications have not been precisely determined, especially in severe COVID-19 where patients get admitted to intensive care units (ICU). In this study, the remained complications and complaints of patients who were discharged from the ICU were investigated.

Methods: This is a case series study on patients discharged from the intensive care unit in January 2021 to December 2022 in Payambar Azam Complex. Patients discharged from the ICU were followed for 6 months after discharge. Demographic data was collected along with the data of the survey evaluating complications and complaints of patients. Referring a patient for a cardiologist, neurologist, or psychologist visit was considered as having cardiac, neurological, and psychological complications. Any episode of referring to healthcare centers for high blood pressure was considered as a history of newly emerged hypertension. Patients were asked for other complaints of myalgia and dyspnea.

Results: In 140 patients (61.4% women and 38.6% men), the average age was 44.96±17.78 years. Almost one-third (32.9%) of patients reported myalgia, while 30.7% reported dyspnea. Older patients with COVID-19 have more stroke/neurological diseases than younger patients ($P = 0.004$). Older patients with COVID-19 had more stroke/neurological disease than younger patients ($P < 0.001$). Only 38.6% had a full recovery. Adjusted for gender, the study found that for every year of age, the chance of complete recovery decreased by 3.2%.

Conclusion: These findings can contribute to future research on the long-term effects of COVID-19 on the nervous and cardiovascular systems in older patients.

Keywords: Coronavirus, COVID-19, Recovery, ICU.

Citation: Vatankhah, M., Ghasemof, Z., Hassaniazad, M., Ramezanian Nik, E., Mouseli, A. Complications after COVID-19 recovery in patients discharged from intensive care unit: A case series study. Updates in Emergency Medicine. Retrieved from https://uiemjournal.com/index.php/main/article/view/28

Received: October 3, 2022
Reviewed: October 28, 2022
Accepted: November 18, 2022
Published: December 2, 2022

Introduction

COVID-19 is an infectious respiratory disease caused by the novel coronavirus SARS-CoV-2. The virus was first detected in Wuhan, China in December 2019 and quickly spread to become a

global pandemic. COVID-19 is mainly transmitted through respiratory droplets when an infected person talks, coughs, or sneezes. It can also spread through contact with infected surfaces (1-2). Symptoms of COVID-19 can range from mild to severe and can include fever, cough, fatigue, myalgia, loss of smell or taste, sore throat, and stuffy or runny nose. In severe cases, COVID-19 can cause pneumonia, acute respiratory distress syndrome, and organ failure (3). Some patients with Covid-19 may experience long-term symptoms such as fatigue and difficulty breathing, even after recovering from the acute illness (4). Patients discharged from the ICU after a COVID-19 illness may face multiple challenges during their recovery (5-8).

Patients with severe COVID-19 may experience persistent respiratory symptoms such as Dyspnea, cough, and chest pain after discharge from the ICU. COVID-19 can have long-term effects on lung health, with many patients experiencing respiratory symptoms and lung complications even after recovery from the acute illness. These long-term effects are collectively referred to as the post-acute squeal of SARS-CoV-2 infection (PASC) or "prolonged COVID" (9-11).

Although the clinical manifestations of COVID-19 are mainly respiratory, as the number of infected patients increases, major cardiac diseases have been reported in a significant number of patients with COVID-19. Hypotension, cardiac arrhythmias, and even sudden cardiac death (SCD) were described as possible manifestations of SARS-CoV. Tachycardia was stable in approximately 40% of patients within 30 days after hospital discharge (12). Considering the complications and problems caused by covid-19 and considering that this disease is emerging unemployment and its complications have not been precisely determined, in this study, the rate of complications after covid-19 recovery in patients discharged from the ward He received special care in 2021 and 2022 at Payambar Azam Complex.

Methods

This study is a case series study. The target population in this study includes patients discharged from the special care department from January 2021 to December 2022 in Payambar Azam Complex, Hormozgan. This study was conducted based on the principles of the Declaration of Helsinki, and patient information remained confidential. This study was approved by the Medical Ethics Committee of Hormozgan University of Medical Sciences with the code of ethics "IR.HUMS.REC.1401.137".

The sample size in this study included all ICU hospitalized COVID-19 patients who had recovered 6 months ago. The number of 576 were admitted to our ICUs in these two years, of which 345 died in hospital and 231 recovered. Inclusion criteria were available data of follow-up at 6 months after discharge. Exclusion criteria also include patients who died less than 6 months after discharge.

The tool used in this study was a questionnaire that includes information such as; Age and sex. Referring a patient for a cardiologist, neurologist, or psychologist visit was considered as having cardiac, neurological, and psychological complications. Any episode of referring to healthcare centers for high blood pressure was considered as a history of newly emerged hypertension. The physician made the decision about the diagnosis of newly emerged hypertension after discharge or other referral conditions. Patients were asked for other complaints of myalgia and dyspnea.

Data analysis was done using SPSS software version 21 and descriptive (mean, standard deviation, number, and percentage) and inferential (chi-square, t-test) statistics at a significance level of $P<0.05$.

Results

One hundred and forty patients with COVID-19 were included in the study, of which 61.4% are women and 38.6% are men.

Table 1. Characteristics of patients discharged from the intensive care unit

Characteristics of Discharged Patients		n	%
Age	Less than or equal to 40 years	75	53.57
	More than 40 years	65	46.43
Sex	Female	86	61.43
	Male	54	38.57
Cardiac complications	No	122	87.14
	Yes	18	12.86
Hypertension	No	122	87.14
	Yes	18	12.86
Psychological complications	No	99	70.71
	Yes	41	29.29
Neurological complications	No	127	90.71
	Yes	13	9.29
Dyspnea	No	97	69.29
	Yes	43	30.71
Myalgia	No	94	67.14
	Yes	46	32.86

In terms of age distribution, 53.6% of patients are 40 years or younger, while 46.4% are over 40 years of age. Their average age was 44.96±17.78 years. Only 12.9% of patients received cardiology consultations. Among the patients, 12.9% have high blood pressure and 29.3% have psychological complications. Almost one-third (32.9%) of patients reported myalgia, while 30.7% reported dyspnea. Only 9.3% of patients had a stroke (Table 1).

There was no statistically significant relationship between gender and cardiovascular counseling (P = 0.583), gender and psychological complications (P = 0.283), gender and myalgia (P=0.784), and gender and stroke/neurological complications (P=0.555). Our analyses showed a significant relationship between age groups and consultation in cardiology (P = 0.004). This shows that older patients with COVID-19 face the need for cardiovascular consultation more than younger patients. There was no significant relationship between age groups and high blood pressure (P = 0.406), age groups and psychological complications (P = 0.270), age groups and myalgia (P = 0.226), and age group and shortness of breath (P = 0.265).

Table 2. Complications remained in ICU-recovered patients

	Female, number = 86		Male, number = 54		P	Higher than 40 years old, number = 75		Lower than 40, number = 65		P
	n	%	n	%		n	%	n	%	
Cardiac complications	10	11.63	8	14.81	0.583	4	5.33	14	21.54	0.004
high blood pressure	10	11.63	8	14.81	0.583	8	10.67	10	15.38	0.406
Psychological complications	28	32.56	13	24.07	0.283	19	25.33	22	33.85	0.283
Myalgia	29	33.72	17	31.48	0.784	28	37.33	18	27.69	0.226
Shortness of breath	24	27.91	19	35.19	0.364	20	26.67	23	35.38	0.364
Neurological/stroke	7	8.14	6	11.11	0.555	0	0	13	20	<0.001

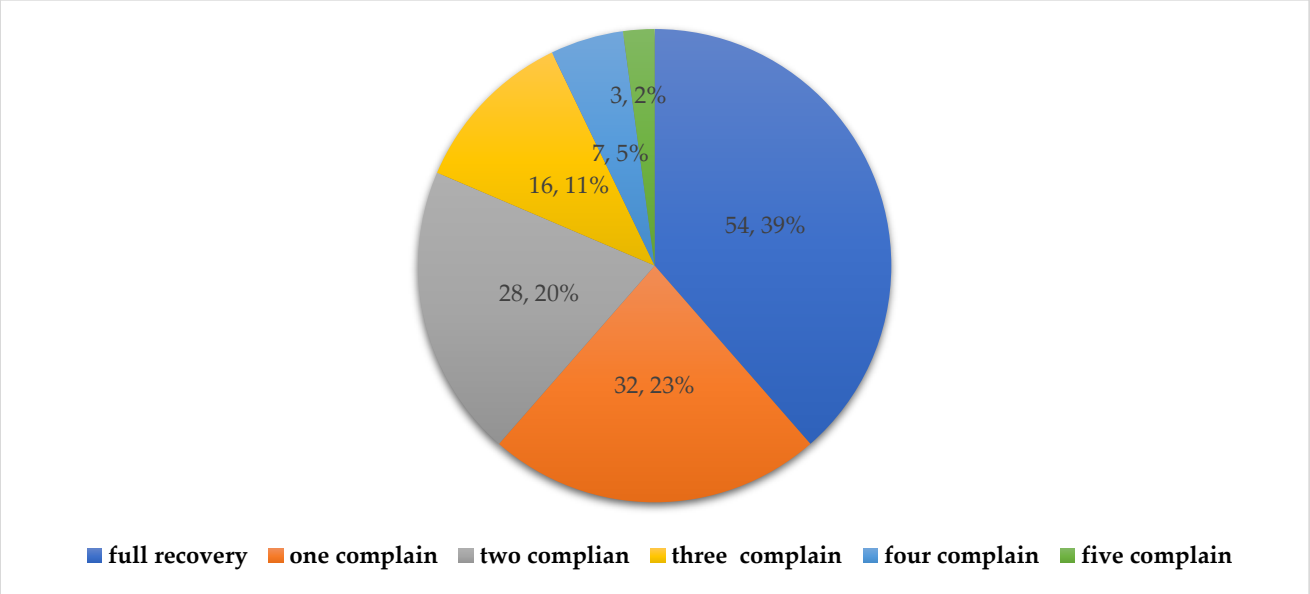

Figure 1. Number of patients' complaints

However, the results indicate a statistically significant relationship between the age group and stroke or neurological complications (Pearson Chi-Square = 16.535, P < 0.001). This suggests that older patients with COVID-19 have more stroke/neurological complications than younger patients (table 2).

The number of complaints from patients is summarized in Figure 1. Only 38.6% had a complete recovery. The results of the logistic regression model for predicting complete recovery are given. The results show that age has a significant negative relationship with the dependent variable of complete recovery, with an odds ratio of 0.968. This means that for every year of age, the chance of a full recovery decreases by 3.2%. The gender variable was not significant in predicting complete recovery. The overall model was statistically significant (df = 2, P=0.005), indicating that the combination of age and gender significantly predicted the outcome of complete recovery.

Discussion

Our study focused on the follow-up of patients discharged from the intensive care unit with COVID-19. We found that older patients with Covid-19 were more likely to require neurology consultation compared to younger patients. In addition, older COVID-19 patients were more likely to require cardiovascular consultation compared to younger patients. While these findings may seem obvious, they are still important to document because they can help healthcare providers better understand the needs of COVID-19 patients in different age groups. By identifying which specialties are most needed for elderly COVID-19 patients, healthcare providers can prioritize resources and provide more appropriate care. In our study, information was provided on the characteristics of patients admitted to the intensive care unit of Corona, including age, gender, need for cardiovascular consultation, blood pressure, anxiety and depression, myalgia, dyspnea, stroke, or neurological diseases. This information can help researchers and health professionals improve the care of hospitalized Covid-19 patients. Patients discharged from the ICU after a COVID-19 illness may face multiple challenges during their recovery. In our study, the most common complaints after discharge from the ICU were myalgia and dyspnea. Chronic post-ICU fatigue, also known as post-care syndrome (PICS) fatigue, is a common problem

experienced by many patients discharged from the ICU. This issue has been the subject of many studies in the field of ICU patients with the new coronavirus. In the observational cohort study by Vlake et al., it was also seen that sleep disorders, cognitive impairment, and reduced physical performance were among the most important problems of these patients (13). In our study, outcomes were examined for patients admitted to the intensive care unit of the Coronavirus in the month after their discharge, while Rousseau's study looked at patients with covid-19 who were admitted to the intensive care unit for at least 7 days and after 3 months. Since their leave, he has reported the results (14). The results of our study are reported based on various variables such as age, gender, need for cardiovascular consultation, blood pressure, anxiety and depression, body pain, dyspnea, and stroke or neurological diseases. In contrast, Rousseau's study focused on health-related quality of life, sleep disorders, physical conditions, mental health disorders, cognitive disorders, and biological parameters. Also, the results of Rousseau's study show that after 3 months of discharge, only 6.2% of patients have fully recovered and 87.5% have not regained their initial level of daily activities. This is despite the fact that in our study, 38.6% of patients did not report any specific problem one month after discharge. However, these two studies differ in several aspects because we did not compare patients in terms of baseline variables such as underlying diseases. In the study by Rousseau et al., it was shown that hospitalized covid-19 patients may not recover due to long-term complications of corona and require closed follow-up for survivors. This study was conducted on more than 150 covid-19 patients who returned to the hospital for follow-up more than 6 months after being discharged from the hospital. The results showed that more than 80% of patients needed re-care after 6 months. In our study, in our study, 38.6% of patients did not report any special problems one month after discharge and had a complete recovery. Overall, these data suggest that Covid-19 may have serious long-term complications and require post-discharge follow-up and care. In Li et al.'s study, fatigue symptoms and sleep problems were the most prevalent. Also, diffusion disorders and decreased kidney function have also been investigated in patients (15). Therefore, our study and their study show that patients with Covid-19 may still experience complications after the disease and need continuous follow-up and treatment. In our study, anxiety disorders were seen in 29.29% of participants. In a study by Nakayama et al., it was shown that hospitalization in the intensive care unit due to COVID-19 can lead to respiratory system changes six to twelve months after hospitalization (16). In our study, dyspnea remained in 30.73% of patients, which shows a very high percentage. However, in Nakayama, et al.'s study, advanced lung capacity measurement tests were used, while we used dyspnea questions.

Limitations of the study

Several factors may inadvertently bias this finding. For example, older patients with Covid-19 may have a higher prevalence of neurological and cardiovascular diseases, which could increase the likelihood of needing consultation in those specialties. In addition, elderly patients may have more severe cases of COVID-19, which may increase their risk of neurological and cardiovascular complications. Another potential bias is that older patients may generally have more comorbidities, which could increase the likelihood of needing multispecialty consultation. Finally, there may be changes in healthcare provider practice patterns or referral patterns for older versus younger COVID-19 patients. These factors should be considered when interpreting the study findings.

Conclusion

Our study focused on the follow-up of patients discharged from the intensive care unit with COVID-19. We found that older patients with Covid-19 were more likely to require neurology consultation compared to younger patients. In addition, older

COVID-19 patients were more likely to require cardiovascular consultation compared to younger patients. We also found that for every year of age, the chance of complete recovery decreased by 3.2%. These findings can contribute to future research on the long-term effects of Covid-19 on the nervous and cardiovascular systems in older patients.

Declarations:

Funding:

Hormozgan University of Medical Sciences.

Conflicts of interest:

None.

Authors' contributions:

MV, ZG, MH, ERN, AM wrote the study protocol, collected datasets, AM and MH performed statistical analyses and wrote the final manuscript.

Acknowledgments

None.

Ethical considerations

The study was approved by the Institutional Review Board of Hormozgan University of Medical Sciences with the code of ethics "IR.HUMS.REC.1401.137".

REFERENCES

1. Tao K, Tzou PL, Nouhin J, Gupta RK, de Oliveira T, Kosakovsky Pond SL, Fera D, Shafer RW. The biological and clinical significance of emerging SARS-CoV-2 variants. Nature Reviews Genetics. 2021 Dec;22(12):757-73.
2. Hu B, Guo H, Zhou P, Shi ZL. Characteristics of SARS-CoV-2 and COVID-19. Nature Reviews Microbiology. 2021 Mar;19(3):141-54.
3. Jackson CB, Farzan M, Chen B, Choe H. Mechanisms of SARS-CoV-2 entry into cells. Nature reviews Molecular cell biology. 2022 Jan;23(1):3-20.
4. Hasöksüz M, Kilic S, Sarac F. Coronaviruses and sars-cov-2. Turkish journal of medical sciences. 2020;50(9):549-56.
5. Ceruti S, Glotta A, Biggiogero M, Marzano M, Bona G, Previsdomini M, Saporito A, Capdevila X. Long-Term Evolution of Activities of Daily Life (ADLs) in Critically Ill COVID-19 Patients, a Case Series. InHealthcare 2023 Jan (Vol. 11, No. 5, p. 650). Multidisciplinary Digital Publishing Institute.
6. Wahlgren C, Forsberg G, Divanoglou A, Balkhed ÅÖ, Niward K, Berg S, Levi R. Two-year follow-up of patients with post-COVID-19 condition in Sweden: a prospective cohort study. The Lancet Regional Health–Europe. 2023 Feb 24.
7. Alotibi WM, Alzeer Z, Alfarhan IF, Alharbi AD, Alhaqbani FA, Almutairi AS, Alhazmi TM. The Incidence of Long-Term Fatigue in Patients Who Achieved Remission From COVID-19 at King Abdulaziz Medical City. Cureus. 2023 Jan 17;15(1).
8. Rodrigues M, Costa AJ, Santos R, Diogo P, Gonçalves E, Barroso D, Almeida MP, Vaz IM, Lima A. Inpatient rehabilitation can improve functional outcomes of post-intensive care unit COVID-19 patients—a prospective study. Disability and Rehabilitation. 2023 Jan 16;45(2):266-76.
9. Rodrigues M, Costa AJ, Santos R, Diogo P, Gonçalves E, Barroso D, Almeida MP, Vaz IM, Lima A. Inpatient rehabilitation can improve functional outcomes of post-intensive care unit COVID-19 patients—a prospective study. Disability and Rehabilitation. 2023 Jan 16;45(2):266-76.
10. Chommeloux, J., Valentin, S., Winiszewski, H., Adda, M., Pineton de Chambrun, M., Moyon, Q., Mathian, A., Capellier, G., Guervilly, C., Levy, B. and Jaquet, P., 2023. One-Year Mental and Physical Health Assessment in Survivors after Extracorporeal Membrane Oxygenation for COVID-19–related Acute Respiratory Distress Syndrome. American Journal of Respiratory and Critical Care Medicine, 207(2), pp.150-159.
11. Ribeiro Carvalho CR, Lamas CA, Chate RC, Salge JM, Sawamura MV, de Albuquerque AL, Toufen Junior C, Lima DM, Garcia ML, Scudeller PG, Nomura CH. Long-term respiratory follow-up of ICU hospitalized

COVID-19 patients: Prospective cohort study. PloS one. 2023 Jan 20;18(1):e0280567.
12. Kochi AN, Tagliari AP, Forleo GB, Fassini GM, Tondo C. Cardiac and arrhythmic complications in patients with COVID-19. J Cardiovasc Electrophysiol. 2020 May;31(5):1003-1008.
13. Vlake JH, Wesselius S, Van Genderen ME, van Bommel J, Boxma-de Klerk B, Wils EJ. Psychological distress and health-related quality of life in patients after hospitalization during the COVID-19 pandemic: A single-center, observational study. PloS one. 2021 Aug 11;16(8):e0255774.
14. Rousseau AF, Minguet P, Colson C, Kellens I, Chaabane S, Delanaye P, Cavalier E, Chase JG, Lambermont B, Misset B. Post-intensive care syndrome after a critical COVID-19: cohort study from a Belgian follow-up clinic. Annals of intensive care. 2021 Dec;11(1):1-9.
15. Li D, Liao X, Ma Z, Zhang L, Dong J, Zheng G, Zi M, Peng W, Wei L, Li Z, Kong Y. Clinical status of patients 1 year after hospital discharge following recovery from COVID-19: a prospective cohort study. Annals of Intensive Care. 2022 Dec;12(1):1-1.