Observational Study

Medicine®

OPEN

Epidemiological and clinical characteristics of 2019 novel coronavirus disease (COVID-19) in Jilin, China

A descriptive study

Han Liu, MD[a], Jinying Gao, MD[a], Yangyang Wang, MD[a], Jing Jie[a], Jingjing Luo, MD[a], You Xu, PhD[a,b], Hongying Sun, MD[a], Lei Song, PhD[a], Dan Li, PhD[a], Liping Peng, PhD[a], Shucheng Hua, PhD[a,*]

Abstract

Coronavirus diseases 2019 (COVID-19) has become a global pandemic. To add to the scarce information on this disease, here, we investigated the epidemiological and clinical characteristics of 93 hospitalized patients with COVID-19 in Jilin, China from January 22 to March 15, 2020.

We retrospectively investigated the demographic information, recent exposure history, clinical symptoms or signs, comorbidity, chest computed tomographic (CT) scan or X-ray results, laboratory test results, diagnostic classification, treatment, length of hospitalization, complications, and outcomes.

Of the 93 patients, 54 were male and 39 female. More than half of these patients had a history of exposure to infected patients. The mean incubation period was 10.4 days in 87 patients, where the data was available. The 5 most common symptoms of illness onset were fever, cough, expectoration, fatigue, and dyspnea. One patient was asymptomatic. The imaging results were abnormal in majority of the patients. Almost one-third of the patients had lymphopenia. All patients received antiviral therapy, 84 patients were treated with antibiotics and 54 received different doses of the hormone for methylprednisolone. In addition, 72 patients used traditional Chinese medicine. Oxygen therapy, high nasal flow oxygen, non-invasive ventilator, invasive ventilator and extracorporeal membrane oxygenation (ECMO) were used symptomatically in different patients. Except 1 patient who died during treatment, all others were discharged.

The average incubation time is prolonged in the present analysis, as compared to that in other reports. A few patients symptoms improved but CT exacerbated. Therefore, we suggest that close follow-up observation is still required after discharge.

Abbreviations: 2019-nCoV = 2019 novel coronavirus, ARDS = adult respiratory distress syndrome, CBC = complete blood count, COVID-19 = coronavirus diseases 2019, CRP = C-reactive protein, CT = computed tomographic, DVT = deep venous thrombosis, ECMO = extracorporeal membrane oxygenation, FiO2 = fraction of inspiration O_2, HNFO = high nasal flow oxygen, MERS-CoV = Middle East respiratory syndrome coronavirus, OI = oxygenation index, PO2 = pressure of oxygen, RT-PCR = reverse transcriptase polymerase chain reaction, SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2, SOFA = Sequential Organ Failure Assessment.

Keywords: COVID-19, COVID-19 prognosis, COVID-19 treatment, epidemiology

Editor: Babak Abdinia.

LS, DL, LP, and SH contributed equally to this work.

This work was supported by the grants of Jilin Scientific and Technological Development Program (No. 20200901010SF, No. 20200901006SF, 20200901024SF) and National Major Science and Technology Projects of China (No. 2017ZX10103004).

All data are fully available without restriction.

The authors declare that they have no conflicts of interest.

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

[a] Department of Respiratory Medicine, Key Laboratory of Organ Regeneration & Transplantation of the Ministry of Education, the First Hospital of Jilin University, Changchun, PR China, [b] Department of Pharmacy, Faculty of Health & Medical Sciences, University of Copenhagen, Copenhagen, Denmark.

[*] Correspondence: Shucheng Hua, Department of Respiratory Medicine, Key Laboratory of Organ Regeneration & Transplantation of the Ministry of Education, the First Hospital of Jilin University, Changchun, Jilin 130000, China, No. 1, Xinmin Street, Changchun 130000, Jilin province, PR China (e-mail: hsc@jlu.edu.cn).

How to cite this article: Liu H, Gao J, Wang Y, Jie J, Luo J, Xu Y, Sun H, Song L, Li D, Peng L, Hua S. Epidemiological and clinical characteristics of 2019 novel coronavirus disease (COVID-19) in Jilin, China: a descriptive study. Medicine 2020;99:47(e23407).

Received: 4 June 2020 / Received in final form: 30 September 2020 / Accepted: 30 October 2020

http://dx.doi.org/10.1097/MD.0000000000023407

1. Introduction

Since December 2019, after the first case of new coronavirus pneumonia was reported in Wuhan,[1] Hubei province, the disease has rapidly spread not only in China but worldwide. The novel coronavirus, causing coronavirus diseases 2019 (COVID-19), has been identified as a type of beta coronavirus,[2] which primarily leads to respiratory system infection. The virus is an enveloped virion that appears round or oval, often polymorphous, with a diameter of 60 to 140 nm.[3] The pathogen has been named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which has a phylogenetic similarity to SARS-CoV.

As on March 30, 2020, a total of 81,518 confirmed cases have been reported in China, with another 771 imported cases from abroad, and total 3305 fatal cases.[4] Through active and effective control, the epidemic situation of COVID-19 in China is gradually leveling off. However, more than 770,000 cases have been identified all over the world on March 30, 2020,[5] indicating that a big threat to global health has been posed by the novel coronavirus infection.

Coronaviruses can cause multiple system infection in various animals and mainly respiratory tract infection in humans. Serious cases of COVID-19 can develop severe pneumonia, adult respiratory distress syndrome (ARDS) and multiple organ failure leading to death.[6,7] So far, China has launched a series of guidelines for diagnosis and treatment of COVID-19.[8–14] The number of confirmed daily cases in China is falling gradually.

Jilin is a province located in the northeast of China with a population of 27 million. It is a province with less population mobility than other big cities. Until March 31, 2020, there are only 93 patients diagnosed with COVID-19 in this area and an additional 5 new imported cases from abroad.[15] At present, information regarding the epidemiology and clinical features of pneumonia caused by COVID-19 in Jilin province is scarce. In this report, we provide a comprehensive analysis of 93 recovered COVID-19 patients in Jilin Province, China. Hopefully our experience will provide help and support to more areas all over the world.

2. Materials and methods

2.1. Patients

All patients were seen in the outpatient department of a government-designated hospital, but were transferred to 19 different hospitals for hospitalization all over the province between January 22 and March 15, 2020. The data were obtained retrospectively from the medical records of these 19 different hospitals. All patients underwent 2 or more nucleic acid tests at the time of discharge. COVID-19 was diagnosed on the basis of the WHO interim guidance[16] based on real-time reverse transcriptase polymerase chain reaction (RT-PCR) assay of nasal and pharyngeal swab specimens or blood specimens. Only laboratory-confirmed cases were included in the analysis. This study was approved by the ethics committee of the hospital where the paper was published.

The data retrieved from the medical records included demographic information, recent exposure history, clinical symptoms or signs, comorbidity, CT scan or X-ray results, laboratory test results, diagnostic classification, treatment, length of hospitalization, complication and outcome. All the data was checked by 3 physicians. The detailed history, clinical manifestations, pathogenic evidence, and disease severity retrieved from the medical records were summarized and classified as follows.

Epidemiological history:

1. history of travel or residence in Wuhan or its surrounding areas, or other communities with confirmed cases within 14 days before onset
2. contact with confirmed COVID-19 cases within 14 days prior to onset
3. contact with suspected patients (having fever, respiratory symptoms) from Wuhan or its surrounding areas, or communities with confirmed cases within 14 days before the onset of the disease
4. aggregation: 2 or more cases with fever or respiratory tract infection were found in an enclosed environment (such as home, office, school, etc.) at the same time within 14 days before the onset of the disease.

Clinical manifestations:

1. fever and/or respiratory symptoms
2. imaging data indicating the characteristics of the novel coronavirus pneumonia;[18]
3. in the early stage of the disease, white blood cell count or lymphocyte count are in or below the normal range.

Pathogenic evidence:

Real-time RT-PCR used to detect SARS-CoV-2 virus in nasal or pharyngeal swab specimens, or blood specimens, or stool samples.

The disease is divided into 4 levels according to severity[17]:

1. Mild type: The clinical symptoms were mild, and no manifestations of pneumonia were found on imaging.
2. Moderate type: Had fever and respiratory symptoms, and manifestations of pneumonia can be seen on imaging.
3. Severe type: Meeting any of the following criterion can be diagnosed:
   a. Shortness of breath, 30 or more breaths per minute;
   b. Oxygen saturation is 93% or less at rest;
   c. The oxygenation index is less than or equal to 300 mm Hg.
4. Critically ill type: Meeting any of the following criterion can be diagnosed:
   a. Respiratory failure occurs and mechanical ventilation is required;
   b. shock;
   c. Combined with other organ failure requires intensive care.

We defined the suspected cases as anyone with an epidemiological history consistent with any 2 clinical manifestations, or no history but positive for all 3 clinical manifestations. All confirmed cases in this study met the following diagnostic criteria is that any suspected cases with a positive pathogenic evidence.

2.2. Image analysis

All patients underwent CT or chest radiography. The radiologic details were retrieved from the documents. Wherever imaging scans were available, they were reviewed by 3 Physicians from the Department of respiratory medicine.

2.3. Laboratory testing

The laboratory tests included complete blood count (CBC), blood chemical analysis, coagulation testing, liver and renal function, C-reactive protein, procalcitonin, and arterial blood gas analysis. We calculated the oxygenation index (OI) according to the partial

pressure of oxygen (PO_2) and fraction of inspiration O_2 (FiO_2). We also calculated the Sequential Organ Failure Assessment (SOFA) score.

2.4. Statistical analysis

The continuous variables were expressed as mean ± SD. Non-normally distributed data and ordinal data were expressed as median (IQR). The classification variable is presented as count (%). All statistical analysis were performed with SPSS software version 22.0, and *P* value less than .05 was considered statistically significant.

3. Results

A total of 93 patients with COVID-19 were included in this study at 19 sites. Among these 93 patients, 54 (58.1%) patients were male, 39 (41.9%) were female, with a median age of 43 (IQR 29–54) years. Of them, 4 (4.3%) patients were below 18 years of age. Ten (10.8%) patients were over 65 years of age. Altogether 54 (58.0%) patients had a history of exposure to infected patients; 19 (20.4%) patients returned from the affected area, 11 (11.8%) patients had a history of travelling, 5 (5.4%) patients had close contact with travelers, 2 (2.2%) patients had indirect contact with confirmed patients, and exposure history was unknown in 2 (2.2%) patients. The incubation duration was not clear in 6 patients; the mean period of incubation for the remaining 87 patients was 10.4 days. The first case in Jilin province was confirmed on January 22, 2020. In terms of clinical classification, 6 (6.5%) patients were critically ill, 5 (5.4%) severe type, 80 (86.0%) moderate type, and 2 (2.1%) were mild type (Table 1).

The 5 most common symptoms of illness onset were fever (76, 81.7%), cough (52, 55.9%), expectoration (17, 18.3%), fatigue (13, 14.0%), and dyspnea (12, 12.9%). Other symptoms included throat discomfort (9, 9.7%), diarrhea (6, 6.5%), muscular soreness (4, 4.3%), headache (2, 2.2%), nausea (2, 2.2%). From illness to discharge, the average time of fever was 6.1 days. Remarkably, 1 patient with a history of contacting with a confirmed patient tested positive but had no symptoms. Overall, 17 (18.3%) patients were found to have comorbidities before hospitalization: hypertension (6.5%), diabetes or impaired glucose tolerance (IGT) (6.5%), heart disease (3.2%), stroke (2.2%), hypothyroidism (2.2%), COPD or chronic bronchitis (2.2%), other comorbidities or history of chronic conditions included gout, hypoproteinemia, interstitial pneumonia, lacunar infarction. Thirteen (14.0%) patients developed complications during hospitalization which included gastrointestinal discomfort, ARDS, hypoproteinemia, disturbance of water and electrolyte, myocardial damage, deep venous thrombosis (DVT), and liver damage (Table 2).

Ninety (96.8%) patients had chest CT scan and 3 (3.2%) had chest radiography imaging done during their hospital admission. Majority (84, 90.3%) had abnormal results; 59 (63.4%) patients had typical images of bilateral multiple ground glass opacities (Fig. 1). The lesions in 16 (17.2%) patients were visible only in the right lung (Fig. 2) and 9 (9.7%) had in the left lung. Most of the images (44, 47.3%) showed ground-glass changes; 23 (24.3%) had patchy lesions. Other imaging patterns such as centrilobular nodules, cystic changes and enlarged mediastinal lymph nodes were rare. Majority of the patients (90, 96.8%) had at least 2 chest CT imaging done. Among them 71 (76.3%)

Table 1

Demographics, history of exposure, and clinical classification of 93 patients with COVID-19 pneumonia.

	Patients (N = 93)
Age, years	
Mean (SD)	43 (17.34)
Median	42
Q1, Q3	29, 54
Range	9-87
Sex	
Male	54 (58.1%)
Female	39 (41.9%)
History of exposure	
Exposure to infected patients	54 (58.0%)
Returned from the affected area	19 (20.4%)
History of travelling	11 (11.8%)
Close contact with travelers	5 (5.4%)
Indirect contact with confirmed patients	2 (2.2%)
Unknown	2 (2.2%)
Clinical classification	
Mild	2 (2.1%)
Moderate	80 (86.0%)
Severe	5 (5.4%)
Critically ill	6 (6.5%)

Table 2

Clinical characteristics of 93 patients with COVID-19 pneumonia.

	Patients (N = 93)
Signs and symptoms at admission	
Fever	76 (81.7%)
Cough	52 (55.9%)
Expectoration	17 (18.3%)
Fatigue	13 (14.0%)
Dyspnea	12 (12.9%)
Throat discomfort	9 (9.7%)
Diarrhea	6 (6.5%)
Muscular soreness	4 (4.3%)
Headache	2 (2.2%)
Nausea	2 (2.2%)
Vomiting	1 (1.1%)
Discomfort in eyes	1 (1.1%)
Symptoms	
More than 1 symptom	66 (71.0%)
One symptom	26 (28%)
No symptoms	1 (1.1%)
Comorbidities	
Any	17 (18.3%)
Hypertension	6 (6.5%)
Diabetes or IGT	6 (6.5%)
Heart disease	3 (3.2)
Stroke	2 (3.2)
Hypothyroidism	2 (2.2%)
COPD or chronic bronchitis	2 (2.2%)
Complications	
Any	13 (14.0%)
Gastrointestinal discomfort	5 (5.4%)
Disturbance of water and electrolyte	2 (2.2%)
Myocardial damage	2 (2.2%)
Hypoproteinemia	1 (1.1%)
DVT	1 (1.1%)
liver damage	1 (1.1%)
ARDS	1 (1.1%)

ARDS = acute respiratory distress syndrome, COPD = chronic obstructive pulmonary disease, DVT = deep vein thrombosis, IGT = impaired glucose tolerance.

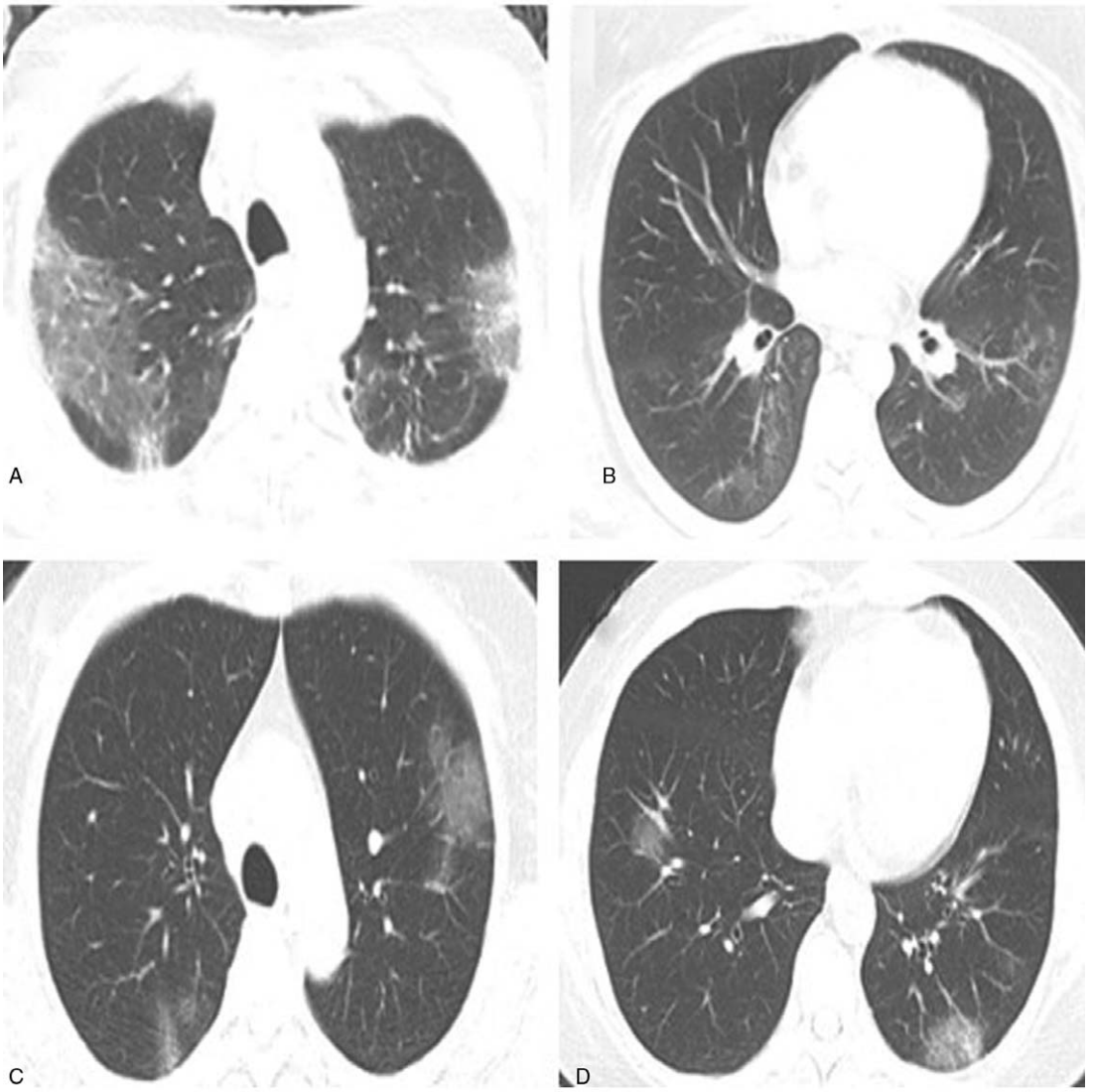

Figure 1. Typical images of bilateral multiple ground glass opacities seen in 4 COVID-19 patients.

patients had improved significantly, but few patients had no changes.

The blood leucocytes were below the normal range in 13 (14.0%) patients and above the normal range in 5 (5.4%) patients; 30 (32.6%) patients had severe leucopenia. In 51 (54.8%) patients had elevated C-reactive protein (CRP) levels. The OI was calculated according to PO_2 and FiO2, as there was no need to do the PO_2 in all the patients. Among the 11 patients who were critically ill and severe type, the OI values were reduced; less than 100 in 2 patients, between 100 and 200 in 4 patients, between 200 and 300 in 2 patients, and between 300 and 400 patients in 3 patients. Two patients had a SOFA score of 1 and 9 had a score of more than 2.

The treatment details on admission are summarized in Table 3. All patients were treated in isolation. All patients had antiviral therapy (93, 100%), including oral kaletra (82, 88.2%), aerosol inhalation of interferon (81, 87.1%), oral arbidol (45, 48.4%), oral oseltamivir (22, 23.7%), and oral ribavirin (19, 20.4%). Almost all patients received 2 or more antiviral drugs. Eighty four (90.3%) patients were treated with antibiotics, including moxifloxacin, azithromycin, doxycycline, amikacin, levofloxacin, and so on. Most of the patients (64, 68.8%) were treated empirically with a single antibiotic; moxifloxacin (n=54), levofloxacin (n=5), azithromycin (n=1), amoxicillin (n=1), cefepime (n=1), Cefperazone-Sulbactam (n=1), and cefixime (n=1). Twenty (21.5%) patients were treated with drug combination, 3 patients with both anti-bacterial and antifungal therapy. Fifty four (58.1%) patients received different doses of the hormone for methylprednisolone depending on the severity of their condition and 30 (32.6%) patients had oxygen therapy. Six (5%) patients were managed with non-invasive ventilator out of which 1 died during the sequential retrograde tracheal intubation. One patient had to use high nasal flow oxygen (HNFO), invasive ventilator and extracorporeal membrane oxygenation (ECMO) sequentially. In addition, 72 (77.4%) patients used traditional Chinese medicine which were formulated individually by the expert group on traditional Chinese medicine to improve their lung function.

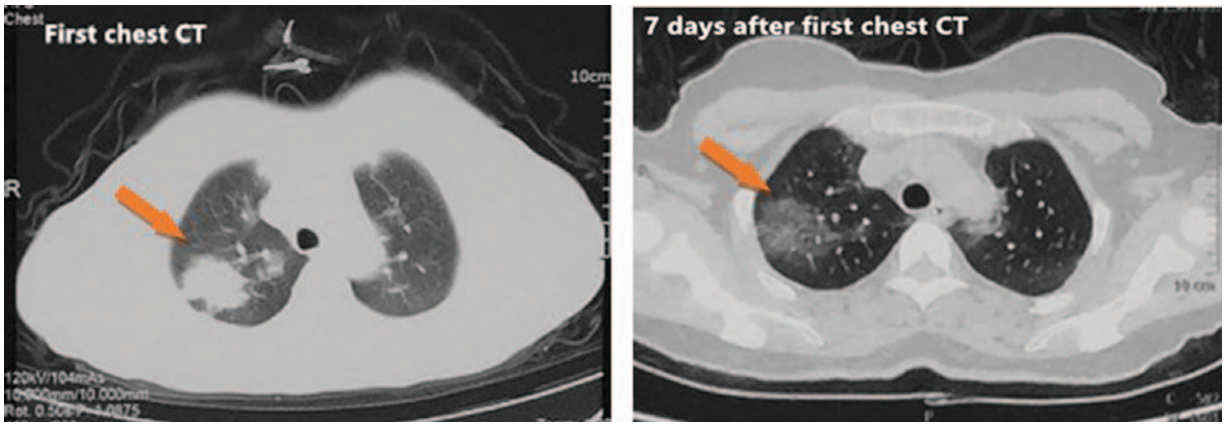

Figure 2. A 41-year-old COVID-19 positive woman with history of recent travel to Wuhan, presented lesions in right lung (A) Image at diagnosis (B) The lesions significantly improved after treatment during 7 days.

Table 3

Treatment details of 93 patients with 2019-nCoV pneumonia.

	Patients (N = 93)
Antiviral therapy	
Kaletra	82 (88.2%)
Interferon	81 (87.1%)
Arbidol	45 (48.4%)
Oseltamivir	22 (23.7%)
Ribavirin	19 (20.4%)
Antibiotics therapy	
Moxifloxacin	73 (78.5%)
Levofloxacin	8 (8.6%)
Doxycycline	6 (6.5%)
Amikacin	6 (6.5%)
Cefperazone-Sulbactam	4 (4.3%)
Azithromycin	4 (4.3%)
Amoxicillin	3 (3.2%)
Meropenem	3 (3.2%)
Cefepime	2 (2.2%)
Piperacillin-tazobactam	2 (2.2%)
Cefixime	1 (1.1%)
Antibiotic condition	
Single	64 (68.8%)
Moxifloxacin,	54 (58.1%)
Levofloxacin	5 (5.4%)
Azithromycin	1 (1.1%)
Amoxicillin	1 (1.1%)
Cefepime	1 (1.1%)
Cefperazone-Sulbactam	1 (1.1%)
Cefixime	1 (1.1%)
Drug combination	20 (21.5%)
None	9 (9.7%)
Hormone	
Any	54 (58.1%)
None	39 (41.9%)
Intensive care treatment	
Oxygen therapy	30 (32.6%)
Non-invasive ventilator	6 (6.5%)
Invasive ventilator	1 (1.1%)
HNFO	1 (1.1%)
ECMO	1 (1.1%)

ECMO = extracorporeal membrane oxygenation, HNFO = high nasal flow oxygen.

By March 15, 2020, 92 patients were discharged and only 1 patient died. The average length of hospital stay was 18.2 days (IQR 14–21 days).

4. Discussion

This is a descriptive study on the epidemiology and clinical characteristics of COVID-19 which included data from 93 patients who were treated in Jilin province, China. The average age of these patients was 43 years (range 9–86 years). The number of male patients was higher (58.1%), an observation seen in case of MERS-CoV and SARS-CoV infections too.[19]

In view of the fact that majority of patients had a clear history of exposure it is clear that COVID-19 has the ability for person-to-person transmission.[18,20,21] The asymptomatic carriers were mildly ill during hospitalization, but their communicable period could be up to 3 weeks and there is a possibility that communicated patients develop severe illness. These results highlight the importance of close contact tracing and longitudinal surveillance via virus nucleic acid tests.[22]

Average incubation period of COVID-19 in our study was around 10.4 days (range 2–25 days). The average incubation period in the present report is more than some of the published reports[23,24] indicating that extending the monitoring time might be justified in extreme cases.

More than 80 patients were moderate and mild type. Only 11 patients were critically ill and severe type. Almost all of them recovered, except 1 critically ill patient, aged 81 years, who died during his stay in the hospital. The patient had chronic comorbidities like hypertension, interstitial pneumonia, cardiac insufficiency, and lacunar cerebral infarction. He died on the 7th day after admission after he received intensive care with non-invasive ventilator, endotracheal intubation and vasoactive drugs. The risk factors were advanced age and associated chronic illnesses. He died of ARDS and respiratory failure.

The patients predominantly presented with fever and cough as reported earlier.[18] Most patients had multiple symptoms. In few patients, fatigue or throat discomfort was the only symptom and 1 was asymptomatic. So, the absence of clinical symptoms cannot rule out the infection. Regardless of clinical symptoms, the

persons should be considered for medical observation, home isolation, and further examination.

One of the main diagnostic tests is Chest imaging.[25] Most patients had a CT scan of the lungs rather than a chest X-ray. Majority had abnormal results showing typical bilateral multiple ground glass opacities. In some patients either the right lobe or the left lobe only was involved. The health of majority of the patients improved significantly after the nucleic acid test was negative. Some patients still had abnormal imaging changes in their lungs even after clinical recovery. In this regard, we suggest that when screening COVID-19 patients, the clinical manifestations, laboratory findings, and chest imaging should be comprehensively analyzed, and a close follow-up observation is still required after discharge from the hospital.

In terms of laboratory tests, few patients had a decreased or an increased number of WBC. One third of the patients had a decreased number of lymphocytes, which was similar to previous studies.[17] So, whether the lymphocyte is below the normal range is worthy of attention. COVID-19 may exert a major impact on lymphocytes, especially T lymphocytes. The virus triggers a series of immune responses and induces cytokine storm in vivo, resulting in changes in immune components such as peripheral blood leukocytes and lymphocytes.[26] CRP level was elevated in more than half of the patients.

There is no specific drug for the treatment of patients with COVID-19 till date.[27,28] All patients received different kinds of antiviral drugs, majority being on oral kaletra (82, 88.2%) and aerosol inhalation of interferon. Although a study showed that remdesivir might have a good therapeutic effect,[29] yet the drug is still in clinical trials[30] and not ready for patient use. Currently, the clinical treatment mainly involves oral antiviral drugs, aerosol inhalation of interferon, empirical antibacterial drugs, and appropriate dose of hormone. In addition, traditional Chinese medicine is also recommended for improving the lung function as a supporting symptomatic treatment for improving the lung function. Considering that there was only 1 fatality among 93 patients analyzed in the present series, it can be assumed that the treatment strategies followed were appropriate and acceptable. One of the contentions may be the average length of hospital stay was 18.2 days, far more than the average of 8 days in Jiangsu province.[17] Recently there are reports of patient becoming positive for nucleic acid after recovery and disappearance of clinical symptoms.[31,32] Continuation of isolation, laboratory and clinical monitoring may also be recommended for COVID-19 patients.

This study has included all patients diagnosed with COVID-19 in Jilin province so far. In sum up, most of the patients were men. Some patients were asymptomatic. The longest incubation period in this study was 25 days, indicating that extending the monitoring time might be justified in extreme cases. The most common symptoms were fever and cough. Laboratory tests showed that CRP levels were elevated in more than half of the patients. Majority had abnormal imaging results showing typical bilateral multiple ground glass opacities. There is no specific drug treatment, but traditional Chinese medicine played an important role in the treatment process. At present, only 1 patient died in Jilin Province considering that Jilin Province is relatively far away from the epidemic area and has a small floating population between Hubei Province. Showing that the epidemiological surveillance, early intervention and treatment are a great value for the control of COVID-19 disease.

The data are relatively comprehensive and have certain local characteristics, which can also reflect the diagnosis and treatment of COVID-19 in China at this time. But our work is limited by its retrospective nature. Due to the limited number of patients, our conclusions need to be further verified by large sample size. Extended follow-up time would be needed to determine the prognosis after discharge and would provide more detailed information.

In view of the current global spread of COVID-19, China is again facing the risk of imported cases. Chinas achievements in the first stage will undoubtedly provide valuable experience for the next stage of the prevention of the epidemic.

Author contributions

Shucheng Hua designed the study and revised the manuscript. Han Liu, Jing Jie and Lei Song prepared the manuscript. Han Liu, Yangyang Wang and Jinying Gao collected the data. Hongying Sun, Jingjing Luo and You Xu searched the literature. Dan Li and Liping Peng reviewed the results and made critical comments on the manuscript.

Data curation: Jinying Gao, Yangyang Wang, You Xu, Lei Song.
Formal analysis: Jing Jie.
Investigation: Jingjing Luo, Hongying Sun.
Supervision: Shucheng Hua.
Writing – original draft: Han Liu, Lei Song.
Writing – review & editing: Dan Li, Liping Peng.

References

[1] Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet 2020;395:497–506.
[2] Chen HD, Chen J, Luo Y, et al. A pneumonia outbreak associated with a new coronavirus of probable bat origin. Nature 2020;579:270–3.
[3] Zhao S, Lin Q, Ran J, et al. Preliminary estimation of the basic reproduction number of novel coronavirus (2019-nCoV) in China, from 2019 to 2020: a data-driven analysis in the early phase of the outbreak. Int J Infect Dis 2020;92:214–7.
[4] Press Conference of the Joint Prevention and Control Mechanism of the State Council. A transcript of the press conference on 31 March 2020 (in Chinese). http://www.nhc.gov.cn/xcs/s3574/202003/de0fbd4f7a0349299e36f4fa3af3a005.shtml [Accessed 31 March 2020]
[5] The Indian Express. COVID-19 latest update, March 31: US death toll climbs past 3,500, surpasses China's official count. https://indianexpress.com/article/coronavirus/coronavirus-world-updates-march-31-italy-china-us-6339733/ [Accessed 31 March 2020]
[6] Chih-Cheng Lai, Yen Hung Liu, Cheng-Yi Wang, et al. Asymptomatic carrier state, acute respiratory disease, and pneumonia due to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2): Facts and myths. J Microbiol Immunol Infect 2020;53:404–12.
[7] Tanu Singhal. A review of coronavirus disease-2019 (COVID-19). Indian J Pediatr 2020;87:281–6.
[8] National Health Commission and National Administrative Office of Chinese Tradition Medicine. Chinese Diagnosis and Treatment Recommendation for COVID-19 (the 1st edition) (in Chinese). http://med.china.com.cn/content/pid/156973/tid/1026 [Accessed 16 January 2020]
[9] National Health Commission and National Administrative Office of Chinese Tradition Medicine. Chinese Diagnosis and Treatment Recommendation for COVID-19 (the 2nd edition) (in Chinese). http://xajdyfytsg.superlib.libsou.com/info/71527.jspx [Accessed 18 January 2020]
[10] National Health Commission and National Administrative Office of Chinese Tradition Medicine. Chinese Diagnosis and Treatment Recommendation for COVID-19 (the 3rd edition) (in Chinese). http://www.nhc.gov.cn/yzygj/s7653p/202001/f492c9153ea9437bb587ce2ffcbee1fa.shtml[Accessed 23 January 2020]
[11] National Health Commission and National Administrative Office of Chinese Tradition Medicine. Chinese Diagnosis and Treatment Recommendation for COVID-19 (the 4th edition) (in Chinese). http://www.nhc.

gov.cn/yzygj/s7653p/202001/4294563ed35b43209b31739bd0785e67.shtml [Accessed 27 January 2020]
[12] National Health Commission and National Administrative Office of Chinese Tradition Medicine. Chinese Diagnosis and Treatment Recommendation for COVID-19 (the 5th edition) (in Chinese). http://www.nhc.gov.cn/yzygj/s7653p/202002/3b09b894ac9b4204a79db5b8912d4440.shtml [Accessed 4 February 2020]
[13] National Health Commission and National Administrative Office of Chinese Tradition Medicine. Chinese Diagnosis and Treatment Recommendation for COVID-19 (the 6th edition) (in Chinese). http://www.nhc.gov.cn/yzygj/s7653p/202002/8334a8326dd94d329df351d7da8aefc2.shtml [Accessed 18 February 2020]
[14] National Health Commission and National Administrative Office of Chinese Tradition Medicine. Chinese Diagnosis and Treatment Recommendation for COVID-19 (the 7th edition) (in Chinese). http://www.nhc.gov.cn/yzygj/s7653p/202003/46c9294a7dfe4cef80dc7f5912eb1989.shtml [Accessed 3 March 2020]
[15] Jilin Provincial People's Government. Notification of COVID-19 by Jilin Provincial Health Commission. http://www.jl.gov.cn/szfzt/jlzxd/yqtb/202005/t20200531_7246194.html [Accessed 31 March 2020]
[16] World Health Organization. Clinical management of severe acute respiratory infection when novel coronavirus (2019-nCoV) infection is suspected. WHO int. https://www.who.int/publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-(ncov)-infection-is-suspected [Accessed 13 March 2020]
[17] Wu J, Liu J, Zhao X, et al. Clinical characteristics of imported cases of COVID-19 in Jiangsu province: a multicenter descriptive study. Clin Infect Dis 2020;70:ciaa199.
[18] Chen N, Zhou M, Dong X, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet 2020;395:507–13.
[19] Badawi A, Ryoo SG. Prevalence of comorbidities in the Middle East respiratory syndrome coronavirus (MERS-CoV): a systematic review and meta-analysis. Int J Infect Dis 2016;49:129–33.
[20] Chan JF, Yuan S, Kok KH, et al. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. Lancet 2020;395:514–23.
[21] Xu X, Chen P, Wang J, et al. Evolution of the novel coronavirus from the ongoing Wuhan outbreak and modeling of its spike protein for risk of human transmission. Sci China Life Sci 2020;63:457–60.
[22] Hu Z, Song C, Xu C, et al. Clinical characteristics of 24 asymptomatic infections with COVID-19 screened among close contacts in Nanjing, China. Sci China Life Sci 2020;63:706–11.
[23] Wang Y, Wang Y, Chen Y, et al. Unique epidemiological and clinical features of the emerging 2019 novel coronavirus pneumonia (COVID-19) implicate special control measures. J Med Virol 2020;92:568–76.
[24] Tian S, Hu N, Lou J, et al. Characteristics of COVID-19 infection in Beijing. J Infect 2020;80:401–6.
[25] Chung M, Bernheim A. CT imaging features of 2019 novel coronavirus (2019-nCoV). Radiology 2020;295:202–7.
[26] Song F, Shi N, Shan F, et al. Emerging 2019 novel coronavirus (2019-nCoV) pneumonia. Radiology 2020;295:210–7.
[27] Lu H. Drug treatment options for the 2019-new coronavirus (2019-nCoV). Biosci Trends 2020;14:69–71.
[28] Morse JS, Lalonde T, Xu S, et al. Learning from the past: possible urgent prevention and treatment options for severe acute respiratory infections caused by 2019-nCoV. ChemBioChem 2020;21:730–8.
[29] Holshue ML, DeBolt C, Lindquist S, et al. First case of 2019 novel coronavirus in the United States. N Engl J Med 2020;382:929–36.
[30] Wang M, Cao R, Zhang L, et al. Remdesivir and chloroquine effectively inhibit the recently emerged novel coronavirus (2019-nCoV) in vitro. Cell Res 2020;30:269–71.
[31] Zhou L, Liu K, Liu HG. Cause analysis and treatment strategies of "recurrence" with novel coronavirus pneumonia (covid-19) patients after discharge from hospital. Chin J Tuberculosis Respir Dis 2020;43:E028.
[32] Lan L, Xu D, Ye G, et al. Positive RT-PCR test results in patients recovered from COVID-19. JAMA 2020;323:1502–3.