

# Clinical features and outcomes of 197 adult discharged patients with COIVD-19 in Yichang, Hubei

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**Abstract Purpose** To investigate the epidemiology and clinical features of discharged adult patients with COIVD-19 in Yichang. **Method** The retrospective study recruited 197 cases of COIVD-19 discharged from Yichang Central People's Hospital and Yichang Third People's Hospital from Jan 17 to Feb 26, 2020. All cases were confirmed by real-time RT-PCR or chest computer tomography (CT). The survivors were followed up until March 4, 2020. Clinical data, including demographic characteristics, presentation, underlying diseases, exposure history, laboratory examination, radiology and prognosis were enrolled and analysed by SPSS 19.0 software. **Results** There were 197 adult discharged patients with COIVD-19 in this study. Statistical analysis indicated that the average age was 55.94 years, and female patients were 99(50.3%). Those patients mainly resided in urban with exposure history in 2 weeks, while 7 medical staffs were infected. Fever (77.6%), cough (43.6%) and weakness (14.7%) were the common symptoms. Leucocytes were mainly normal or decreased in 185 patients (92.9%), both lymphocytes and eosinophils were below normal range, the ratios were 56.9% and 50.3%, respectively. On the contrary, lactate dehydrogenase raised in 65 patients. C-reactive protein (72.4%) elevated in the most of patients. The sensitivity of RT-PCR was 63.5%. Chest CT indicated that bilateral patchy shadows (69.0%) were the most common imaging manifestations. 169 (85.8%) patients recovered and transferred to a designated hospital for observation, and the others (14.2%) turned worst and died of acute respiratory failure. **Conclusion** COIVD-19 infection with highly contagious have become a life-threatening public health problem, the sensitivity of RT-PCR was limited. Chest CT scan was recommended for the suspected patients. Furthermore, lymphocytopenia and eosinophils declining without leukocytosis may be considered as a useful evidence for the diagnosis.

**Keywords:** Coronavirus infection, Acute respiratory distress syndrome, pneumonia, COVID-19

## Introduction

Since several cases of 2019 novel coronavirus (2019-nCoV) pneumonia was reported in Wuhan<sup>[1]</sup>. This disease was identified by the Chinese Center for Disease Control and Prevention (CDC) on January 3, 2020. And then was named as COVID-19 by WHO<sup>[2]</sup>. At the end of January, this disease spreaded rapidly to other cities of adjacent to Wuhan in Hubei province, including Huanggang, Xiaogan, Jingzhou and Yichang. Yichang, the 2<sup>nd</sup> largest city with Three Gorges Dam in Hubei province, was about 300 kilometers far away from Wuhan, and many residents who worked or studied at Wuhan, returned to hometown for Spring Festival. By March 4, 2020, official reported there was 931 confirmed cases with COVID-19 in Yichang.

Similar to the severe acute respiratory syndrome (SARS) and Middle East respiratory (MERS),

2019-nCoV can also cause severe acute respiratory syndrome<sup>[3]</sup>. Numerous patients can be cured effectively at the early stage, but some patients with COVID-19 may develop pulmonary oedema, ARDS, or multiple organ failure, and even died abruptly<sup>[4]</sup>. Currently, researches about epidemiology and clinical features of COVID-19 focused on the hospitalized patients<sup>[5]</sup>, but the discharged patients were still scarcely investigated. Therefore, this study was aimed to clarify the epidemiology and clinical features of discharged patients with COVID-19.

## Methods

This study was approved by the Ethics Committee of Yichang Central People's Hospital. All adult discharged patients with COVID-19 from Yichang Central People's Hospital and The Third People's Hospital from Jan 17 to Feb 26, 2020. Those patients with epidemiology history were confirmed by chest CT scans or RT-PCR assays. Throat-swab or bronchoalveolar lavage fluid sample were collected from all the suspected patients at admission, and RT-PCR assays were performed at clinical laboratory. According to the fifth edition expert conference by Chinese Healthy Commission, except being identified by RT-PCR, those suspected patients presenting with lung imaging feature also regarded as clinically diagnosis cases in Hubei province. ARDS was identified in accordance with the Berlin definition<sup>[6]</sup>, and acute kidney injury was verified according to Improve Global Outcome definition<sup>[7]</sup>. If the serum levels of cardiac biomarkers ascended to the 99th percentile upper reference limit or new abnormalities were displayed in echocardiography or electrocardiography (ECG), the patient was regarded as acute cardiac injury. The discharged criteria included that symptom disappeared and the lesions eliminated evidently in the chest CT. Furthermore, RT-PCR was negative 2 consecutive beyond 24 hours. After discharged from hospital, the patients went to the designated hospital for observation. All patients except deaths were monitored up to March 4, 2020.

## Statistical Analysis

Clinical data, including date, ages, occupation, location, presentation, underlying diseases, laboratory test, RT-PCR, chest CT, treatment and outcome were collected from electronic medical record (EMR). If data were missing, we collect data by direct communication with attending doctor. Then the data were inputted and analyzed by SPSS 19.0 software. Descriptive statistics were presented as median with interquartile range or frequency with percentage.

## Results

### Epidemiology of COVID-19 patients in Yichang

A total of 197 adult discharged patients with COVID-19 were recruited in Yichang Central People's Hospital (101, 51.3%) and Yichang Third People's Hospital (86, 48.7%). The first case was a 65-year-old woman from Wuhan on January 15, 2020. The quantity of admitted patients increased sharply on the 15 days later, ascended to the peak on the February 2, and decreased obviously on February 7 (See the Figure 1).

The average age of discharged patients was  $55.94 \pm 18.83$  (IQR, 40.25-70.75) years, and percentage of 49.7 (98) was female. Those cases were mainly occurred in the urban (178, 90.4%), especially Xiling District, because numerous patients were employees of China Gezhouba Group Corporation (CCGC) returning from Wuhan. Except for seven medical staffs, most of them were employees (58, 29.4%), retirees (55, 27.4%), and agriculture workers (29, 14.7%). A total of 187 patients were clustered and

had clear exposure histories. Among of them, 75(38.7%) patients resided in the community of COVID-19 patients, 71(36.8%) patients had ever contacted with relatives or friends from Wuhan, 41(20.8%) patients had a trip to Wuhan.

### **Clinical features of adult discharged patients with COVID-19**

Fever (153, 77.6%) was the most common presentations, following cough (89, 45.2%) and weakness (29, 14.7%), respectively. Other less common symptoms were sore throat (11, 5.6%), shortness of breath (10, 5.1%), and muscle ache (9, 4.6%, Table 2). However, 3 patients without any complaints were detected by chest CT scan. Among all those patients, the average days from exposure to symptom onset was  $6.14 \pm 9.27$  (IQR, 2-7) days. The longest incubation period was 55 days. 48 patients were accompanied with underlying illness, including cardiovascular (24.4%) and cerebrovascular diseases (4.6%), endocrine system diseases (9.1%), chronic renal diseases (1.5%), malignant tumor(1.5%), and digestive system diseases (1.0%), nervous system diseases. Considering vital sign and CT manifestations, 56 patient were admitted to intensive care unit (ICU) , and 141 patients were transferred to general isolation wards.

### **Laboratory examinations of adult discharged patients with COVID-19**

The laboratory examination was underwent after admission, the blood routine results revealed that monocytes and platelet kept at normal range in numerous patients, leucocytes were at the normal range in 117 (59.4%) patients, and below the normal range in 66 (33.5%) patients. While lymphocytes decreased in many patients. Interestingly, eosinophils displayed a similar change tendency as lymphocytes, it decreased obviously over half of them. 44 (22.3%) patients had different degrees of liver function abnormality, with elevating of aspartate aminotransferase (AST) or alanine aminotransferase (ALT). Total bilirubin (TBIL) was above the normal range in 24(12.2%) patients, and direct bilirubin (DBIL) was above in 10 (5.1%) patient. Most of those patients had an abnormal myocardial zymogram, which indicated that Creatine kinase was above in 10 (5.1%) patients, Creatine kinase MB in 19 (9.6%) patients, and Lactate dehydrogenase in 65(33.0%) patients. For the coagulation tests, Prothrombin time (PT) and activated partial thromboplastin time (APTT) were at the normal range in the majority of patients, while fibrinogen was above the normal range in the 78 (39.6%) patients, D-dimer was above the normal range in the 99 (47.2%) patients. 65 (33.0%) patients had different degrees of renal function damage, with elevating blood urea nitrogen or creatinine. Blood gas analysis was examined in 69 cases, and the result demonstrated that PaO<sub>2</sub> was decreased in the 28(40.5%) patients. Regarding the infection index, procalcitonin mainly kept at the normal range. On the contrary, c-reactive protein (CRP), erythrocyte sedimentation rate (ESR) and interleukin-6 (IL-6) increased in most of patients.

Although RT-PCR was regarded the most accurate examinations for COVID-19, the sensitivity was limited. RT-PCR positive rate was 63.5%, the first test was 46.7%, and the second test was 11.2%. Comparing with PCR , almost all patients had been discovered lesions in the chest CT scans, 32 (15.3%) patients displayed unilateral pneumonia, 136 (69.0%) patients displayed bilateral pneumonia, and only 25(12.7%) patients displayed multiple mottling and ground-glass opacity (Table 4, Figure 2).

### **Treatment and outcome of adult discharged patients with COVID-19**

To avoid hypoxemia and acute respiratory distress, 147(76.6%) patients received oxygen by nasal catheter, 34(15.3%) patients received oxygen by mask, and 16 (8.1%) patients were

treated with invasive ventilation in the ICU. Common complication among the 197 discharged patients included acute liver injury, septic shock, acute myocardial injury, acute renal injury and ARDF. Most patients were treated with antiviral drugs (Oseltamivir), 151(76.6%) patients received antibiotics(moxifloxacin and ceftazidime-sulbactam), and several patients were treated with glucocorticoids (75, 38.1%) and immunoglobulin(52, 26.9%). Additionally, 81(41.1%) patients were treated with Chinese traditional medicine. By the end of February 26, 28 (14.2%) patients had died, and 169(85.2%) patient was discharged and transferred to designated hospital for observation. The average of hospital stay was 15.08 days (IQR, 4-24, Table 4).

## Discussion

Coronavirus was a large RNA virus, including SARS-CoV, MERS-CoV, HCoV-OC43, HCoV-229E, HCoV-NL63 and HCoV-HKU1. SARS-CoV and MERS-CoV may induce severe respiratory syndrome, but the remains only caused mild upper respiratory infectious. 2019-nCoV was a new subtype, with high incidence and rapid infection, it has spreaded widely in China and abroad, involving Italy, German, Korean, Iran, and Japan<sup>[8-9]</sup>. At present, there was no vaccine and antiviral drugs against this disease. Therefore, Extensive studies of clinical features on COVID-19 have not only a better understanding of coronavirus transmission, but have also been key to detect quickly and accurately.

COVID-19 diagnosis was based on exposures, symptoms, laboratory tests, chest CT and RT-PCR. In the early phase of the epidemic, almost all patients worked at or lived around the Huanan Seafood Whole Market in Wuhan<sup>[10]</sup>. With COVID-19 spreaded rapidly in Hubei province, Wuhan-related exposures was regarded as a key criterion. Previous retrospective research demonstrated that 86% cases had a Wuhan-related exposures history<sup>[11]</sup>. Similarly, our study revealed most of infected patients lived around Xiling street, because of many residents working at China Gezhouba Group Corporation, returning from Wuhan. The common symptoms of COVID-19 patients were fever, fatigue and cough, some patients may present with abdominal symptoms<sup>[12]</sup>. While a few patients without any symptoms were detected accidentally by chest CT<sup>[11]</sup>. Thus, it is difficult to suspect the disease without auxiliary examinations.

The significant of laboratory examinations was blood routine, the results suggested leucocytes were mainly normal or decreased, and lymphocytes reduced evidently in many COVID-19 patients<sup>[13]</sup>. A recent research indicated that lymphocytes, especially CD3<sup>+</sup> lymphocytes and CD45<sup>+</sup> lymphocytes, decreased significantly in comparison with non-COVID patients, while there was no significantly difference in quantities and proportions of neutrophils and monocytes<sup>[14]</sup>. Results of this analysis showed lymphocytes and eosinophils decreased obviously without leukocytosis in most patients, and Neutrophils, monocytes and platelet mainly kept at normal range, it was consistent with previous reports. In term of chest CT, the typical image features were peripheral, subpleural ground glass opacities in the lower lobes. However, a study of CT manifestations demonstrated that it was approximately 14% COVID-19 patients with atypical CT features<sup>[15]</sup>. Real time RT-PCR was considered a standard assessment for COVID-19, but the sensitivity was lower than chest CT scans, RT-PCR was 71%, chest CT scans reached 98%<sup>[16]</sup>. Thus, it was essential to perform chest CT for detecting the suspected patients.

As described before, there was currently no clinical approved antiviral drugs and vaccine

for coronavirus infections except for supportive treatment<sup>[17]</sup>. Immunoglobulin may enhance the ability of anti-infection in severely ill patient, and steroids are considered in those patients with ARDS. Oxygen inhalation was important to avoid to ARDS for the COVID-19 patients with hypoxemia. In this study, 76.6% patients received oxygen by nasal catheter, and 90% received antiviral therapy, and 38.1% received glucocorticoids. CDC reported that the case-fatality rate (CFR) of COVID-19 the overall case-fatality rate (CFR) of COVID-19 was 2.3% in confirmed cases, and CFR among critical cases may reach 49.0%<sup>[11]</sup>. Nevertheless, most of patients were still treated in the hospital. Another retrospective study suggests the CFR was about 11%<sup>[13]</sup>. Statistical analysis of this study found that the CFR was 14.2%, and most of them were over 70 year-old patients accompanying with chronic illness. In the past one month, numerous effective measures, including blocking cities and roads, closing supermarket, monitoring temperature, building a new hospital and setting up medical assistance team, have been carried out to controlling infection source, preventing transmission and reducing death. Until now, there was no new confirmed patients for 13 days, and hospitalized patients decreased sharply.

In conclusion, this retrospective study, based on clinical data, revealed that COVID-19 mainly infected in older people with comorbidities, and may cause acute severe respiratory syndrome. Chest CT was key to screen those suspected patients, and lymphocytopenia and eosinophils declining without leukocytosis may be regarded as a novel evidence in the diagnosis of COVID-19.

#### **Conflicts of interest**

The authors have declared that no conflict of interest exists.

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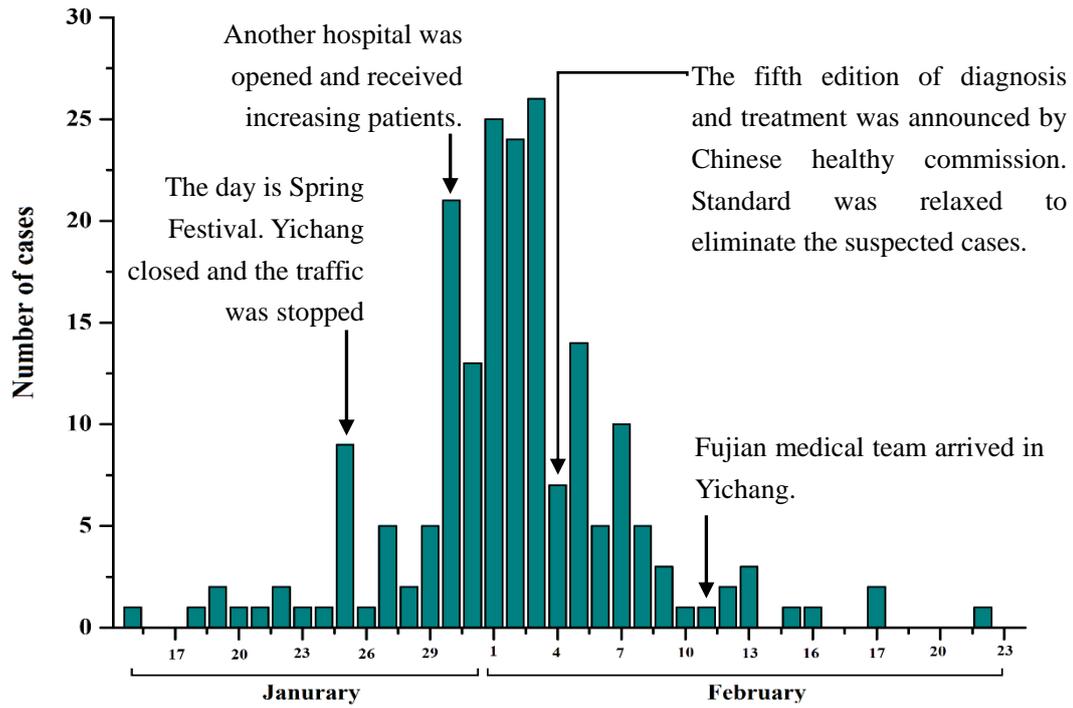


Fig 1. The distribution of admission date and crucial event in Yichang.

Patients(n=197)	
<b>Age,years</b>	
Mean( $\bar{X} \pm SD$ )	55.94 $\pm$ 18.83
Range	18-91
$\leq 30$	21(10.7%)
30-60	96(48.7%)
$> 60$	80(40.6%)
<b>Sex</b>	
Female	98 (49.7%)
Male	99 (50.3%)
<b>Month</b>	
January	66(33.5%)
February	131(66.5)
<b>Occupation</b>	
Agricultural worker	29(14.7%)
Retired	55(27.9%)
Employee	58(29.4%)
Self-employed	22(11.2%)
Medical staff	7(3.6%)
Others	26(13.2%)
<b>Location</b>	
Rural	19(9.6%)
Urban	178(90.4%)
<b>Exposure history (&lt;2 weeks)</b>	
A trip to Wuhan	41 (20.8%)
Contacting with relatives or friends from Wuhan	71 (36.8%)
2019-nCov patients in their community	75 (38.7%)

**Table1. Demographics and baseline characteristics of 197 discharged patients with COVID-19.**

Patients(n=197)	
<b>Signs and symptoms at admission</b>	
Fever	153(77.66%)
Cough	89(45.2%)
Weakness	29(14.7%)
Sore throat	11(5.6%)
Shortness of breath	10(5.1%)
Muscle ache	9(4.6%)
<b>Days from exposure to sympom onset</b>	
Means	6.14±9.27
Range	1-55
<b>Chronic medical illnes</b>	
Cardiovascular diseases	48(24.4%)
Diabetes	18(9.1%)
Cerebrovascular diseases	9(4.6%)
Chronic renal diseases	3(1.5%)
Malignant tumor	3(1.5%)
Digestive system diseases	2(1.0%)
Respiratory system diseases	2(1.0%)
<b>Admission to intensive care unit</b>	<b>56(29.4%)</b>

**Table2. Clinical characteristics of 197 discharged patients' with COVID-19.**

	Average	Normal Range	Increased	Decreased
<b>Blood routine</b>				
Leucocytes	5.79±3.13	4-10 ( $\times 10^9$ / L)	14(7.1%)	66(33.5%)
Neutrophils	4.18±3.06	1.8-6.3 ( $\times 10^9$ / L)	33(16.8%)	23(11.7%)
Eosinophils	0.09±0.51	0.02-0.52 ( $\times 10^9$ / L)	1(5.1%)	99(50.3%)
Lymphocytes	1.13±0.74	1.1-3.2 ( $\times 10^9$ / L)	7 (3.6%)	112 (56.9%)
Monocytes	0.41±0.22	0.1-0.6 ( $\times 10^9$ /L)	4(2.0%)	31(15.7%)
Platelet	165.35±67.97	100-400 ( $\times 10^9$ /L)	1(0.5%)	30(15.2%)
<b>Blood chemistry</b>				
Alanine aminotransferase	38.40±44.42	9-50 (U/ L)	36(18.3%)	7(35.5%)
Aspartate aminotransferase	38.84±44.42	15-40 (U/ L)	44(22.3%)	11(5.6%)
Total bilirubin	16.31±13.86	5.1-28 ( $\mu$ mol/L)	24(12.2%)	2(1.0%)
Direct bilirubin	6.15±12.35	0-10.0 ( $\mu$ mol /L)	10(5.1%)	–
Blood urea nitrogen	7.69±9.86	3.1-8.0 ( $\mu$ mol /L)	47(23.9%)	52(26.4%)
Serum creatinine	106.80±150.53	57-97 ( $\mu$ mol /L)	35(17.8%)	53(26.9%)
<b>Myocardial enzymes</b>				
Creatine kinase	133.67±223.48	50-310 (IU/L)	10(5.1%)	39(19.8%)
Creative kinase MB	21.11±57.00	0-25 (IU/ L)	19(9.6%)	–
Lactate dehydrogenase	266.20±153.70	120-250 (IU/L)	65(33.0%)	8(4.1%)
Hydroxybutyrate dehydrogenase	189.96±116.88	95-250 (IU /L)	30(15.2%)	14(7.1%)
<b>Coagulation function</b>				
Prothrombin time	11.18±1.72	10.0-14.5(s)	6(3.0%)	14(7.1%)
Activated partial thromboplastin time	32.66±7.15	20.0-45.0(s)	10(5.1%)	2(1.0%)
Fibrinogen	4.13±2.64	2.00-4.00(g /L)	78(39.6%)	–
D-dimmer	2309.36±8217.50	0-500(ng/ mL)	93(47.2%)	–
<b>Blood gas analysis</b>				
pH	7.40±0.10	7.35-7.45	15/69(21.7%)	11/69(15.9%)
PaO <sub>2</sub>	81.77±37.73	80-100 (mmHg)	4/69(5.8%)	28/69(40.5%)
PaCO <sub>2</sub>	37.73±9.53	35-45 (mmHg)	8/69(11.6%)	25/69(36.2%)
<b>Infection related biomarkers</b>				
Procalcitonin	0.46±2.17	0-0.05 (ng/ mL)	60/176(34.1%)	–
C-reactive protein	54.97±58.76	0-10 (mm /h)	80/123(72.4%)	–
Erythrocyte sedimentation rate	32.00±27.50	0-10 (mm/h)	59/82(71.2%)	–
Interleukin-6	112.69±254.68	0-7 (pg/mL)	23/35(65.7%)	–

**Table3. Results of laboratory examinations in the 197 adult discharged patients with COVID-19.**

<b>Total positive of RT-PCR</b>	<b>63.5%</b>
The first test	46.7%
The Second test	11.2%
The third test	4.1%
<b>Chest CT scan or X-ray</b>	
Abnormalities	193(98.0%)
Unilateral pneumonia	32(16.24%)
Bilateral pneumonia	136(69.0%)
Multiple mottling and ground-glass opacity	25 (12.7%)
<b>Treatment</b>	
Oxygen therapy	147(76.6%)
No-invasive	34(15.3%)
invasive	16(8.1%)
Antibiotic	151(76.6%)
Antiviral	179(90.9%)
Glucocorticoids	75(38.1%)
Intravenous immunoglobulin	52(26.9%)
Chinese Traditional medicine	81(41.1%)
<b>Complication</b>	
ARDS	26(13.2%)
Acute renal injury	16(8.1%)
Acute myocardial injury	14(7.1%)
Septic shock	12(6.1%)
Acute liver injury	8(4.1%)
<b>Outcome</b>	
Death	28(14.2%)
Survival	169(85.8%)
<b>Hospital stays (days)</b>	
Means	15.08±17.47
0-7 (days)	79(40.1%)
7-14 (days)	31(15.7%)
>14 (days)	87(44.2%)

**Table 4. PCR, chest CT scans and treatment of discharged patients.**

a. Chest CT images on 9 days after symptom onset



b. Chest CT images on 19 days after symptom onset



c. Chest CT images on 26 days after symptom onset



**Fig2. Chest CT images of a 26-year-old patient with COVID-19.** a Chest CT images obtained on February 2, 2020, showed ground glass opacity in both lungs on day 5 after symptom onset. b Images taken on February 12, 2020, indicated the lesions increased obviously. c Images taken on February 19, 2020, revealed bilateral ground glass opacity absorbed dramatically, and the patient discharged from hospital and return to the local hospital.

a. Chest CT images on 5 days after symptom onset



b. Chest CT images on 14 days after symptom onset



**Fig3. Chest CT images of a 62-year-old patient with COVID-19.** a Chest CT images obtained on February 2, 2020, showed ground glass opacity in both lungs on day 5 after symptom onset. b Images taken on February 11,2020, revealed the lesions increased rapidly, and the patient died on February 16,2020.