

# Characteristics of Health Care Workers with COVID-19 Mainland China, Jan 4-Jun 2, 2020

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## Abstract

**Background:** The coronavirus disease 2019 (COVID-19) among health care workers (HCWs) in China has been contained rapidly. Here, we report the results of a descriptive, exploratory analysis of all HCWs cases diagnosed during the outbreak and the containment of the epidemic.

**Methods:** All COVID-19 cases of HCWs reported through Jun 2, 2020, were extracted from the Chinese Red Cross Fund (CRCF) website. Analyses included the following: 1) summary of patient characteristics; 2) examination of sex ratios and age distributions; 3) calculation of case fatality and mortality rates; 4) comparison between physician and nurses; 5) epidemiological curve construction; and 6) employment setting (the hospital; community health center; clinics). The 111 HCWs with COVID-19 reported by CRCF from June 3 to November 22 were not included in this analysis.

**Results:** A total of 3,623 HCWs were diagnosed with COVID-19 across mainland China, and 31 of them died (0.9%). Among the 3,623 HCWs, most were female (70.7%), nurses (49.9%), diagnosed in Hubei (98.8%), and in January and early February 2020 (81.9%). The epidemic curve of diagnosis peaked on Jan 23, 2020, which was three days after Chinese law's amendment categorizing COVID-19 as a Class B notifiable disease and three weeks earlier than the peak time in the general population. With sufficient and rigorous protection, the curve declined rapidly after early-February.

**Conclusion:** Rapid containing COVID-19 among HCWs in China is shared in the hope of ensuring the health and safety of HCWs worldwide.

**Keywords:** Covid-19; CDC; SARS-CoV-2

## Introduction

As of Jun 2, 2020, the COVID-19 pandemic had resulted in 83,021 cases and 4,634 deaths in mainland China [1]. In the summary report of 72,314 cases from the Chinese Center for Disease Control and Prevention (CDC) during the early period of the epidemic, 1,716 health workers with laboratory-confirmed COVID-19 were reported [2]. Five of them died through Feb 11, 2020 [2]. We performed a descriptive, exploratory analysis of the outbreak and also the containing of COVID-19 among Health Care Workers (HCWs) in mainland China.

## Methods

The epidemiological characteristics of HCWs with COVID-19 in Mainland China as of Jun 2, 2020, are the focus of this investigation. The Chinese Red Cross Fund (CRCF) is the national center for the HCWs or their family members to claim financial support due to COVID-19. All HCWs diagnosed with COVID-19 are eligible to receive compensation from the CRCF [3]. As of September 11, 2020, the CRCF has provided more than \$62 million in financial assistance to 3,734 health care workers-more than \$14,000 per person for those who got infected during the fight against COVID-19 and more than \$142,000 per family for health care workers who lost their lives while carrying out their duty [4]. As of Jul 31, 2020, the CRCF has provided more than \$62 million in financial assistance to 3,732 health care workers-more than \$14,000 per person for those who got infected during the fight against COVID-19 and more than \$142,000 per family for health care workers who lost their lives while carrying out their duty. By using case report data from the CRCF through Jun 2, 2020, the variety of demographic and clinical practices of HCWs with COVID-19 were identified and analyzed. Analyses included the following: 1) summary of patient characteristics; 2) examination of sex ratios and age distributions; 3) calculation of case fatality and mortality rates; 4) comparison between physician and nurses; 5) epidemiological curve construction; and 6) employment

setting (the hospital; community health center; clinics). The 111 HCWs with COVID-19 reported by CRCF from June 3 to November 22 were not included in this analysis [5].

## Results

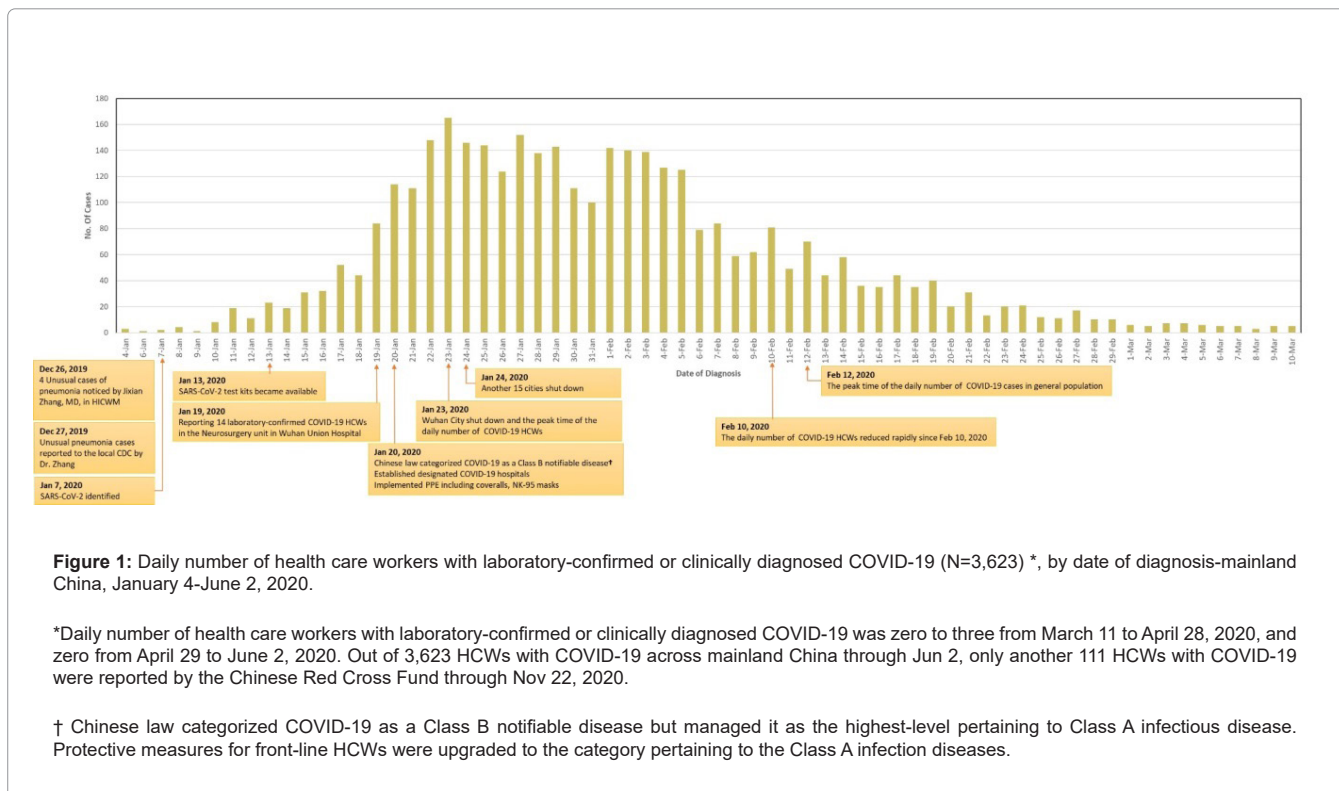
A total of 3,623 HCWs with laboratory-confirmed or clinically diagnosed COVID-19 across mainland China were reported through Jun 2, 2020. Among the 3,623 HCWs, 2560 (70.7%) were women, and 1,063 were men. Of these HCWs, 1,808 (49.9%) were nurses, 1,188 were physicians, and 627 were other health care staff. By early-January, there were only 19 HCWs diagnosed with COVID-19. However, the daily number of HCWs with COVID-19 by date of diagnosis rapidly increased to a peak of 166 on Jan 23, 2020, and, subsequently, the daily number quickly reduced three weeks later (mid-February) (Figure 1), (Table 1). The clear majority (82%) of the 3,623 HCWs were diagnosed in January and early February 2020. The epidemic curve of diagnosis peaked on Jan 23, 2020, which was three days after Chinese law's amendment categorizing COVID-19 as a Class B notifiable disease. The daily number of patients with laboratory-confirmed or clinically diagnosed COVID-19 among the general population by date of diagnosis peaked on Feb 12, 2020, according to our analysis of the data from the National Health Commission of the People's Republic of China [1,4]. The daily number of HCWs with COVID-19 peaked three weeks earlier than the

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general population's peak time. Of the 3,623 HCWs, the vast majority (98.8%) was from Hubei Province, and the clear majority (82.6%) from Wuhan. Out of the total 117,100 HCWs in Wuhan, 2,993 HCWs were diagnosed with COVID-19 resulting in an overall 2.6% infection rate. Only 45 HCWs were from 16 provinces outside of the Hubei Province, with 1-15 cases in each province.

Time of diagnosis	No
Early-January, 2020	19
Mid-January, 2020	429
Late-January, 2020	1483
Early-February, 2020	1037
Mid-February, 2020	431
Later-February, 2020	145
Early-March, 2020	54
Mid-March, 2020	10
Late-March, 2020	4
Early-April, 2020	7
Mid-April, 2020	1
Late-April, 2020	2

**Table 1:** Number of health care workers with laboratory-confirmed or clinically diagnosed covid-19, by time of diagnosis, as of June 2, 2020.

Of the 3,623 HCWs in mainland China, a vast majority (3,350) were from 171 hospitals, fewer (264) were from 119 community health centers, and only nine were from private or local CDC clinics. The first ten hospitals with the largest number of HCWs infected accounted for 1504 of the 3350 hospital-based COVID-19 infections among HCWs with each of these ten hospitals had between 96 to 324 COVID-19

HCWs. The Central Hospital of Wuhan had the highest number of COVID-19 HCWs (324) and the highest infection rate (7.5%). In contrast, few HCWs infections occurred in hospitals specializing in infectious diseases. The first two hospitals converted into designated COVID-19 facilities (Wuhan Jinyintan Hospital and Wuhan Pulmonary Hospital) were hospitals specializing in infectious disease and had only 20 and 12 COVID-19 HCWs (infection rate: 2.2% and 1.7%, respectively). Tongji Hospital of Tongji Medical College and Wuhan Union Hospital had the highest numbers of HCWs in Wuhan, but with low infection rates of 1.8% and 1.2%. Hubei Integrated Chinese and Western Medicine Hospital, where the first four patients were reported to the local CDC (by Jixian Zhang, MD), had relatively few COVID-19 HCWs (75 cases, the infection rate, 5.8%) and no deaths.

Among the total 31 HCWs who died from COVID-19, 23 were men, and 8 were women. The fatality rate was 2.2% for male HCWs and 0.3% for female HCWs. Twenty-five of the HCWs were physicians, two were nurses, and four were other HCWs. The fatality rate was 2.1% for physicians, 0.11% for the nurses, 0.64% for other HCWs (Table 2). Among the 31 HCWs deaths, 23 were diagnosed in mid-January and late-January 2020, and 21 died before Feb 20, 2020. The median age of the 26 HCWs with data available on age was 55 years (range, 29 to 72) and, 16 of those who died were 55 years or older (Table 3). Eighteen of 31 HCWs who died were from top-level hospitals, six from middle-level hospitals, five from low-level hospitals, and two from a private clinic. Thirty HCWs were from Hubei Province, including the 23 from Wuhan. Only one was from outside of Hubei Province (Table 4). Among the 2,993 HCWs with COVID-19 in Wuhan, 23 died, and the fatality rate was 0.77%. Six were from the Central Hospital of Wuhan with 324 COVID-19 HCWs, and the fatality rate was 1.9%. Among the 117,100 HCWs in Wuhan, 23 died, and the mortality rate was 0.02%.

Characteristic	No. of deaths from COVID-19	No. of HCWs with COVID-19	Fatality rate	
Physicians	25	1,188	2.1%	RR (Physicians/Nurses) = 19.1
Nurses	2	1,808	0.11%	
Other health care workers	4	627	0.64%	RR (Other HCWs/Nurses) = 5.8

**Table 2:** Comparison on deaths from COVID-19 for physicians, nurses, and other health care workers (HCWs).

Characteristic	No. with available information (%) for Deaths from COVID-19	Male	Female	Doctors	Nurses	Other health care workers
Age group (years)	26	19	7	23	1	2
16-44	6	4	2	6		
45-54	4	3	1	3		1
55-64	7	6	1	6	1	
≥65	9	6	3	8		1

**Table 3:** Demographic characteristics with age distribution among the health care workers died from COVID-19.

Characteristic	No. of deaths from COVID-19
Hospital level	n=31
3 (Top-level)	18
2 (Middle-level)	6
1 (low-level)	5
Other health facilities	2
City or Rural	n=31
City	31
Rural	0
Wuhan or outside of Wuhan	n=31
Wuhan	23
Hubei province outside of Wuhan	7 (In 5 cities with 1-3 HCWs in each city)
Out of Hubei province	1

**Table 4:** Practice location among the health care workers (HCWs) died from COVID-19.

## Discussion

In mid-January, as more and more patients infected with COVID-19, especially the fourteen HCWs in the Neurosurgery unit in Wuhan Union Hospital, were reported CDC, high contagiousness and severity of the new disease were further recognized [2]. It promoted the Chinese government amending the “National Infectious Diseases Law” to categorize COVID-19 as a Class B notifiable disease. Furthermore, to upgrade the management to the highest level of Class A infectious diseases on January 20 [7]. The law required all cases to be immediately reported to China’s Infectious Disease Information System. Protective measures for front-line HCWs were upgraded to the highest-level a Class A infectious disease. Since then, all front-line HCWs have had sufficient protection awareness, screening protocols, and rigorous protection, including coveralls, N95 masks, and goggles. All patients with COVID-19 were admitted to the designated hospitals or other facilities. Three weeks later (mid-February), the daily number of infected HCWs was significantly reduced (Figure 1). Reporting infection cases, especially the cases among HCWs, and the amendment to National Infectious Diseases Law played a vital role in increasing protection awareness among all HCWs. Strict implementation of coverall protection protocols and admission of all COVID-19 patients to designated facilities eventually resulted in a rapid decline in the number of HCWs infected [8]. Only 45 HCWs were infected with

COVID-19 outside Hubei Province. The lockdown of Hubei Province was timely and effective, avoiding the infection of HCWs outside Hubei Province.

The first two hospitals (Wuhan Union Hospital and Tongji Hospital) with the largest number of HCWs had low infection rates and only one death. Two hospitals specializing in infectious diseases were among the first designated hospitals and had low infection rates and no deaths. The hospital (Hubei Integrated Chinese and Western Medicine Hospital), reporting the first COVID-19 patients, had a relatively low infection rate and no death. The hospital (Wuhan Union Hospital), reporting the first 14 HCWs with laboratory-confirmed COVID-19 in the same unit, had a low infection rate and no death. These implied that adequate protection awareness and measures could prevent COVID-19 infections and the subsequent risk of death.

The number of women HCWs with COVID-19 was more than twice of the men. The difference was because 50% of the HCWs with COVID-19 (1,808/3,623) were nurses and the majority of the nurses were women [9]. The fatality-rate of nurses was lower than physicians. This reduction in the fatality rate may be confounded by age and gender since most women HCWs were nurses, and most nurses are younger than physicians. Being younger has proven to be protective for COVID-19 fatalities [10-13].

## Conclusion

Overall, the number of HCWs who died from COVID-19 was relatively low in China. The number of nurses with COVID-19 was higher than physicians. However, physicians had a higher fatality rate. Those over 55 years old had a high fatality rate. The initial lack of protection awareness and personal protective equipment, including coveralls, seems to be associated with the high number of HCWs infected. This conjecture is supported by the lower infection rate of HCWs working at infectious disease hospitals. The daily number of HCWs diagnosed with COVID-19 peaked on the day three weeks earlier than the peak time in the general population and then decreased rapidly with the sufficient and rigorous protection three weeks later. As the overall infection rate in the general population decreased, the HCWs' infection rate remained low. These findings indicated the importance of protective awareness and measures to ensure the health and safety of HCWs during the COVID-19 outbreak. The lockdown, mandatory mask-wearing, and contact tracing all appear to contribute to the containment.

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