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***Retrospective Study***

**Clinical features of elderly patients with COVID-19 in Wuhan, China**

Wei S e*t al*. Clinical features of elderly COVID-19 patients

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**Abstract**

BACKGROUND

Elderly patients with coronavirus disease 2019 (COVID-19) who have comorbidities, frailty or profound disabilities experience poor outcomes. We analyzed the clinical characteristics of elderly patients from Wuhan who had COVID-19 during the early stages of the pandemic.

AIM

To identify factors affecting the early mortality of elderly patients with COVID-19.

METHODS

The records of 234 patients who were 65-years-old or more and were hospitalized in Wuhan Huoshenshan Hospital from February 4 to March 4, 2020 were reviewed. All patients had confirmed COVID-19 and the final date of follow-up was April 4, 2020.

RESULTS

There were 163 cases of mild disease (69.66%), 39 cases of severe disease (16.67%) and 32 cases of critical disease (13.68%). Twenty-nine patients died within 1 mo (12.40%), all of whom had critical disease. Surviving patients and deceased patients had no significant differences in age or chronic diseases. Overall, the most common symptoms were fever (65.4%), dry cough (57.3%), fatigue (47.4%) and shortness of breath (41%). The deceased patients had higher levels of multiple disease markers (C-reactive protein, D-dimer, lactate dehydrogenase, alanine amino transferase, aspartate aminotransferase, creatinine kinase and creatinine kinase-MB) and higher incidences of lymphocytopenia and hypoproteinemia.

CONCLUSION

This single-center study of elderly patients from Wuhan, China who were hospitalized with COVID-19 indicated that age and chronic diseases were not associated with mortality. Hypertension, diabetes and cardiovascular disease were the most common comorbidities and the most common symptoms were fever, dry cough, fatigue and shortness of breath. Lymphocytopenia, increased levels of D-dimer and other markers indicative of damage to the heart, kidneys or liver were associated with an increased risk of death.

**Key Words:** Elderly; COVID-19; Chronic underlying diseases; Clinical features; Supportive treatment

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**Core Tip:** The records of 234 patients who were 65-years-old or more and were hospitalized in Wuhan Huoshenshan Hospital because of coronavirus disease 2019 from February 4 to March 4, 2020 were reviewed. The results indicated that age and chronic disease were not associated with an increased risk of mortality. Hypertension, diabetes and cardiovascular disease were the most common comorbidities, and the most common symptoms were fever, dry cough, fatigue and shortness of breath. Lymphocytopenia and increased levels of D-dimer and other markers indicative of damage to the heart, kidneys or liver were associated with an increased risk of death.

**INTRODUCTION**

Coronavirus disease 2019 (COVID-19), which is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was first reported in Wuhan City on Dec 8, 2019. COVID-19 is now a global pandemic that has had significant impact on public health systems worldwide[1,2]. Clinical studies have examined the effects of several antiviral and other pharmaceutical treatments but most available drugs provide limited benefit. Thus, most patients simply receive supportive care. Although there are several effective vaccines, distribution has been difficult and many patients who are already infected still require treatment.

Elderly patients, especially those who are frail or have multiple comorbidities are more susceptible to infection and a poor outcome[3-7]. In this study, we comprehensively examined the clinical and laboratory data of 234 elderly patients (> 65-years-old) who had confirmed COVID-19 and were admitted to Wuhan Huoshenshan Hospital (an emergency field hospital) during the early stages of the pandemic.

**MATERIALS AND METHODS**

***Patients***

All 234 patients were from Wuhan Huoshenshan Hospital, a field hospital designated for the care of patients with COVID-19. This study was approved by the Ethics Committee of Huoshenshan Hospital (No. HSS141, March 8, 2020). All patients were elderly (> 65-years-old), diagnosed with COVID-19, and were enrolled, diagnosed and admitted in accordance with the guidelines of the National Health Commission of China[8]. The final date of follow-up was April 4, 2020. Based on the guidelines of the National Health Commission of China[8], 163 patients had moderate disease, 39 had severe disease and 32 had critical disease. Twenty-nine patients (12.4%) died within 1 mo of admission.

***Data collection***

The medical records of all patients were analyzed by the team at the Second Ward of the Infection Department at Huoshenshan Hospital No. 4. All clinical, laboratory and outcome data were obtained from the electronic medical records and were recorded and reviewed by a trained team of physicians. The information recorded included medical history, underlying comorbidities, symptoms, signs and laboratory findings. The date of disease onset was defined as the day when the patient first noticed symptoms.

***Statistical analysis***

Continuous variables were expressed as medians and interquartile ranges (IQRs) and categorical variables as frequencies and percentages. The means of continuous variables were compared using a *t*-test for independent groups when the data had normal distributions, and using the Mann-Whitney test when the data had non-normal distributions. The proportions of categorical variables were compared using the Chi-square test. All statistical analyses were performed using SPSS version 23.0 (IBM Corp., Armonk, NY, United States). A two-tailed *P* value below 0.05 was considered significant.

**RESULTS**

***Baseline demographic and clinical characteristics of patients***

We examined the records of 234 elderly patients with COVID-19 (Table 1). The median age was 70 years (IQR: 67-75); 52.1% of the patients were male and 29 patients (12.4%) died within 1 mo. The deceased patients (19 men and 10 women) were all critically ill at admission and their median age was 72 years (IQR: 68-75.5). Comparison of deceased and surviving patients indicated no significant differences in age, sex or major comorbidities. Overall, the most common presenting symptoms were fever (153, 65.4%), dry cough (134, 57.3%), fatigue (111, 47.4%) and shortness of breath (96, 41%). Dry cough was significantly more common in survivors, but deceased patients had higher body temperature, higher heart rate and lower percutaneous oxygen saturation (all *P* < 0.05).

***Laboratory findings***

We analyzed the laboratory data of all patients using samples collected at admission (Table 2). Overall, the surviving patients and deceased patients had significant differences in WBC count, lymphocyte count, C-reactive protein (CRP), D-dimer, prothrombin time, thrombin time, alanine amino transferase (ALT), aspartate amino transferase (AST), albumin (ALB), blood glucose (GLU), blood urea (BUN), creatinine kinase (CK), lactate dehydrogenase (LDH) and creatinine kinase-MB (all *P* < 0.05).

We also compared the number of patients in each group who had laboratory parameters outside the reference range. Thus, relative to the deceased patients, the surviving patients had a lower prevalence of lymphocytopenia [65 (31.71%) *vs* 23 (79.31%), elevated CRP [117 (57.07%) *vs* 27 (93.10%)], elevated D-dimer [126 (61.46%) *vs* 23 (89.66%), hypoproteinemia [175 (85.36%) *vs* 28 patients (96.55%)], elevated BUN [41 (20.00%) *vs* 14 (48.27%)], elevated serum creatinine [22 (10.73%) *vs* 6 (20.69%)] and elevated LDH [49 (23.90%) *vs* 20 (68.97%)]. Each of these differences was statistically significant based on a Chi-square test (*P* < 0.05).

**DISCUSSION**

In late 2019, clinicians identified several patients with pneumonia caused by an unknown agent in Wuhan (Hubei Province, China). The causative virus, subsequently named SARS-CoV-2[1,9], is now considered responsible for a worldwide pandemic. SARS-CoV-2 has a single positive-sense RNA genome, a diameter of about 50 nm to 200 nm and is in the *Coronaviridae* family. Many viruses in this family cause respiratory tract infections[10]. Since the 1960s, researchers have identified 7 coronaviruses that are responsible for human diseases[11]. SARS-CoV-2 and two other strains of human coronaviruses, SARS-CoV-1 and Middle East respiratory syndrome coronavirus (MERS-CoV), are associated with high mortality rates in humans[12]. We now know that SARS-CoV-2 uses the human ACE2 receptor for viral ingress and primarily infects and replicates in epithelial cells of the nasopharynx, and subsequently gains access to the distal alveolar space[13,14].

Patients with COVID-19 may present with varying degrees of disease severity, from flu-like symptoms to death[15]. The fatality rates vary among geographic regions and are greater in regions with strained healthcare systems[16-18].

Patients with underlying chronic diseases, such as cardiovascular disease (CVD), have a greater risk of SARS-CoV-2 infection and a greater risk of poor outcomes after infection[19,20]. Studies in numerous countries reported higher case fatality rates in the elderly[21-25], possibly because they have an increased prevalence of comorbid conditions and age-related declines in the functions of T-cells and B-cells[26]. The present single-center study of 234 hospitalized elderly patients with confirmed COVID-19 indicated that most patients (69.66%) had mild disease. Among all patients, 29 patients died within 1 month, all of whom had critical disease. Most of our elderly COVID-19 patients had underlying chronic diseases (77.35%), and the most common chronic diseases were hypertension, diabetes and CVD. The most common symptoms in our patients were fever, dry cough, fatigue and shortness of breath, and the most common laboratory abnormalities were hypoproteinemia and elevated levels of CRP and D-dimer. Notably, our deceased patients had more laboratory abnormalities than the survivors.

There is still a limited understanding of the pathogenesis of COVID-19. Direct viral toxicity, endothelial cell damage, thrombo-inflammation, dysregulation of the immune response and dysregulation of the renin-angiotensin-aldosterone system all appear to function in the pathophysiology of COVID-19[27-30]. Our analysis of elderly patients indicated that mortality at 1 mo was not significantly associated with advanced age or co-morbidities. We therefore speculate that a weak immune response may not increase the risk for excessive inflammation during the early onset of COVID-19 in elderly patients. However, as the disease progresses, organ dysfunction and possibly multiple organ dysfunction and other complications, such as nosocomial infections, increase the risk of mortality.

Meticulous supportive care is currently the most beneficial treatment for patients with COVID-19[31]. Du *et al*[32] demonstrated that basic supportive care, not experimental therapies, was the most important determinant of survival in COVID-19 patients who had critical disease. Clinicians should select a treatment profile based on each individual because the optimal treatment may depend on an individual’s status and the clinician should aim to reduce complications by management of symptoms as the patient improves. Upon admission of elderly patients with functional impairment of the heart, liver or kidneys, the selection of supportive treatment should consider multiple pharmacokinetic and pharmacodynamic factors. Thus, the clinician should consider interventions that control the illness and are prudent for elderly patients. The precise pathogenesis and optimal therapy for COVID-19 remain unclear, but we believe it is crucial for clinicians to use proven standards of care. The current pandemic provides an opportunity to learn how to best treat patients and test different therapies. Trials of experimental therapies are certainly justified when properly conducted, but untried combinations of different therapies may increase the risk of harm. COVID-19 threatens a substantial portion of the world’s population and is an especially serious concern for the elderly. In view of the characteristics of COVID-19 in elderly patients, control of underlying chronic diseases, maintenance of organ function and rational use of drugs (especially antibiotics) are keys to treatment. The pandemic response remains hamstrung by our limited understanding of how to generate effective immunity, particularly in the elderly. COVID-19 is a serious threat to the elderly and these patients deserve more attention because a safe and effective vaccine may be their only lifeline.

This study has several limitations. First, we only examined 234 elderly patients from Wuhan who had confirmed COVID-19. It is necessary to examine more patients from multiple geographic areas to provide a more comprehensive understanding of the effect of COVID-19 in the elderly. Second, more detailed patient information, particularly regarding clinical outcomes, was unavailable at the time of our analysis of respiratory tract specimens. Third, we only analyzed the mortality rate of patients within 1 mo of admission. In fact, the mortality rate of elderly patients increases as the duration of disease increases. Therefore, it is necessary to identify additional risk factors for poor outcome and to make long-term observations of the natural history of COVID-19 in elderly patients.

**CONCLUSION**

This single-center study of elderly patients from Wuhan, China who were hospitalized with COVID-19 indicated that age and chronic disease were not associated with mortality within 1 month of admission. Lymphocytopenia, and increased levels of D-dimer and other markers of damage to the heart, kidneys or liver were associated with increased risk of death. The COVID-19 epidemic has persisted for more than 2 years and is likely to remain a problem for a long time. Elderly patients with COVID-19 continue to have considerable shorter-term and long-term morbidity and mortality. Further study of the characteristics of such patients may lead to improvements in their clinical management.

**ARTICLE HIGHLIGHTS**

***Research background***

Patients with coronavirus disease 2019 (COVID-19) can present with a wide range of symptoms and different degrees of severity. Although most patients are asymptomatic or have mild disease, some patients develop a severe form of the disease. Previous studies showed that disease severity was correlated with several risk characteristics, such as older age. In view of this, we analyzed the clinical characteristics of elderly patients from Wuhan who had COVID-19 during the early stages of the pandemic.

***Research motivation***

To evaluate the factors affecting early mortality of elderly patients with COVID-19 in Wuhan, China.

***Research objectives***

To identify factors affecting the mortality of elderly patients with COVID-19 within 1 mo after admission.

***Research methods***

The records of 234 COVID-19 patients who were 65-years-old or more and were hospitalized in Wuhan Huoshenshan Hospital from February 4 to March 4, 2020 were reviewed.

***Research results***

There were 163 cases of mild disease, 39 cases of severe disease, and 32 cases of critical disease. Twenty-nine patients died within 1 month, all of whom had critical disease. The survivors and deceased had no significant differences in age or chronic diseases. Fever, dry cough, fatigue and shortness of breath were the most common symptoms. Elevated levels of multiple disease markers (C-reactive protein, D-dimer, lactate dehydrogenase, alanine amino transferase, aspartate aminotransferase, creatinine kinase and creatinine kinase-MB) and the prevalence of lymphocytopenia and hypoproteinemia were more common in the deceased patients.

***Research conclusions***

Our study of elderly patients who were hospitalized with COVID-19 indicated that age and chronic disease were not associated with mortality. Hypertension, diabetes and cardiovascular disease were the most common comorbidities, and the most common symptoms were fever, dry cough, fatigue and shortness of breath. Lymphocytopenia and increased levels of D-dimer and other markers were indicative of damage to the heart, kidneys or liver and were associated with an increased risk of death.

***Research perspectives***

We speculate that weak immune responses of elderly patients may not increase their risk for excessive inflammation during the early onset of COVID-19. However, as the disease progresses, organ dysfunction and other complications increase the risk of mortality.

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**Footnotes**

**Institutional review board statement:** The study was reviewed and approved by the Ethics Committee of Fujian Provincial Hospital Institutional Review Board (Approval No. K2020-03-044).

**Conflict-of-interest statement:** The authors have declared that no competing interest exists.

**Data sharing statement:** No additional data are available.

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**Table 1 Demographic and clinical characteristics of elderly COVID-19 patients at admission1**

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| --- | --- | --- | --- | --- |
| **Characteristic** | **Total, *n* = 234** | **Survivors, *n* = 205** | **Deceased, *n* = 29** | ***P* value** |
| Age, yr | 70 (67-75) | 70 (67-74) | 72.0 (68.0-75.5) |  |
| Sex |  |  |  |  |
| Male | 122 (52.1) | 103 (50.2) | 19 (65.5) | 0.16 |
| Female | 112 (47.9) | 102 (49.8) | 10 (34.5) |
| Age range, yr |  |  |  |  |
| ≤ 79 | 207 (88.5) | 182 (88.8) | 25 (86.2) | 0.68 |
| > 79 | 27 (11.5) | 23 (11.2) | 4 (13.8) |
| Comorbidities |  |  |  |  |
| Diabetes | 50 (21.4) | 40 (19.5) | 10 (34.5) | 0.088 |
| Hypertension | 106 (45.3) | 88 (42.9) | 18 (62.0) | 0.07 |
| Cardiovascular disease | 30 (12.8) | 25 (12.2) | 5 (17.2) | 0.55 |
| Malignancy | 6 (2.56) | 5 (2.44) | 1 (3.44) | 0.55 |
| [Cerebrovascular](javascript:;) disease | 12 (5.13) | 10 (4.88) | 2 (6.90) | 0.65 |
| Asthma | 1 (0.4) | 1 (0.5) | 0 | > 0.99 |
| COPD | 6 (2.6) | 5 (2.4) | 1 (3.4) | 0.55 |
| Chronic kidney disease | 6 (2.6) | 6 (2.9) | 0 | > 0.99 |
| Rheumatologic disease | 4 (1.7) | 4 (2.0) | 0 | > 0.99 |
| Admission signs and symptoms |  |  |  |  |
| Fever | 153 (65.4) | 135 (65.9) | 18 (62.0) | 0.68 |
| Dry cough | 134 (57.3) | 124 (60.5) | 10 (34.5) | 0.009 |
| Shortness of breath | 96 (41.0) | 80 (39.0) | 16 (55.2) | 0.11 |
| Chills | 1 (0.4) | 1 (0.5) | 0 | > 0.99 |
| Fatigue | 111 (47.4) | 98 (47.8) | 13 (44.8) | 0.84 |
| Headache | 4 (1.7) | 4 (2.0) | 0 | > 0.99 |
| Myalgia | 2 (0.9) | 2 (1.0) | 0 | > 0.99 |
| Diarrhea | 5 (2.1) | 3 (1.5) | 2 (6.9) | 0.12 |
| Dyspnea | 7 (3.0) | 6 (2.9) | 1 (3.4) | > 0.99 |
| Body temperature, °C | 36.6 (36.38-36.83) | 36.5 (36.3-36.8) | 36.8 (36.6-37.2) | < 0.0001 |
| Heart rate, bpm | 84 (78-89) | 84 (78-88) | 88 (80-92) | 0.01 |
| Respiratory rate, bpm | 20 (19-22) | 20 (19-22) | 20 (19-22) | < 0.0001 |
| Percutaneous oxygen saturation, % | 96 (92-97.25) | 96 (94-98) | 83 (77.5-94.5) | < 0.0001 |
| Clinical category |  |  |  |  |
| Moderate | 163 (69.7) | 163 (79.5) | 0 | NA |
| Severe | 39 (16.7) | 39 (19.0) | 0 | NA |
| Critical | 32 (13.7) | 3 (1.5) | 29 (100) | NA |

1Data are expressed as *n* (%) or median (interquartile range). NA: Not available.

**Table 2 Laboratory characteristics of elderly patients with COVID-19 at admission1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Characteristic** | **Reference range** | **Total, *n* = 234** | **Survivors, *n* = 205** | **Deceased, *n* = 29** | ***P* value** |
| White blood cells, × 109/L | 3.5-9.5 | 5.9 (4.8-8.3) | 5.6 (4.6-6.9) | 8.4 (6.8-11.4) | < 0.0001 |
| Lymphocytes, × 109/L | 1.1-3.2 | 1.2 (0.9-1.6) | 1.3 (1.0-1.7) | 0.6 (0.4-0.9) | < 0.0001 |
| Platelets, × 109/L | 125-350 | 239 (177-300) | 244 (186-303) | 163 (112-271) | 0.1400 |
| C-reactive protein, mg/L | 0-4 | 6.4 (1.9-34.2) | 5.4 (1.6-20.7) | 100.0 (25.4-153.5) | < 0.0001 |
| D-dimer, mg/L | 0-0.55 | 0.69 (0.44-1.24) | 0.64 (0.4-1.035) | 3.88 (0.895-7.245) | 0.0025 |
| Prothrombin time, s | 9.2-15.0 | 13.2 (12.4-13.9) | 13.0 (12.3-13.7) | 14.7 (13.9-16.2) | < 0.0001 |
| Activated partial thromboplastin time, s | 21-37 | 28.3 (26.1-30.2) | 28.3 (26.2-30.0) | 28.8 (24.9-31.6) | 0.8000 |
| Fibrinogen, g/L | 2-4 | 3.2 (2.8-3.7) | 3.2 (2.8-3.6) | 3.3 (2.8-4.2) | 0.1500 |
| Thrombin time, s | 10-20 | 16.0 (15.1-16.9) | 15.9 (15.0-16.6) | 16.89 (15.7-17.9) | 0.0007 |
| Alanine aminotransferase, IU/L | 9-50 | 23.2 (15.5-36.0) | 22.3 (15.1-34.0) | 31.1 (18.5-48.8) | 0.0004 |
| Aspartate aminotransferase, IU/L | 15-40 | 21.8 (16.4-28.6) | 21.4 (16.1-26.9) | 30.6 (19.6-46.0) | < 0.0001 |
| Albumin, g/L | 40-55 | 35.1 (32.1-37.5) | 35.3 (32.5-37.9) | 32.7 (28.9-35.9) | 0.0008 |
| Blood glucose, mmol/L | 3.9-6.1 | 5.1 (4.6-6.0) | 5.0 (4.5-5.7) | 6.9 (5.2-9.1) | < 0.0001 |
| Blood urea nitrogen, mmol/L | 2.5-6.4 | 4.7 (3.8-6.2) | 4.6 (3.8-5.9) | 6.2 (4.2-9.6) | 0.0008 |
| Creatinine, µmol/L | 40-88 | 64.2 (56.400-76.125) | 63.8 (56.5-74.9) | 65.6 (56.0-81.6) | 0.4300 |
| Uric acid, µmol/L | 112-416 | 265 (210-329) | 267 (217-325) | 257 (173-392) | 0.4700 |
| Creatine kinase, IU/L | 24-170 | 43 (31-73) | 41 (30-69) | 46 (31-147) | < 0.0001 |
| Lactate dehydrogenase, IU/L | 120-250 | 199 (167-267) | 194 (161-241) | 354 (208-470) | < 0.0001 |
| Creatine kinase-MB, IU/L | 0-24 | 9.1 (7.2-12.5) | 9.1 (7.0-12.0) | 12.5 (8.6-20.0) | 0.0008 |

1Data are expressed as *n* (%) or median (interquartile range).



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