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Contents

Thrice Monthly Volume 10 Number 35 December 16, 2022

EVIDENCE REVIEW

12804 Principle and progress of radical treatment for locally advanced esophageal squamous cell carcinoma

Zhang XF, Liu PY, Zhang SJ, Zhao KL, Zhao WX

REVIEW

12812 Minimally invasive techniques in benign and malignant adrenal tumors

Dogrul AB, Cennet O, Dincer AH

12822 Planning issues on linac-based stereotactic radiotherapy

Huang YY, Yang J, Liu YB

MINIREVIEWS

12837 Hepatitis of unknown etiology in children: Current evidence and association

Zhong R, Yi F, Xiang F, Qiu YF, Zhu L, Zou YH, Wang W, Zhang Q

12844 Anatomical basis for pancreas transplantation *via* isolated splenic artery perfusion: A literature review

Dmitriev I, Oganesyan M, Popova A, Orlov E, Sinelnikov M, Zharikov Y

12854 Antenatal imaging: A pictorial review

Ece B, Aydın S, Kantarci M

12875 Real role of growth factor receptor-binding protein 10: Linking lipid metabolism to diabetes cardiovascular complications

Yang Y, Yao HJ, Lin WJ, Huang SC, Li XD, He FZ

ORIGINAL ARTICLE

Retrospective Study

12880 Radiological and clinical outcomes of midline lumbar fusion on sagittal lumbar-pelvic parameters for degenerative lumbar diseases

Wang YT, Li BX, Wang SJ, Li CD, Sun HL

12890 Clinical features of elderly patients with COVID-19 in Wuhan, China

Wei S, Chen G, Ouyang XC, Hong YC, Pan YH

Observational Study

12899 Do inflammatory bowel disease patient preferences from treatment outcomes differ by ethnicity and gender? A cross-sectional observational study

Naftali T, Richter V, Mari A, Khoury T, Shirin H, Broide E

World Journal of Clinical Cases

Thrice Monthly Volume 10 Number 35 December 16, 2022

Contents

12909 Lipoprotein (a) variability is associated with mean follow-up C-reactive protein in patients with coronary artery disease following percutaneous coronary intervention

Zhang SS, Hu WY, Li YJ, Yu J, Sang S, Alsalman ZM, Xie DQ

12920 Efficacy evaluation of neuroendoscopy *vs* burr hole drainage in the treatment of chronic subdural hematoma: An observational study

Wang XJ, Yin YH, Wang ZF, Zhang Y, Sun C, Cui ZM

12928 Optimal approach for total endoscopic discectomy and its effect on lumbar and leg function in patients with disc herniation

Zhang ZH, Du Q, Wu FJ, Liao WB

12936 Value of inflammatory mediator profiles and procalcitonin in predicting postoperative infection in patients with hypertensive cerebral hemorrhage

Yin RH, Zhang B, Zhou XH, Cao LP, Li M

SYSTEMATIC REVIEWS

12946 *De novo* non-alcoholic fatty liver disease after pancreatectomy: A systematic review

Shah P, Patel V, Ashkar M

META-ANALYSIS

12959 Comparative effectiveness of first-line therapies for eradication of antibiotic-resistant *Helicobacter pylori* strains: A network meta-analysis

Zou SP, Cheng Q, Feng CY, Xu C, Sun MH

CASE REPORT

12971 Malignant atrophic papulosis: Two case reports

Li ZG, Zhou JM, Li L, Wang XD

12980 Endoscopic treatment of urothelial encrusted pyelo-ureteritis disease: A case series

Liu YB, Xiao B, Hu WG, Zhang G, Fu M, Li JX

12990 Nearly-complete labial adhesions diagnosed with repetitive cystitis in postmenopausal women: A case report

Kwon H

12996 Congenital dysfibrinogenemia misdiagnosed and inappropriately treated as acute fatty liver in pregnancy: A case report and review of literature

Jia Y, Zhang XW, Wu YS, Wang QY, Yang SL

13006 Lung squamous cell carcinoma presenting as rare clustered cystic lesions: A case report and review of literature

Shen YY, Jiang J, Zhao J, Song J

13015 Management of ductal spasm in a neonate with pulmonary atresia and an intact ventricular septum during cardiac catheterization: A case report

Zhang X, Zhang N, Song HC, Ren YY

World Journal of Clinical Cases

Thrice Monthly Volume 10 Number 35 December 16, 2022

Contents

13022 Symptomatic accessory soleus muscle: A cause for exertional compartment syndrome in a young soldier: A case report

Woo I, Park CH, Yan H, Park JJ

13028 Multiple myeloma presenting with amyloid arthropathy as the first manifestation: Two case reports

He C, Ge XP, Zhang XH, Chen P, Li BZ

13038 Kawasaki disease without changes in inflammatory biomarkers: A case report

Yamashita K, Kanazawa T, Abe Y, Naruto T, Mori M

13044 Atypical Whipple's disease with special endoscopic manifestations: A case report

Chen S, Zhou YC, Si S, Liu HY, Zhang QR, Yin TF, Xie CX, Yao SK, Du SY

13052 Acute limb ischemia after minimally invasive cardiac surgery using the ProGlide: A case series

Lee J, Huh U, Song S, Lee CW

13058 Genetic changes in refractory relapsed acute myeloid leukemia with *NPM1* mutation: A case report

Wang SL

13064 Successful surgical treatment of polybacterial gas gangrene confirmed by metagenomic next-generation sequencing detection: A case report

Lu HY, Gao YB, Qiu XW, Wang Q, Liu CM, Huang XW, Chen HY, Zeng K, Li CX

13074 Pulmonary sarcoidosis: A novel sequelae of drug reaction with eosinophilia and systemic symptoms: A case report

Hu YQ, Lv CY, Cui A

13081 Hammered silver appearance of the corneal endothelium in Fuchs uveitis syndrome: A case report

Cheng YY, Wang CY, Zheng YF, Ren MY

13088 Tracheostomy and venovenous extracorporeal membrane oxygenation for difficult airway patient with carinal melanoma: A case report and literature review

Liu IL, Chou AH, Chiu CH, Cheng YT, Lin HT

13099 Surgery combined with antibiotics for thoracic vertebral *Escherichia coli* infection after acupuncture: A case report

Mo YF, Mu ZS, Zhou K, Pan D, Zhan HT, Tang YH

13108 Multidisciplinary treatment of a patient with severe immune checkpoint inhibitor-induced colitis: A case report

Lu L, Sha L, Feng Y, Yan L

13115 Systemic combined with intravitreal methotrexate for relentless placoid chorioretinitis: A case report

Luo L, Chen WB, Zhao MW, Miao H

13122 Response to roxadustat in a patient undergoing long-term dialysis and allergic to erythropoiesis-stimulating agents: A case report

Xu C, Luo DG, Liu ZY, Yang D, Wang DD, Xu YZ, Yang J, Fu B, Qi AR

13129 Liver collision tumor of primary hepatocellular carcinoma and neuroendocrine carcinoma: A rare case report

Jeng KS, Huang CC, Chung CS, Chang CF

13138 Unexpected delayed reversal of rocuronium-induced neuromuscular blockade by sugammadex: A case report and review of literature

Wang HC, Lu CW, Lin TY, Chang YY

LETTER TO THE EDITOR

13146 Immunoglobulin G4 associated autoimmune cholangitis and pancreatitis and nivolumab

Joob B, Wiwanitkit V

World Journal of Clinical Cases

Thrice Monthly Volume 10 Number 35 December 16, 2022

Contents

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Editorial Board Member of *World Journal of Clinical Cases*, Lovenish Bains, FACS, FICS, FRCS, MBBS, MS, Associate Professor, Surgeon, Teacher, Department of Surgery, Maulana Azad Medical College, New Delhi 110002, India. lovenishbains@gmail.com

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ORIGINAL ARTICLE

Retrospective Study

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

Shuo Wei, Guang Chen, Xiao-Chun Ouyang, Yuan-Cheng Hong, Yun-Hu Pan

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Shuo Wei, Department of Infectious Disease, Shengli Clinical Medical College of Fujian Medical University, Fujian Provincial Hospital, Fuzhou 350000, Fujian Province, China

Guang Chen, Yun-Hu Pan, Department of Respiratory Medicine, 907 Hospital of the Joint Logistics Team, Nanping 353000, Fujian Province, China

Guang Chen, Xiao-Chun Ouyang, Yuan-Cheng Hong, Yun-Hu Pan, No. 4 Infection Department Second Ward, Wuhan Huoshenshan Hospital, Wuhan 430010, Hubei Province, China

Xiao-Chun Ouyang, Department of Respiratory Medicine, 908 Hospital of the Joint Logistics Team, Nanchang 330038, Jiangxi Province, China

Yuan-Cheng Hong, Department of Respiratory Medicine, 910 Hospital of the Joint Logistics Team, Quanzhou 362046, Fujian Province, China

Corresponding author: Yun-Hu Pan, MD, Associate Chief Physician, Department of Respiratory Medicine, 907 Hospital of the Joint Logistics Team, No. 99 Binjiang North Road, Nanping 353000, Fujian Province, China. 18750975908@163.com

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.

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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

Table 1 Demographic and clinical characteristics of elderly COVID-19 patients at admission[1]

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 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

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

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.

Table 2 Laboratory characteristics of elderly patients with COVID-19 at admission[1]

Characteristic	Reference range	Total, *n* = 234	Survivors, *n* = 205	Deceased, *n* = 29	*P* value
White blood cells, × 10^9/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, × 10^9/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, × 10^9/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

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

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

Author contributions: Pan YH and Wei S conceived the structure of the manuscript and wrote the manuscript; Chen G contributed to data collection; Ouyang XC and Hong YC had roles in clinical management; all authors revised the manuscript and approved the final manuscript.

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Country/Territory of origin: China

ORCID number: Shuo Wei 0000-0003-0241-2474; Yun-Hu Pan 0000-0001-7172-8267.

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