Short Communication

Journal of Iranian Medical Council, Volume 5, Issue no. 1
http://dx.doi.org/10.18502/jimc.v5i1.9589

Incidence of COVID-19 in Health Care Personnel in a Tertiary Hospital in Iran

Mahnaz Montazeri[1], Samira Kafan[2], Marzieh Pazoki[2], Khashayar Danandeh[3], Fazeleh Majidi[4], Firoozeh Alavi[4], Soraya Babaei[4] and Azar Hadadi[1,5]*

1. Department of Internal Medicine, Sina Hospital, Faculty of Medicine, Tehran University of Medical Sciences, Tehran, Iran
2. Department of Pulmonary Diseases, Sina Hospital, Faculty of Medicine, Tehran University of Medical Sciences, Tehran, Iran
3. Students' Scientific Research Center (SSRC), Tehran University of Medical Sciences, Tehran, Iran
4. Research Development Center, Sina Hospital, Tehran University of Medical Sciences, Tehran, Iran
5. Research Center For Clinical Virology, Tehran University of Medical Sciences, Tehrn, Iran

*** Corresponding author**

Azar Hadadi, MD
Department of Internal Medicine, Faculty of Medicine, Sina Hospital, Tehran University of Medical Sciences, Tehran, Iran
Fax: +98 21 6634 8550
Email: hadadiaz@tums.ac.ir

Received: Jun 13 2021
Accepted: Oct 2 2021

Citation to this article:
Montazeri M, Kafan S, Pazoki M, Danandeh Kh, Majidi F, Alavi F, et al. Incidence of COVID-19 in Health Care Personnel in a Tertiary Hospital in Iran. *J Iran Med Counc*. 2022;5(1):204-11.

Abstract

Background: Since the initiation of the new coronavirus (COVID-19) in February 2020 in Wuhan, the Health Care System (HCS) has tolerated a lot of morbidities and mortalities all around the world. While the COVID -19 is spreading out the whole world, HCS carries almost all the burden as the first line. However, countries like Iran suffer from a lack of infected Health Care Workers (HCW) population data and statistics, especially the major hospitals for COVID-19 referrals.

Methods: In this single-center cross sectional study, we studied the healthcare personnel infected by COVID-19, from February 2020 to August 2020, in a major tertiary hospital of Tehran, Iran.

Results: Of total 1595 HCW working in Sina hospital, 389 (24%) with the mean age of 35.43 ± 8.2 years were infected by COVID-19, almost one fourth. 238 (61.2%) were women, though 92.5% of the population used Personal Protective Equipment (PPE). 140 (36%) of them were personnel of the wards assigned to the COVID-19, Personnel went on sick leave for 7.76 ± 4.64 days. 51(13.1%) personnel had an exacerbation of symptoms, and only one of the personnel experienced COVID-19 almost twice in four months.

Conclusion: COVID-19 infection risk is considered to be very low for HCWs in case suitable PPE and social distancing are regarded. In our study, more than 92% of the infected personnel utilized PPE, which indicates that they might have failed to use PPE properly or might not have taken hand-hygienic precautions well. It is necessary to limit working hours and prevent excessive workload so that the staff could adhere more to hygienic precautions in hospitals or in society.

Keywords: COVID-19, Healthcare personnel, Infection

Introduction

Since the beginning of the new coronavirus pneumonia disease 2019 (COVID-19) outbreak on 31th of December 2019 from Wuhan in China, people and especially the Health Care System (HCS) has tolerated a lot of morbidities and mortalities (1-3). According to the latest World Health Organization (WHO) situation reports in late August 2020 considering the COVID-19 burden, approximately 21 million officially reported cases of COVID-19 were detected all around the world with more than 750000 deaths (4). All of these statistics demonstrate how COVID-19 inspired the quality of life. While the COVID-19 is spreading out the whole world, HCS carries almost all the burden as the first line. Besides, HCS and the frontline Health Care Workers (HCW) suffer a lot of human and financial losses. Primary situation data just from the origin of the outbreak, Wuhan, on the 25th of February 2020 reported 3387 infected HWCs along with at least 18 deaths (5,6). Unfortunately, a group of HCWs consisting of Dr. Chaolin Huang and his colleagues, who had introduced the COVID-19 clinical manifestations, passed away due to a new coronavirus infection (7). On March 15, 2020, Italy recorded 2026 confirmed COVID-19 cases of HCWs (8). Recent valuable shreds of evidence express COVID-19 virus transmitted *via* droplets, small 5-10 μm particles indeed, in direct person to person contacts (9,10). Although it is recommended to have social distancing, wearing the face mask, and staying home to reduce the risk of infection (11), HCWs should allocate more hours to HCS duties (12). Often this strange new coronavirus disease does not have typical COVID-19 manifestation, thus people with insufficient Personal Protective Equipment (PPE) can easily transmit it to others (12,13). Therefore, not only do HCWs contact more COVID-19 viral loads, but also lack of PPE puts them in danger of infection (14). The first confirmed COVID-19 case in Iran was reported on 19 February 2020 in Qum province (15). Now Iran is known as one of the top 20 countries in prevalence and incidence of COVID-19 with 340,070 confirmed cases and 19,492 total deaths based on the latest WHO report on the 16th of August 2020 (4). Also, 8.41% mortalities among HCWs were reported as of March 28, 2020 in Iranian population (16). Many infected cases in Iran are front-line personnel, but there was not enough scientific evidence to demonstrate the estimated cases so far, especially in major tertiary hospitals in Iran. In this study, we collected information from HCWs infected with COVID-19 in one of the most referral hospitals in Iran along with the data regarding new coronavirus clinical features or positive tests. The current study can be important and informative due to the lack of information among HCWs population as the front line of COVID-19 disease in Iran, and it aims at contributing to future studies to have a better insight about major hospitals and their bias.

Materials and Methods

In this single-center cross-sectional study based in Sina Hospital as a major tertiary hospital in Tehran, Iran, from February 2020 to August 2020, 1595 HCWs with COVID-19 were considered as the study population. We evaluated HCWs with the positive test *via* real-time reverse-transcriptase polymerase-chain-reaction (RT-PCR) performed by oropharyngeal swab. Besides, according to the latest World Health Organization's interim guidance and Iranian national committee of COVID-19, we included patients with a history of COVID-19 manifestations along with Ground-Glass Opacity (GGO) alone or GGO accompanied with consolidation in chest Computed Tomography (CT) (17,18). Also, patients with highly suspicious clinical features for COVID-19 were added up. The algorithm of patient care for individuals presenting with respiratory symptoms to Sina Hospital has already been published (19).

Data were collected *via* a well-designed form that includes clinical features, exposures with family prior to the COVID-19 confirmation, history of exposure with known cases of COVID-19 in their work sections, signs and symptoms during the disease, and underlying health conditions among HCWs with COVID-19. Demographic characteristics, exposures, symptoms, and underlying health conditions among HCWs were recorded. Patients were classified by their hospital position and the department and sections they work in. PPE using was considered. Symptoms (such as fever, cough, dyspnea, myalgia, anorexia, and sore throat, all as the main manifestations) were considered based on the latest COVID-19 shreds of reports (20,21).

This study was approved by the Ethics Committee of Tehran University of Medical Sciences (IR.TUMS.VCR.REC.1399.231)

Statistical analyses

We considered the mean ± standard deviation for continuous variables' descriptive data, and categorical variables were presented as numbers (percentage). All statistical analyses were performed using the SPSS version 23.0 software (IBM, Armonk, New York).

Results

Through this study, we considered 389 HCWs, classified by gender, confirmed for COVID-19 by PCR tests, radiographic (CT-scan) pattern or based on clinical presentation.

Among 1595 staff members working at Sina hospital, almost one fourth of the service personnel in different departments of this hospital have experienced the symptoms of COVID-19 disease.

In this study, of 389 HCWs (24.38%) as patients with the mean age of 35.43 ± 8.2 (20-60) years, 238 (61.2%) were women. Based on the ward type, 140 (36%) personnel of the wards assigned to the COVID-19 were infected, and among them, 51 patients (13.1%) were personnel of COVID-19 wards, 43 (11.1%) were personnel of COVID-19 ICU, and 46 (11.8%) were COVID-19 emergency department personnel. Information on other (non-frontline) sections is given in table 1. On average, the personnel infected with COVID-19 went on sick leave for 7.76 ± 4.64 days. 51 (13.1%) personnel had an exacerbation of symptoms, and only one of the personnel experienced COVID-19 almost twice in four months. Only seven individuals were hospitalized, all of whom were discharged in good health. We followed all these seven people and all of them had a complete recovery. There was no death in total.

As shown in table 1, PCR was performed in 258 patients (66.3%) of whom 133 (51.6%) were positive. Chest CT-scan was performed for 208 patients, of whom 55 (26.4%) had pulmonary involvement in favor of COVID-19. In chest CT-scans; 94.5% of patients had GGO alone, and 5.5% had GGO accompanied with consolidation. Lung involvement was mostly reported bilaterally (53.7%).

The patients' body temperature at baseline was 37.01± 0.7 °*C* with a maximum of 40 °*C*. The mean blood oxygen level was 96.7 ± 1.8 (85-99). Among the initial symptoms, myalgia with 225 patients (57.8%), cough with 213 patients (54.8%), and fever with 197 patients (50.6%) were the most common complaints. Nine patients (2.3%) had more than one underlying disease. Among the underlying diseases, cardiovascular disease with 3.1% and diabetes with 2.6% were the most common ones. Sixty-four patients (16.5%) had a history of COVID-19 infection in at least one of their family members prior

Table 1. Demographics and baseline characteristics of patients infected with COVID-19

Variable		Percentage	Total number
Gender	Woman	61.2	238
	Man	38.8	151
PCR test result	Test done	66.3	258
	Positive	51.6	133
	Negative	48.8	125
Chest CT-scan	Chest-CT¶ scan done	53.5	208
	Chest-CT scan deficits	26.4	55
	Ground Glass Opacity	94.5	52
	Ground Glass Opacity with consolidation	5.5	3

Cont Table 1

Symptoms	Fever	50.6	197
	Chilling	33.2	129
	Shortness of breath	29.8	116
	Coughing	54.8	213
	Myalgia	58.1	226
	Dry mouth	19	74
	Anorexia	30.3	118
	Weakness/tiredness	158	40.6
	Sore throat	34.7	135
	Headache	40.1	156
	Olfactory change	17	66
	Taste change	17	66
	Diarrhea	26.2	102
	Nausea	19.8	77
	Vomiting	27	6.9
	Chest discomfort	17	66
Past medical history	Diabetes	2.6	10
	Cardiovascular disease	3.1	12
	Hypertension	1.5	6
	Respiratory disease	2.1	8
	Immunodeficiency	1.3	5
	Others	0.6	2
Drugs prescribed for Covid-19	Oseltamivir	29	7.5
	Chloroquine	168	43.2
	Azithromycin	32	8.2
	Levofloxacin	4	1
	Lopinavir/Ritonavir	9	2.3
	Naproxen	70	18
	Dexamethasone	12	3.1
	Acetaminophen	35	9
Job categories	Doctors	54	13.9
	Nurse and nurse assistants	194	49.9
	Hospital services workers	22	5.7
	Official clerks	32	8.2
	Paramedical staff	27	6.9
	Operation room workers	33	8.5
	Secretaries	27	6.9

Cont Table 1

Sections	Operation room	53	13.6
	COVID-19 ward	51	13.1
	COVID-19 ICU§	43	11.1
	COVID-19 Emergency room	46	11.8
	Non-COVID-19 wards	68	17.5
	Non-COVID-19 ICU	30	7.7
	Non-COVID-19 Emergency room	8	2.1
	Laboratory	14	3.6
	Radiology	3	0.8
	Clinic	8	2.1
	Office	26	6.7
Personnel protective equipment usage	Surgery masks	88.4	344
	N95 Masks	42.2	164
	Medical Protective Clothing	40.1	156
	Protective Glasses	18.3	71
	Face Shield	22.6	88
	Gloves	70.7	275

- ¶ chest computed tomography; § Intensive care unit

to becoming infected, and 39 (10%) had it after they became infected. Besides, 290 (74.6%) patients had a history of taking care of infected patients. Of the 389 individuals with probable COVID-19 infection, 360 (92.5%) utilized PPE. The most likely drug prescribed for patients was chloroquine and Naproxen. All the suggestive treatments had been considered based on experts' orders and recent shreds of reports on COVID-19 management (Table 1).

Discussion

We reported 389 patients who were HCWs in Iran from March to July 2020. By performing all diagnosing evidences, we demonstrated 24.38% infection proportion among all HCWs in Sina Hospital *vs.* another study in the United Kingdom which was performed by PCR swab tests with only 5% (22), or in Qatar as one of the Middle East regions like Iran, 10.6% of HCWs were reported as COVID-19 confirmed patients (23). However, in the United States of America and Italy, almost 20% of HCWs were diagnosed as COVID-19 infected patients. Moreover, China reported that 3–4% of HCWs were infected with COVID-19 (24). However, in a study based in the southern Italy, Naples, it was revealed that 3.4% of HCWs were diagnosed with COVID-19 after performing RT-PCR and serology tests (25).

HCWs are the front line fighters against this new outbreak. More than half of our study patients presented with at least one symptom among cough, fever, and myalgia, which indicates that disease presentation is similar to the population other than health workers (12,13).

According to recent studies, COVID-19 transmission is so fast by small droplets that can easily infect many people in a swift time as we knew asymptomatic COVID-19 carriers transmitted the infection to the community by a person-to-person contact (26,27). Droplets that are expelled through coughing, sneezing, and even breathing in COVID-19 infected people can be the primitive way of COVID-19 transmission (28). There would be a lot of asymptomatic infected people that easily live and breathe beside others and spread out the disease. This may claim the fast growth in COVID-19 pandemic patients (29). Although there are several recommended ways to diagnose COVID -19, such as CT-scan, RT-PCR, and typical clinical manifestations of this virus, patients are considered

by a compound of these results. RT-PCR is more common these days due to easy access and performing by a few swabs; however, recent studies have shown that CT-scan has more than 90% sensitivity *vs*. RT-PCR with 70% to 80%. Hence, by performing RT-PCR, some patients would be missed as a false negative result (30,31). In our study, due to the lack of a sufficient number of diagnostic kits in the early weeks of the COVID-19 pandemic, PCR test was performed with 258 personnel of which 51% were positive that could associated with test sensitivity and false negative tests.

HCWs' job circumstances such as long hours shifts, direct contact with infected patients, and various PPE access reveal that they are at high risk of infection (32). HCW exposures are significantly greater than a normal person such as direct and indirect contacts with atypical or asymptomatic patients for COVID-19, family, friends, colleagues, and communities of active transmission (33). In this study, nurses and their assistants had the highest number of COVID-19 infection (49.9% of total). The results of the Qatar study are in line with this result (33.2% of all). Nurses spend more time with patients and the virus-infected settings. Perhaps this is why nurses are more likely to become infected. (22). Based on the recommendation for HCWs caring like using suitable PPEs and social distancing, COVID-19 infection risk is considered to be very low (34). A considerable prospective observational study in the United Kingdom and the United states of America has shown that the risk of Coronavirus infection was increased among HCWs with inadequate PPE or reused PPE indeed (35). In this study, more than 92% of the infected personnel used PPE such as medical or N95 masks, guns and gloves, shields, or glasses; their infection indicates that either they failed to use properly or they did not take hand-hygienic precautions at hospital, at home or in society well. HCWs should be ensured about the proper PPEs and facilities while they are at work to improve community hygiene against the outbreak. Reuse of PPEs, unavailability or improper use of equipment may significantly increase the risk of transmission. One of the causes of disease transmission among health workers can be not using PPEs while resting or eating and also not meeting social distancing during the rest time. This transmission may also stem from contaminated surfaces at restrooms, therefore daily environmental cleaning and disinfection is recommended. It is necessary to limit working hours and prevent excessive workload so that the staff could adhere more to hygienic precautions in the restrooms. Proper ventilation in the restroom is another important point.

Also, we can mention that positive history of cardiovascular diseases and diabetes mellitus may play a key role for more mortality and morbidities. Moreover, they are in a higher risk of being infected. Among all the HCWs in different parts of hospital, personnel in COVID-19 wards are in danger of being infected and higher risk of physical damages than the other parts. We also suggest that according to the most prevalent manifestations in this study, each HCW with history of myalgia or cough or fever as initial symptoms even in mild ones refer to complete workups regarding COVID-19.

Acknowledgements

We acknowledge all the hardworking health-care workers involved in the diagnosis and treatment of patients in Sina Hospital, doing their best in the time of the pandemic. We are indebted to the Research Development Center of Sina Hospital for their help and support. This study was approved by the Ethics Committee of Tehran University of Medical Sciences (IR.TUMS.VCR.REC.1399.231).

Conflict of Interest

The authors declare that there is no conflict of interest

Funding

This study has been supported by the Tehran University of Medical Sciences [Grant number: 99-1-101-47546]. The funding source had no role in the study design, data collection, data analysis, data interpretation, writing of the manuscript, or decision of submission.

Ethical approval

This study was approved by the Ethics Committee of Tehran University of Medical Sciences (IR.TUMS.VCR.REC.1399.231).

References

1. Sadeghi Dousari A, Taati Moghadam M, Satarzadeh N. COVID-19 (Coronavirus Disease 2019): A New Coronavirus Disease. Infect Drug Resist 2020 Aug 12;13:2819-28.

2. Kursumovic E, Lennane S, Cook T. Deaths in healthcare workers due to COVID-19: the need for robust data and analysis. Anaesthesia 2020 Aug;75(8):989-992.

3. Barranco R, Ventura F. Covid-19 and infection in health-care workers: An emerging problem. Med Leg 2020 Jul;88(2):65-6.

4. World Health Organization. Coronavirus disease (COVID-19): situation report, 209. Geneva: World Health Organization; 2020 2020-08-16.

5. Su A. Doctors and Nurses fighting Coronavirus in China die of both infection and fatigue. Los Angeles Times Feb 2020;25;25.

6. Schwartz J, King C-C, Yen M-Y. Protecting Healthcare Workers During the Coronavirus Disease 2019 (COVID-19) Outbreak: Lessons From Taiwan's Severe Acute Respiratory Syndrome Response. Clinical Infectious Diseases. 2020;71(15):858-60.

7. Xiang Y-T, Jin Y, Wang Y, Zhang Q, Zhang L, Cheung T. Tribute to health workers in China: A group of respectable population during the outbreak of the COVID-19. Int J Biol Sci 2020 Mar 15;16(10):1739-40.

8. Livingston E, Bucher K. Coronavirus Disease 2019 (COVID-19) in Italy. JAMA 2020 Apr 14;323(14):1335-

9. Omer SB, Malani P, Del Rio C. The COVID-19 Pandemic in the US: A Clinical Update. JAMA 2020 May 12;323(18):1767-8.

10. Bourouiba L. Turbulent gas clouds and respiratory pathogen emissions: potential implications for reducing transmission of COVID-19. JAMA 2020 May 12;323(18):1837-8.

11. Koo JR, Cook AR, Park M, Sun Y, Sun H, Lim JT, et al. Interventions to mitigate early spread of SARS-CoV-2 in Singapore: a modelling study. Lancet Infect Dis 2020 Jun;20(6):678-688.

12. Burrer SL, de Perio MA, Hughes MM, Kuhar DT, Luckhaupt SE, McDaniel CJ. Characteristics of Health Care Personnel with COVID-19-United States, February 12-April 9, 2020. Morb Mortal Wkly Rep 2020 Apr 17;69(15):477–481.

13. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet 2020 Feb 15;395(10223):497-506.

14. Misra-Hebert AD, Jehi L, Ji X, Nowacki AS, Gordon S, Terpeluk P, et al. Impact of the COVID-19 pandemic on healthcare workers risk of infection and outcomes in a large, integrated health system. J Gen Intern Med 2020 Nov;35(11):3293-3301.

15. Gharebaghi R, Heidary F. COVID-19 and Iran: swimming with hands tied! Swiss Med Wkly 2020 Apr 7;150(1516).

16. Papoutsi E, Giannakoulis VG, Ntella V, Pappa S, Katsaounou P. Global burden of COVID-19 pandemic on healthcare workers. ERJ Open Res 2020 Jul 6;6(2):00195-2020.

17. World Health Organization. Global surveillance for COVID-19 caused by human infection with COVID-19 virus: interim guidance, 20 March 2020. Geneva: World Health Organization; 2020. Contract No.: WHO/2019-nCoV/SurveillanceGuidance/2020.6.

18. Xu Z, Shi L, Wang Y, Zhang J, Huang L, Zhang C, et al. Pathological findings of COVID-19 associated with acute respiratory distress syndrome. Lancet Respir Med 2020 Apr;8(4):420-2.

19. Talebpour M, Hadadi A, Oraii A, Ashraf H. Rationale and Design of a Registry in a Referral and Educational Medical Center in Tehran, Iran: Sina Hospital Covid-19 Registry (SHCo-19R). Front Emerg Med 2020 Mar 22;4(2s):e53-

20. Tian S, Hu N, Lou J, Chen K, Kang X, Xiang Z, et al. Characteristics of COVID-19 infection in Beijing. J Infect

2020 Apr;80(4):401-6.

21. Shereen MA, Khan S, Kazmi A, Bashir N, Siddique R. COVID-19 infection: Origin, transmission, and characteristics of human coronaviruses. J Adv Res 2020 Mar 16;24:91-8.

22. Rivett L, Sridhar S, Sparkes D, Routledge M, Jones NK, Forrest S, et al. Screening of healthcare workers for SARS-CoV-2 highlights the role of asymptomatic carriage in COVID-19 transmission. Elife 2020 May 11;9:e58728.

23. Alajmi J, Jeremijenko AM, Abraham JC, Alishaq M, Concepcion EG, Butt AA, et al. COVID-19 infection among healthcare workers in a national healthcare system: The Qatar experience. Int J Infect Dis 2020 Nov;100:386-9.

24. World Health Organization. Risk assessment and management of health-care workers in the context of COVID-19. 2020.

25. Fusco F, Pisaturo M, Iodice V, Bellopede R, Tambaro O, Parrella G, et al. COVID-19 among healthcare workers in a specialist infectious diseases setting in Naples, Southern Italy: results of a cross-sectional surveillance study. J Hosp Infect 2020 Aug;105(4):596-600.

26. Yu X, Yang R. COVID-19 transmission through asymptomatic carriers is a challenge to containment. Influenza Other Respir Viruses 2020 Jul;14(4):474-475.

27. Jin H, Liu J, Cui M, Lu L. Novel coronavirus pneumonia emergency in Zhuhai: impact and challenges. J Hosp Infect 2020 Apr;104(4):452-3.

28. Ng K, Poon BH, Kiat Puar TH, Shan Quah JL, Loh WJ, Wong YJ, et al. COVID-19 and the risk to health care workers: a case report. Ann Intern Med 2020 Jun 2;172(11):766-767.

29. Li R, Pei S, Chen B, Song Y, Zhang T, Yang W, et al. Substantial undocumented infection facilitates the rapid dissemination of novel coronavirus (SARS-CoV-2). Science 2020 May 1;368(6490):489-93.

30. Long C, Xu H, Shen Q, Zhang X, Fan B, Wang C, et al. Diagnosis of the Coronavirus disease (COVID-19): rRT-PCR or CT? Eur J Radiol 2020 May;126:108961.

31. Fang Y, Zhang H, Xie J, Lin M, Ying L, Pang P, et al. Sensitivity of Chest CT for COVID-19: Comparison to RT-PCR. Radiology 2020 Aug;296(2):E115-E7.

32. Zhang SX, Liu J, Afshar Jahanshahi A, Nawaser K, Yousefi A, Li J, et al. At the height of the storm: Healthcare staff's health conditions and job satisfaction and their associated predictors during the epidemic peak of COVID-19. Brain Behav Immun 2020 Jun;87:144-6.

33. Bielicki JA, Duval X, Gobat N, Goossens H, Koopmans M, Tacconelli E, et al. Monitoring approaches for health-care workers during the COVID-19 pandemic. Lancet Infect Dis 2020 Oct;20(10):e261-e7.

34. The Lancet. COVID-19: protecting health-care workers. Lancet 2020 Mar 21;395(10228):922.

35. Nguyen L, Drew D, Graham M, Joshi A, Guo C, Ma W, et al. Consortium, COPE. Risk of COVID-19 among front-line health-care workers and the general community: a prospective cohort study. Lancet Public Health 2020 Sep;5(9):e475-83.