A Comparison of Clinical Characteristics and Outcomes in Elderly and Younger Patients with COVID-19

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Background: The aim of this study was to describe the clinical characteristics and outcomes of patients with coronavirus disease 2019 (COVID-19) and compare these parameters in an elderly group with those in a younger group.

Material/Methods: This retrospective, single-center observational study included 69 hospitalized patients with laboratory-confirmed COVID-19 from a tertiary hospital in Wuhan, China, between January 14, 2020, and February 26, 2020. Epidemiological, demographic, clinical, and laboratory data, as well as treatments, complications, and outcomes were extracted from electronic medical records and compared between elderly patients (aged ≥60 years) and younger patients (aged <60 years). Patients were followed until March 19, 2020.

Results: Elderly patients had more complications than younger patients, including acute respiratory distress syndrome (ARDS; 9/25, 36% vs. 5/44, 11.4%) and cardiac injury (7/25, 28% vs. 1/44, 2.3%), and they were more likely to be admitted to the intensive care unit (6/25, 24% vs. 2/44, 4.5%). As of March 19, 2020, 60/69 (87%) of the patients had been discharged, 6/69 (8.7%) had died, and 3/69 (4.3%) remained in the hospital. Of those who were discharged or died, the median duration of hospitalization was 13.5 days (interquartile range, 10–18 days).

Conclusions: Elderly patients with confirmed COVID-19 were more likely to develop ARDS and cardiac injury than younger patients and were more likely to be admitted to the intensive care unit. In addition to routine monitoring and respiratory support, cardiac monitoring and supportive care should be a focus in elderly patients with COVID-19.

MeSH Keywords: Coronavirus Infections • COVID-19 • Pneumonia, Viral

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Background

At the end of 2019, a novel coronavirus named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) emerged and subsequently caused an acute respiratory illness epidemic in Wuhan, China [1]. In February 2020 the World Health Organization named that illness coronavirus disease 2019 (COVID-19). By that stage COVID-19 had become a pandemic, rapidly moving through China and spreading to more than 80 countries. As of March 30, 2020, more than 630 000 cases had been diagnosed, there had been more than 30 000 deaths globally, and the numbers were increasing rapidly.

Full genome sequencing and phylogenetic analyses indicate that SARS-CoV-2 shares more than 79% of its genetic sequence with the severe acute respiratory syndrome (SARS-CoV) and 50% with the Middle East respiratory syndrome (MERS-CoV) [2]. All 3 viruses are classified as betacoronaviruses. Recent studies [3–5] suggest that symptoms of respiratory infection are the most frequent clinical manifestations, including fever, cough, dyspnea, and bilateral infiltration on chest imaging. As the outbreak has progressed, digestive symptoms, cardiovascular symptoms, and even multiple organ damage have been reported in some patients. Conversely, asymptomatic infections have also been described. There is evidence that SARS-CoV-2 can be transmitted from human to human via respiratory droplets and direct contact, and may even be transmissible via the fecal–oral route [6,7]. At present, no drug has been proven to be safe and effective for treating COVID-19. For patients with COVID-19, comprehensive assessment is essential when the patient is admitted, including the features associated with severe illness, organ dysfunction, and comorbidities that could complicate supportive or specific treatment.

Although accounting for only about 6% of the total Chinese population, the elderly seem to be more susceptible to COVID-19 and more vulnerable to fatality [4,8–11]. A study of 1099 hospitalized patients with COVID-19 found that 15.1% of the population were aged 60 years or above, and 27.0% of severe cases were in patients aged 60 years or above [10]. A larger study involving 4021 confirmed cases showed that 1052 (26.2%) were aged 60 years or above. In terms of mortality, the mortality rate of patients aged 60 years or above (5.3%) is significantly higher than that of patients under 60 years (1.4%) [11]. Given the high morbidity and mortality of elderly patients with COVID-19, analyzing its clinical characteristics can help to better inform the efforts to treat and control the current epidemic. The aim of this study was to describe the epidemiological, clinical, and laboratory characteristics, as well as the treatments and outcomes of a series of hospitalized patients with confirmed COVID-19, and to compare these parameters in an elderly group (aged ≥ 60 years) with those in a younger group (aged < 60 years).

Material and Methods

Study design and participants

This retrospective, single-center observational study included patients with laboratory-confirmed SARS-CoV-2 infection who were admitted to the Puai Hospital in Wuhan, China, from January 14, 2020 to February 26, 2020. The study was approved by the ethics committee of Puai Hospital. The requirement for written informed consent was waived because of the rapid emergence of this potentially fatal infectious disease and the corresponding urgent need to disseminate valuable empirically derived information pertaining to it. Clinical outcomes were monitored until March 19, 2020, the final date of follow-up.

Data collection

Data on epidemiology (including recent exposure history), demographic parameters, signs and symptoms on admission, comorbidity, laboratory and chest computed tomography findings, management, complications, and outcomes were obtained from patients’ medical records. In instances where core data were missing or records were unclear, requests for clarification were sent to the attending doctors and other healthcare providers. All data were reviewed by two physicians (SJ and WM). COVID-19 was confirmed via real-time reverse transcriptase polymerase chain reaction (RT-PCR) of throat-swab specimens from the upper respiratory tract or sputum specimens from the lower respiratory tract.

Statistical analysis

Data are presented as medians and interquartile ranges (IQRs) for continuous variables and were compared using the Mann-Whitney U test. Categorical variables are expressed as number (%) and were compared using either the chi-square test or Fisher’s exact test if the data were limited. All statistical analyses were performed using SPSS 26.0 (IBM). Two-sided P values <0.05 were considered statistically significant.

Results

The baseline characteristics of 69 patients with COVID-19

The study included 69 hospitalized patients with RT-PCR-confirmed COVID-19. The median age was 52 years (IQR 37–63, range 20–83 years), and 28 patients (40.6%) were men. Thirty-five (50.7%) were residents of Hubei province. The patients’ baseline characteristics are shown in Table 1. Of the 69 patients, 2 (2.9%) had a history of exposure to the Huanan Seafood Market. Of the 34 patients who lived outside Hubei province, 25 (73.5%) had contact with people from Hubei province, and
2 (2.9%) had no traceable history of exposure to Hubei. Of the 69 patients, 24 (34.8%) had one or more coexisting illnesses, and the coexisting illnesses included hypertension, diabetes, cardiovascular and cerebrovascular diseases, malignancy, and chronic obstructive pulmonary disease. Patients aged ≥60 years were more likely to be Hubei residents (20/25, 80% vs. 15/44, 34.1%) and were more likely to have underlying comorbidities (15/25, 60% vs. 9/44, 20.5%).

In a total of 69 patients, the most common symptoms at the onset of illness were fever (50; 72.5%) and dry cough (36; 52.2%), and nearly a quarter of the patients (17; 24.6%) had shortness of breath. Less common symptoms included headache, dizziness, abdominal pain, diarrhea, nausea, and vomiting (Table 1). The median duration from the onset of symptoms to the first hospital admission was 4 days (IQR 2–7 days).

The laboratory and chest imaging findings on admission of patients with COVID-19

The laboratory and chest imaging findings on admission of patients with COVID-19 are shown in Table 2. Blood counts were performed on admission in 67 of the 69 patients, and those of 21/67 patients (31.3%) indicated leucopenia (white blood cell count <4.0×10⁹/L), including 13/42 younger patients (31%) and 8/25 elderly patients (32%). Lymphopenia (lymphocyte count <1.0×10⁹/L) was evident in 27/67 patients (40.3%), including 14/42 younger patients (33.3%) and 13/25 elderly patients (52%). Compared with younger patients, elderly patients had higher D-dimer, urea nitrogen, and lactate dehydrogenase levels upon admission, and higher levels of infection-related biomarkers including erythrocyte sedimentation rate, C-reactive protein, and procalcitonin. All 69 patients underwent chest computed tomography upon admission, which depicted bilateral involvement in 54 (78.3%), unilateral involvement in 12 (17.4%), and no pneumonia in 3 (4.3%).

The treatments, complications, and outcomes of patients with COVID-19

All 69 patients were treated in isolation. The treatments, complications, and outcomes of patients with COVID-19 are shown in Table 3. Antiviral treatment was administered to 64 patients (92.8%), and those treatments included arbidol (47; 68.1%), lopinavir/ritonavir (41, 59.4%), oseltamivir (15, 21.7%), interferon alpha (7, 10.1%), and traditional Chinese medicine (31, 44.9%). Empirical antibiotic treatment was administered to 55 patients (79.7%), systemic corticosteroid was given to 25 patients (36.2%), and gamma globulin was given to 15 patients (21.7%). Oxygen therapy was administered to all 69 patients. Most (63, 91.3%) needed oxygen only via nasal cannula, but 9 (13%) received high-flow oxygen or noninvasive ventilation. Invasive mechanical ventilation was required in 7 patients (10.1%), and 1 (1.4%) underwent extracorporeal membrane oxygenation therapy due to refractory hypoxemia. During hospitalization 25/69 patients (36.2%) experienced complications, and the most common complication was acute respiratory distress syndrome (ARDS) (14, 20.3%), followed by cardiac injury (8, 11.6%), acute kidney injury (6, 8.7%), and secondary infection (6, 8.7%). Of the total 69 patients, 7 (10.1%) had multiple organ dysfunction syndrome and 8 (11.6%) were admitted to the intensive care unit (ICU). Compared with younger patients, elderly patients had more complications including ARDS (9/25, 36% vs. 5/44, 11.4%) and cardiac injury (7/25, 28% vs. 1/44, 2.3%), and were more likely to be admitted to the ICU (6/25, 24% vs. 2/44, 4.5%).

As of March 19, 2020, 60 of the 69 patients had been discharged (87%), 6 (8.7%) had died, and 3 (4.3%) were still in the hospital. Of those who had been discharged or had died, the median duration of hospitalization was 13.5 days (IQR 10–18 days). According to the Diagnosis and Treatment Protocol for Novel Coronavirus Pneumonia (Trial Version 7) released by the National Health Commission & State Administration of Traditional Chinese Medicine [12], patients who meet the following 4 criteria can be discharged: 1) body temperature remains normal for more than 3 days; 2) respiratory symptoms exhibit obvious improvement; 3) pulmonary imaging depicts obvious absorption of inflammation; and 4) 2 consecutive nucleic acid-based tests of respiratory tract samples such as sputum or nasopharyngeal swabs are negative (with a sampling interval of at least 24 hours).

Discussion

This single-center observational study included 69 patients with laboratory-confirmed COVID 19, and clinical characteristics and outcomes were compared between elderly patients (aged ≥60 years) and younger patients (aged <60 years). Compared with younger patients, elderly patients were more likely to develop ARDS and cardiac injury, and were more likely to be admitted to the ICU.

Concordant with previous studies [4,13,14], most of the patients in the current study presented with symptoms of respiratory infection. Fever and dry cough were the most common symptoms, but a small minority of patients presented with gastrointestinal symptoms such as diarrhea. In the present cohort, a fecal sample from 1 patient with diarrhea was positive for SARS-CoV-2 RNA. In a recent report, it is suggested that the fecal-oral route is a potential mode of SARS-CoV-2 transmission [15]. In another report, viral shedding in feces was detected for nearly 5 weeks after the patients’ respiratory samples tested negative for SARS-CoV-2 RNA [16]. This indicates that routine fecal sample testing is necessary after a patient’s...
Table 1. Baseline characteristics of patients with coronavirus disease 2019 (COVID-19).

| Characteristics | All patients (n=69) | Younger patients (n=44) | Elderly patients (n=25) | P       |
|-----------------|--------------------|-------------------------|-------------------------|---------|
| Age, median (IQR), years | 52 (37–63) | 44 (34–51) | 65 (62–71) | <0.001 |
| Sex, No. (%)     |                    |                         |                         | 0.344   |
| Female           | 41 (60)            | 28 (63.6)               | 13 (52)                 |         |
| Male             | 28 (40.6)          | 16 (36.4)               | 12 (48)                 |         |
| Exposure history, No. (%) |          |                         |                         | >0.99   |
| Huanan Seafood Wholesale Market exposure | 2 (2.9) | 1 (2.3) | 1 (4) |         |
| Living in Hubei Province | 35 (50.7) | 15 (34.1) | 20 (80) | <0.001 |
| Had contact with people from Hubei Province | 25/34 (73.5) | 20/29 (69) | 5/5 (100) | 0.293   |
| Had contact with patients | 40 (58) | 26 (59.1) | 14 (56) | 0.803   |
| No clear exposure history | 2 (2.9) | 2 (4.5) | 0 | 0.531   |
| Smoking history | 17 (25) | 6 (13.6) | 7 (28) | 0.143   |
| Any comorbidity, No. (%) | 21 (31) | 9 (20.5) | 12 (48) | 0.091   |
| Hypertension | 16 (23.2) | 8 (18.2) | 8 (32) | 0.191   |
| Diabtes | 9 (13) | 3 (6.8) | 6 (24) | 0.029   |
| Cardiovascular disease | 5 (7.2) | 1 (2.3) | 4 (16) | 0.103   |
| Cerebrovascular disease | 7 (10.1) | 1 (2.3) | 6 (24) | 0.090   |
| Malignancy | 2 (2.9) | 0 | 2 (8) | 0.128   |
| Chronic obstructive pulmonary disease | 1 (1.4) | 0 | 1 (4) | 0.362   |

| Signs and symptoms at admission, No. (%) |           |               |               |       |
|-----------------|-----------|---------------|---------------|-------|
| Fever           | 50 (72.5) | 33 (75)       | 17 (68)       | 0.532 |
| Dry cough       | 36 (52.2) | 20 (45.5)     | 16 (64)       | 0.138 |
| Shortness of breath | 17 (24.6) | 8 (18.2)     | 9 (36)        | 0.099 |
| Fatigue         | 12 (17.4) | 6 (13.6)      | 6 (24)        | 0.275 |
| Diarrhea        | 8 (11.6) | 5 (11.4) | 3 (12) | 0.755 |
| Sputo            | 1 (1.4) | 0 | 1 (4) | 0.763 |
| Muscle ache      | 7 (10.1) | 7 (15.9)     | 0 | 0.091 |
| Headache        | 7 (10.1) | 7 (15.9)     | 0 | 0.091 |
| Sore throat     | 6 (8.7) | 3 (6.8) | 3 (12) | 0.772 |
| Anorexia        | 5 (7.2) | 4 (9.1) | 1 (4) | 0.763 |
| Runny nose      | 5 (7.2) | 4 (9.1) | 1 (4) | 0.763 |
| Chest pain      | 1 (1.4) | 1 (2.3) | 0 | >0.99 |
| Onset of symptom to first hospital admission, median (IQR), days | 4 (2–7) | 4 (2–7) | 6.5 (3–7) | 0.379 |
| Respiratory rate >24 breaths per min | 13 (18.8) | 6 (13.6) | 7 (28) | 0.252 |
| Heart rate, median (IQR), beat per minute | 84 (77–100) | 84 (78–100) | 80 (76–96) | 0.569 |
| Mean arterial pressure, median (IQR), mmHg | 96 (86–102.3) | 95 (85.5–102) | 97 (92–101.5) | 0.691 |

Data are presented as numbers (%) or median (IQR).
Table 2. Laboratory and chest imaging findings on admission of patients with coronavirus disease 2019 (COVID-19).

| Variables                          | All patients (n=69) | Younger patients (n=44) | Elderly patients (n=25) | Normal range   | P     |
|-----------------------------------|---------------------|-------------------------|-------------------------|----------------|-------|
| White blood cell count, median    | 4.7 (3.9–6.5)       | 4.8 (3.9–6.4)           | 4.6 (3.8–6.4)           | 3.5–9.5        | 0.917 |
| (IQR), ×10⁹/L                     |                     |                         |                         |                |       |
| <4                               | 21/67 (31.3)        | 13/42 (31)              | 8/25 (32)               |                | 0.929 |
| 4–10                             | 42/67 (62.7)        | 28/42 (66.7)            | 14/25 (56)              |                | 0.383 |
| >10                              | 4/67 (6)            | 1/42 (2.4)              | 3/25 (12)               |                | 0.283 |
| Neutrophil count, median (IQR),   | 3 (2.4–4.7)         | 3.2 (2.4–4.3)           | 2.9 (2.4–4.7)           | 1.8–6.3        | 0.881 |
| ×10⁹/L                            |                     |                         |                         |                |       |
| Lymphocyte count, ×10⁹/L          | 1.1 (0.8–1.4)       | 1.2 (0.8–1.5)           | 1 (0.8–1.3)             | 1.1–3.2        | 0.171 |
| <1.0                             | 27/67 (40.3)        | 14/42 (33.3)            | 13/25 (52)              |                | 0.132 |
| ≥1.0                             | 40/67 (59.7)        | 28/42 (66.7)            | 12/25 (48)              |                |       |
| Hemoglobin, median (IQR), g/L     | 130 (124–141.5)     | 132.5 (127–143)         | 125 (111–130)           | 115–150        | 0.006 |
| Platelet count, median (IQR),     | 176 (144.5–263.3)   | 176.5 (156.5–222.3)     | 176 (134–288)           | 125–350        | 0.851 |
| ×10⁹/L                            |                     |                         |                         |                |       |
| <100                             | 4/67 (6)            | 2/42 (4.8)              | 2/25 (8)                |                | 0.994 |
| ≥100                             | 63/67 (94)          | 40/42 (95.2)            | 23/25 (92)              |                |       |
| Prothrombin time, median (IQR),   | 11.7 (10.9–12.3)    | 11.6 (10.9–12.4)        | 11.8 (11.1–12)          | 9.4–12.5       | 0.946 |
| s                                |                     |                         |                         |                |       |
| Activated partial thromboplastin  | 29.8 (26.7–32)      | 30.2 (28.3–31.5)        | 29.2 (25.3–33)          | 25.1–36.5      | 0.436 |
| time, median (IQR), s             |                     |                         |                         |                |       |
| D-dimer, median (IQR), mg/L       | 0.3 (0.2–0.5)       | 0.2 (0.1–0.3)           | 0.4 (0.2–1.1)           | 0–0.5          | 0.005 |
| Alanine aminotransferase, median  | 20.5 (15–34)        | 20.5 (14.5–33)          | 20.5 (16–34)            | 5–35           | 0.578 |
| (IQR), U/L                        |                     |                         |                         |                |       |
| Aspartate aminotransferase, median| 25 (17–35)          | 24.5 (16–32)            | 28 (21–39)              | 13–35          | 0.081 |
| (IQR), U/L                        |                     |                         |                         |                |       |
| Creatine kinase, median (IQR),    | 64.5 (53.5–113.3)   | 63.5 (52.3–113)         | 70 (59.3–99.3)          | 26–140         | 0.614 |
| U/L                               |                     |                         |                         |                |       |
| Glucose, median (IQR), mmol/L      | 5.4 (4.9–6.9)       | 5.3 (4.8–6.9)           | 5.4 (5.2–7.2)           | 3.9–6.1        | 0.174 |
| ≤6.1                              | 42/66 (63.6)        | 28/42 (66.7)            | 14/24 (58.3)            |                | 0.498 |
| >6.1                              | 24/66 (36.4)        | 14/42 (33.3)            | 10/24 (41.7)            |                |       |
| Creatine, median (IQR), μmol/L    | 68 (58.3–82)        | 66.5 (58–81.5)          | 71.5 (60.6–85.9)        | 45–84          | 0.617 |
| ≤133                              | 65/66 (98.5)        | 42/42 (100)             | 23/24 (95.8)            |                | 0.364 |
| >133                              | 1/66 (1.5)          | 0                      | 1/24 (4.2)              |                |       |
| Urea nitrogen, median (IQR), mmol/L| 4.3 (3.4–5.4)     | 3.8 (3.2–4.6)           | 5.4 (4.6–6.2)           | 2.8–7.2        | <0.001|
| ≤5.5                              | 15/26 (57.7)        | 9/18 (50)               | 6/18 (33.3)             |                |       |
| >5.5                              | 11/26 (42.3)        | 6/18 (33.3)             | 9/18 (50)               |                |       |
| Lactate dehydrogenase, median     | 199 (154–259)       | 162 (144–230)           | 238.5 (201.5–266.5)     | 110–240        | 0.002 |
| (IQR), U/L                        |                     |                         |                         |                |       |
| ≤245                              | 35/53 (66)          | 26/35 (74.3)            | 9/18 (50)               |                | 0.077 |
| >245                              | 18/53 (34)          | 9/35 (25.7)             | 9/18 (50)               |                |       |
Table 2 continued. Laboratory and chest imaging findings on admission of patients with coronavirus disease 2019 (COVID-19).

| Variables                                      | All patients (n=69) | Younger patients (n=44) | Elderly patients (n=25) | Normal range | P   |
|------------------------------------------------|---------------------|-------------------------|-------------------------|--------------|-----|
| **Creatinine, median (IQR), mg/dL**            | 10 (7 – 13)         | 10 (7 – 12)             | 9 (5.3 – 13.2)          | 0 – 25       | 0.572 |
| ≤25                                            | 51/53 (96.2)        | 35/35 (100)             | 16/18 (88.9)            | 0.111        |
| >25                                            | 2/53 (3.8)          | 0                       | 2/18 (11.1)             |              |
| **Erythrocyte sedimentation rate, median (IQR), mm/h** | 38 (18 – 56)       | 22 (13 – 51)            | 44.5 (38 – 74)          | 0 – 20       | 0.035 |
| ≤20                                            | 9/29 (31)           | 8/17 (47.1)             | 1/12 (8.3)              | 0.043        |
| >20                                            | 20/29 (69)          | 9/17 (52.9)             | 11/12 (91.7)            |              |
| **HCRP, median (IQR), mg/L**                   | 11.5 (3 – 30.1)     | 9.9 (2.7 – 24)          | 26.8 (8.9 – 53.9)       | 0 – 3        | 0.013 |
| **Procalcitonin, median (IQR), ng/mL**         | 0.04 (0.03 – 0.09)  | 0.04 (0.03 – 0.06)      | 0.06 (0.04 – 0.15)      | 0 – 0.5      | 0.014 |
| ≤0.5                                           | 49/50 (98)          | 29/29 (100)             | 20/21 (95.2)            |              | 0.42  |
| ≥0.5                                           | 1/50 (2)            | 0                       | 1/21 (4.8)              |              |      |
| **Bilateral involvement on chest radiographs, No. (%)** | 54 (78.3)          | 38 (86.4)               | 16 (64)                 | 0.348        |

HCRP – hypersensitive C-reactive protein. Data are presented as numbers (%) or median (IQR).

In previous studies, older age has been reported as an important independent predictor of mortality in COVID-19 [20–22]. A multi-center study that analyzed the complete clinical data of 171 adult patients with COVID-19 found that older age, higher sequential organ failure assessment score, and elevated D-dimer at admission were risk factors for death [22]. Another study based on the data of 154 elderly patients with COVID-19 from 26 provinces of China showed that age was an independent risk factor for mortality (adjusted odds ratio=1.04) [20]. In our study, the death rate in elderly patients was higher than that in younger patients, but was not statistically significant. The reason may be related to the small sample size of our study and that we were missing outcome data on 3 patients at the final date of follow-up. In the present cohort, comorbidities and ICU admissions were more frequent in elderly patients, which is consistent with studies from China and other countries with severe epidemics [4,5,8,23–25]. In a case series of 1591 consecutive patients with COVID-19 admitted to ICUs in Lombardy, Italy, the proportion of elderly patients (>60 years) reached 60.4% [24]; similar data was also reported in China. In our study, elderly patients have a lower ICU admission rate because we included severe and non-severe patients in our study population. It is also notable that elderly patients were more likely to develop a myocardial injury than younger patients, which may be associated with a higher number of elderly patients having underlying cardiovascular diseases and becoming critically ill, although the underlying mechanisms involved are uncertain. Acute cardiac injury and heart failure could be major risk factors for fatality in patients with COVID-19.

Notably, 6 patients in the present cohort had no symptoms on the first visit. They underwent RT-PCR testing because they were on the same flight as a patient with confirmed infection. In another study conducted in China, an infected individual never developed symptoms but shed a similar amount of virus as those who did [17], suggesting that an asymptomatic person could easily transmit the pathogen via coughs or sneezes. Such asymptomatic infections may have contributed substantially to the rapid virus spread observed around the world. The implementation of effective social isolation measures may currently be the only way to stop the virus from spreading [18].

With regard to laboratory tests, more than 40% of the patients in the present cohort exhibited reduced absolute lymphocyte counts upon admission. Recent data indicate that CD4 and CD8 T lymphocytes have significant differences in mild (non-ICU) and severe or critical (ICU) cases without glucocorticoid treatment [19]. Damage to T lymphocytes may contribute to exacerbation in some patients. According to the Diagnosis and Treatment Protocol for Novel Coronavirus Pneumonia [12], a low absolute lymphocyte count could be used as a reference index in the diagnosis of COVID-19 in the clinic. Immunomodulators such as thymosin α1 and intravenous immunoglobulins may improve patients’ immune function, but stronger evidence of this is required.

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with COVID-19, in addition to ARDS [23,26], indicating that elderly patients are more vulnerable to heart damage when infected with SARS-CoV-2. Particular attention should be paid to cardiovascular protection during treatment for COVID-19 [26].

The current study had several limitations. Only 69 patients were included, and all were treated at the same hospital in Wuhan. Larger studies involving more patients have been published elsewhere [13], but the analysis of clinical characteristics in elderly patients in the present study did yield informative data. Other study limitations are the retrospective nature of the study and missing laboratory data for some patients that may have led to bias in analyzing clinical characteristics. Lastly, due to the limited number of patients, they were not

Table 3. Treatments, complications and outcomes of patients with coronavirus disease 2019 (COVID-19).

| Treatment, No. (%) | All patients (n=69) | Younger patients (n=44) | Elderly patients (n=25) | P |
|--------------------|---------------------|-------------------------|------------------------|---|
| Antiviral treatment | 64 (92.8)           | 41 (93.2)               | 23 (92)                | 0.763 |
| Arbidol            | 47 (68.1)           | 34 (77.3)               | 13 (52)                | 0.03 |
| Lopinavir/ritonavir| 41 (59.4)           | 29 (65.9)               | 12 (48)                | 0.145 |
| Oseltamivir        | 15 (21.7)           | 8 (18.2)                | 7 (28)                 | 0.342 |
| Interferon alpha inhalation | 7 (10.1) | 6 (13.6) | 1 (4) | 0.39 |
| Traditional Chinese medicine | 31 (44.9) | 22 (50) | 9 (36) | 0.261 |
| None               | 5 (7.2)             | 3 (6.8)                 | 2 (8)                  | 0.763 |
| Antibiotics        | 55 (79.7)           | 32 (72.7)               | 23 (92)                | 0.056 |
| Corticosteroid     | 25 (36.2)           | 17 (38.6)               | 8 (32)                 | 0.582 |
| Gamma globulin     | 15 (21.7)           | 9 (20.5)                | 6 (24)                 | 0.731 |
| Oxygen support, No. (%) |                     |                         |                        |     |
| Nasal cannula      | 63 (91.3)           | 40 (90.9)               | 23 (92)                | 0.772 |
| Non-invasive ventilation or high-flow nasal cannula | 9 (13) | 6 (13.6) | 3 (12) | 0.859 |
| Invasive mechanical ventilation | 7 (10.1) | 2 (4.5) | 5 (20) | 0.103 |
| ECMO               | 1 (1.4)             | 1 (2.3)                 | 0                      | >0.99 |
| Complications, No. (%) |                     |                         |                        |     |
| Acute respiratory distress syndrome | 14 (20.3) | 5 (11.4) | 9 (36) | 0.014 |
| Cardiac injury     | 8 (11.6)            | 1 (2.3)                 | 7 (28)                 | 0.005 |
| Acute kidney injury| 6 (8.7)             | 2 (4.5)                 | 4 (16)                 | 0.239 |
| Secondary infection| 6 (8.7)             | 4 (9.1)                 | 2 (8)                  | 0.772 |
| Multiple organ dysfunction syndrome | 7 (10.1) | 2 (4.5) | 5 (20) | 0.103 |
| Admission to intensive care unit | 9 (11.6) | 2 (4.5) | 6 (24) | 0.042 |
| Median length of hospital stay | 13.5 (10–18) | 14 (10–20) | 13 (11–15.3) | 0.374 |
| Prognosis, No. (%) |                     |                         |                        |     |
| Discharge from hospital | 60 (87) | 40 (90.9) | 20 (80) | 0.357 |
| Death              | 6 (8.7)             | 2 (4.5)                 | 4 (16)                 | 0.239 |
| Hospitalization    | 3 (4.3)             | 2 (4.5)                 | 1 (4)                  | 0.612 |

ECMO – extracorporeal membrane oxygenation. Data are presented as numbers (%) or median (IQR).
grouped based on disease severity. Further studies are warranted to investigate clinical characteristics in elderly patients with COVID-19 in an effort to reduce mortality.

Conclusions

Compared with younger patients with confirmed COVID-19, elderly patients were more likely to develop ARDS and cardiac injury, and were more likely to be admitted to the ICU. In addition to routine monitoring and respiratory support, cardiac monitoring and supportive care are crucial for elderly patients.

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Conflicts of interest

None.