Original Article

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TANAFFOS

Descriptive Analysis of COVID-19 among Health Care Workers in a Tertiary Center in Iran

Shahnaz Sali [1], Mitra Rezaei [2,3], Majid Marjani [2], Shabnam Tehrani [1], Amirmohammad Abdolmohammadzadeh [4], Amirali Soheili [5], Davood Yadegarynia [1], Sara Abolghasemi [1]

[1] Infectious Diseases and Tropical Medicine Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran, [2] Clinical Tuberculosis and Epidemiology Research Center, National Research Institute of Tuberculosis and Lung Diseases (NRITLD), Shahid Beheshti University of Medical Sciences, Tehran, Iran, [3] Virology Research Center, National Research Institute of Tuberculosis and Lung diseases (NRITLD), Shahid Beheshti University of Medical Sciences, Tehran, Iran, [4] School of Medicine, Iran University of Medical Sciences, Tehran, Iran, [5] Student Research Committee, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

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Correspondence to: Abolghasemi S
Address: Infectious Diseases and Tropical Medicine Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran
Email address: saraabolghasemi1@gmail.com

Background: Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) spread widely all around the world and has infected too many healthcare workers (HCWs) as the pioneers combating coronavirus disease 2019 (COVID-19). This study aims to evaluate the symptoms and outcome of medical staff from a tertiary hospital in Tehran, Iran.

Materials and Methods: The diagnoses of 29 HCWs presenting COVID-19 symptoms were confirmed by molecular and imaging studies. Epidemiologic and disease-related data were collected via phone calls and filling a questionnaire and then analyzed descriptively.

Results: Eighteen (62.1%) of the affected HCWs were males. The mean age of them was 41.86 years with a lower average (38.27) for females than males. Nurses comprised 41.4% of our population. Only 2 (6.9%) patients were admitted to the respiratory care unit (RCU) (), marked as critical patients. The most presented symptoms were fever (79.3%) and dyspnea (79.3%). Overall, 55.2% of them had a longer exposure time (more than a week), which was more frequent in men than women.

Conclusion: Fever was the most prevalent symptom among the study group. Even though the clinical features of COVID-19 among HCWs cannot be copiously determined by this study, it highlights the requirement for comparative studies to illustrate differences among HCWs and the general population. There might be an association between the duration of the exposure and the risk of the infection in men.

Key words: Covid-19; Coronavirus; Healthcare workers; Medical staff; Occupational health; SARS-CoV-2

INTRODUCTION

In December 2019, several patients presented with symptoms of new atypical pneumonia with an unexplained etiology, though they were mostly related to a big seafood wholesale market in Wuhan, China. It didn't take long for the pathogen of this infectious disease to be discovered and introduced to the public as severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) causing the widespread disease of the coronavirus disease 2019 (COVID-19) (1, 2). Since then, it has spread very rapidly worldwide (3) and became a public health emergency and an "international concern" announced by the World Health Organization (WHO) (4). By 20 December 2020, 75129306 confirmed cases and 1680794 COVID-19 related deaths have been reported globally (5).

The clinical presentation of this disease is like the symptoms of older known coronavirus disease, the severe acute respiratory syndrome (SARS) including a range of symptoms from fever, dyspnea, dry cough, fatigue, and pharyngodynia in mild cases to acute respiratory distress syndrome (ARDS) and death in very severe and complicated cases (1).

Dr. Li Wenliang was the first clinician who warned about this serious condition and tragically lost his life due to SARS-CoV-2 contraction and became a member of the long list of health care workers (HCWs) to be the victim of Middle East Respiratory Syndrome (MERS), SARS, Ebola, and currently SARS-CoV-2 (6). Like him, since the beginning of this pandemic health care staff contributed a lot in this battle. As a result many of them became afflicted with SARS-CoV-2 and unfortunately, thousands of them died while helping their patients demonstrating that they are at an inevitable risk of infection, due to the more exposure to pathogens, long working shifts, exhaustion and also the shortage of knowledge and personal protective equipment (PPE) especially at the beginning of the epidemic (7, 8). Just in China, more than 4% of patients were medical staff including nearly 3,300 persons. Likewise, up to 25th March 2020, one percent of the medical staff in Spain contracted COVID-19 and consisted 13.6% of the total confirmed cases in this country (9).

Hitherto, accurate statistics on the incidence rate of COVID-19 among medical staff are not available. Formerly, the secretary of the national headquarter of combat against COVID-19 announced that among 150,000 active HCWs (including 20,000 doctors and 100,000 nurses) more than a hundred people have died (10), but there isn't any evidence of a distinct incidence rate for medical staff in Iran and also little is known about their health status. However, a review by Ing et al. has reported the death of 43 physicians in Iran comprising a mortality rate of 15% among all reported physician deaths up to 15 April 2020 worldwide (11). Furthermore, another official agent has announced that Iran stands third in the countries with the most SARS-C0V-2 afflicted HCWs after the United States and Russia (12).

It seems that HCWs have more academic knowledge and therefore use PPE such as N95 respirators, goggles, and protective clothing properly (13), but there is a noticeable incidence rate among HCWs of our hospital leading us to report their conditions. Herein, we present the clinical manifestations, disease severity, possible exposures, the approach of diagnosis, and outcome of this disease among the HCWs in a tertiary hospital in Iran.

MATERIALS AND METHODS

Among 327 HCWs working at Labbafinezhad Hospital in Tehran, Iran, data of 29 HCW infected with SARS-CoV-2 was gathered. They were either hospitalized at this center, or if they were quarantined at home, under active surveillance by the physicians working at this hospital. Suspicious cases presenting symptoms such as fever, dyspnea, and coughs underwent two of the following paraclinical interventions for confirming their diagnosis with COVID-19: 1) Performing a chest Computed Tomography (CT) scan 2) and examining the nasopharyngeal swap with real-time polymerase chain reaction (RT-PCR) specified for SARS-CoV-2. Due to the limitation at the first month of the outbreak to perform RT-PCR test, patients were mostly diagnosed with CT scan, however, when the evidence wasn't enough for a definite diagnosis, PCR tests were also performed.

The starting point was the beginning of the outbreak at this hospital in February 2020 and all affected HCWs until April 22, 2020, were enrolled. The information was collected retrospectively via phone calls and through certain questionnaire after a patient was cured. Improvement in chest imaging, negative PCR tests, and remission of the symptoms were the main criteria for knowing whether the patient's condition was resolved.

We only knew that nearly 29 HCWs contracted COVID-19 in this hospital and got well, so through a call,

we asked them about their identification (ID), the position at the hospital, whether they worked at the front-line departments, medical history with a better focus on chronic medical comorbidities (diabetes mellitus type 2, hypertension, etc.), high-risk activities such as direct and close contact with patients during visits, physical examination and check of vital signs (blood pressure, body temperature, etc.), and usage of PPE such as masks and gloves by them at least during high-risk activities. We had a better focus on the number of days they had these high-risk activities before they started developing the disease. Other data such as certain symptoms, diagnostic evidence, and medication used for treatment were also obtained.

Furthermore, HCWs who were confirmed with COVID-19 diagnosis less than 15 days after the national epidemic announcement were defined as having short-time exposure, and those working for 15 days and more were defined as having long-time exposure.

According to the report of the WHO-China Joint Mission on COVID-19, patients of this study were classified into three groups:

1) Mild to moderate cases including non-pneumonia and pneumonia cases whom underwent treatment at home and self-quarantine.
2) Severe cases were admitted to the hospital general wards and had dyspnea, respiratory rate ≥30/minute, at room blood oxygen saturation ≤90%, PaO_2/FiO_2 ratio <300, and more than 50% of the lung field involvement within 24-48 hours.
3) Patients with respiratory failure, septic shock, and/or multiple organs dysfunction/failure, and who were admitted to the Respiratory Care Unit (RCU) were classified as critical cases (14).

All the information was then added to the SPSS software (ver. 26.0) and the descriptive analysis was conducted.

RESULTS

From February 20 to April 20, 2020, out of 329 HCWs working in this hospital, 29 (8.8%) HCWs with confirmed diagnosis of COVID-19 were reported. This group consisted of 18 (62.1%) males and 11 (37.9%) females. Their ages ranged from 26 to 74 with an average of 41.86 years (SD: 11.95). Moreover, male participants aged between 26 and 74 years with an average of 44.1 ± 13.3, and female participants aged from 27 to 52 years with an average of 38.3± 8.7. The study group was comprised of 9(31%) doctors, 12(41.4%) nurses, and 8(27.6%) other hospital staff. Five (56%) physicians worked at front-line departments, having direct contact with the infected individuals, while four (44%) attending physicians worked at other departments. All of the nurses and 4 (50%) of the other personnel also had direct contact with COVID-19 patients at some point. HCWs with long-time exposure consisted (55.2%) of the population including 61.1% of males and 45.5% of females. An underlying condition of chronic diseases was seen in 6 (20.7%) personnel. The frequency of high-risk activities and PPE used by the medical staff are listed in Table 1. Patients presented mostly with fever (79.3%), dyspnea (79.3%), cough (71.4%), hyposmia (41.4%), and diarrhea (20.7%). Overall, between the first presented symptom and a confirmed diagnosis was a mean delay of 3.72 days (SD: 2.61). This was 3.72 (SD: 2.94) and 3.73 (SD: 2.10) for males and females, respectively, with no significant difference. On admission, the CT scan was compatible with the COVID-19 pattern for 24 (82.8%) patients and also RT-PCR of nasopharyngeal swab samples was conducted for 21 patients (72.4%) and 16 (76.1%) of them had positive results. According to the current national and local guidelines (15), most of the patients were treated with Hydroxychloroquine and Azithromycin (79.3%). Other medications are listed in Table 1. After detection, 16 (55.2) of HCWs were treated as outpatients (mild to moderate cases), 11 (37.9%) admitted to the hospital (severe cases) and 2 (6.9%) of them got transferred

to RCU as a result of symptom's deterioration (critical cases). Fortunately, all patients in this study survived and there was no mortality case.

Table1. Characteristics of the COVID-19 among medical personnel in general and by gender

	Male N (%)	Female N (%)	Total N (%)
Gender	18(62.1)	11(37.9)	29(100)
Symptoms			
Fever	15(83.3)	8(72.7)	23(79.3)
Cough	13(72.2)	7(63.6)	20(71.4)
Dyspnea	14(77.8)	9(81.8)	23(79.3)
Diarrhea	6(33.3)	0(0)	6(20.7)
Hyposmia	6(33.3)	6(54.5)	12(41.4)
Comorbidity			
Yes	3(16.7)	3(27.3)	6(20.7)
No	15(83.3)	8(72.7)	23(79.3)
Diagnosis			
CT scan compatible	15(83.3)	9(81.8)	24(82.8)
PCR positive	11(61.1)	5(45.5)	16(55.2)
Severity			
Mild to moderate	8(44.4)	8(72.7)	16(55.2)
Severe	8(44.4)	3(27.3)	11(37.9)
Critical	2(11.1)	0(0)	2(6.9)
Role in hospital			
Physician	8(44.4)	1(9.1)	9(31)
Nurse	6(33.3)	6(54.5)	12(41.4)
Others	4(22.2)	4(36.4)	8(27.6)
Basic activity			
Physical examination	9(50)	3(27.3)	12(41.4)
Giving medication to infected patients	4(22.2)	5(45.5)	9(31)
Suction	4(22.2)	1(9.1)	5(17.2)
Intubation	6(33.3)	4(36.4)	10(34.5)
PPE[3] usage			
Gown/Glove/Mask	9(50)	5(45.5)	14(48.3)
Shield	9(50)	4(36.4)	13(44.8)
Goggle/Footwear	8(44.4)	4(36.4)	12(41.4)
Duration of exposure*			
Long	11(61.1)	5(45.5)	16(55.2)
Short	7(38.9)	6(54.5)	13(44.8)
Treatment			
Hydroxychlroquine + Azithromycin	15(83.3)	8(72.7)	23(79.3)
Lopinavir/Ritonavir	8(44.4)	1(9.1)	9(31)
Other/None	3(16.7)	3(27.3)	6(20.7)

Abbreviations: CT: Computed tomography; PCR: Polymerase chain reaction; PPE: Personal protective equipment

* Long: 15 or more days of high-risk exposure- Short: less than 15 days of exposure

DISCUSSION

According to a review by Xu et al. Iranian physicians comprise 15% (43 persons) of the mortality rate of all reported physicians deaths during the COVID-19 pandemic until 15 April 2020 globally (11). Moreover, in a report from centers for disease control and prevention (CDC-US government) among 49,370 confirmed cases, 9,282 (19%) were HCWs (16). As a study by Liu et al. (2) nurses were more frequently affected compared to the physicians, possibly due to closer and longer contacts with patients and performing more high risk (17) medical procedures such as suction. In the current study, most of the patients were under 50 years old with a mean age of 41.86 years (S.D=11.95) similar to studies by Burrer et al. (16), Petersen et al. (6), and Liu et al. (2). A possible explanation can be the higher ratio of younger medical staff compared to the general population and younger HCWs having a greater desire and better physical strength to work for longer hours and serve at the frontline departments. In contrast to an earlier study by Burrer et al. (16), most of the cases were males. Fever and dyspnea were the most common symptoms in HCWs like the general population (18). Also, cough, hyposmia, and diarrhea were other symptoms in order of prevalence and this fits well with findings of Burrer et al. (16) and Liu et al. (2).

At the beginning of the epidemic, due to the resource limitations, most of the diagnoses were confirmed by a CT-scan compatible with the COVID-19 pattern in a symptomatic individual but afterward, PCR kits became more available and performed more widely. Along with the differences in sensitivity of these two tests, this can explain the marked difference between positive results of the two tests (82.8% and 55.2% for CT-scan and PCR assay, respectively). This difference was significantly more than the previous results in the literature (19). We should also state that for five cases (17.2%) despite a non-compatible CT-scan pattern with COVID-19, due to the aggravation of symptoms and unexplained etiology PCR test was performed and the result was positive.

Unlike the study was performed by Burrer et al. (16), most of the cases (79.3%) didn't have an underlying disease. The most severe case was a 65 years old male with a history of hypertension and diabetes mellitus and it is completely known that increasing age and comorbidity are highly associated with disease severity (16, 20). Similar to the literature review (2, 16), severe cases comprise a minority of our patients, probably as the medical staff are more alert and attentive, therefore COVID-19 would be suspected earlier, and also better self-care would be provided. Although in the whole study group no significant difference was reported, male medical staff with long-time exposure were remarkably more than male medical staff with short-time exposure. It is noteworthy to state that high-risk procedures including intubation (41.4%) and physical examination (34.5%) were probably associated with a higher risk of exposure. This also matches well with the findings of previous studies (6, 21). However, HCWs from non-first-line departments were also among the current population showing the probable transmission from contiguous asymptomatic patients and colleagues (22) and also viral spread from environment and surfaces as the potential vector (23, 24). Further studies should be done to clarify the pattern of SARS-CoV-2 transmission in the medical setting.

It is also pivotal to note that the noticeable delay between the presentation of first symptoms and the confirmed diagnostic test (3.72 days) can result in a higher risk of transmission among colleagues and highlights the importance of rapid diagnosis of COVID-19 among HCWs.

Therefore, to reduce the risk of transmission in hospitals, we recommend: 1) Rapid diagnosis of COVID-19 among ill HCWs especially by rapid antigen tests, 2) Continuous training of medical staff on preventive measures should be considered, 3) Provide essential PPE for medical staff, 4) Legislate rational leave policies for ill HCWs to accept temporary self-quarantine at home, 5) Arrange telemedicine facilities where possible, and 6) Prevent overcrowding at clinics and hospital wards (19, 25). Sufficient resting time, psychological support, and job security of medical staff should be considered, as well (2).

We are aware that our research has some limitations. Firstly, our study was a modest-sized retrospective study in a single-center and hopefully there were not too many healthcare-related infections among our medical staff, probably due to the quick access to preventive methods in the capital, Tehran. Secondly, results would be more precious if we had a comparison group. Thirdly, it's not clear whether all of our cases had been infected in the hospital. For instance, two of our attending physicians (who were not infectious disease specialist or involved in the diagnostic and treatment of patients with COVID-19) mentioned the history of traveling to Qom, where the first confirmed cases of COVID-19 in Iran were announced at the beginning of the epidemic (26). Unfortunately, it was not possible to provide PCR molecular tests for every patient and due to the lack of sources and risk of excessive radiation, we were unable to have serial CT scans for each patient. And finally, personnel's knowledge and access to PPE varied, particularly at the beginning of the epidemic. They probably didn't use sufficient PPE in the wards other than infectious wards, albeit there were possibly asymptomatic carriers among patients and other medical staff.

CONCLUSION

Fever was the most common symptom among the study group. Moreover, there might be an association between the duration of the exposure and the risk of the infection in men. Physical examination of the patients might possess the highest risk of transmission in comparison to other activities.

Although the clinical features of COVID-19 among HCWs cannot be copiously determined by this study, it highlights the requirement for comparative studies to illustrate differences among HCWs and the general population .

Conflict of interest

No financial support was provided for this study. All authors state no conflicts of interest relevant to this study.

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