



# Clinical Features of ICU Admitted and Intubated Novel Corona Virus-infected Patients in Iran

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Received 2020 April 02; Accepted 2020 April 22.

## Abstract

**Background:** Recently, a novel coronavirus was reported from Wuhan, Hubei Province, China. The novel coronavirus infection was spread from China to other countries, including Iran.

**Objectives:** We report the clinical characteristics, laboratory findings, and chest exams of infected patients.

**Methods:** All patients suspected to the novel coronavirus were hospitalized in a special airborne protection room. We collected and analyzed the characteristics of confirmed patients by data extraction from electronic medical records.

**Results:** The Computerized Tomography (CT) scan and radiography results showed ground glass in the lung of patients, and real-time PCR confirmed the infection. The myocardial and liver function tests showed abnormalities in infected patients.

**Conclusions:** Most patients admitted to the Intensive Care Unit (ICU) showed respiratory problems, and their infection was confirmed by virological tests and chest images. The main reason for the patient's death was the signs of acute heart failure, such as hypotension and cardiac arrhythmia.

**Keywords:** COVID-19, SARS, MERS, Coronavirus

## 1. Background

Most coronaviruses cause mild infections in humans (1). In the past decade, two coronaviruses belonging to betacoronaviruses, including Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV) and the Middle East Respiratory Syndrome Coronavirus (MERS-CoV), infected more than 10,000 people all around the world, with a mortality rate of 10% and 37% for SARS and MERS, respectively (2, 3). Recently, in December 2019, patients with clinical presentations of viral pneumonia were reported from Wuhan, Hubei, China (4, 5). The sequencing results of patients' samples revealed that Wuhan patients were infected with a novel coronavirus (COVID-2019). Several reports all around the world, including Japan, South Korea, USA, Italy, and

Germany, confirmed the prevalence of the novel coronavirus (2019-nCoV) (6, 7). Based on the WHO, pneumonia of COVID-19 is highly infectious, and this outbreak is one of the most important public health problems. It has distributed broadly due to human-to-human transmission in countries that have challenges with this agent (4, 5).

## 2. Objectives

In this study, we report and describe novel coronavirus-infected patients with pneumonia whose specimens were confirmed in the Pasteur Institute of Iran. We also describe the clinical features of patients infected with the novel coronavirus.

### 3. Methods

#### 3.1. Patient Isolation

Following the emergence of COVID-2019 in Iran, patients with pneumonia signs were considered to be infected with COVID-19. For the time being, 10 patients suspected to COVID-19 with cough and fever more than 38°C, were transferred to an isolated region in ICU. Furthermore after government alert, a rapid response team contain physician, virologist, and nursing was formed. The diagnosis of COVID-19 was according to the clinical characteristics, chest exam, laboratory findings, and virologic tests. The patients suspected to COVID-19 were isolated in a special airborne protection agent room.

#### 3.2. Ethics Statement

This study was approved by the Infectious Disease Ethical Review Board.

#### 3.3. Data Gathering

We investigated the clinical characteristics, chest imaging, liver function tests, and laboratory findings of patients suspected to COVID-19 (8, 9). The data were extracted from electronic medical records of infected patients.

### 4. Results

In this study, 10 out of 22 patients with positive clinical and laboratory results of COVID-19 infection were hospitalized and intubated in a special airborne protection agent room. The median age of the patients was 50 years. The demographic characteristics of the infected patients are summarized in [Table 1](#).

#### 4.1. Laboratory Characteristics

All hospitalized patients showed leucopenia. The cardiac-related enzymes were higher in patients admitted to the ICU. The liver function test LFT results showed variations in infected patients. The laboratory findings are summarized in [Table 2](#).

#### 4.2. Chest Images

Chest CT images revealed the presence of abnormalities in all admitted patients. The CT scan and radiographic images of seven dead patients revealed bilateral multilobar ground-glass opacity, consolidation, and ground-glass opacity with interlobular septal thickening (crazy-paving) in the peripheral distribution in infected patients. The results are shown in [Figure 1](#).

### 5. Discussion

In early 2020, the outbreak of novel coronavirus (COVID-19) occurred, and it spread from China to other countries. Many viruses can cause respiratory infections, and there is evidence that viruses in the same family have similar pathogenesis (5).

We evaluated the clinical and laboratory characteristics of 22 patients that were ICU-admitted and confirmed cases of COVID-19 infection. Ten (45.4%) patients were intubated. In this study, we reported COVID-19 diagnosis in patients hospitalized in Tehran, Iran. The average age of patients was 50 years, and their disease was confirmed based on and CT scans, radiographic images, and real-time PCR.

Seven of 10 patients in this study died; they had diffused ground-glass opacities in radiographic images. Radiologic findings mostly indicated bilateral multilobar ground-glass opacity and consolidation with interlobular septal thickening (crazy-paving) in peripheral distribution (10-13). Most patients presenting with severe respiratory symptoms and respiratory failure were hospitalized in the ICU. Two of seven intubated patients died because of hemoptysis and respiratory failure. The rest of the patients (five of seven) died with the signs of acute heart failure, such as hypotension, cardiac arrhythmias, and cardiogenic shock. The liver and cardiac-related enzymes of all patients were elevated. Most patients had lymphopenia without leukocytosis (14). Our data showed that COVID-19 infection was more important in older people, and the more severity of infection in these patients was probably due to their weaker immune system or coexisting diseases (15, 16). Seven patients showed degrees of abnormality in their liver function, and their ALT and AST enzymes were above normal. Most abnormal myocardial enzymes revealed the elevation of CK-MB and LDH enzymes. Delayed referral and diagnosis may be the other important causes of mortality in these patients (14).

#### 5.1. Conclusion

Most patients infected with the novel coronavirus were admitted to intensive care units because of respiratory problems, but the causes of death of patients, except for two patients, were related to sudden cardiac arrest and delayed referral and diagnosis. It is very important to diagnose high-risk patients in the early stage of infection.

### Acknowledgments

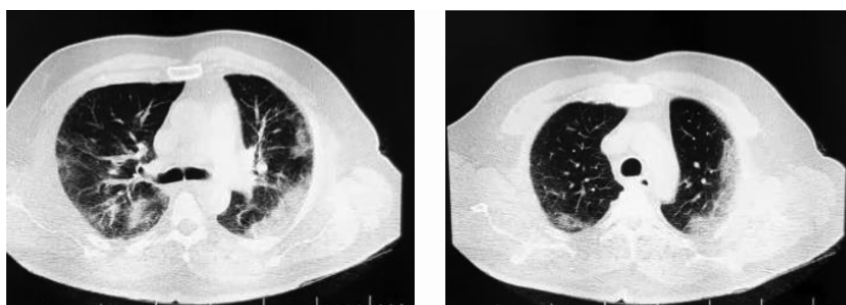
We thank our colleagues at Aja University for their kind assistance.

**Table 1.** Demographic Characteristics of Infected and Intubated Patients with COVID-19

Variables	Patients (N = 10)									
	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6	Patient 7	Patient 8	Patient 9	Patient 10
Age	45	56	65	42	55	40	56	60	40	43
Sex	Female	Male	Male	Male	Male	Female	Male	Male	Female	Male
Smoking	No	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Diabetes	No	Yes	Yes	No	No	No	Yes	Yes	No	No
Hypertension	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No
<b>Clinical symptoms</b>										
Fever	40	38	38.5	38.4	39	40	38.5	40	37	37
Dyspnea	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Phenomena	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fatigue	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Headache	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cough	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Haemoptysis	No	No	No	Yes	No	No	No	Yes	No	No
Bradycardia	+	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No

**Table 2.** Clinical Characteristics of Infected and Intubated Patients with COVID-19

Variables	Patients (N = 10)									
	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6	Patient 7	Patient 8	Patient 9	Patient 10
WBC ( $\times 10^3/\text{mlcl}$ )	13.9	5.7	12.75	20.1	16.2	5.5	6	9.7	4.7	3.6
RBC ( $\times 10^6/\text{mlcl}$ )	4.84	3.46	3.91	3.32	3.84	3.61	3.98	4.61	4.51	4.45
ALT (U/L)	11	60	50	123	130	125	30	40	17	23
AST (U/L)	10	100	88	178	167	177	50	79	35	45
Hb	11.8	10	11.58	11.8	11.3	7.2	12.2	12.9	11.1	10
HCT	39.7	31.8	33.8	34.6	34.2	25	37.4	38.5	-	-
Platelet	231	-	343.0	155	166	158	314	244	200	151
Lymphocyte (%)	17	16	8.80	7.7	15	10	26	12	38	32
Neutrophils (%)	60	79	86.93	88	80	87	70	85	59	64
CRP (mg/L)	31	22	45	22	30	23	23	12	13	14
LDH (U/L)	451	605	555	456	1743	1516	666	-	520	-
CPK (U/L)	38	149	140	960	138	392	200	251	201	546
BUN	50	25	47	13	156	38	22	32	40	18
Ck-MB	50	25	60	89	75	77	20	16	24	16
Alk.ph	237	115	244	250	155	177	180		133	113

**Figure 1.** Chest radiography and CT scan results. CT scan shows bilateral multifocal ground-glass/crazy-paving and consolidation in peripheral distribution. AP chest radiographs show multifocal patchy consolidation in bilateral lungs.**Footnotes**

**Authors' Contribution:** Ramin Hamidi Farahani: conceptualization and design; Mohammad Gholami: writing  
[Arch Clin Infect Dis. 2020;15\(2\):e103295.](https://doi.org/10.1007/s12275-020-01032-9)

the original draft, data collection, and analysis; Ebrahim Hazrati: conceptualization and design; Negin Hosseini

Rouzbahani: writing the original draft and data collection; Ziia Hejripour: revision and editing; Saeed Soliman-Meigooni: paper editing; Maryam Dadmanesh: sample collection and data analysis; Mahtab Noorifard: data entry; Jalal Kargar: sample collection and validation; Frahad Motavalli: sample collection; Reza Laripour: revision and editing; Abbas Nourmohammadi: data entry; Sanaz Zargar: sample collection

**Conflict of Interests:** The authors declare that there is no conflict of interest.

**Ethical Approval:** This study was approved by the Infectious Disease Ethical Review Board.

**Funding/Support:** This study received no support.

## References

1. Su S, Wong G, Shi W, Liu J, Lai ACK, Zhou J, et al. Epidemiology, genetic recombination, and pathogenesis of coronaviruses. *J Trends in microbiology*. 2016;**24**(6):490-502.
2. Drosten C, Günther S, Preiser W, Van Der Werf S, Brodt H, Becker S, et al. Identification of a novel coronavirus in patients with severe acute respiratory syndrome. *J New England journal of medicine*. 2003;**348**(20):1967-76.
3. Zhong NS, Zheng BJ, Li YM, Poon LLM, Xie ZH, Chan KH, et al. Epidemiology and cause of severe acute respiratory syndrome (SARS) in Guangdong, People's Republic of China, in February, 2003. *The Lancet*. 2003;**362**(9393):1353-8.
4. Na Z, Dingyu Z, Wenling W. A Novel Coronavirus from Patients with Pneumonia in China, 2019. *J N Engl J Med*. 2020.
5. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *J The Lancet*. 2020.
6. Wang C, Horby PW, Hayden FG, Gao GF. A novel coronavirus outbreak of global health concern. *J The Lancet*. 2020;**395**(10223):470-3.
7. Haynes B, Messonnier NE, Cetron MS. First travel-related case of 2019 novel coronavirus detected in United States: press release, Tuesday, January 21, 2020. 2020.
8. World Health Organization. *Clinical management of severe acute respiratory infection when novel coronavirus (2019-nCoV) infection is suspected: interim guidance, 28 January 2020*. World Health Organization; 2020.
9. Corman VM, Landt O, Kaiser M, Molenkamp R, Meijer A, Chu DK, et al. Detection of 2019 novel coronavirus (2019-nCoV) by real-time RT-PCR. *J Eurosurveillance*. 2020;**25**(3).
10. Chung M, Bernheim A, Mei X, Zhang N, Huang M, Zeng X, et al. CT imaging features of 2019 novel coronavirus (2019-nCoV). *J Radiology*. 2020:200230.
11. Chen H, Guo J, Wang C, Luo F, Yu X, Zhang W, et al. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. *J The Lancet*. 2020.
12. Jin Y, Cai L, Cheng Z, Cheng H, Deng T, Fan Y, et al. A rapid advice guideline for the diagnosis and treatment of 2019 novel coronavirus (2019-nCoV) infected pneumonia (standard version). *J Military Medical Research*. 2020;**7**(1):4.
13. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A novel coronavirus from patients with pneumonia in China, 2019. *J New England Journal of Medicine*. 2020.
14. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *J The Lancet*. 2020;**395**(10223):507-13.
15. Badawi A, Ryoo SG. Prevalence of comorbidities in the Middle East respiratory syndrome coronavirus (MERS-CoV): a systematic review and meta-analysis. *J International Journal of Infectious Diseases*. 2016;**49**:129-33.
16. Dryden M, Baguneid M, Eckmann C, Corman S, Stephens J, Solem C, et al. Pathophysiology and burden of infection in patients with diabetes mellitus and peripheral vascular disease: focus on skin and soft-tissue infections. *J Clinical Microbiology Infection*. 2015;**21**:S27-32.