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Characterization of Long COVID and Its Contributing Factors among a Population of Health Care Workers in a 6-Month Follow-up

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Abstract

Background: Health care workers (HCWs) are at the frontline of the fight against the coronavirus disease 2019 (COVID-19). Long COVID is defined as "the persistence of some symptoms of COVID-19, more than 4 weeks after the initial infection." The aim of the present study was to investigate the prevalence of long COVID status among HCWs in the largest hospital complex of Iran.

Methods: In this cross-sectional study, all patients with COVID-19 who had taken sick leave were included in the study (n = 445). Data regarding sick leave characteristics were collected from the records of the nursing management department of the hospital. Study variables included demographic and occupational information, variables related to mental health assessment, organ systems involved in COVID-19, and duration of symptoms. Frequencies, percentage distributions, means, standard deviation, and range (minimum, maximum) were used as descriptive analysis methods. Associations between symptoms' persistency and clinical characteristics were assessed by logistic and linear regressions.

Results: Age, N95 mask use, and respiratory protection significantly contributed to the persistence of COVID-19 symptoms ($P < 0.05$). The prevalence of long COVID among HCWs was 9.44% among 445 participants. The loss of taste persisted longer than the other symptoms before returning to normal. Among the postrecovery complications asked, anxiety was the most common persistent mental symptom (58.5%), followed by gloomy mood (46.3%) and low interest (46.2%), respectively.

Conclusion: HCWs with COVID-19 symptoms had prolonged symptoms of COVID-19 that can affect their work performance, thus, we recommend evaluating COVID-19 symptoms in HCWs with infection history.

Keywords: Long COVID, Health Care Workers, COVID-19

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Introduction

In December 2019, human infection with the SARS-CoV-2 or COVID-19 respiratory virus first appeared in Wuhan, China (1). Since its identification, the virus has spread around the world, infecting many people, with a wide spectrum from mild to severe disease. According to the World Health Organization, as of Aguest 27, 2022, the disease has infected approximately 596,873,121 and killed 6,459,684 people (2).

During an outbreak, health care workers (HCWs) are at the frontline of the fight against this disease. Due to their greater exposure to the disease agent, there is more concern about the incidence of the disease and its consequences in this population. In addition, the illness of health workers can spread the disease to other hospital patients, family members, and the community. The rate of HCWs infection with COVID-19 has been reported in various articles between 0.9% and 19% (3-6); however, the exact number is unknown.

The term "long COVID" was first used by Elisa Perego (7). This combination is meant to prolong the duration of

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↑What is "already known" in this topic:
COVID-19 symptoms and their persistency have been discussed well in previous studies but long COVID has been less discussed.

→What this article adds:
To our knowledge, this is the first study to examine long COVID among HCWs in Iran.

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COVID-19 disease and actually includes cyclical, progressive, and multiphasic diseases. Even though there is still a lot of discussion surrounding this term, we describe it as persistent COVID-19 symptoms occurring 4 to 12 weeks after infection (8). Long COVID, like acute COVID, involves not only the respiratory system but also many organs of the body and adversely affects them; therefore, it needs special attention.

Examining the prevalence of long COVID and then considering ways to prevent and treat this condition as soon as possible can be of great help to solve this problem given the importance of HCWs' health as well as the heavy burden on the health system and society in case of their illness and absence from work. On the other hand, we have limited evidence on the prevalence of long COVID symptoms among HCWs. Therefore, the aim of the present study was to investigate the prevalence of long COVID among HCWs.

Methods

This was a cross-sectional study conducted between July and September of 2020 in Imam-Khomeini hospital complex (IKHC) and approved by the ethics committee of Tehran University of Medical Sciences (Ethics code: IR.TUMS.IKHC.REC.1399.297).

All patients with COVID-19 who had taken sick leave were recruited in the study. Data regarding sick leave characteristics were collected from the records of the nursing management department of hospital. Verbal consent was obtained from all of them. The sample size eligible for the study was 445 people. All survey participants who had registered with sickness absenteeism due to COVID-19 were included in our study. and the exclusion criterion was unwillingness to participate in the study.

Data on eligible individuals were recorded in a data collecting sheet by individual interviews. Study variables included demographic (age, sex, and level of education) and occupational information, variables related to mental health assessment (anxiety and depression), organ systems involved in COVID-19, sleep problems, duration of symptoms and other factors that may be influential, such as smoking, excersise and and so on. Long COVID-19 was defined as persistency of some COVID-19 symptoms for more than 4 weeks after the initial infection.

The data were analyzed statistically with SPSS software (IBM SPSS), with a P value of < 0.05 indicating statistical significance. Frequencies and percentage distributions were used to describe the categorical variables. Means, standard deviation, and range (minimum, maximum) were used to describe the quantitative variables as descriptive analysis methods.

Associations between symptoms persistency and clinical characteristics were assessed by logistic and linear regressions.

In this study, taste/smell loss, hoarseness, nasal congestion, cervical mass, and epistaxis were included as ear, nose and throat (ENT) symptoms. rash, urticaria, and hair loss were included as skin symptoms. Blurred vision, red eye, and tearing were included as eye symptoms. dyspnea, cough, and rhinorrhea were included as respiratory symptoms. Nausea, vomiting, and diarrhea were included as gastrointestinal symptoms. Fever, chill, sweat, anorexia, tiredness, and lethargy were included as constitutional symptoms. Sore throat, headache, abdominal pain, myalgia, arthralgia, otalgia, and ophthalmodynia were included as pain. Hypertension, tachycardia, palpitation, and hypotension were included as cardiovascular symptoms. Insomnia, interrupted sleep, long sleep, and somnolence were included as sleep problems. Dizziness/vertigo, palpitation, memory impairment, red eye, eye itching, emotional lability, sensory impairment, and ear congestion were included as other symptoms.

Our symptoms questions were open and these symptoms were reported at least one time.

Results

In this study, 77.1% of participants were women and the mean (SD) age was 35.2 years (± 8.500). Underlying disease was present in 20.1% (n = 89). Nearly 66% (n = 289) of those surveyed did not wear the N95 mask at work but almost 99% (n = 436) used some forms of respiratory protection (Tables 1 and 2).

The duration of symptoms varied from 1 day to 120 days. The mean days of absence from work and the average persistence of symptoms were 9.09 and 12.55 days, respectively. The prevalence of long COVID among HCWs was 9.44% among 445 participants in this study (Table 3). Non-long COVID involved 403 participants (90.56%).

In both long COVID and non-long COVID groups, the majority of participants were women and nurses. Employees in critical wards, such as the emergency and COVID-19 wards showed a higher incidence of the disease. Among the asked cases, only “using respiratory protection” and “personal protective equipment quantity” were identified as statistically significant and had a significant effect on reducing the incidence of long COVID (Table 3).

We examined age, sex, body mass index, underlying diseases, using the N95 mask, and using respiratory pro-

Table 1. Descriptive statistics of qualitative study variables

Categorical Variable		n (%)
Gender		
	Male	102 (22.9)
	Female	343 (77.1)
Underlying Disease		
	No	353 (79.9)
	Yes	89 (20.1)
N95 Use		
	No	289 (65.7)
	Yes	151 (34.3)
Respiratory Protection		
	No	5 (1.1)
	Yes	436 (98.9)

Table 2. Descriptive statistics of quantitative study variables

Continuous Variable	Mean (SD)	Min-Max
Age, Year	35.20 (26.7-43.7)	21-59
BMI*, kg/m^2	25.19 (21.17-29.21)	15-42
Sick leave, Days	9.09 (2.25-15.93)	0-60
Persistency, days	12.55 (0.13-24.97)	1-120

* Body Mass Index

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Table 3. Comparative statistics of Study groups based on Long COVID

Characteristic	Long COVID	Non-Long COVID	*P*-Value
Gender			0.523
Female: n(%)	291 (%76.6)	34 (%81)	
Male: n(%)	89 (%23.4)	8 (%19)	
Job			0.405
Nurse	227 (%60)	28 (%66.6)	
Other (Nursing aid, OR[1] technician, Anesthetic technician)	151 (%40)	14 (%33.3)	
Working unit			0.270
General	178 (%47.7)	15 (%38.5)	
Critical	195 (%52.3)	24 (%61.5)	
Ward			0.146
Emergency	69 (%18.5)	9 (%23)	
General	178 (%47.7)	15 (%38.5)	
ICU[2]	76 (%20.4)	11 (%28.2)	
OR	50 (%13.4)	4 (%10.3)	
Flu Vaccination			0.317
Yes	101 (%26.8)	14 (%34.1)	
No	276 (%23.2)	27 (%65.9)	
Underlying disease			0.807
Yes	75 (%19.8)	9 (%21.4)	
No	303 (%80.2)	33 (%78.6)	
Smoking			1.000
Yes	21 (%5.6)	2 (4.8)	
No	354 (%94.4)	40 (95.2)	
Exercise history			0.422
Yes	121 (%32.3)	11 (%26.2)	
No	254 (%67.7)	31 (%73.8)	
Non-Work-related Exposure to COVID-19			0.565
Yes	34 (%9.2)	5 (%11.9)	
No	337 (%90.8)	37 (%88.1)	
Using N95 mask			0.091
Yes	121 (%32.3)	19 (%45.2)	
No	254 (%67.7)	23 (%54.8)	
Using Surgical mask			0.928
Yes	333 (%88.6)	37 (%88.1)	
No	43 (%11.4)	5 (%11.9)	
Using Medical Body suit			0.092
Yes	218 (%58.0)	30 (%71.4)	
No	158 (%42.0)	12 (%28.6)	
Using Face Shield			0.241
Yes	151(%40.6)	21 (%50)	
No	221(%59.4)	21 (%50)	
Using Respiratory protection (using N95 or surgical mask)			0.0346
Yes	373 (%99.2)	41 (%97.6)	
No	3 (%0.8)	1 (%2.4)	
Using Eye protection			0.389
Yes	188 (%49.9)	24 (%57.1)	
No	187 (%50.1)	18 (%42.9)	
Hand Hygiene			1.000
Yes	376 (%99.5)	42 (%100)	
No	2 (%0.5)	0 (%0)	
PPE[3] Quantity*			0.029
Sufficient	301 (%79.8)	27 (%64.3)	
Insufficient	76 (%20.2)	15 (%35.7)	
PPE Quality**			0.087
Well	256 (%67.9)	23 (%54.8)	
Not well	121 (%32.1)	19 (%45.2)	

* Sufficiency of personal protective equipment provided based on the individual's own statement
** Quality of personal protective equipment provided based on the individual's own statement
1. Operating Room
2. Intensive Care Unit
3. Personal Protective Equipment

tection as predictors of symptom persistency by using linear regression. Among these, age, N95 mask use, and respiratory protection significantly contributed to the persistence of COVID-19 symptoms ($P < 0.05$) (Table 4).

Participants in the study were also asked about the symptoms based on the organ involved. The constitutional symptoms were the most prevalent symptoms (n = 414 [93.3% of all participants]) while cardiovascular symptoms (n = 8 [1.8% of all participants]) were the rarest (Figure 1).

Among the postrecovery complications asked, anxiety was more common than the others so that only 41.5% of people reported experiencing no amount of anxiety, while this number was 53.8%, 53.7%, and 60.8% for low interest, gloomy mood, and sleep problems, respectively (Figure 2).

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Table 4. Predictors of symptom persistency in healthcare workers with COVID-19

Variable	Beta	Standard Error	Standardized Beta	T score	*P*-Value
Age	0.161	0.080	0.104	2.017	0.044
sex	2.867	1.480	0.094	1.937	0.054
BMI	-0.239	0.165	-0.073	-1.449	0.148
Underlying disease	-1.240	1.556	-0.039	-0.797	0.426
N95 Mask	3.488	1.318	0.127	2.646	0.009
Respiratory Protection	-19.728	8.338	-0.117	-2.366	0.019
Sick leave	0.727	0.091	0.406	7.956	<0.001

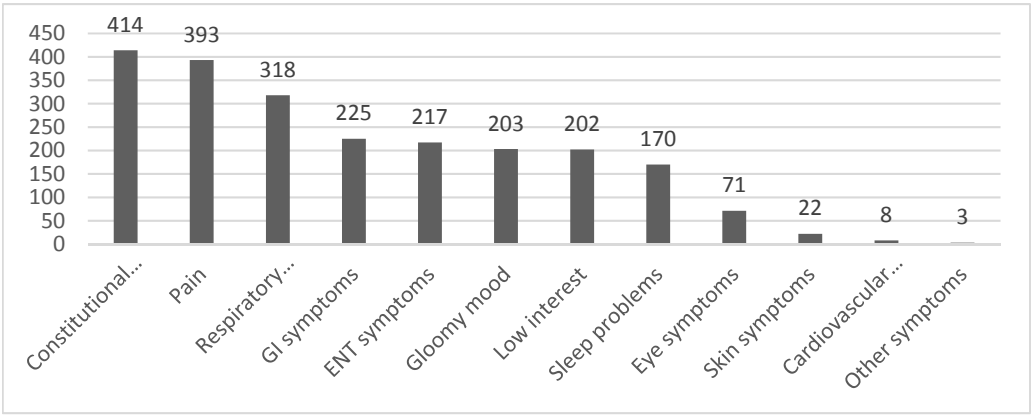

Figure 1. The Number of participants by symptoms (Involved persons)

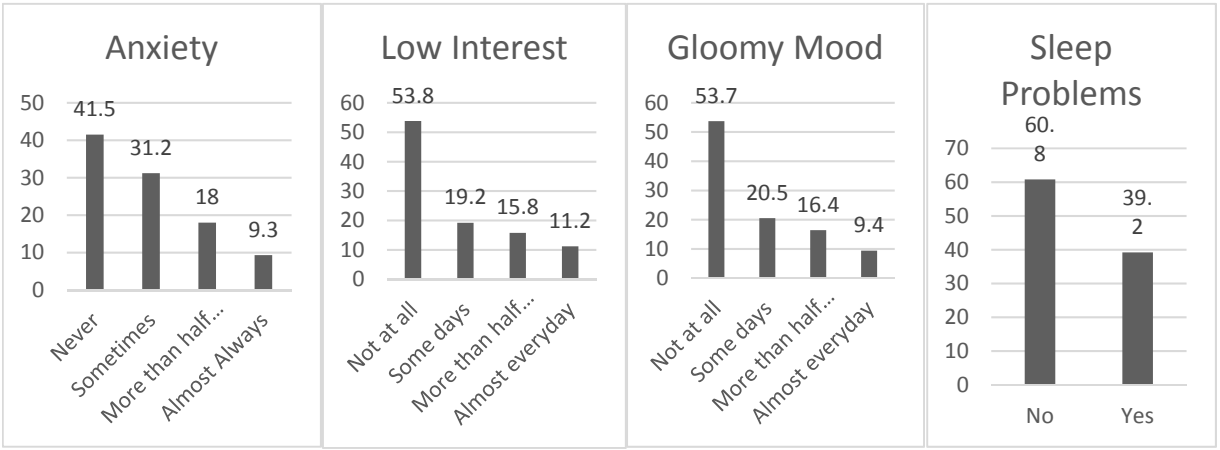

Figure 2. Post-recovery mental and sleep complications (%)

The frequency of cardiovascular symptoms ($P = 0.036$) and gastrointestinal symptoms ($P = 0.037$) differed significantly between the 2 groups with and without long COVID, but the other types of symptoms did not show any significant difference between the 2 groups.

Discussion

The present study was designed to investigate long COVID among HCWs in the largest hospital complex of Iran. The importance of examining the factors affecting the incidence of COVID-19 (especially long COVID) among HCWs is obvious to everyone. The findings of the present study can prevent HCWs from COVID-19 and then transmitting the disease from one HCW to another.

From the beginning of the COVID-19 pandemic, there was a great deal of concern about HCWs contracting the disease and its aftermath, that is, transferring it to their families, colleagues, and patients, as well as staff shortages. One study reported that 49% of HCWs with COVID-19 were at work for at least 1 day after being symptomatic before calling the HCW hotline (9). Early studies showed that fever and cough were the first signs of the disease (10). Therefore, diagnostic tests are expected to be performed as soon as a HCW develops these symptoms to prevent transmission of the virus to other people.

Dev et al (11) stated that the prevalence of COVID-19 is highest in nurses and sanitation workers of medical centers and lowest in clerical workers and technicians. He attributed this difference to the fact that nurses are more exposed to the virus. Several previous studies have demonstrated the effect of personal protective equipment on reducing COVID-19 incidence among HCWs (11-13).

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In our study, the effect of respiratory protection was also measured, which showed that people who used the N95 mask were significantly less likely to develop long COVID. This finding is consistent with a systematic review by Chu et al (14), since they also concluded that using the mask versus not using it (n = 2647; aOR 0.15 [95% CI, 0.07-0.34], difference −14.3% [95% CI, −15.9 to −10.7]), as well as using the N95 mask versus the 3-layer surgical mask, reduces the risk of infection. In fact, our study and other studies emphasize the important role of respiratory protection in reducing the incidence of COVID-19 and the persistence of symptoms (long COVID). Studies have also shown that HCWs who work in high-risk areas for the production of the aerosols carrying SARS-CoV-2 virus (such as respiratory department, infectious department, etc) or in areas where intervention or surgery is performed are at greater risk (13).

Long COVID is actually associated with patients whose symptoms last longer than expected. The term "long COVID" was first coined by a professor of infectious diseases in the BMJ Opinion journal (15). After that, with the increasing use of this combination in social networks and articles, long COVID became famous in the world of medicine. Today, the National Institute for Health & Care Excellence guidelines (8) and the Centers for Disease Control and Prevention (16) define long COVID as "the persistence of some symptoms of COVID-19 more than 4 weeks after the initial infection." The COVID-19 symptom prevalence for 5 weeks was 22.1% and for 12 weeks was 9.9%, according to the UK Office for National Statistics (2).

Long COVID involve different parts of the body. Respiratory, cardiovascular, gastrointestinal, mental, cognitive, olfactory, and also constitutional symptoms are among the main symptoms. In our study, olfactory and gustatory dysfunction was the last symptom to return to normal. Previous studies have reported the prevalence of this symptom up to 45.1% (17). The UK Office for National Statistics estimates that the prevalence of persistent lack of sense of smell and taste for 5 weeks is 7.9% and 8.2%, respectively (2). Fatigue, which is a constitutional symptom of COVID, is considered a permanent symptom in most studies (18-21). However, in our study, it lasted an average of 13.33 days. The COVID-19 pandemic also affects the psychological realm. The most common persistent mental symptom in our study was anxiety, which has possible causes such as isolation, inability to work, and so on.

Although some studies have identified age and preexisting conditions as risk factors for long COVID (22), others have found no association between them (23). It should be noted, however, that in 1 study, asthma was significantly associated with this condition (24). For the treatment of long COVID, various medical institutions have published (and probably will) a number of guidelines that are currently used to treat this medical condition (8, 25, 26).

HCWs are no exception to long COVID, and as mentioned, getting this condition and taking more sick leave imposes more burden on the health system and community. In a study by Doherty et al, of 114 senior specialist doctors, 77% screened positive for burnout and 25% had long COVID (27). The incidence of long COVID among HCWs, the typical symptoms that last a long time, and how long they last, as well as measures to prevent this illness, were all thoroughly explored in the present study. It is hoped that HCWs will follow the hygienic principles of preventing COVID-19 and, if they are infected, proper treatment can prevent the disease from progressing to long COVID as much as possible.

Conclusion

To our knowledge, this is the first study to examine long COVID among HCWs. The prevalence of long COVID among HCWs in our study was 9.44%. Age, N95 mask use, and respiratory protection significantly contributed to the persistence of COVID-19 symptoms. Olfactory and gustatory dysfunction returned to normal later and the constitutional symptoms improved sooner than the others. Among the postrecovery complications asked in this study, anxiety was the most common complication. It seems that further studies are needed for investigation of long COVID in patients with this disease, especially HCWs.

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Ethical Approval

This study has received the ethical code IR.TUMS.IKHC.REC.1399.297 at the ethic's committee of Tehran University of Medical Sciences.

Conflict of Interests

The authors declare that they have no competing interests.

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