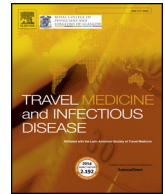




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Clinical characteristics of laboratory confirmed positive cases of SARS-CoV-2 infection in Wuhan, China: A retrospective single center analysis

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Dear Editor

According to the Health Commission of Hubei province, China, multiple pneumonia cases first appeared in Wuhan with unclear etiology in December 2019 [1,2]. Soon after, a novel type of coronavirus SARS-CoV-2 (coronavirus disease 2019; previously 2019-nCoV) was isolated by Chinese authorities on 7 January 2020 [3,4]. It was reported that in most cases, patients were exposed to the Huanan Seafood Wholesale Market in Wuhan, China, and transmission appeared to be from animals into human [2,5,6]. No province in China has been exempt from the reach of the SARS-CoV-2, and 24 countries have reported cases of the infection until 1st February 2020. To make explicit the pathogenesis and pathophysiology of SARS-CoV-2, we retrospectively analyzed a cohort of patients who were diagnosed with "2019 novel coronavirus disease (COVID-19)" in the Zhongnan Hospital of Wuhan University, describing the clinical features of laboratory-confirmed cases of SARS-CoV-2 infection. (see Table 1)

This retrospective study was approved by the Zhongnan Hospital of Wuhan University's ethical review board (Clinical Ethical Approval No.2020015). In total, the information of 84 patients who were

diagnosed from December 2019 to January 2020 were collected and patients who did not undergo laboratory confirmation of SARS-CoV-2 or who were tested negative in the laboratory of Zhongnan Hospital were excluded in this research. Ultimately, 34 patients who tested positive to the SARS-CoV-2 at least once via laboratory were included in this study. Among these 34 patients, the earliest admission date was 21 December 2019 and the latest admission date was 28 January 2020. Patients were followed up to 29 January 2020, any missing data was recorded as unknown.

Demographical, clinical, laboratory and imaging tests (including CT and X-ray) data as well as management, treatment, and prognosis for the included patients were acquired from their medical history. Data collected were sorted and summarized.

The mean age of those patients was approximately 56 years and the range of age is from 26 to 88 years old. There were 8 patients who were younger than 40 years of age and also 8 patients who were older than or equal to 70 years of age. We didn't obtain young patients in our cohort and further research are needed to verify whether children and juveniles are of less likely to be infected.

The number of female patients was 20, accounting for 58.8% of all

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Table 1

Demographical and clinical information, initial outcomes of laboratory tests, management and treatment of 34 patients who were confirmed as being infected with SARS-CoV-2 after admission to Zhongnan Hospital.

Covariate	Level	Number	%	
Age, years		56.24 ± 17.14		
	younger than or equal to 40	8	23.5	
	41–57	10	29.5	
	58–69	8	23.5	
	older than or equal to 70	8	23.5	
Sex	Female	20	58.8	
	Male	14	41.2	
Comorbidity	None	18	52.9	
	Yes	16	47.1	
	Diabetes	4	11.8	
	Hypertension	8	23.5	
	Cardiovascular disease	6	17.6	
	Chronic obstructive pulmonary disease	1	2.9	
	Malignancy	2	5.9	
	Chronic liver disease	3	8.8	
	Hyperuricemia	1	2.9	
	Hypothyroidism	1	2.9	
	HIV infection	2	5.9	
	Symptoms when admitted to the hospital	Fever	32	94.1
		Temperature of the admission, °C	37.34 ± 0.92	
		Highest temperature, °C	38.61 ± 0.81	
		Cough	17	50.0
Myalgia or fatigue		22	64.7	
Sputum production		8	23.5	
Headache		2	5.9	
Diarrhea		5	14.7	
Dyspnea		5	14.7	
Bilateral involvement of chest radiographs		Bilateral	27	79.4
	Unilateral	3	8.8	
	Nothing abnormal detected	1	2.9	
White blood cell count	Unknown	3	8.8	
	Decreased	6	17.6	
Neutrophil count	Increased	4	11.8	
	Decreased	4	11.8	
Lymphocyte count	Decreased	17	50.0	
Hemoglobin	Decreased	13	38.2	
Platelet count	Decreased	9	26.5	
Prothrombin time	Decreased	1	2.9	
	Increased	17	50.0	
D-dimer	Increased	5	14.7	
Albumin	Decreased	25	73.5	
Alanine aminotransferase	Increased	8	23.5	
	Decreased	7	20.6	
Aspartate aminotransferase	Increased	7	20.6	
Total bilirubin	Increased	3	8.8	
Potassium	Decreased	4	11.8	
	Increased	2	5.9	
Creatinine	Decreased	7	20.6	
	Increased	6	17.6	
Creatine kinase	Increased	1/12	8.3	
Myoglobin	Increased	3/12	25.0	
Hypersensitive troponin I	Increased	1/15	6.7	
Procalcitonin	Increased	13/31	41.9	
Erythrocyte sedimentation rate (ESR)	Increased	13/22	59.1	
	Decreased	9/9	100.0	
Interleukin-6	Increased	9/9	100.0	
Brain natriuretic peptide (BNP)	Increased	1/4	25.0	
Hospitalization	ICU care	8	23.5	
	No-ICU care	26	76.5	
Treatment	Antibiotic therapy	31	91.2	
	Antiviral therapy (other drugs but not lopinavir/ritonavir)	32	94.1	
	Antiviral therapy (switch to lopinavir/ritonavir later)	9	26.5	
	Use of corticosteroid	21	61.8	

Table 1 (continued)

Covariate	Level	Number	%
Oxygen Support	Oxygen Therapy	25	73.5
	Non-invasive ventilation or high-flow nasal cannula	2	5.9
	Invasive mechanical ventilation	3	8.8
Change of chest radiographs (before switching to lopinavir/ritonavir)	Unknown	4	11.8
	Worse manifestations	14/16	87.5
	Improve manifestations	1/16	6.25
	No difference	1/16	6.25
	Intervals of re-examined, days	4.5 (3.0–6.0)	
Change of chest radiographs (Refer in particular to the 9 patients who switched to lopinavir/ritonavir later)	Unknown	18	52.9
	Change of chest radiographs	1/9	11.1
	Improve manifestations		
	Intervals of re-examined, days	4	
	Not re-examined	8	88.9
Change of Procalcitonin	Elevated	4/11	36.4
	Declined	3/11	27.3
	No difference	4/11	36.4
	Unknown	23	67.6
Prognosis	Hospitalization	33	97.1
	Home isolation	1	2.9

these 34 patients. Most patients (64.7%) lived in the Wuchang district. Among the patients, 47.1% had underlying diseases including diabetes, hypertension, cardiovascular disease, chronic obstructive pulmonary disease, malignancy, chronic liver disease, hyperuricemia and hypothyroidism. Two patients were known to be human immunodeficiency virus (HIV) positive.

Up to 94.1% patients had fever on admission or during hospitalization. The highest recorded temperature during hospitalization was 38.61 °C (± 0.81 °C). Half of the patients had coughs, and nearly two thirds of patients had myalgia or fatigue. A small group of patients had symptoms of diarrhea and headache. It is worth noting that a fraction of patients did not present with fever. Their symptoms were mild and limited to coughing and fatigue. In addition, findings from the chest radiographs indicated that up to 79.4% patients were infiltrated bilaterally. Only 3 patients showed unilateral infiltrates in their chest radiographs. Surprisingly, one patient presented normally in chest radiographs and this patient only presented with fever and fatigue. These variations in presentations may lead to a missed diagnosis in the primary examination. Therefore, clinicians must be mindful of patients presenting with atypical symptoms since the appearance of pulmonary infiltrates may be delayed and the absence of pulmonary changes on initial imaging does not mean that pneumonia will not develop.

17.6% patients presented with leucopenia, while 11.8% patients presented with leukocytosis, on admission. It is worth noting that up to half of the patients had lymphopenia and 73% showed hypoalbuminemia. Most patients had a reduction in hemoglobin (38.2%) and prolonged prothrombin time (50%). Sodium level of all the patients was within the normal range. Most patients (52.9%) had normal serum levels of procalcitonin. Interleukin-6 level was tested in only 9 patients, and all 9 patients showed an increased level of Interleukin-6. Erythrocyte sedimentation rate (ESR) also increased in most cases (59.1%). Only one out of four patients who were tested, showed elevated brain natriuretic peptide. Among patients who had multiple laboratory confirmation tests, 2 patients changed from positive to negative, while 3 patients changed from negative to positive.

Of the 34 patients, 8 (23.5%) were initially or subsequently admitted to the intensive care unit (ICU) and all of them were over 50 years-old. Over 90% of patients received antibiotic therapy, while only 26.5% used corticosteroid. Up to 94.1% patients received antiviral therapy other than lopinavir/ritonavir. Of these, 9 patients switched to lopinavir/ritonavir after a period of time. Patients who were not

prescribed lopinavir/ritonavir and patients prior to being prescribed lopinavir/ritonavir tended to have worse manifestations on their chest radiographs (14 out of 16, 87.5%). The intervals between examinations were 4.5 days. Surprisingly, one patient who was prescribed lopinavir/ritonavir at a later date, and who was re-examined after using lopinavir/ritonavir for four days, showed improvements in his chest radiographs. Even he was worse according to the changes of CT before switching to lopinavir/ritonavir therapy. However, as other patients were not re-examined, more information relating to the effects of lopinavir/ritonavir therapy could not be determined and further investigation and evaluation are needed. As for procalcitonin, of the 11 patients who received re-examination, 4 showed an elevation of procalcitonin, while 3 patients showed the opposite. Only one patient out of the 34 patients was treated with home isolation. All other patients required hospitalization.

In summary, the range of age in these cohort is from 26 to 88 years old and the mean age is approximately 56 years old. Patients infected with SARS-CoV-2 were more likely to present with lymphopenia, and increase of ESR and IL-6. Since there are patients with atypical symptoms and imaging of chest radiograph, more attention to atypical symptoms during the early stage of COVID-19 and repeated chest imaging examinations are called for.

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CRediT authorship contribution statement

Yihui Huang: Conceptualization, Writing - original draft. **Mengqi Tu:** Software. **Shipei Wang:** Conceptualization. **Sichao Chen:** Methodology. **Wei Zhou:** Resources. **Danyang Chen:** Validation. **Lin Zhou:** Formal analysis. **Min Wang:** Investigation. **Yan Zhao:**

Validation. **Wen Zeng:** Data curation. **Qi Huang:** Visualization. **Hai'bo Xu:** Investigation. **Zeming Liu:** Writing - original draft. **Liang Guo:** Supervision, Project administration.

Declaration of competing interest

The authors declare no conflict of interest.

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