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# Long Coronavirus Disease and Chronic Coronavirus Disease in Health-Care Workers: A Cross-Sectional Study

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***Abstract***

**Objective:** Recent studies on coronavirus disease 2019 (COVID-19) reported that symptoms persisted for weeks or even months in some patients and they are called long COVID, post-acute COVID-19, etc. The aim of this study is to examine the frequency of long COVID in health-care workers, identify the common symptoms, and assess the possible factors that may be associated.

**Methods:** In this cross-sectional study a self-administered questionnaire was carried out. About half (48.1%) of the 131 participants evaluated had long COVID. The 41.3% of long COVID cases had chronic COVID.

**Results:** The percentage of those who were hospitalized in inpatient clinics or intensive care units during infection was higher in long COVID patients (31.7% vs. 14.3%) as well as frequency of oxygen need (36.5% vs. 17.9%). Fatigue was the most frequent symptom (54%), followed by myalgia (47.6%) and arthralgia (42.9%).

**Conclusion:** The study showed that approximately half of health-care workers who had COVID-19 suffer from long COVID.

**Keywords:** Chronic COVID, COVID-19, health-care workers, long COVID, persistent symptoms

## Introduction

In 2020, a year in which the coronavirus disease 2019 (COVID-19) pandemic was most common, initial reports stated that most people infected with COVID-19 experienced mild-to-moderate illness and recovered in 2 weeks.[1,2] However, subsequent studies showed that several symptoms persist for weeks or even months in some patients. Among these symptoms, the most common ones were fatigue, dyspnea, cognitive impairment, and cough.[3,4]

Terms such as long COVID, chronic COVID, and post-acute COVID-19 have been used to describe the disease in people who got infected with COVID-19 and still reported persistent effects of the infection or had symptoms for much longer than expected.[5-10] Although there is no consensus yet, in some literature, long COVID is used for patients whose symptoms still persist 3 weeks after the onset of the first symptoms, and chronic COVID is used for patients whose symptoms still persist after 12 weeks.[5] According to the recommendation of the National Institute for Health and Care Excellence's guideline on the long-term effects of COVID-19, the symptoms of COVID-19 present from 4 to 12 weeks are called "Ongoing symptomatic COVID-19" and symptoms that present for more than 12 weeks are called "Post-COVID-19 syndrome." But the guideline also acknowledges the common usage of long COVID.[11]

Epidemiologic studies show a great variety related to the frequency of long COVID, though there is a lack of universal terminology and definitions.[12] In some studies, the frequency of COVID-19 patients with persistent symptoms is lower than 15%, while in others it is up to 88%.[7-10] There is still a lot to be discovered about the long-term effects of COVID-19. Limited information is available in the literature on the prevalence of long/chronic COVID in hospital workers who are at risk of exposure to high viral loads due to encountering a large number of infected individuals. Recent reports indicate a higher incidence of COVID-19 infection among health-care workers (HCWs), as well as a higher frequency of post-COVID-19 symptoms.[11,13]

The aim of this study is to examine the frequency of long/chronic COVID in HCWs, identify the most common symptoms, and assess possible associated factors.

## Methods

### Study Design and Participants

This cross-sectional study was conducted between March 13, 2020 (first COVID-19-positive HCW), and January 13, 2021, in a university hospital in İstanbul, Türkiye. Of the 697 HCWs who had COVID-19 infection between those dates, 132 were randomly selected (N = 697, $P$ = 12%, $d$ = 5%, 95% CI). Microsoft Office Excel RANDBETWEEN function was used for random selection. The study was approved by the Clinical Research Ethics Committee of İstanbul University-Cerrahpaşa, Cerrahpaşa Faculty of Medicine (Approval No: 69802; Date: April 6, 2021) and conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from participants.

A self-administered questionnaire including 21 questions on sociodemographic and COVID-19-related information was carried out on participants. Long COVID was defined as new symptoms or symptoms that persisted 3 weeks after the first symptoms or the

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confirmation of COVID-19 infection. Chronic COVID was defined as new symptoms or symptoms that persisted 12 weeks after the first symptoms or the confirmation of COVID-19 infection.

### Statistical Analysis

Analyses was performed by using the Statistical Package for Social Sciences version 21.0 software (IBM Corp.; Armonk, NY, USA). The categorical variables were given as frequency and percentage while the continuous variables were given as mean ± SD. The categorical variables were analyzed using chi-square or Fisher exact test, where appropriate. The continuous variables were analyzed by the Student *t*-test. A *P*-value < .05 was accepted for statistical significance.

## Results

Out of 132 questionnaires, 131 (99.2%) were evaluated. One participant (0.8%) was excluded for not giving complete answers to the questions about COVID-19 symptoms. While 9.2% (n = 12) of the HCWs had an asymptomatic form of the disease, 42.7% (n = 56) had symptoms lasting less than 3 weeks and 48.1% (n = 63) had long COVID, symptoms lasting more than 3 weeks. The 41.3% (n = 26) of the long COVID cases had symptoms persisting more than 12 weeks, which is called chronic COVID.

The mean age was 35.5 ± 8.8 years, and 55.7% (n = 73) of the HCWs were female. Among the HCWs, 11.5% (n = 15) were medical doctors, 44.3% (n = 58) were nurses or health technicians, 23.7% (n = 31) were administrative personnel, and 20.6% (n = 27) were service workers. The sociodemographic and COVID-19-related information of HCWs are given in Table 1.

There were no significant differences between HCWs whose symptoms lasted less than 3 weeks and HCWs lasting longer than 3 weeks in terms of age, sex, education status, marital status, position in the hospital, means of transport, income status, physical activity, alcohol, and smoking (*P* > .05). The frequency of those who were hospitalized in inpatient clinics or intensive care units during the COVID-19 infection was higher in HCWs with long COVID compared to those whose symptoms lasted less than 3 weeks (31.7% vs. 14.3%, *P* = .025). Likewise, the frequency of oxygen need (mask/intubation) was higher in HCWs with long COVID (36.5% vs. 17.9%, *P* = .023) (Table 2).

Fatigue was the most frequent symptom (65.6%) in symptomatic cases, followed by fever and myalgia (62.6% both). Fatigue was also the most frequent symptom in long COVID (26% of all cases, 54% of long COVID cases), followed by myalgia (22.9% of all cases, 47.6% of long COVID cases), and arthralgia (20.6% of all cases, 42.9% of long COVID cases). The frequency of symptoms that lasted less than 3 weeks and longer than 3 weeks is shown in Figure 1.

**Table 1.** Sociodemographic and Coronavirus Disease 2019-Related Characteristics of Health-Care Workers

| Characteristics | | Mean ± Standard Median (P25-75) |
|---|---|---|
| Age | | 35 ± 9 35 (28-42) |
| | | n (%) |
| Sex | Male | 58 (44.3) |
| | Female | 73 (55.7) |
| Educational status | Below high school | 20 (15.3) |
| | High school | 21 (16) |
| | Under/postgraduate | 90 (68.7) |
| Marital status | Single | 61 (46.6) |
| | Married | 70 (53.4) |
| Position in the hospital | Medical doctor | 15 (11.5) |
| | Nurse or health technician | 58 (44.3) |
| | Administrative staff | 31 (23.7) |
| | Servant | 27 (20.6) |
| Way of transportation to work | Private vehicle | 44 (33.6) |
| | Public transport | 70 (53.4) |
| | On foot | 16 (12.2) |
| Income status | Income < expense | 40 (30.5) |
| | Income = expense | 65 (49.6) |
| | Income > expense | 21 (16) |
| Physical activity | None | 41 (31.3) |
| | Rarely | 65 (49.6) |
| | Regularly | 24 (18.3) |
| Alcohol use | No | 73 (55.7) |
| | Yes | 58 (44.3) |
| Smoking | No | 79 (60.3) |
| | Yes or quit | 52 (39.7) |
| Hospitalization for COVID-19 | No | 103 (78.6) |
| | Yes (inpatient and/or intensive care unit) | 28 (21.4) |
| Oxygen need during COVID-19 | No | 98 (74.8) |
| | Yes (oxygen mask and/or intubation) | 33 (25.2) |
| Duration of symptoms | No symptom | 12 (9.2) |
| | ≤3 weeks | 56 (42.7) |
| | 3 weeks to 3 months | 37 (28.2) |
| | ≥3 months | 26 (19.8) |

HCW, health-care worker; ICU, intensive care unit; P25-75, 25th-75th percentile.

## Discussion

The present study showed that nearly half (48.1%) of HCWs infected with COVID-19 had symptoms lasting longer than 3 weeks. It was also determined that the frequency of long COVID was higher in people who were hospitalized for COVID-19 and/or needed oxygen during infection. In a large cohort conducted in Northwest Spain, 48% of the patients described one or more persisting symptoms during 6 months of follow-up, and these symptoms were found to be more common in hospitalized patients, similar to our study.[14] A study evaluating post-COVID symptoms in HCWs found a similar frequency (45%) to our study for persistent symptoms.[13] However, the current literature has varying results on the frequency of long COVID and patients at risk. In a study collecting information on COVID-19 symptoms by an application,

**Table 2.** Sociodemographic and Coronavirus Disease 2019 (COVID-19)-Related Characteristics of Health-Care Workers by Duration of COVID-19 Symptoms

| | | Duration of Symptoms | | |
|---|---|---|---|---|
| **Characteristics** | | **<3 Weeks (n = 56)** | **>3 Weeks (n = 63)** | ***P*** |
| Age | | 36 ± 9 36 (27-41) | 35 ± 8 32 (29-42) | .764[s] |
| Sex | Male | 25 (44.6) | 25 (39.7) | .584[c] |
| | Female | 31 (55.4) | 38 (60.3) | |
| Educational status | Below high school | 8 (14.3) | 9 (14.3) | .868[c] |
| | High school | 9 (16.1) | 8 (12.7) | |
| | Under/postgraduate | 39 (69.6) | 46 (73) | |
| Marital status | Single | 23 (41.1) | 33 (52.4) | .217[c] |
| | Married | 33 (58.9) | 30 (47.6) | |
| Position in the hospital | Medical doctor | 7 (12.5) | 8 (12.7) | .134[c] |
| | Nurse or health technician | 19 (33.9) | 33 (52.4) | |
| | Administrative staff | 19 (33.9) | 11 (17.5) | |
| | Servant | 11 (19.6) | 11 (17.5) | |
| Way of transportation to work | Private vehicle | 24 (43.6) | 17 (27) | .158[c] |
| | Public transport | 24 (43.6) | 37 (58.7) | |
| | On foot | 7 (12.7) | 9 (14.3) | |
| Income status | Income < expense | 16 (30.8) | 20 (32.3) | .910[c] |
| | Income = expense | 26 (50) | 32 (51.6) | |
| | Income > expense | 10 (19.2) | 10 (16.1) | |
| Physical activity | None | 22 (39.3) | 16 (25.4) | .246[c] |
| | Rarely | 26 (46.4) | 34 (54) | |
| | Regularly | 8 (14.3) | 13 (20.6) | |
| Alcohol use | No | 27 (48.2) | 41 (65.1) | .064[c] |
| | Yes | 29 (51.8) | 22 (34.9) | |
| Smoking | No | 35 (62.5) | 37 (58.7) | .675[c] |
| | Yes or quit | 21 (37.5) | 26 (41.3) | |
| Hospitalization for COVID-19 | No | 48 (85.7) | 43 (68.3) | .025[c] |
| | Yes (inpatient and/or intensive care unit) | 8 (14.3) | 20 (31.7) | |
| Oxygen need during COVID-19 | No | 46 (82.1) | 40 (63.5) | .023[c] |
| | Yes (oxygen mask and/or intubation) | 10 (17.9) | 23 (36.5) | |

Age was given as mean ± SD and median (25th-75th percentile), other variables were given as frequency (%).
[s]Student *t*-test.
[c]Chi-square test.

13.3% of the 4182 users reported symptoms that lasted 28 days or more.[7] Conversely, in a study conducted in Italy, it was reported that in 87.4% of cases, at least 1 symptom persisted.[10] A cohort study assessing the long-lasting symptoms of COVID-19 in patients discharged from the hospital reported that 76% of patients had at least 1 symptom 6 months after the onset of symptoms, and severe patients were in a risk group that needed intervention for long-term recovery.[15] In a study among non-hospitalized patients, the frequency of persistent symptoms was similar to our study (53.1%). However, no difference was found in the presence of long-lasting symptoms with regard to hospitalization.[16] This heterogeneity may have resulted from the inclusion of different populations in the studies, the use of different definitions, and different follow-up periods.

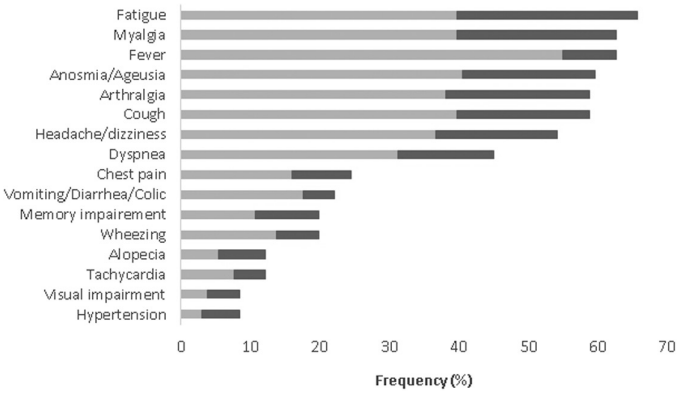


**Figure 1.** Frequency of symptoms that lasted less than 3 weeks (light gray) and lasting longer than 3 weeks (dark gray).

In the present study, while the most frequent symptoms in the symptomatic cases were fatigue, fever, and myalgia, the most frequent persistent symptoms were fatigue, myalgia, and arthralgia, respectively. In a large majority of the current literature on long-lasting symptoms of COVID-19, fatigue is the most frequent persistent symptom. However, the subsequent symptoms usually vary.[11] In a study carried out in Ecuadorian patients, the most common symptom was fatigue (67.3%), followed by headache (45.2%) and body pain (42.3%).[8] A meta-analysis study showed that fatigue, dyspnea, and chest pain were the most prevalent respiratory symptoms between 3 weeks and 3 months after discharge.[17] There is no accurate evidence of a particular symptom for long COVID, and the certainty of the current evidence is very low-to-moderate at this time.[11] Moreover, other diseases such as community-acquired pneumonia might cause persistent symptoms, which also suggests these findings may not be specific to COVID-19[10].

The current literature has different findings on the risk factors of long COVID. In a study conducted in the Faroe Islands, no difference was found in the presence of long-lasting symptoms with regard to sex and smoking, similar to our study. The symptoms were found to be more persistent with increasing age, unlike our study.[16] A meta-analysis study including 10 longitudinal studies found that being female significantly increased the risk of symptoms lasting 4 weeks or more.[18] However, the quality of evidence was very low due to a very serious risk of bias and serious inconsistencies.[11] Moreover, the quality of evidence was low due to a very serious risk of bias in other studies finding obesity, smoking, poor general health, and/or hospitalization as risk factors of long-lasting symptoms.[11,18,19] More accurate evidence is still needed to identify patients at risk of long COVID.

This study has several possible limitations. The study was conducted in a single center and had a relatively small sample size, but it suggests that the sample size may be more extensive in future studies, as it is a tertiary university hospital that took an active role in the pandemic. Only confirmed cases of COVID-19 were included in the study. Health-care workers who were not diagnosed due to the asymptomatic course of the disease were not included in the study. This may have caused an incorrect estimation of the frequency of long COVID. The self-reporting nature of the questionnaire may be an important limitation in this study as it may cause reporting bias or memory bias.

## Conclusion

In this study, it was observed that the symptoms lasted longer than 3 weeks from the onset of infection in approximately half of the HCWs who were infected with COVID-19. The findings of the study suggest that people who are hospitalized due to COVID-19 and/or who need oxygen during the infection period should receive follow-up care for long/chronic COVID. Future studies should focus on identifying the red flag symptoms and the risk factors for long/chronic COVID for early diagnosis and treatment.

**What do we already know about this topic?**

Symptoms of COVID-19 persist for weeks or even months in some patients.

**How does our research contribute to the field?**

A significant percentage of COVID-19 patients suffer from persistent symptoms, and these patients were most likely hospitalized or had an oxygen need at the time of infection.

**What are our study's implications toward theory, practice, or policy?**

Future studies should focus on identifying the red flag symptoms and the risk factors for long/chronic COVID for early diagnosis and treatment.

**Availability of Data and Materials:** The datasets generated and/or analyzed during the current study are not publicly available due to Turkish Personal Data Protection Law no 6698 but are available from the corresponding author on reasonable request.

**Ethics Committee Approval:** The study was approved by the Ethics Committee of İstanbul University-Cerrahpaşa, Cerrahpaşa Faculty of Medicine (Approval No: 69802, Date: April 6, 2021).

**Informed Consent:** Written informed consent was obtained from the participants who participated in this study.

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