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Epidemiological and clinical features of 125 Hospitalized Patients with COVID-19 in Fuyang, Anhui, China

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ABSTRACT

Objective: To investigate the epidemiological and clinical features of patients with COVID-19 in Anhui province of China.
Method: In this descriptive study, we obtained epidemiological, demographic, manifestations, laboratory data and radiological findings of patients confirmed by real-time RT-PCR in the NO.2 People's Hospital of Fuyang City from Jan 20 to Feb 9, 2020. Clinical outcomes were followed up to Feb 18, 2020.
Results: Of 125 patients infected SARS-CoV-2, the mean age was 38.76 years (SD, 13.799) and 71(56.8%) were male. Common symptoms include fever [116 (92.8%)], cough [102(81.6%)], and shortness of breath [57(45.6%)]. Lymphocytopenia developed in 48(38.4%) patients. 100(80.0%) patients showed bilateral pneumonia, 26(20.8%) patients showed multiple mottling and ground-glass opacity. All patients were given antiviral therapy. 19(15.2%) patients were transferred to the intensive care unit. By February 18, 47 (37.6%) patients were discharged and none of patients died. Among the discharged patients, the median time of length of stay was 14.8 days (SD 4.16).
Conclusion: In this single-center, retrospective, descriptive study, fever is the most common symptom. Old age, chronic underlying diseases and smoking history may be risk factors to worse condition. Certain laboratory inspection may contribute to the judgment of the severity of illness.

Introduction

In December 2019, there were several cases of pneumonia of unknown cause in Wuhan, Hubei province, China, which seemed to be relevant to a local seafood wholesale market in Wuhan. The initial symptoms of most patients are fever, dry cough, and fatigue, then they developed into dyspnea quickly, even acute respiratory distress syndrome (ARDS) (Chen et al. 2020a; Huang et al., 2020). The Chinese center for disease control and prevention (CDC) promptly dispatched a team to assist local health authorities in Wuhan to carry out investigations on December 31, 2019. The Chinese CDC obtained lower respiratory tract samples, which were called bronchoalveolar lavage fluid, from patients of unknown etiology pneumonia in Wuhan Jinyintan Hospital. By whole-genome sequencing, real-time reverse transcription PCR (RT-PCR) and culture of the virus, we recognized that this is a new coronavirus, which is different from severe acute respiratory syndrome (SARS) and middle east respiratory syndrome (MERS) coronavirus (Zhu et al., 2020).

Several days after, similar patients appeared in other cities of China, most of whom had a history of exposure to Wuhan within 14 days. On Jan 22, Anhui province confirmed first case of Novel Coronavirus Pneumonia (NCP). The number of confirmed cases grew rapidly. Anhui province, which borders Hubei province, is also a major province for migrant workers, many of whom work in Wuhan and other provinces in Hubei. As Chinese Spring Festival drawing near, 4.3 million people travelled out of Wuhan to other

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cities in China between 11 January and 23 January (Tian et al., 2020), a lot of whom were migrant workers and college students returned from Wuhan. It provided a shortcut for the virus spreading. On February 7, 2020, National Health Commission of the People's Republic China temporarily named the pneumonia infected by the new coronavirus as Novel Coronavirus Pneumonia (General Office of National Health Commission, 2020). On February 11, 2020, World Health Organization (WHO) named it coronavirus disease-19 (COVID-19) officially.

By February 9, 2020, more than 37,000 patients had been diagnosed nationwide, including 779 patients in Anhui province. And the number of confirmed cases is still rising (Fig. 1). The situation of outbreak in Anhui province is serious. Nowadays, Wuhan has caught the eyes of most people, there are many studies on patients confirmed COVID-19 in Wuhan. However, the study of epidemiological and clinical characteristics of patients with COVID-19 outside Hubei province, such as Anhui province is still blank.

We aim to describe epidemiological, demographic, clinical, laboratory and radiologic features in patients confirmed to have COVID-19 of Fuyang, Anhui province. On the one hand, it can provide a theoretical basis for prevention and treatment of the outbreak. On the other hand, it is a good chance to explore whether there are differences in epidemiological features and clinical outcomes of patients with COVID-19 between Wuhan and city outside Hubei province.

As of March 20, 2020, the cumulative number of people diagnosed with COVID-19 in China was more than 81416, while the cumulative number of cured cases was 72386. Through the efforts of the whole country and people in China, the situation is basically stable. Despite a phased victory in the fight against the outbreak of COVID-19 in China, the situation outside China has become serious, more than 160 countries in six continents had reported cases of COVID-19. It is frightening that the number of confirmed cases outside China continued to rise, with a cumulative total of more than 200,000, of which Italy, Spanish, Germany and the United States of America were seriously affected (World Health Organization (2020)). At present, COVID-19 is not only a matter of China, it has become a threat to the health of people around the world. Through this study, it can bring some experience of diagnosis and treatment of COVID-19 to medical practitioners in various countries around the world, in order to strive to win this war without gunpowder as soon as possible.

Methods

Participants

Patients from Jan 20 to Feb 9, 2020, who were diagnosed with COVID-19 at the NO.2 People's Hospital of Fuyang City were enrolled in this study. These patients were confirmed by a positive result for real-time RT-PCR in the respiratory tract samples. We sought the consent of the patients or their authorized clients orally to conduct this study.

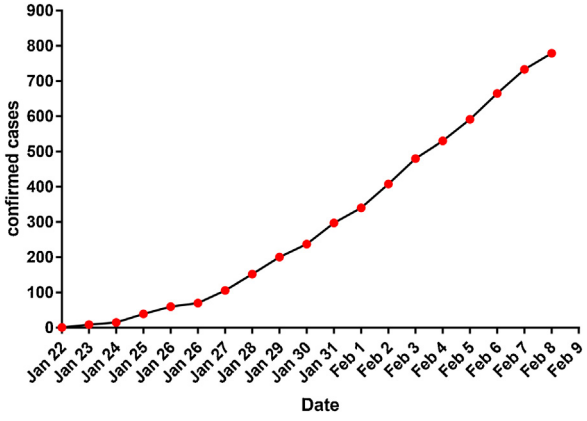

Fig. 1. Patients with COVID-19 in Anhui province

Data Collection

Epidemiological, demographic, clinical manifestations, laboratory results and chest computed tomography (CT) findings, treatment and clinical outcomes of these patients were obtained from electronic medical records. In order to ascertain some incomplete data, such as epidemiological data, we obtained it through communicating with patients directly. The laboratory results and chest CT findings of the patients were acquired on the day of admission. The clinical outcomes of the patients were followed up to Feb 18, 2020.

Oxygen therapy

In this study, we provided respiratory support for critically ill patients according to the criteria of the treatment protocol (version 5) (General Office of National Health Commission, General Office of National Administration of Traditional Chinese Medicine, 2020). High flow nasal catheter oxygen therapy or non-invasive ventilation is feasible when respiratory distress and (or) hypoxemia cannot be alleviated after receiving standard oxygen therapy. If the condition cannot be improved or even deteriorated in a short period of time (1-2 hours), tracheal intubation or invasive ventilation should be carried out in time.

Definitions

The date of onset was defined as the date when the patients had clinical symptoms. The date of admission was defined as the date when patients' s first visit to this hospital after the onset of illness. The date of diagnosis was defined as the date when the nucleic acid test results were obtained. Acute respiratory distress syndrome (ARDS) is defined according to the Berlin definition: a. within 1 week of a known clinical insult or new or worsening respiratory symptoms; b. bilateral opacities-not fully explained by effusions, lobar/lung collapse, or nodules; c. respiratory failure not fully explained by cardiac failure or fluid overload need objective assessment (eg, echocardiography) to exclude hydrostatic edema if no risk factor present; d. patients were classified as mild (200 mmHg < $PaO_2/FIO_2 \leq 300$ mmHg with PEEP or CPAP $\geq$ 5 cmH_2O), moderate (100 mmHg < $PaO_2/FIO_2 \leq 200$ mmHg with PEEP $\geq$ 5 cmH_2O) and severe ($PaO_2/FIO_2 \leq 100$ mmHg with PEEP $\geq$ 5 cmH_2O) according to oxygenation index. Secondary infection was diagnosed based on clinical symptoms or laboratory results, such as aggravated cough, yellow sputum, lung rales and fever after a period time of normal temperature or elevated neutrophil ratio/CRP/PCT.

RT-PCR

Doctors who collected upper respiratory tract samples were under third-level protection. All patients were sampled with throat swab, then these samples were conduct real time RT-PCR in the laboratory of the NO.2 People's Hospital of Fuyang. All the respiratory specimens of confirmed patients were reviewed by the Fuyang CDC and Anhui provincial CDC.

Statistical analysis

We express categorical variables in terms of frequency (percentage), and express continuous variables in terms of mean

(standard deviation) or median (IQR) based on whether the variables were normally distributed. Proportion of the categorical variables were compared using the $\chi 2$ test. Means for continuous variables were compared by independent group t tests or Kolmogorov–Smirnov test as appropriate. And all statistical analyses were performed using SPSS (Statistical Package for the Social Sciences) version 25.0 software.

Results

By Feb 9, 125 patients confirmed COVID-19 in Fuyang, Anhui province were enrolled in this study, including 25 critical patients. Among these patients, the median time was 4 days from onset of illness to admission. From admission to definite diagnosis, the median time was 1 day (Fig. 2).

In these patients, men (71/125, 56.8%) are more than women (54/125, 43.2%), with a mean age of 41.46 years (SD 15.094) (Fig. 3, Table1). The mean age of critical patients is 49.4 years (SD 13.638) (Fig. 4, Table 4), which is higher than the mean age of whole patients. There is a wide age range among these patients, with three children under the age of ten and the youngest patient is less than two years old. 12.8% of them have a history of smoking. 72 (57.6%) patients had a history of exposure to Wuhan within 2 weeks, and 12(9.6%) patients had a clustering history, most of whom were family clustering cases. It is worth noting that 28 (22.4%) patients had no significant history of exposure. 34(27.2%) patients have chronic underlying diseases, which are cardiovascular disease, endocrine system disease and digestive system disease mainly (Table 1).

Among these patients, the most common symptom is fever, followed by cough, shortness of breath. Other symptoms include fatigue, myalgia, sore throat, diarrhea, headache and dizzy. Most patients [117(93.6%)] had more than one symptom, there was one asymptomatic infected person, and of the other seven, three only had diarrhea and four only had low fever (Table 2).

On admission, 16(12.8%) patients had white blood cell count below the normal range, with a third of the patients showing low lymphocyte counts (Table 3). Neutrophils were above the normal range in 3(2.4%) patients and below the normal range in 9(7.2%) patients. Monocytes were above the normal range in 13(10.4%) patients. Most patients had hemoglobin in the normal range. Platelets were below the normal range in 21(16.8%) patients (Table 3). The majority of patients had normal coagulation function. About 20% patients had different degrees of elevation of alanine aminotransferase and aspartate transaminase. Few patients had renal function damage (only one patient had blood urea nitrogen above the normal range slightly).76 patients underwent the test for myocardial enzyme, most of whom had lactate dehydrogenase above the normal range (Table 2). For the infection-related biomarkers, C-reactive protein (CRP) were above the normal range in 88(70.4%) patients (Table 3). The majority of patients had iterleukin-6 (IL-6) and serum amyloid protein A (SAA) above the normal range.118 patients were tested for nine

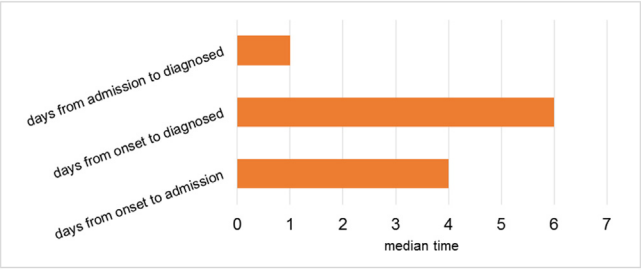

Fig. 2. Timeline of patients with COVID-19 after onset of illness

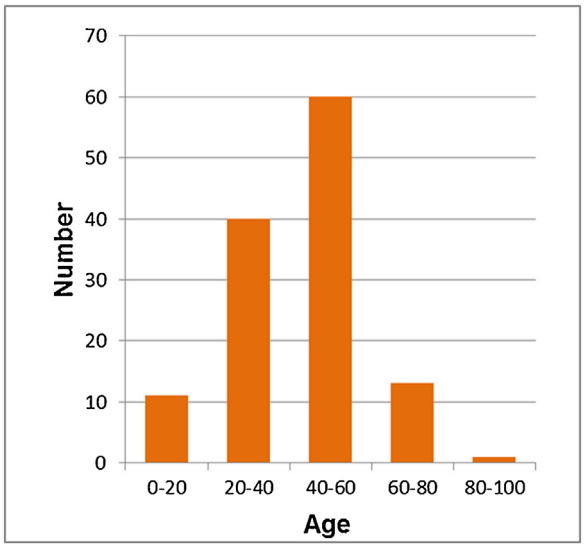

Fig. 3. Age of all confirmed patients

respiratory pathogens, 40 of whom showed positive or weak positive IgM for mycoplasma pneumoniae (MP). Only one patient showed positive IgM for adenovirus (ADV) and influenza virus A/B (INFA/B), but had a negative result in the nucleic acid detection of INFA/B. All patients underwent chest CT examination. 100(80.0%) patients showed bilateral pneumonia, with 26(20.8%) patients showing multiple mottling and ground-glass opacity. Five (4.0%) patients presented with no abnormality in chest CT (Table 3).

According to the criteria of the treatment protocol (version 5) (General Office of National Health Commission, General Office of National Administration of Traditional Chinese Medicine, 2020), patients were classified as non-critical type (light, common) and critical type (severe, critical). The critical patients were older and had more underlying disease than non-critical patients (Table 4). Meanwhile, smoking history was statistically significant. However, there was no difference in the proportion of male and female and time from onset to admission (definite diagnosis). Compared to non-critical patients, critical patients had lower levels of lymphocytes and higher levels of CRP, IL-6 and SAA, which were statistically significant (Table 4).

There were 19(15.2%) patients who were admitted to the intensive care unit (ICU) in this study. The majority of patients used nasal cannula oxygen therapy. Only four critical patients admitted to the ICU underwent invasive ventilator mechanical ventilation to assist ventilation (Table 2). All patients received antiviral therapy [kaletra(lopinavir/ritonavir), oseltamivir, arbidol, interferon inhalation]. Of 28 patients who received combination therapy, nineteen received kaletra combined with oseltamivir; eight received kaletra combined with arbidol; one was treated with a combination of the three antiviral drugs. Only one patient was treated with interferon inhalation without other antiviral drugs. Moreover, 79(63.2%) patients were given antibiotic therapy based on the secondary infection (Table 2). 35(28.0%) patients were treated with glucocorticoids, and 24(19.2%) patients received intravenous immunoglobulin therapy. Among these patients, the most common complication is secondary infection, and 6(4.8%) patients developed into ARDS (Table 2).

In our study, there are four critical patients receiving invasive ventilator. Of the four patients, there were three male patients above 40 years (Table 5). Patients 117 and Patient 123 were in fair general condition at admission. After admission, nasal catheter was given for oxygen inhalation. However, they developed obvious chest distress and short of breath later, which could not be relieve

Table 1
Epidemiological, baseline features and clinical outcomes of patients with COVID-19 at the NO.2 People's Hospital of Fuyang City.

Characteristic	n = 125 Frequency (%); Mean ± SD; Median (IQR)
Age, years	38.76 ± 13.799
Mean (SD)	
Range	1 year 4 months-82
≤18	8(6.4%)
[19, 29)	17(13.6%)
[29, 39)	23(18.4%)
[39, 49)	39(31.2%)
[49, 59)	24(19.2%)
≥59	14(11.2%)
Sex	54(43.2%)
Female	71(56.8%)
Male	
Smoking history	16(12.8%)
Occupation	8(6.4%)
Student	1(0.8%)
Wuhan	7(5.6%)
Local	26(20.8%)
Agricultural worker	5(4.0%)
Wuhan	21(16.8%)
Local	21(16.8%)
Self-employed	12(9.6%)
Wuhan	8(6.4%)
Local	1(0.8%)
Other City	59(47.2%)
Employee	33(26.4%)
Wuhan	20(16.0%)
Local	6(4.8%)
Other City	3(2.4%)
Retired	8(6.4%)
Else	
Exposure to Wuhan	72(57.6%)
Clustering cases	12(9.6%)
No exposure	28(22.4%)
Chronic underlying disease	34(27.2%)
Cardiovascular disease	18(14.4%)
Digestive system disease	8(6.4%)
Endocrine system disease	10(8.0%)
Rheumatic immune disease	1(0.8%)
Respiratory system disease	2(1.6%)
Hematological system disease	1(0.8%)
Nervous system disease	1(0.8%)
Malignant tumor	1(0.8%)
HIV infection	1(0.8%)
Clinical Outcomes	78(62.4%)
Remained in hospital	47(37.6%)
Discharged	0
Died	

by increasing the concentration of oxygen inhaled. Therefore, they were transferred to ICU for intensive care, and were treated with high-flow nasal cannula at the same time. On account of the low level of oxygen saturation, invasive ventilation was eventually performed. Patients 117 was given invasive ventilation two hours after transferred to ICU, and Patients 123 on the second day after transferred to ICU. Another male patient (Patient 116) was treated with non-invasive ventilation (NIV) during the course of disease, whereas he was given invasive ventilation due to intolerance and low oxygenation index on the 12th day after onset. Both Patient 116 and Patient 123 had cardiovascular and endocrine diseases.

The last critical patient to undergo invasive ventilation was a young woman (Patient 118) without any chronic underlying disease in this study (Table 5). On the 10th day after the onset, she was admitted to the hospital, whose arterial blood gas analysis indicated type I respiratory failure with an oxygenation index less than 300 mmHg. Blood routine suggested lymphocytopenia and chest CT showed bilateral pneumonia with multiple mottling and ground-glass opacity, which indicated that she had developed into ARDS. A few hours after admission she was transferred to the ICU and underwent invasive ventilation due to her low oxygenation index, which was only 116 mmHg under high-flow oxygen therapy (FIO2: 50%). Meanwhile, she was given antiviral, antibiotic, glucocorticoids and intravenous immunoglobulin therapy. After 10 days of intensive care in the ICU, she was transferred back to the general isolation ward and has been discharged from the hospital on Feb 18.

Up to the 18th of February, 78(62.4%) patients still remain in hospital. 47(37.6%) patients were cured and discharged in accordance with clinical cure standard (Table 1). The mean time of length of stay was 14.8 days (SD 4.16) among those discharged cases. And none of the patients died.

Discussion

This is a descriptive research of epidemiological and clinical features of COVID-19 patients. WHO called the virus SARA-CoV-2 which caused the COVID-19. Recent studies suggested that genomes of SARS-CoV-2 are different from SARS-CoV (with about 79% identity) and MERS-CoV (with about 50% identity), via next-generation sequencing and cultured isolates of respiratory tract samples from confirmed patients. Most sequences of the SARA-CoV-2 are highly consistent with the bat-associated coronavirus (Lu et al., 2020). This may be relevant to wildlife illegally sold in Huanan seafood market. Moreover, updated research suggests that pangolins may be the potential hosts of SARA-CoV-2, with 99% identity between the sequences of coronavirus separated from pangolin and SARS-CoV-2 (Kangpeng et al., 2020). Previous study has shown that pangolin have a variety of coronaviruses as well, which may be a latent host for passing the SARS-CoV to humans (Liu et al., 2019).

Our study confirms the presence of human-to-human transmission, with nearly half of the patients not having history of exposure to Wuhan. Existing studies have confirmed the transmission of SARA-CoV-2 through respiratory tract and indirect contact (General Office of National Health Commission, General Office of National Administration of Traditional Chinese Medicine, 2020). Besides, the latest study found that the live SARS-CoV-2 was found in the feces of patients diagnosed with COVID-19. However, it needs further study to determine whether the SARS-CoV-2 can be transmitted through the fecal-oral route (National Health Commission of the People's Republic of China, 2020).

We achieved a consistent result with previous studies, that fever is the most common symptom in these patients. And most patients have multiple symptoms. Cough, fatigue, myalgia, sore throat are also common symptoms in patients infected with SARS-CoV-2. Therefore, it is difficult to distinguish COVID-19 from influenza based on symptoms for there are no specific symptoms compared with those with general influenza. It is worth noting that diarrhea is the initial and only symptom in some patients. Meanwhile, the presence of asymptomatic infection makes diagnosis more difficult. In the study of all COVID-19 cases reported through February 11, there are 889(1.2%) asymptomatic cases (Novel Coronavirus Pneumonia Emergency Response Epidemiology Team, 2020). It is necessary to make a comprehensive assessment of the patient's condition in fever clinic to avoid missed diagnosis.

In this study, people of all ages are susceptible to the virus, with about 60% of patients over the age of forty. Male patients are more than female, which is consistent with a number of studies. It may be related to different lifestyles between men and women, especially smoking. Updated study suggests that smoking can increase the expression of the angiotensin converting enzyme 2 (ACE 2) in lung tissue (Cai, 2020), which was suggested to be the receptor for SARS-CoV-2 (Xu et al., 2020). It may explain the higher

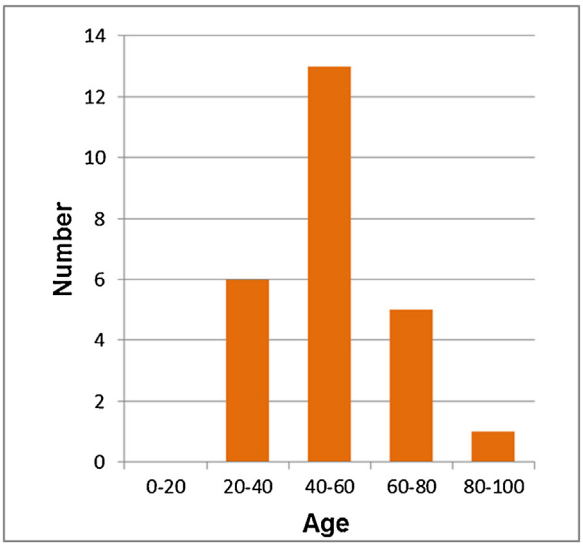

Fig. 4. Age of the critical patients

number of middle-aged and elderly male patients. In addition, there were 14(11.4%) patients were over 59 years old in our study, while 6 of whom were critical patients. It may be related to the high incidence of comorbidities of older patients.

The majority of patients had abnormalities in chest CT. Chest CT screening is an important instrument to discriminate suspicious

Table 2
Clinical Features, treatment and complications of patients with COVID-19.

Clinical Characteristics	n = 125 Frequency (%); Mean ± SD; Median (IQR)
Fever	116(92.8%)
Highest temperature, ℃	9(7.2%)
< 37.3	42(33.6%)
37.3-38.0	55(44.0%)
38.1-39.0	12(9.6%)
> 39.0	7(5.6%)
unknown	
Cough	102(81.6%)
Shortness of breath	57(45.6%)
Fatigue	43(34.4%)
Myalgia	4(3.2%)
Sputum production	52(41.6%)
Bloody sputum	4(3.2%)
Pharyngalgia	17(13.6%)
Chest pain	2(1.6%)
Runny nose	4(3.2%)
Diarrhoea	50(40.0%)
Nausea and vomiting	24(19.2%)
Headache/Dizzy	11(8.8%)
Erythra	2(1.6%)
More than one symptom	117(93.6%)
Admission to intensive care unit	19(15.2%)
Treatment	75(60.0%)
Oxygen therapy	16(12.8%)
nasal cannula	4(3.2%)
Non-invasive ventilation or high-flow nasal	125(100%)
cannula	79(63.2%)
Invasive ventilation	35(28.0%)
Antiviral therapy	24(19.2%)
Antibiotic therapy	
Glucocorticoids	
Intravenous immunoglobulin therapy	
Complications	6(4.8%)
ARDS	71(56.8%)
Secondary infection	

Table 3
Laboratory results and radiological findings of patients with COVID-19.

Characteristic	n = 125 Frequency (%); Mean ± SD; Median (IQR)
Blood routine	
Leucocytes count ($\times 10^9$/L)	4.78(3.775-6.11)
< 3.5	16(12.8%)
> 9.5	2(1.6%)
Neutrophils count ($\times 10^9$/L)	3.27(2.225-4.36)
< 1.8	9(7.2%)
> 6.3	3(2.4%)
Lymphocytes count ($\times 10^9$/L)	1.04(0.74-1.335)
< 1.1	48(38.4%)
> 3.2	1(0.8%)
Monocytes count ($\times 10^9$/L)	0.34(0.26-0.51)
> 0.6	13(10.4%)
Hemoglobin (g/L)	140(129-151)
< 115	6(4.8%)
Platelet count ($\times 10^9$/L)	167(133-212)
< 125	21(16.8%)
> 350	2(1.6%)
Coagulation function*	
Prothrombin time (s)	11.6(10.9-12.5)
< 10.5	12(9.92%)
> 14.5	1(0.82%)
Activated partial thromboplastin time (s)	29.38 ± 6.103
< 22	6(4.96%)
> 38	3(2.48%)
D-dimer (mg/L)	0.28(0.20-0.535)
> 0.55	28(23.14%)
Liver function	
Alanine aminotransferase (U/L)	24(15-38)
> 40	26(20.8%)
Aspartate transaminase (U/L)	27(21-34)
> 35	27(21.6%)
Serum total bilirubin (μmol/L)	9.6(6.5-14.55)
> 21	9(7.2%)
Renal function	
Blood urea nitrogen (mmol/L)	3.8(3.1-4.8)
< 3.1	28(22.4%)
> 8.8	1(0.8%)
Serum creatinine (μmol/L)	64.33 ± 16.163
< 35	3(2.4%)
> 115	0
Myocardial enzyme**	
Creatine kinase (U/L)	66.0(44.0-91.5)
< 40	12(15.79%)
> 200	4(5.26%)
Creatine kinase MB (U/L)	9(5-13)
> 24	5(6.58%)
Lactate dehydrogenase (U/L)	239.0(207.0-291.5)
> 250	57(75.0%)
Infection-related biomarkers	
C-reactive protein (mg/mL)	15.4(4.2-36.05)
> 6	88(70.4%)
Procalcitonin (ng/mL)	0.03(0.0176-0.06345)
> 0.5	3(2.4%)
Interleukin-6 (pg/mL)	18.90(6.85-38.35)
> 7	90(72.0%)
Serum amyloid protein A (mg/L)	80.80(23.75-177.60)
> 10	106(84.8%)
Erythrocyte sedimentation rate (mm/h)***	25(9-41)
> 15	47(62.7%)
Co-infection	
Detection of nine pathogens in respiratory tract ****	35(29.66%)/5(4.24%) 1(0.85%)
MP-IgM positive/weak positive	1(0.85%)
ADV-IgM weak positive	
INFA/B-IgM positive	
Chest CT	
Unilateral pneumonia	19(15.2%)
Bilateral pneumonia	100(80.0%)
Multiple mottling and ground-glass opacity	26(20.8%)
Normal	5(4.0%)

*Data available for 121 patients. **Data available for 76 patients. ***Data available for 75 patients.****Data available for 118 patients.

Table 4
A comparison of demographic features and laboratory findings between critical patients and non-critical patients.

Characteristic	Critical patients (n = 25) Frequency (%); Mean ± SD; Median (IQR)	Non-critical patients (n = 100)	P value*
Age	49.40 ± 13.64	39.47 ± 14.84	0.003
Sex	16(64%)	55(55%)	0.416
Male	9(36%)	45(45%)	
Female			
Current smoking	7(28%)	9(9%)	0.027
Comorbidities	12(48%)	22(22%)	0.009
Time from onset to attendance (days)	5.72 ± 3.20	3.50(2.26-7.0)	0.466
Time from onset to diagnosed (days)	7.44(3.10)	5.0(3.0-9.0)	0.288
Laboratory findings			
Leucocytes	5.11 ± 2.32	4.92(3.818-6.085)	0.466
count ($\times 10^9$/L)	3.86 ± 2.18	3.49 ± 1.62	0.433
Neutrophils	0.74(0.615-1.035)	1.11(0.83-1.37)	0.001
count ($\times 10^9$/L)	0.30(0.235-0.52)	0.36(0.26-0.51)	0.341
Lymphocytes	136.68 ± 16.92	140.86 ± 15.27	0.233
count ($\times 10^9$/L)	163.40 ± 60.263	169.50(142-212)	0.134
Monocytes	25.0(17.5-37.0)	24.0(13.25-38.0)	0.61
count ($\times 10^9$/L)	29.0(23.5-36.5)	26.0(20.0-34.0)	0.069
Hemoglobin (g/L)	10.40(7.0-17.9)	9.25(6.25-13.775)	0.685
Platelet count ($\times 10^9$/L)	4.612 ± 2.28	3.905 ± 1.20	0.145
Alanine	67.32 ± 16.81	64.50 ± 15.997	0.303
aminotransferase (U/L)	56.26 ± 47.88	10.80(3.45-25.875)	< 0.001
Aspartate	0.05(0.02-0.137)	0.0263(0.016-0.058)	0.134
transaminase (U/L)	39.80(23.75-60.6)	16.80(5.55-29.7)	0.001
Serum total	134.76 ± 65.54	73.15(17.925-170.55)	0.008
bilirubin (μmol/L)			
Blood urea			
nitrogen (mmol/L)			
Serum creatinine (μmol/L)			
C-reactive protein (mg/mL)			
Procalcitonin (ng/mL)			
Interleukin-6 (pg/mL)			
Serum amyloid protein A			
(mg/L)			

patients. The most typical manifestation is multiple mottling and ground-glass opacity, which is mainly associated with inflammatory infiltration in subpleural or peribronchovascular regions at the early stage of COVID-19. But it is difficult to distinguish COVID-19 from influenza A/B, adenovirus, respiratory syncytial virus and other viral pneumonia even bacterial pneumonia in imaging features (Dai et al., 2020).

The study of clinical characteristics of 1099 patients had 15.7% critical patients (Guan Weijie, 2020). There were 25(20.0%) critical patients in our study. Therefore, the majority of patients are mild or normal type, who have favorable prognosis. All critical patients showed bilateral pneumonia, 19(76%) of whom had lymphocytopenia in blood routine. And the median of lymphocyte count of critical patients is lower than all patients. Besides, we found elevated IL-6 in most patients. Recent study has shown that elevated IL-6 may be associated with poor prognosis (Chen et al. 2020b). It is well known that cytokines play an important role in viral infection. In addition, relevant study has shown that the cytokines in severe infected patients are significantly increased, which can be used to reflect the severity of disease (La Gruta et al., 2007). Furthermore, CRP and SAA are biomarkers reflecting inflammation. Elevated CRP and SAA are more common in critical patients, who had a higher level than non-critical patients, which tells that there is a severe inflammatory response in critically ill patient. A study of dead cases with COVID-19 also suggested that the high level of CRP and SAA may be related to a poor prognosis (Li et al., 2020). In our study, none of patients died. A recent study showed an overall case-fatality rate of 2.3% (Novel Coronavirus Pneumonia Emergency Response Epidemiology Team, 2020) in COVID-19 patients, which is lower than the mortality of SARS (9.6%) (World Health Organization, 2004) and MERS (34.4%) (World Health Organization, 2019).

Based on the study to SARS and MERS, there is no specific treatment to coronavirus infection currently (Arabi et al., 2020), in addition to supportive therapy. In this study, all patients received antiviral therapy. The most commonly drug is kaletra, which was found to reduce viral loads and improve clinical symptoms during the treatment in a study (Lim et al., 2020). But randomized controlled clinical trials are required to further confirm the clinical efficacy of kaletra. Moreover, it is still controversial about corticosteroid treatment. There are several critical patients in this study, who were given to corticosteroid treatment based on the diagnostic and treatment protocol for COVID-19 (version 5) (General Office of National Health Commission, General Office of National Administration of Traditional Chinese Medicine, 2020). However, the available clinical evidence is insufficient to support the efficacy of glucocorticoids in the treatment of COVID-19 (World Health Organization, 2020; Russell et al., 2020). A retrospective study on critically ill patients with MERS found that the use of glucocorticoids did not reduce fatality rate within 90 days. Conversely, it may delay the clearance of viral RNA in respiratory tract (Arabi et al., 2018). Other studies suggested that corticosteroid treatment may lead to other related side effects, such as diabetes, psychosis, avascular necrosis and increase the risk of secondary infection of patients with respiratory viral infection(Lee, 2004; Ni et al., 2019; Li et al., 2004; Xiao et al., 2004). Therefore, it should be cautious about using glucocorticoids in patients with COVID-19. The cumulative cured cases of the COVID-19 have reached more than 10,000 in China by Feb 18, 2020. Plasma from convalescent patients may be a safe and effective treatment. A

Table 5
Respiratory support of four patients with invasive mechanical ventilation.

	Patient 116	Patient 117	Patient 118	Patient 123
Sex	male	male	female	male
Age, years	69	40	21	67
Date of onset	02-03	01-28	01-19	01-28
Date of admission	02-09	02-01	01-29	02-04
Vital signs on admission				
Temperature, ℃	37.8	37.4	37.1	37.5
Pulse, per minute	148	96	102	74
Respiratory rate, per minute	26	20	28	18
Blood pressure, mmHg	143/99	147/99	104/56	150/88
SpO_2, %	90	>95	89	>95
Admission to ICU				
Date	02-09	02-04	01-29	02-07
Temperature, ℃	39	40.6	-	39.0
Pulse, per minute	140	123	-	113
Respiratory rate, per minute	26	33	-	26
Blood pressure, mmHg	154/106	108/64	-	120/65
SpO_2, %	90	80	88	99
PO_2, mmHg	73.3	47.9	44.9	59.2
PaO_2/FiO_2, mmHg	97.7 (high-flow, FiO2: 75%)	106.4 (high-flow, FiO2: 45%)	112 (high-flow, FiO2: 40%)	107.6 (high-flow, FiO2: 55%)
APACHE II score*	19	11	6	19
SOFA score**	8	6	3	6
Non-invasive ventilation				
Date	02-14	-	-	-
Mode	CPAP	-	-	-
Parameter	45	-	-	-
FiO_2, %	12			
Pressure, cmH_2O	6			
PEEP, cmH_2O	16			
Respiratory rate, per minute				
Before invasive ventilation				
SpO_2, %	79	80	88	70
PO_2, mmHg	75.3	47.9	58.2	-
PaO_2/FiO_2, mmHg	121 (NIV, FiO2: 70%)	106 (high-flow, FiO2: 45%)	116 (high-flow, FiO2: 50%)	-
Date of invasive ventilation	02-15	02-04	01-29	02-08
SpO_2 (%) after invasive ventilation				
2 hours	94	92	99	97
12 hours	93	98	100	98
24 hours	96	-	99	98
First blood gas analysis after invasive ventilation				
Mode	PVC	PVC	PVC	PVC
Parameter	80	50	50	60
FiO_2, %	16	11	13	10
Pressure, cmH_2O	14	12	14	12
PEEP, cmH_2O	20	18	16	15
Respiratory rate, per minute				
PO_2, mmHg	156.9	119.7	137.4	105
PaO_2/FiO_2, mmHg	196	239.4	274.8	175

CPAP: continuous positive airway pressure; PVC: pressure-control ventilation.
*APACHE II: Acute Physiology and Chronic Health Evaluation.
**SOFA: Sequential Organ Failure Assessment.

meta-analysis suggests that plasma therapy may reduce mortality of severe acute respiratory infections of viral etiology (Mair-Jenkins et al., 2014).

Lung is the first target organ to be damaged in most patients with COVID-19. Respiratory failure was the cause of most deaths (Li et al., 2020), so respiratory support plays an important role in the treatment of COVID-19. From this case of Patient 118, we wanted to explore why a young woman without underlying disease infected SARS-CoV-2 developed into ARDS. Correlational studies suggests that the time from onset to ARDS is 8 days (Wang et al., 2020). In this case, the time from onset to admission was 10 days, at the time she had developed into ARDS. Therefore, we inferred that delayed admission may have contributed to her critical condition. In addition, even critical patients may be cured and discharged after aggressive treatment.

There are several limitations in our study. First, we included the patients with COVID-19 who were admitted to the NO.2 People's Hospital of Fuyang City, not all the patients in Fuyang city. Therefore, the results can only preliminarily describe the epidemiological characteristics of patients with COVID-19 in Fuyang city. After that, a more comprehensive study of all patients is needed. Furthermore, at the end of our observation, most patients were still hospitalized, and there was no death in the study. We cannot assess the risk factors of poor outcome. In this regard, we will continue to follow up the patients enrolled in this study until their clinical outcomes.

Conclusion

In conclusion, COVID-19 cause a large-scale spread around China and the world. The vast majority of patients are mild or common type. Early finding, diagnosis and treatment have a certain extent of positive effect on the prognosis. Old age, chronic basal diseases and smoking history may be risk factors to a poor prognosis. In addition, based on certain laboratory results we may be able to judge the severity of the illness in a timely manner.

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Author contributions

Xiaoyun Fan and Mingfeng Han designed the study. Ruirui Wang was responsible for collecting all the epidemiological and clinical data and Min Pan was responsible for processing the statistical data and writing the paper. Minglong Guan made the illustrations and Manli Miao helped analyze the data. The authors from the NO.2 People's Hospital of Fuyang City contributed to the treatment of patients and All the authors contributed to this paper.

Conflicts of interest

The authors declare that there are no conflicts of interest.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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