

The epidemiological characteristics of 2019 novel coronavirus diseases (COVID-19) in Jingmen, Hubei, China

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Summary

Background: Some articles have reported the epidemiological and clinical characteristics of coronavirus disease (COVID-19) in Wuhan, but other cities have rarely been reported. This study explored the epidemiology of COVID-19 in Jingmen.

Methods: All confirmed cases of COVID-19 in the First People's Hospital of Jingmen are included from January 12 to February 14, 2020. Cases were analyzed for epidemiological data and were confirmed by real-time PCR.

Findings: Of the 213 cases (108 men and 105 women), 88 (41%) had exposure to Wuhan. The median age was 48 years (range, 2-88 years; IQR, 35-58.5). Thirty-three severe patients with a median age of 66 years (range, 33-82 years; IQR, 57-76) were treated in intensive care units; out of these patients, 66.7% (22) were men and 19 (57.5%) had chronic diseases, including hypertension, diabetes, heart failure, stroke, and renal insufficiency. Under the controlled measures, the number of new patients gradually decreased and nearly disappeared after 20 days.

Interpretation: All people are susceptible to the COVID-19, but older males and those with comorbid conditions are more likely to have severe symptoms. Even though COVID-19 is highly contagious, control measures have proven to be very effective.

Key words: COVID-19, epidemiological characteristics, Infectious Disease

Introduction

Wuhan, the capital of Hubei province in China, reported an outbreak of atypical pneumonia caused by a new coronavirus detected on December 31, 2019, which was named 2019 coronavirus disease (COVID-19).¹⁻⁴ Cases have surfaced in other Chinese cities, as well as other countries and regions.⁵⁻⁷ The number of cases in Wuhan and other cities in China is on the rise. Since February 20, authorities have reported more than 70,000 confirmed cases and 2,122 deaths across all Chinese provinces. More than 26 countries or regions have reported confirmed cases.⁸ With the number of confirmed cases increasing, the implementation of corresponding outbreak control policies began on January 23. By following these procedures, most cities have been controlled, except Wuhan; however, there have been outbreaks in countries outside China.⁹

Some articles have reported the epidemiological and clinical characteristics of COVID-19 in Wuhan¹⁰⁻¹³, but other cities have rarely been reported. Clinical manifestations do not vary widely, but the epidemiology may be different from region to region. We analyzed the epidemiology of 213 COVID-19 patients admitted to the First People's Hospital of Jingmen, which admitted all the confirmed patients within the municipal districts (not including county or county-level cities) of Jingmen, a city of Hubei about 250 miles away from Wuhan.

Methods

Patients: For this retrospective study, we recruited patients in the First People's Hospital of Jingmen from January 12 to February 14, 2020. All the confirmed COVID-19 patients at our hospital were enrolled in this study. Most of the patients are from municipal districts of Jingmen. The government closed all city entrances on January 26, but before that, some patients arrived from other locations. The

study was approved by the First People's Hospital of Jingmen Ethics Committee. The patients' written informed consent was obtained before data was collected.

Procedures: Epidemiological data was collected from patients' medical records. If more information was needed, we communicated with attending health care providers, patients, and their families. Throat-swab specimens from the upper respiratory tract were obtained for Real-Time Reverse Transcription Polymerase Chain Reaction(RT-PCR). The Wuhan Institute of Virology provided the RT-PCR detection reagents.

Outcomes: We described epidemiological data and observed the impact of control measures on the epidemic.

Statistical analysis: Statistical analysis was performed with SPSS 19.0. Continuous variables were described using mean, median,interquartile range (IQR) values and categorical variables were described as frequency rates and percentages.

Source of funding: This research received no external funding.

Results

The 213 patients were aged 2–88 years old with 51.1% of the sample being men. The median age of the patients was 48 years(IQR, 35-58.5,figure 1) . Including 33 patients in the intensive care unit (ICU), the median age of the patients was 66 years(IQR, 57-76), ranging from 33–82 years old, with 22 (66.7%) being men and 19 (57.5%) patients having chronic diseases, including hypertension, diabetes, heart failure, stroke, and renal insufficiency. By the end of January 14, seven (3.27%) patients had died (four patients with renal failure and three had been on dialysis for years), and five of them were men. The average age of the patients who died was 60, with a range from 45–73 years old. The COVID-19 patients were divided into three groups:

1. Wuhan group (88 cases): Patients with a history of exposure to Wuhan. Sixty-one worked or lived in Wuhan, 22 had short-term exposure by staying in Wuhan for about two days, and five patients only visited a Wuhan railway station or airport for about two hours. These people were free to move around until January 23, and many subsequent cases of infection were caused by the Wuhan group.
2. Family group (56 cases): Patients who had not been to Wuhan within 20 days since the illness started and were infected by acquaintances, mainly family members and other relatives, friends, and colleagues. Some of them only had brief contact with infected people, such as talking or eating together.
3. Stranger group (69 cases): Patients who had not been to Wuhan within 20 days since the illness started and had been infected by strangers. The first patient was a bus driver, infected from his passengers, who began to cough and have a fever on January 4. One female patient, who had never been to Wuhan, was a sales clerk in a shopping center. Twenty-three patients were infected in hospital; twelve had uremia and were on dialysis in two hospitals. Eight medical staff in the non-infected ward were infected by confirmed patients. These staff worked in the gastroenterology department, intensive care unit, emergency department, joint surgery

department, and dialysis room. Seven of them became ill between January 21 and 25, one became ill on January 29.

The number of confirmed patients was analyzed according to the date of symptom onset, asymptomatic patients used the date of admission instead (Figure 2). The number peaked on January 21 followed by a gradual decline, most patients had a history of exposure to Wuhan before January 25, the number of locally infected cases peaked on January 26. The last patient from Wuhan began to have symptoms of coughing and fever on February 8, subsequent to having left Wuhan on January 22. The incubation period is more than 17 days. Most of the patients after February 8, 2020 were family members of confirmed patients. All admitted patients after February 9, 2020 were family members of confirmed patients.

Discussion

COVID-19 is a newly discovered and named single-strand, positive-sense RNA coronavirus that may cause respiratory disease.¹⁴ It is related to the other two highly pathogenic viruses, SARS-CoV and MERS-CoV, which have emerged as major global health threats since 2002. SARS-CoV caused 8,422 infections and 800 deaths and spread to 37 countries,^{15,16} and MERS-CoV infected 2,494 individuals and caused 858 deaths worldwide.^{17,18} The number of confirmed COVID-19 patients rose to 70,000 in China by February 20, 2020, with over 44,000 of them in Wuhan. These numbers indicate that COVID-19 is more contagious than SARS¹⁹ and, without protection, people can get infected easily by eating together, shopping, meeting, talking, and staying in crowded places. This is the first descriptive study of the epidemiology of COVID-19 in a city outside Wuhan. A total of 213 patients in Jingmen have provided the opportunity for the whole process of COVID-19, from outbreak to control, to be studied in a single district.

Most confirmed patients are between the ages of 27–68, there was no difference between genders, it's similar to the whole cases in china,²⁰ which suggests that all humans are sensitive to COVID-19; however, older males and those with comorbid conditions are more likely to have more severe symptoms and potentially die. This is consistent with a previous descriptive study of patients in Jingyintan Hospital which was responsible for the treatment of serious cases in Wuhan.¹⁰

No antiviral treatment for COVID-19 infection has been proven to be effective so far.²¹ The best way to fight the virus is to block its spread. In order to cope with the outbreak of COVID-19, the government of Jingmen has implemented several preventative measures since January 23 (figure 3). All markets were closed and all public transportation was suspended. Subsequently, most roads were blocked into the city of Jingmen. Local residents have been advised to stay at home in order to contain the virus spread. Residents were also ordered to wear masks in public areas.

The benefits from these measures were that the number of confirmed patients peaked on January 21 followed by a gradual decline, however, most patients were infected from Wuhan before January 25, these patients could not be controlled, the number of locally infected cases peaked on January 26, three days after the early preventive policies. Infections from strangers were the most dangerous and the hardest to control, since no one knew they were infected before onset, including the individuals infected.

These people were disappeared 15 days after the control measures, indicating most of them were infected before the control measures were implemented. The last few cases were family members of confirmed patients, which were hard to prevent when living in a home with an infected individual. Studies indicate the basic reproductive number of COVID-19 was estimated to be 2.2 (95% CI, 1.4 to 3.9). The epidemic doubled in size every 7.4 days without control measures.²² If measures were not taken in time, the consequences would be unimaginable. To date, some close contacts are still in quarantine and some may become ill in the next few days, however, the situation is under control.

These control measures, along with the professional handling of suspected cases and close contacts, were very effective. Two things were important for disease prevention: avoiding close contact with people whenever possible and wearing masks when contact is required. COVID-19 is apparently more contagious than SARS and, without protection, people can be easily infected by close contact. However, some close contact is inevitable, such as buying necessities and seeing doctors. COVID-19 is transmitted by saliva droplets, contact, and other transmission routes such as aerosols,^{23,24} which can be prevented by wearing masks.

More than ten patients were in the non-infectious ward before the diagnosis. These patients were spread across seven departments, and only eight medical staffs were infected. Moreover, most of them were infected before January 20, when many doctors did not wear masks. Three patients were in the respiratory department before diagnosis. None of the respiratory medical staff had been infected and they had been wearing masks all the time. So far, the majority of departments in non-infected areas do not have protective clothing, masks are the only protective equipment.

Although masks prevent most infections, they are not always available. One citizen was infected only because she had been to the supermarket a few times and, because she could not buy a new mask, had been wearing the same mask all the time for several days without disinfection. We tried to steam sterilize disposable surgical masks, and there was no obvious damage to the masks. Of course, professional tests are needed to determine whether the steam disinfection will reduce the protective effect of the masks. If a mask must be used more than once, steam sterilization should be considered.

Since the infection time of most patients could not be determined, we did not analyze the incubation period. It was reported that the incubation period was 4–7 days.²⁵ Based on the SARS experience, the maximum incubation period is currently considered to be no more than 14 days, but one case in our study was significantly longer at 17 days. A recent study reported the longest incubation period to be 24 days.¹¹ Authorities reported in Guangdong province that a man became ill after 27 days, leading to more than 100 people being quarantined. The maximum incubation period is unclear. Considering the highly infectious nature of the COVID-19, quarantining people from the affected areas for a month should be considered.

The asymptomatic case is a challenge to disease control, and 1.2% of cases are asymptomatic in China.²⁰ Three asymptomatic cases were diagnosed during screening because they were close contacts and had been hospitalized for more than half a month without symptoms. The pneumonia lesions of these three cases were unilateral and limited to a small area (Figure 4). If they were infected by strangers, they will not be found until some people around them being infected and diagnosed. The other challenge to

disease control is how to judge if a confirmed patient did not have infectivity after treatment. At present, nucleic acid detection is mainly relied on, but sometimes this test is not reliable for excluding diseases. One mild case was discharged after three negative nucleic acid tests on different days in a week but then, after two weeks of isolation, the nucleic acid test became positive. Another 4 cases reported in china, however, no one infected from them so far.

There were three limitations in this study. First, only 213 patients diagnosed with COVID-19 were included. Second, the unconfirmed suspected cases in the early stages were excluded in the analyses. Some patients were discharged as suspected patients after one negative nucleic acid test. Many patients had a second or third check before being diagnosed. Third, most of the data were from patients' medical records, with the potential of a few of them not being accurate enough.

In conclusion, all people are susceptible to COVID-19, and older males and those with comorbid conditions are more likely to become severe cases. Even though COVID-19 is highly contagious, control measures have proven to be very effective.

Contributors

The study was designed by QG and ZD; FX, JW, JW and QG collected the epidemiological and clinical data and processed statistical data. Qijun Gao drafted the manuscript. YH contributed to critical revision of the reportand.

Declaration of interests

We declare no competing interests

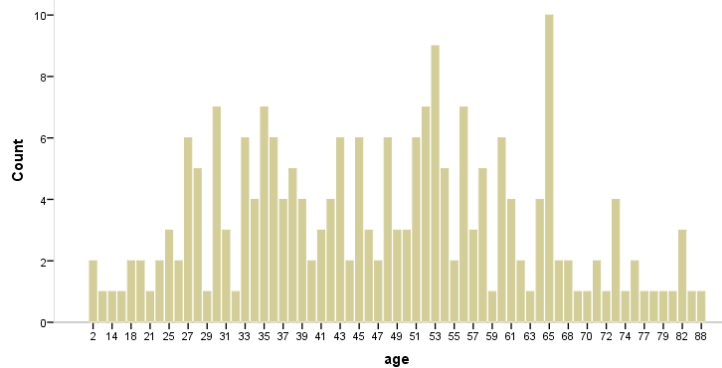


Figure 1: Age distribution of patients with laboratory-confirmed COVID-19

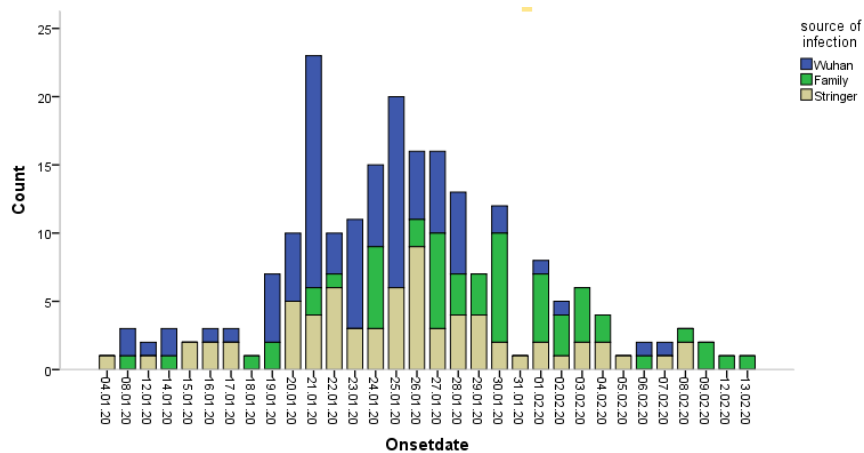


Figure 2: Date of illness onset distribution of patients with COVID-19

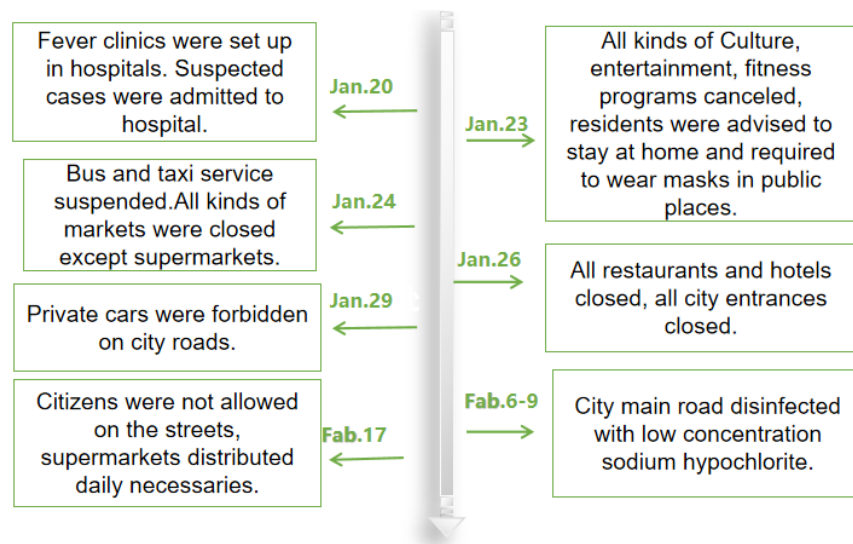


Figure 3: Major prevention and control measures implemented by the government of Jingmen (<http://www.jingmen.gov.cn>)

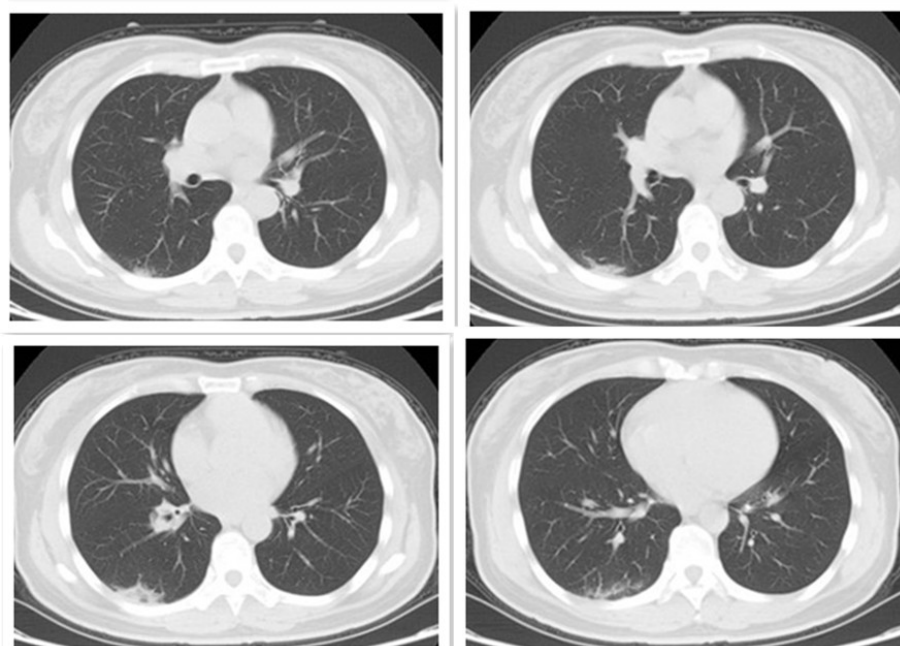


Figure 4: Chest CTs of an asymptomatic patient, obtained on Feb 10 showed small patchy high density shadows and ground glass shadows in the lower lobe of the right lung near the pleural surface.

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