Clinical characteristics of COVID-19 in Fujian Province: a multicenter retrospective study

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Research

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Abstract

Background The coronavirus disease 2019 (COVID-19) has spread worldwide, leading to thousands of deaths. We aim to describe the epidemiological and clinical characteristics of patients with coronavirus disease 2019 (COVID-19) in Fujian province, China.

Methods In this retrospective, multi-center study, we collected and analysed 165 patients of COVID-19 confirmed by real time PCR of nasopharyngeal swab specimens in five tertiary hospitals of Fujian province, China from Jan 22 to Feb 16, 2020. The final date of follow-up was February 21, 2020.

Results Of the 165 hospitalized patients with COVID-19, 101 patients had relation with Wuhan within two weeks. Symptoms at illness onset mainly were fever (76.4%), cough (60%) and expectoration (38.2%). On admission, the severity of most patients were classified as mild or common and lymphopenia (33.9%), hypoxemia (15.2%), elevated and bilateral pneumonia (83.6%) was observed. Patients older than 65 years had significantly high frequency of hypertension, diabetes, severe classification, lymphopenia and hypoxemia than those younger than 65 years. Age correlated negatively with lymphocyte count and oxygenation index on admission while positively with duration from exposure to the time of negative RT-PCR. At the end of follow-up, 80 patients were discharged and one died. The median hospital stay was 17 days.

Conclusions Patients with COVID-19 were mostly non-severe cases in Fujian province and older patients (>65 years) were more likely to have lymphopenia and hypoxemia, and to progress as severe cases of COVID-19 than those younger than 65.

Introduction

The coronavirus disease 2019 (COVID-19) has spread throughout China and worldwide, since firstly began in Wuhan, China in December, 2019 [1–3]. The causative pathogen, severe acute respiratory coronavirus 2 (SARS-CoV-2), became the third coronavirus that cause deadly and disruptive epidemic of acute respiratory disease after SARS-CoV (severe acute respiratory syndrome coronavirus) and MERS-CoV (Middle East respiratory syndrome coronavirus) in 21st century [4, 5]. Next-generation sequencing and phylogenetic analysis suggested that SARS-CoV-2 is a novel beta coronavirus from subgenus Sarbecovirus and bats might be its original hosts [6]. The disease could transmit from person to person through respiratory droplets and close contacts [7–9] and the pathogen was also found in excrements of infected patients [10]. As of April 1, 2020, about 823,000 infected patients had been confirmed globally with 40,598 deaths and the global risk has been assessed very high since February 28, 2020 [11].

Several early studies about Wuhan, the initial epicenter of COVID-19, had described that clinical features were mainly fever, cough, dyspnea, myalgia, fatigue, normal or decreased leukocyte counts, and case of fatal mortality rate was as high as 11% or even 15% [12, 13]. Moreover, patients in ICU were mostly older with underlying comorbidities [14], in consistent with two studies that demonstrated older patients (> 65 years) were more likely to develop acute respiratory distress syndrome (ARDS), which increased the risk of death [15, 16], indicating old age is an important factor of COVID-19 infection. In addition, a report showed that symptoms of patients with COVID-19 in Zhejiang province were milder compared with initially infected patients in Wuhan and the clinical features of COVID-19 in Jangsu province and Beijing were also both similar to that in Zhejiang [17–19].

However, no study have revealed the situation of COVID-19 in Fujian province. In this study, we aim to describe the epidemiological and clinical characteristics of COVID-19 during late-January to mid-February 2020 in Fujian Province, China. We also further investigate and provide more evidence to show the effects old age plays in this highly infectious disease.

Methods

Study Design and Participants

We performed a retrospective, multicenter study of165 patients who were enrolled from 22 January 2020 to 16 February 2020 in hospitals responsible for the treatments for CoVID-19 assigned by the government in Fuzhou, Zhangzhou, Xiamen, Putian, Quanzhou of Fujian province. This study was approved by ethical committee in Zhongshan Hospital, Xiamen Branch, Fudan University. In light of the urgent need to collect data, the requirement for informed consent was waived. The clinical outcomes were monitored up to February 21, 2020.

Data Collection

Nasopharyngeal swab specimens from the upper respiratory tract were obtained from all patients on admission and send to the local Centers for Disease Control to test RNA of SARS-CoV-2 by real time reverse transcription polymerase chain reaction (RTPCR). Demographics (age, sex, BMI), exposure history (Wuhan stay history and contact history with confirmed patients), clinical characteristics (ie, comorbidities, symptoms from onset to admission), laboratory findings, radiological characteristics, treatment (ie, antiviral agents, antibiotics corticosteroids, Chinese medicine), and outcomes (hospitalization, discharge or death) from electronic medical records were collected. Clinical outcomes were followed up to February 21, 2020. If data were conflicting or missing from records, we communicated directly with patients or their families to ascertain. Data were checked by a team of professional physician.

Definitions

The date of illness onset was defined as the day when the symptom was noticed and the incubation period was defined as the time from exposure to the illness onset [20]. Familial clusters was identified as situation that two or more patients were infected in the same family within two weeks. We defined the degree of severity of COVID-19 at the time of admission using Curb-65 score.[21] In addition, according to the seventh edition of diagnosis and treatment program of 2019 novel coronavirus pneumonia in China, patients were classified as four forms including mild, common, severe and critically ill. Briefly, the mild and common were non-severe patients who had mild symptoms with or without radiological pneumonia manifestations. Severe and critically ill patients were defined as those who had dyspnea, hypoxemia, worsening of radiological imaging, or severe complications such as ARDS, respiratory failures or shock. The oxygenation index that arterial oxygen pressure (PaO_2) over inspiratory oxygen fraction (FiO_2) less than 300 mm Hg was defined as hypoxemia. Once disease progressed into another more severe form, it was regarded as aggravation.

Statistical Analysis

Continuous variables were presented as median (IQR) and categorical variables as frequency rates and percentage. The differences between older patients (> 65 years) and the young (18–65 years) were also assessed using two-sample independent group *t* tests or Mann-Whitney U test for continuous variables, and χ^2 test or Fisher's exact test for categorical variables. Spearman's correlation test was used for calculation of correlation between age and indicators like lymphocyte count. The SPSS (version 22.0) was applied for all analyses and graphs was generated using Graphpad Prism version 8.0 software. P value < 0.05 was considered statistically significant.

Results

Epidemiological and clinical characteristics

Of the 165 hospitalized patients with SARS-CoV-2 infection, the median age was 44 (IQR 33–59.5, range 19–93; Table 1) years and 81 were men. A total of 102 patients had residing or short traveling history in Wuhan of which one had direct exposure to Huanan seafood market. Eleven (6.6%) patients had close contact with people from Wuhan. Thirteen family clusters were identified and the biggest one involved six persons. Approximately one third patients had coexisting diseases including hypertension (14.5%) and diabetes (8.2%). Naturally, older patients also had significantly higher percentage of comorbidities than the young below 65 years. The median incubation period was 7 (IQR 4–12) days among 84 patients provided the exact contact date. The most common symptoms at onset of illness were fever (76.4%), cough (60%), expectoration (38.2%), and myalgia/fatigue (29.7%). The gastrointestinal symptom diarrhea were occurred in 14 (8.5%) patients and the typical upper respiratory tract symptoms rhinorrhea and nasal congestion were presented in nine (5.5%) patients. Eight asymptomatic patients who had contact with confirmed cases were admitted into hospitals and then confirmed. No significant difference was observed in clinical symptoms and mean arterial pressure between two age groups. The severity

classification of different age groups was showed in Fig. 1A that older patients had high proportion of sever/critical forms.

Table 1

Demographics and epidemiological features of 165 patients with COVID-19.

	All patients (n = 165)	**Age ≤ 65 y (n = 136)**	**Age > 65 y (n = 29)**	**p value**
Age, years	44 (33-59.5)	38 (32–50)	72 (69-79.5)	< 0.001
BMI	23.6 (21.2–26.1) (n = 143)	23.8 (21.3–26.0) (n = 124)	22.8 (20.2–26.2) (n = 19)	0.457
Sex				
Male	92 (55.8)	73 (53.7)	19 (65.5)	0.244
Female	73 (44.2)	63 (46.3)	10 (34.5)	
Exposure history in Wuhan	107 (64.5)	96 (70.6)	11 (37.9)	0.001
≤ 2 weeks	101 (60.8)	90 (66.2)	11 (37.9)	
> 2 week	6 (3.6)	6 (4.4)	0	
Contact with people from Wuhan	11 (6.6)	10 (7.4)	1 (3.4)	0.691
No relation with Wuhan	47 (28.3)	30 (22.1)	17 (58.6)	< 0.001
Family cluster	56 (33.9)	44 (32.4)	12 (41.4)	0.351
Any Comorbidities	64 (38.8)	41 (30.1)	23 (79.7)	< 0.001
Hypertension	24(14.5)	11 (8.1)	13 (44.8)	< 0.001
Diabetes	12 (8.2)	7 (5.1)	6 (20.7)	< 0.001
Respiratory system disease	11 (6.7)	6 (4.4)	5 (17.2)	0.063
Chronic liver disease	10 (6.1)	10 (7.4)	0	0.212
Cardiovascular disease	8 (4.8)	3 (2.2)	5 (17.2)	0.005
Malignant tumour	7 (4.2)	5 (3.7)	2 (6.9)	0.608
Chronic kidney disease	4 (2.4)	4 (2.9)	0	0.440
Current smoking	12 (7.3)	9 (6.6)	3 (10.3)	0.765

Data are median (IQR) or n (%). BMI, body mass index. p values comparing older patients (> 65 years) and the young patients (18–65 years) from Mann-Whitney U test, χ^2 test or Fisher's exact test.

	All patients (n = 165)	Age ≤ 65 y (n = 136)	Age > 65 y (n = 29)	p value
Days of incubation period	7 (4–12) (n = 84)	7 (4–12) (n = 69)	8 (5–12) (n = 15)	0.627
Signs and symptoms				
Heart rate, bpm	85 (78–93)	85 (78–92)	87 (78–96)	0.718
Mean arterial pressure,	96 (90–104)	96 (89–102)	99 (90–108)	0.096
Fever	126 (76.4)	106 (77.9)	20 (69)	0.302
Highest temperature, ℃				0.970
< 37.3	4 (2.4)	4 (2.9)	0	
37.3–38.0	59 (35.8)	49 (36)	10 (24.5)	
38.1–39.0	54 (32.7)	44 (32.4)	10 (34.5)	
> 39.0	7 (4.2)	7 (5.1)	0	
Cough	99.0 (60.0)	81 (59.6)	18 (62.1)	0.838
Expectoration	63 (38.2)	53 (39.0)	10 (34.5)	0.631
Myalgia or fatigue	49 (29.7)	37 (27.2)	12 (41.4)	0.129
Chills	18 (10.9)	16 (11.8)	2 (6.9)	0.742
Shortness of breath	17 (10.3)	13 (19.6)	4 (13.8)	0.504
Chest distress	16 (9.7)	15 (11.0)	1 (3.4)	0.310
Diarrhea	14 (8.5)	11 (8.1)	3 (10.3)	0.714
Dizziness	11 (6.7)	11 (8.1)	0	0.251
Pharyngalgia	10 (6.1)	9 (6.6)	1 (3.4)	1.000
Rhinorrhea and nasal congestion	9 (5.5)	9 (6.6)	0	0.393
Anorexia	5 (3.0)	2 (1.5)	3 (10.3)	0.038
Hemoptysis	3 (1.8)	3 (2.2)	0	0.551
Dyspnoea	1 (0.6)	1 (1)	0	1.000
Asymptomatic cases	8 (4.8)	6 (4.4)	2 (6.9)	0.631

Data are median (IQR) or n (%). BMI, body mass index. p values comparing older patients (> 65 years) and the young patients (18–65 years) from Mann-Whitney U test, χ^2 test or Fisher's exact test.

	All patients (n = 165)	Age ≤ 65 y (n = 136)	Age > 65 y (n = 29)	p value
CURB-65 Score				0.001
0/1/2	126/32/7	111/22/3	15/10/4	

Data are median (IQR) or n (%). BMI, body mass index. p values comparing older patients (> 65 years) and the young patients (18–65 years) from Mann-Whitney U test, χ^2 test or Fisher's exact test.

Laboratory And Radiological Characteristics

Leucopenia was present in 50 (30.3%) patients and lymphopenia in 56 (33.9%) patients on admission (Table 2). Most patients had normal serum levels of procalcitonin (< 0.1 ng/mL) and about half of patients had normal C-reactive protein level (< 10 mg/L) on admission. As for the hepatic and renal functions and blood gas analysis, aspartate aminotransferase, blood urea nitrogen, creatinine kinase level, and lower oxygenation index were all significantly higher in the old group than the young (all $p < 0.05$). In addition, the age correlated negatively with the number of lymphocytes for all 165 patients ($r = 0.114$, $p < 0.001$, Fig. 1B) and also correlated negatively with the oxygenation index($r = 0.101$, $p < 0.001$, Fig. 1C) for 133 patients though the correlations was not strong.

Table 2

Laboratory and radiological findings of 165 patients with COVID-19 in Fujian province.

	All patients (n = 165)	**Age ≤ 65 y (n = 136)**	**Age > 65 y (n = 29)**	**p value**
White blood cell count, × 10⁹/L	4.88 (3.71–6.40)	5.00 (3.75–6.45)	4.45 (3.45–5.70)	0.384
Neutrophil count, × 10⁹/L	3.11 (2.16–4.33)	3.16 (2.15–4.38)	3.05 (2.23–3.92)	0.918
Lymphocyte count, × 10^9/L	1.19 (0.86–1.73)	1.22 (0.91–1.74)	1.03 (0.63–1.36)	0.012
< 1.0	56 (33.9)	42 (30.9)	14 (48.3)	
≥ 1.0	109 (66.1)	94 (69.1)	15 (51.7)	
Platelet count, × 10^9/L	187 (151–235)	192 (157–237)	151 (125–216)	0.005
Albumin g/L	40.2 (36.0-44.3)	40.5 (37.3–44.9)	36.0 (31.0-40.3)	< 0.001
Alanine aminotransferase, U/L	25 (18–35)	26.5 (18.0-35.8)	23.8 (17.5–36.5)	0.377
Aspartate aminotransferase, U/L	26 (21–33)	25 (20–32)	31 (23–47)	0.007
Lactate dehydrogenase, U/L	259 (175–447)	254 (173–436)	327 (209–507)	0.133
Blood urea nitrogen, mmol/L	3.8 (3.0-4.7)	3.6 (2.8–4.3)	4.7 (3.8–5.7)	< 0.001
Creatinine, μmol/L	67 (56–80)	65 (55–79)	75 (63–87)	0.024
Potassium, mmol/L	3.9 (3.6–4.2)	3.9 (3.6–4.2)	3.8 (3.4–4.4)	0.361
Sodium, mmol/L	138 (136–140)	139 (136–141)	137 (134–140)	0.06
Creatine kinase, U/L	68 (43–129)	64 (41–102)	144 (63–192)	< 0.001
Procalcitonin, ng/mL				0.001
< 0.1	142 (86.1)	126 (92.6)	16 (55.2)	
≥ 0.1	23 (13.9)	10 (7.4)	13 (44.8)	

Data are median (IQR) or n (%). Percentages do not total 100% owing to missing data. [a] Data are available for 133 patients with 21 patients (> 65 y). PaO_2, partial pressure of oxygen; SaO_2, arterial oxygen saturation; CT, computed tomography. p values comparing older patients (> 65 years) and the young patients (18–65 years) from two-sample independent group t tests, Mann-Whitney U test, χ^2 test or Fisher's exact test.

	All patients (n = 165)	Age ≤ 65 y (n = 136)	Age > 65 y (n = 29)	p value
C-reactive protein, mg/L				0.009
< 10	73 (44.2)	66 (48.5)	7 (24.1)	
≥ 10	77 (46.7)	57 (41.9%)	20 (69)	
D-dimer	0.23 (0.05–0.38) (n = 152)	0.21 (0.02–0.34) (n = 127)	0.42 (0.16–0.66) (n = 25)	< 0.001
Blood gas analysis[a]				
PaO_2, mm Hg	95.6 (80.0-111.0)	96.4 (84.3-117.8)	77.1 (65.3-106.4)	0.036
SaO_2, mmHg	97.6 (96.0-98.2)	97.8 (97.0-98.3)	96.0 (93.8–97.9)	0.006
oxygenation index, mm Hg	433 (335–507)	446 (352–522)	311 (177–395)	0.001
< 300 mmHg	25 (15.2)	15 (11.0)	10 (34.5)	0.001
≥ 300 mmHg	108 (65.5)	97 (71.3)	11 (37.9)	
Chest CT image at illness onset				
Bilateral distribution	138 (83.6)	109 (80.1)	29 (100)	0.005
Ground-glass opacity	108 (65.4)	91 (66.9)	38 (76.0)	0.394

Data are median (IQR) or n (%). Percentages do not total 100% owing to missing data. [a] Data are available for 133 patients with 21 patients (> 65 y). PaO_2, partial pressure of oxygen; SaO_2, arterial oxygen saturation; CT, computed tomography. p values comparing older patients (> 65 years) and the young patients (18–65 years) from two-sample independent group t tests, Mann-Whitney U test, χ^2 test or Fisher's exact test.

Bilateral abnormalities on chest CT images were detected in 138 (Table 2) patients and ground-glass opacity were presented in 108 patients. Except six patients only had nodules on admission, the others all had abnormalities on chest CT images such as ground-glass opacity, linear opacities, patchy shadows or consolidation as showed in Fig. 2.

Treatments And Outcomes

As showed in Table 3, 14 patients were admitted into intensive care unit, eight of whom developed ARDS. Invasive mechanical ventilation was conducted in five (3.6%) patients and extracorporeal membrane oxygenation (ECMO) was used to one patient who ever had left kidney transplantation. Patients received antiviral treatment, empirical antibiotics, Chinese medicine like Lianhuaqingwen, expectorants accounted

for 100%, 45.5%, 41.2%, and 35.2%, respectively. Particularly, lopinavir/ritonavir was the most given antiviral drug. Many older patients received corticosteroids and immunomodulators like intravenous immunoglobulin than the young (18–65 years).

Table 3

Treatments and outcomes of 165 patients with COVID-19 in Fujian province.

	All patients (n = 165)	**Ag e ≤ 65 y (n = 136)**	**Age > 65 y (n = 29)**	**p value**
Admission to intensive care unit	14 (8.5)	6 (4.4)	8 (27.6)	0.001
Acute respiratory distress syndrome	8 (4.8)	4 (2.9)	4 (13.8)	0.033
Oxygen therapy	79 (47.9)	58 (41.2)	21 (72.4)	0.004
nasal cannula	67 (40.6)	53 (39.0)	14 (48.3)	
Non-invasive mechanical ventilation or high-flow nasal cannula	7 (4.2)	3 (2.2)	4 (13.8)	
Invasive mechanical ventilation	4 (3.0)	1 (0.7)	3 (10.3)	
Invasive mechanical ventilation and ECMO	1 (0.6%)	1 (0.7)	0	
Treatments				
Antiviral therapy	165 (100)	136 (100)	29 (100)	-
Use of lopinavir/ritonavir	159 (96.4)	132 (97.1)	27 (93.1)	0.623
Antibiotics therapy	75 (45.5)	57 (41.9)	18 (62.1)	0.048
Chinese medicine	68 (41.2)	55 (40.4)	13 (44.8)	0.663
Expectorants	58 (35.2)	43 (31.6)	15 (51.7)	0.040
Corticosteroid	29 (17.6)	17 (12.5)	12 (41.4)	< 0.001
Intravenous immunoglobulin	29 (17.6)	13 (9.6)	16 (55.2)	< 0001
Prognosis				0.006
Discharge	80 (48.5)	72 (52.9)	8 (27.6)	
Hospitalization	84 (50.9)	64 (47.1)	20 (69)	
Death	1 (0.6)	0	1(3.4)	
Aggravation during hospitalization	11 (6.7)	5 (3.7)	6 (20.7)	0.004
Days from admission to discharge	17 (13–20)	16 (12–20)	22 (15.5–24)	0.038

Data are median (IQR) or n (%). ECMO, extracorporeal membrane oxygenation. p values comparing older patients (> 65 years) and the young patients (18–65 years) from Mann-Whitney U test, χ^2 test or Fisher's exact test.

By the end of follow-up, 84 patients were still in hospitalization and 11 patients had distinctively course aggravation (median age 75 years), leading to one death who was 84-year-old with hypertension and cerebral infraction. The median period from admission to discharge was 17 days and the mortality of older patients was 3.4%. Interestingly, one suspected patient sustained negative nucleic acid results till the fifth detection. In 35 discharged patients who had clear exposure time, their ages showed a positive correlation with the interval from exposure to negative turn of nucleic acid ($r = 0.258$, $p = 0.002$, Fig. 1D).

Discussion

Here we report a multi-center case series enrolled in 165 patients with confirmed SARS-CoV-2 infection in Fujian province, presenting the status of the COVID-19 outside Wuhan. Compared with the considerable proportion of critically ill cases and mortality in Wuhan [12, 13, 16], most patients in our study were non-severe with mild to moderate symptoms and older people were more likely to develop as severe or critical cases once infected.

A large proportion of patients had Wuhan exposure history due to the rapidly movement of population during traditional Chinese lunar new year. One third of infected patients were related to family clusters implying that avoiding transmission in family is urgent for control the pandemic. Moreover, reports has found the existence of asymptomatic patients [8] and covert coronavirus infections with mild or no symptoms could spread the virus [22], suggesting more studies on the asymptomatic cases are of great importance to understand and control this pandemic. In addition, the median incubation period was 7 days in Fujian province, longer than 5.2 days in one study found in early outbreak and 4 days in Zhejiang Province [17, 23], which maybe associate with the immunity of population or the size of our cohort.

Pathological findings revealed that count of peripheral CD4 and CD8 T cells were substantially decreased in COVID-19 with ARDS [24], suggesting lymphocyte count was a critical factor associated with disease severity and mortality. Our results demonstrated that many older patients was severe or critical cases and older age negatively correlated with lymphocyte count to some extent, which was consistent with SARS and MERS, implying that one of the potential risk factor of SARS-CoV-2 was older age[25–27]. The high probability of lymphopenia and hypoxemia of older patients may help illustrate why they were at high risk of severe form or even death.

In this study, most patients received antiviral drug lopinavir/ritonavir which had been reported to have the potential to treat SARS infections [28], however, the first trial of lopinavir/ritonavir in adults with Severe Covid-19 showed no benefits compared patients received standard care [29]. Compared with the young, older patients accounting for most severe cases were more likely to be given corticosteroids and immunomodulators. Although corticosteroid treatment is not routinely recommended for COVID-19, pulmonary pathological results demonstrated that appropriate doses of steroids should be considered an important measure to prevent ARDS development for severe patients [24]. Particularly, one important and special treatment was Chinese medicine whose effects required further exploration. By the end of our

follow-up, the mortality rate was 0.6% far less than that in Wuhan [12, 13]. Only one critically ill patient with kidney transplantation history received ECMO treatment and eight patients developed ARDS among all cases, indicating that extensive quarantine and tracing policies taken by the government promoted early detection of infected people, which was meaningful for blocking the disease course timely.

Our results also showed age correlated positively with the period from exposure to the time when nucleic acid detection turned negative, that's to say, the older, the time of viral shedding maybe longer, indirectly showing that older patients require more time to recover. One patient was tested negative nucleic acid results till the fifth detection, pointing out a small number of infected patients may be falsely discharged or excluded which was due to sampling methods, sensitivity of detection kit, and human error [19, 30].Therefore, it's necessary and cautious for suspected patients to be under quarantine and apply for further nucleic acid and specific antibody detection and follow up chest CT dynamically. Last but not least, for discharged patients, although they had improvements in radiological findings and no respiratory symptoms like cough, which decreased the transmission possibility, continuing quarantine at home and avoid close contact with others for another two weeks is essential as well.

The study has several limitations. Firstly, only 29 older patients confirmed with COVID-19 were enrolled in the study, so it may be not representative enough. Secondly, nearly half of patients are still hospitalized at the end of follow up, it is difficult to further figure out the true mortality and further assess risk factors for poor prognosis. Thirdly, we only did univariate analysis between age and some parameters without considering potential confounding factors, so further multivariate analysis maybe more persuasive.

Conclusions

Compared with patients infected with SRAS-CoV-2 in Wuhan, our study suggests most patients with COVID-19 from Fujian province are not severe and the mortality rate is extremely low, which are similar with other provinces in China except Hubei. Older patients tend to have more comorbidities, lymphopenia, hypoxemia, and long viral shedding time, which may could explain why they are more likely to progress into severe or critical form and have higher risk of death than patients younger, indicating patients with old age require close medical monitoring and care in clinical practice. Additionally, more factors of patients related with the severity of COVID-19 are needed in the future.

Abbreviations

COVID-19: The coronavirus disease 2019; SARS-CoV-2: Severe acute respiratory syndrome coronavirus; SARS-CoV: Severe acute respiratory syndrome coronavirus; MERS-COV: Middle East respiratory syndrome coronavirus; ARDS: Acute respiratory distress syndrome; ICU: Intensive care unit; IQR: Interquartile ranges; SPSS: Statistical product and service solutions; PaO□: oxygenation index that arterial oxygen pressure; FiO□: inspiratory oxygen fraction; ECMO: Extracorporeal membrane oxygenation.

Declarations

Ethics approval and consent to participate

Ethical committee in Zhongshan Hospital, Xiamen Branch, Fudan University approved this study.

Consent for publication

Not applicable.

Availability of data and materials

All data generated or analysed during this study are included in this published article.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

SW, ZC, YL, LL, QL and SF designed and undertook most of the work including analysis, interpretation, and drafting the manuscript. YS, XZ, YY and TW involved in data collection and data check. CS obtained funding. HZ and CS are co-corresponding authors who were involved in conception, design, supervision, and final manuscript reviewing. All authors have contributed to the last version of the manuscript. The authors read and approved the final manuscript.

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Figures

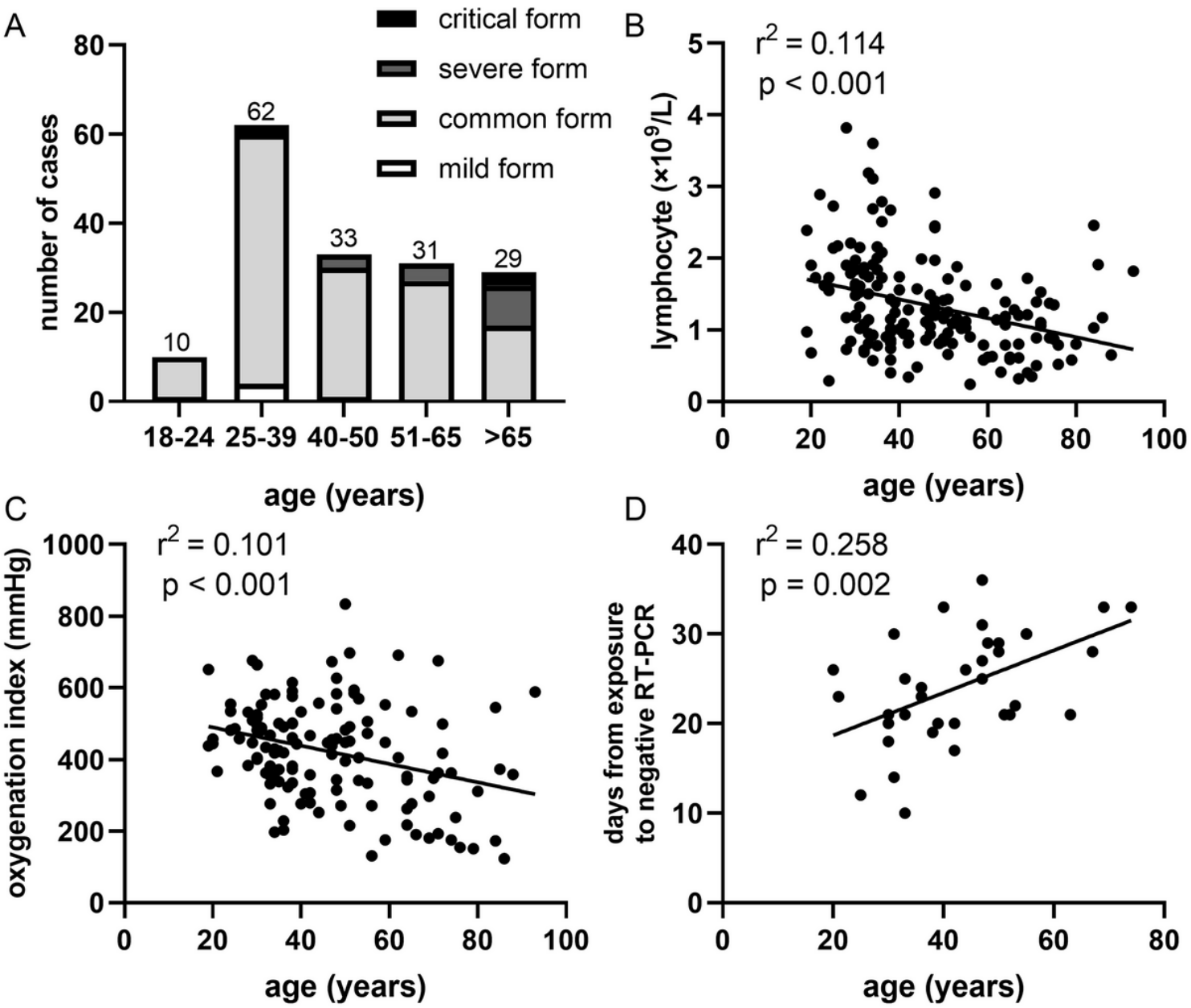

Figure 1

1 Representative thoracic CT images of two patients. (A-B) CT images from a 71-year-old woman showing bilateral focal ground-glass opacities (GGOs) close to subpleural at day 3 after illness onset (A) and multiple patchy shadows with increasing GGOs at day 10 after illness onset (B). (C-D) CT images of

a 48-year-old man showing bilateral patchy shadows and multiple GGOs at day 9 after illness onset (C), and the GGOs was absorbed mostly leaving linear opacities or fibrous stripes at day 18 after illness onset (D).

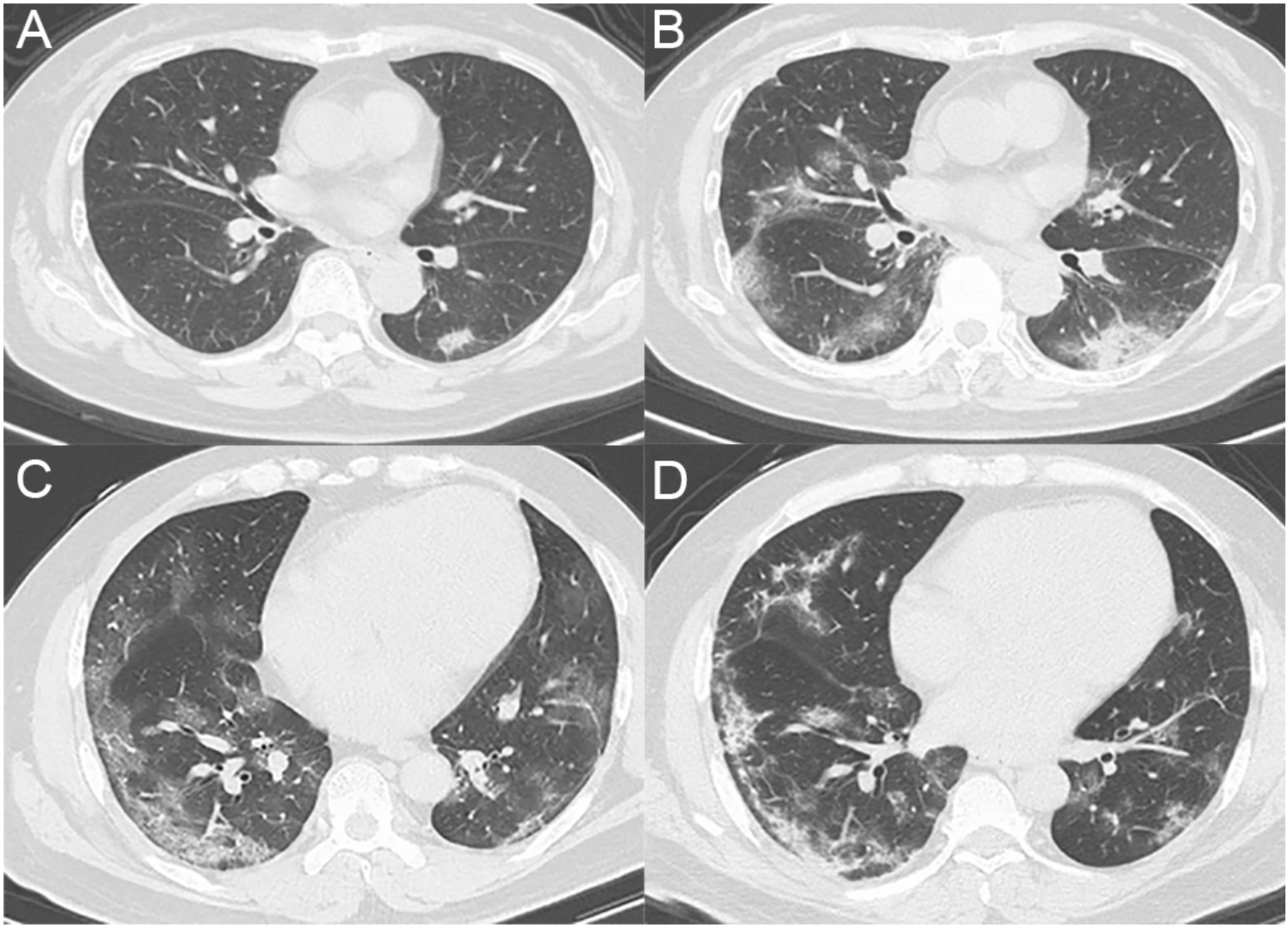

Figure 2

Number of age distribution, clinical classification and correlation between age and lymphocyte count, oxygenation index in patients with COVID-19. (A) In different age groups, number of confirmed patients and the distribution of four clinical classifications, (B) correlation between age and blood lymphocyte absolute number on admission in all cases; (C) correlation between age and oxygenation index on admission in 133 patients, (D) correlation between age and the duration from exposure to the time when nucleic acid result turned negative truly in 35 discharged patients.