

## **Radiographic Findings and other Predictors in Adults with Covid-19**

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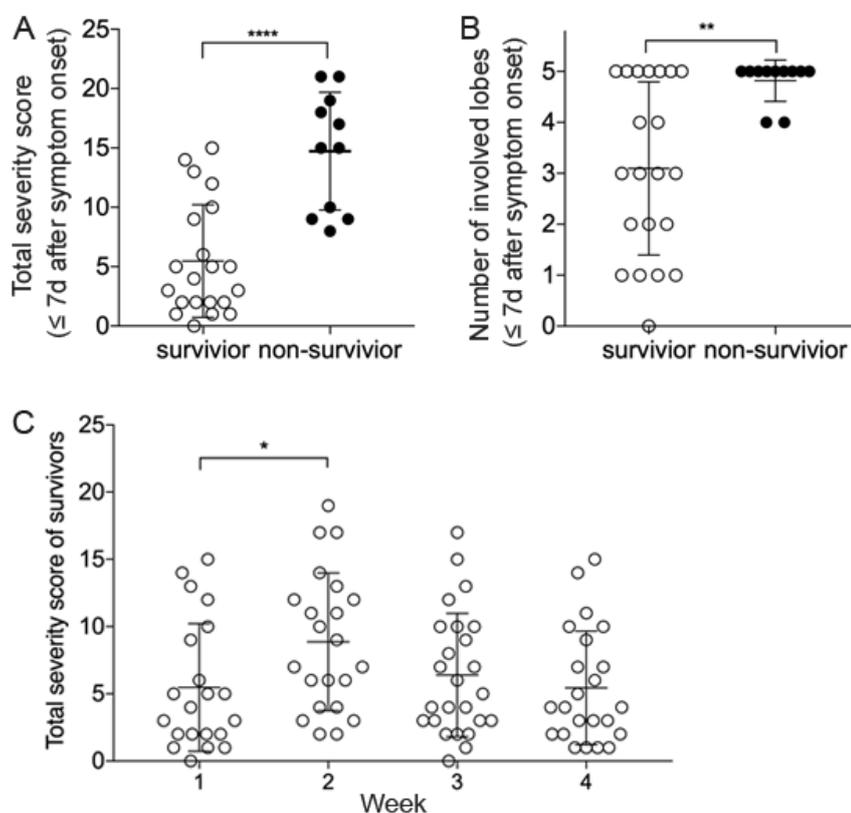
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As of March 20, 2020, there were 234,073 confirmed cases of coronavirus disease 2019 (Covid-19) and 9,840 deaths worldwide <sup>1</sup>. Older age and elevated d-dimer are reported risk factors for Covid-19 <sup>2,3</sup>. However, whether early radiographic change is a predictor of fatality remains unknown. We retrospectively reviewed records of all laboratory-confirmed patients admitted to a quarantine unit at Tongji Hospital, a large regional hospital in Wuhan, China, between January 31 and March 5, 2020. The Tongji Hospital ethics committee approved this study.

A total of 128 patients were admitted. 102 patients were confirmed to have severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection using RNA detection. As of March 20, 82 confirmed patients were discharged, 15 died, and 5 remained hospitalized. The median age was 57 years (range, 27 - 85), 59 (58%) were male, and 44 (43%) patients had a comorbidity. The most common symptoms were fever, cough, and dyspnea (Table S1). When compared with survivors, non-survivors were older and more likely to have lymphopenia, elevated lactate dehydrogenase

(LDH), elevated d-dimer, and increased hypersensitive troponin I (Table S1, S2). In a multivariate regression model that included these predictors, older age and elevated LDH were independent risk factors for fatality (Table S3).



**Figure 1. Total severity score and the number of involved lung lobes in CT images. A-B,** total severity score (A) and the number of involved lung lobes (B) for CT images of survivors and non-survivors within the first week ( $\leq 7$ d) after symptom onset. **C,** total severity score for CT images of survivors over the 4 weeks after symptom onset. Values of survivors and non-survivors are presented with open and closed circles, respectively. Mann-Whitney U test was used to compare the values of survivors in Week 1 with those of non-survivors, and with those of survivors in Week 2, 3, 4, respectively. \*\*\*\*,  $p < 0.0001$ ; \*\*,  $p < 0.01$ ; \*,  $p < 0.05$ .

Twenty-one survivors and 11 non-survivors had CT scans within the first week. We used severity score to quantify the extent of lung opacification as described in the

Supplementary Appendix. The total severity score and number of involved lung lobes within the first week were significantly greater in non-survivors compared to survivors (Table S4). Using univariate logistic regression analysis, higher total severity score ( $\geq 15$ ) (odds ratio 53, 95% CI 3-369;  $p = 0.003$ ), and more involved lung lobes (5 involved lobes) (9, 2-53;  $p = 0.016$ ) in CT images within the first week were significantly associated with fatality (Figure 1A B, Table S5). Moreover, in this subset of patients with CT data within the first week, higher total severity score was the only independent risk factor in a multivariate analysis incorporated the predictors discussed above (older age, lymphocytopenia, elevated LDH, elevated d-dimer, and increased troponin I) (Table S5). For survivors with serial CT scans performed over four weeks, total severity score peaked in the second week (Figure 1C, Table S4).

This report suggests that the extent of lung lesions in early CT images is a potential predictor of poor outcome of Covid-19. This will help clinicians to identify the patients with poor prognosis at early stage.

## References:

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## Supplementary Appendix

### Radiographic Findings and other Predictors in Adults with Covid-19

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## **Methods**

### **Study Population and Data Collection**

This retrospective study was approved by the institutional ethics board of Tongji Hospital of Huazhong University of Science and Technology. Written informed consent was waived. The study included all patients with laboratory-confirmed COVID-19 admitted to a quarantine unit of Tongji Hospital, a large regional hospital in Wuhan, China, between January 31 and March 5, 2020. COVID-19 patients were diagnosed according to World Health Organization (WHO) interim guideline <sup>1</sup>. Confirmed cases were defined by the positive findings in reverse-transcriptase–polymerase-chain-reaction (RT-PCR) assay of throat swab specimens. Clinical characteristics, laboratory test results, and treatment information were extracted from electronic medical records. All laboratory testing and radiological examination were performed according to the clinical care needs of the patient.

### **RT-PCR for SARS-CoV-2**

Throat swab specimens were tested for SARS-CoV-2 using real-time RT-PCR according to the WHO protocol <sup>3</sup>. The following primers and probes were used for real-time RT-PCR detection of N gene of SARS-CoV-2: N forward primer 5'-GAGCCTTGAATACACCAAAG-3', N reverse primer 5'-GCACGATTGCAGCATTGTTAGCAGGATT-3', N probe 5'-FAMCACATTGGCACCCGCAATCC-MGB-3'. Positive results were confirmed in two independent real-time RT-PCR assays.

### **Chest CT Protocols and Evaluation**

High-resolution transverse CT images were obtained using Optima 660 (GE Medical

System, Milwaukee, USA) or Somatom Definition AS+ (Siemens Healthineers, Forchheim, Germany). Tube voltage was 100 or 120 kV, and automatic tube current modulation was 100 - 400 mA. All images were reconstructed with a slice thickness of 1.0mm or 1.25mm. The CT images were reviewed by two radiologists (ZW and NW) who were blinded to the final outcome of the patients. Images were reviewed independently. Any disagreements were resolved by discussion and consensus.

A scoring system was used to estimate the extent of lung opacification based on the area involved <sup>2</sup>. Each of the five lung lobes was visually scored from 0 to 5 as: 0, no involvement; 1, < 5% involvement; 2, 5% - 25% involvement; 3, 26% - 49% involvement; 4, 50% - 75% involvement; 5, > 75% involvement. The total severity score was the sum of scores of each lobe, ranging from 0 (no involvement) to 25 (maximum involvement).

### **Statistical Analysis**

Statistical analysis was done with SPSS Statistics Software (version 26; IBM, New York, USA). Continuous variables were presented as median (IQR) and analyzed using Mann-Whitney U test; categorical variables were presented as number (%) and analyzed by  $\chi^2$  test or Fisher's exact test between survivors and non-survivors where appropriate. Univariable and multivariable logistic regression models were used to estimate odds ratios and the 95% confidence intervals of the risk factors associated with fatal outcome. A two-sided  $\alpha$  of less than 0.05 was considered statistically significant.

**Table S1. Demographics and baseline characteristics of patients with Covid-19**

	Total (n=102)	Non-survivor (n=15)	Survivor (n=87)	p value
<b>Characteristics</b>				
Age, years	57(45-70)	69(58-77)	55(44-66)	0.003
<65	70 (69%)	6 (40%)	64 (74%)	0.010
≥65	32 (31%)	9 (60%)	23 (26%)	
Sex				0.188
Female	43 (42%)	4 (27%)	39 (45%)	
Male	59 (58%)	11 (73%)	48 (55%)	
Any Comorbidity	44 (43%)	9 (60%)	35 (40%)	0.153
Diabetes	15 (15%)	2 (13%)	13 (15%)	0.871
Hypertension	31 (30%)	7 (47%)	24 (28%)	0.138
Coronary heart disease	4 (4%)	2 (13%)	2 (2%)	0.042
Chronic obstructive pulmonary disease	2 (2%)	1 (7%)	1 (1%)	0.155
Malignancy	5 (5%)	0 (0%)	5 (6%)	1.000
Chronic liver disease	3 (3%)	0 (0%)	3 (3%)	1.000
Other	28 (27%)	5 (33%)	23 (26%)	0.580
Current smoker	7 (7%)	1 (7%)	6 (7%)	0.974
<b>Signs and symptoms</b>				
Fever	94 (92%)	14 (93%)	80 (92%)	0.854
Highest temperature, °C	38.6(38.0-39.0)	38.5(38.0-38.9)	38.6(38.0-39.0)	0.458
Chills	23 (23%)	3 (20%)	20 (23%)	0.798
Cough	77 (75%)	13 (87%)	64 (74%)	0.276
Sputum	26 (25%)	6 (40%)	20 (23%)	0.163
Dyspnea	52 (51%)	7 (48%)	45 (52%)	0.717
Hemoptysis	5 (5%)	1 (7%)	4 (5%)	0.732
Chest pain	7 (7%)	1 (7%)	6 (7%)	0.974
Headache	18 (18%)	3 (20%)	15 (17%)	0.796
Fatigue	35 (34%)	5 (33%)	30 (34%)	0.931
Nausea	6 (6%)	1 (7%)	5 (6%)	0.889
Diarrhea	18 (18%)	4 (27%)	14 (16%)	0.321
Myalgia	24 (24%)	3 (20%)	21 (24%)	0.727
Systolic pressure, mm Hg	129.0(112.0-144.0)	144.0(126.0-170.0)	127.0(112.0-141.0)	0.009
Heart rate, beats per minute	93.0(80.0-103.0)	102.0(86.0-111.0)	92.0(80.0-103.0)	0.161
Respiratory rate	20.0(20.0-24.0)	24.0(21.0-25.0)	20.0(20.0-23.0)	0.003
>20 breaths per min	47 (46%)	12 (80%)	35 (40%)	0.004
Time from symptom onset to hospital admission, days	11.0(7.0-16.0)	9.0(6.0-14.0)	11.0(8.0-18.0)	0.291

Data are median (IQR), n (%), or n/N (%), where N is the total number of patients with available data. p values comparing survivor with non-survivor were calculated by  $\chi^2$  test, Fisher's exact test, or Mann-Whitney U test, as appropriate. Covid-19, coronavirus disease 2019.

**Table S2. Laboratory findings of patients with Covid-19 on admission**

	Normal range	Total (n=102)	Non-survivor (n=15)	Survivor (n=87)	p value
White blood cell count, $\times 10^9/L$	4.00-10.00	6.0(4.4-8.6)	9.1(5.5-11.2)	5.8(4.4-8.1)	0.011
<4		11 (11%)	1 (7%)	10 (11%)	0.019
4-10		75 (74%)	8 (53%)	67 (78%)	
>10		16 (15%)	6 (40%)	10 (11%)	
Neutrophil count, $\times 10^9/L$	1.80-6.30	4.2(2.9-6.8)	8.0(3.5-10.6)	4.1(2.8-6.2)	0.006
Lymphocyte count, $\times 10^9/L$	1.10-3.20	0.9(0.6-1.2)	0.5(0.4-0.8)	0.9(0.7-1.2)	0.006
<1.1		66 (65%)	12 (80%)	54 (62%)	0.180
$\geq 1.1$		36 (35%)	3 (20%)	33 (38%)	
Hemoglobin, g/L	130.0-175.0	128.0(115.0-138.0)	120.0(110.0-135.0)	128.0(115.0-139.0)	0.571
Platelet count, $\times 10^9/L$	125.0-350.0	194.0(152.0-250.5)	113.0(97.0-165.0)	206.5(162.0-267.5)	0.001
<125		16/101 (16%)	9 (60%)	7/86 (8%)	0.000
$\geq 125$		85/101 (84%)	6 (40%)	79/86 (92%)	
Lactate dehydrogenase, U/L	135-225	294.5(219.3-417.5)	569.0(362.0-664.0)	272.0(205.0-383.0)	0.000
$\leq 225$		27 (26%)	1 (7%)	26 (30%)	0.060
>225		75 (74%)	14 (93%)	61 (70%)	
D-dimer, $\mu g/mL$	$\leq 0.5$	0.8(0.5-1.7)	2.1(1.2-4.4)	0.7(0.4-1.5)	0.000
$\leq 0.5$		28 (27%)	1 (7%)	27 (31%)	0.002
>0.5 to $\leq 1$		29 (28%)	1 (7%)	28 (32%)	
>1		45 (45%)	13 (86%)	32 (37%)	
Prothrombin time, s	11.5-14.5	14.2(13.7-14.8)	14.9(14.1-17.1)	14.1(13.6-14.5)	0.001
<14.5		65 (64%)	4 (27%)	61 (70%)	0.001
$\geq 14.5$		37 (36%)	11 (73%)	26 (30%)	
International Ratio, INR	0.80-1.20	1.08(1.04-1.15)	1.16(1.08-1.37)	1.08(1.02-1.12)	0.001

Hypersensitive troponin I, pg/mL	≤34.2	5.2(2.2-16.2)	24.1(13.0-202.1)	4.3(2.0-10.6)	0.00
	≤34.2	88/101 (87%)	8 (53%)	80/86 (93%)	0
	>34.2	13/101 (13%)	7 (47%)	6/86 (7%)	0
NT-proB-type Natriuretic Peptide (BNP), pg/mL	<241	131.0(53.5-355.8)	817.5(348.5-3031.0)	92.5(42.3-266.5)	0.00
	<241	64/100 (64%)	1/14 (7%)	63/86 (73%)	0
	≥241	36/100 (36%)	13/14 (93%)	23/86 (27%)	0
Albumin, g/L	35-52	34.8(31.7-39.5)	31.5(28.5-34.0)	36.5(32.5-39.8)	0.00
	<35	52 (51%)	13 (97%)	39 (45%)	2
	≥35	50 (49%)	2 (13%)	48 (55%)	0.00
Alanine aminotransferase, U/L	≤41	23.0(14.0-34.3)	17.0(13.0-29.0)	23.0(14.0-35.0)	0.22
	≤41	86 (84%)	14 (93%)	72 (83%)	3
	>41	16 (16%)	1 (7%)	15 (17%)	0.29
Aspartate aminotransferase, U/L	≤40	26.0(19.0-41.8)	34.0(24.0-54.0)	25.0(19.0-38.0)	0.18
	≤40	75 (74%)	9 (80%)	66 (76%)	7
	>40	27 (26%)	6 (20%)	21 (24%)	0.19
Total bilirubin, μmol/L	≤26	8.5(6.6-11.6)	8.4(6.6-15.3)	8.5(6.6-11.4)	0.75
	≤26	89 (87%)	9 (60%)	80 (92%)	2
	>26	13 (13%)	6 (40%)	7 (8%)	0.01
Creatinine, μmol/L	59-104	68.0(59.5-84.3)	94.0(63.0-164.0)	67.0(58.0-84.0)	0.01
	≤104	89 (87%)	9 (60%)	80 (92%)	4
	>104	13 (13%)	6 (40%)	7 (8%)	0.00
Blood urea nitrogen, mmol/L	3.6-9.5	4.6(3.2-6.2)	9.2(5.4-13.7)	4.3(3.2-5.5)	0.00
	≤9.5	91 (89%)	8 (53%)	83 (96%)	0
	>9.5	11 (11%)	7 (47%)	4 (4%)	0.00
Potassium, mmol/L	3.50-5.10	4.2(3.8-4.5)	4.4(3.6-5.1)	4.1(3.8-4.5)	0.17
	<3.5	13 (13%)	2 (13%)	11 (13%)	1
	3.5-5.1	81 (79%)	9 (60%)	72 (83%)	0.01

>5.1		8 (8%)	4 (27%)	4 (4%)	
Sodium, mmol/L	136-145	137.7(135.8-141.1)	138.6(133.9-142.6)	137.6(136.0-141.1)	0.97
<136		26 (25%)	5 (33%)	21 (24%)	0.24
136-145		74 (73%)	9 (60%)	65 (75%)	8
>145		2 (2%)	1 (7%)	1 (1%)	
Calcium, mmol/L	2.20-2.55	2.1(2.0-2.2)	2.0(1.9-2.2)	2.1(2.1-2.3)	0.00
<2.2		70 (69%)	14 (93%)	56 (64%)	0.02
≥2.2		32 (31%)	1 (7%)	31 (36%)	6
Procalcitonin, ng/mL	<0.05	0.06(0.03-0.15)	0.19(0.12-0.60)	0.05(0.03-0.10)	0.00
<0.05		40 (39%)	0 (0%)	40 (46%)	0.00
≥0.05		62 (61%)	15 (100%)	47 (54%)	0
High-sensitivity C-reactive Protein (hs-CRP), mg/L	<1	34.0(5.8-86.6)	78.7(51.3-166.3)	25.4(3.9-81.3)	0.00
<3		16 (16%)	0 (0%)	16 (18%)	0.11
≥3		86 (84%)	15 (100%)	71 (82%)	9
IL-1β, pg/ml	<5	4.9(4.0-4.9)	4.5(4.0-4.9)	4.9(4.0-4.9)	0.38
IL-2R, U/ml	223-710	605.5(380.8-896.8)	1166.5(898.8-1788.5)	571.5(353.0-821.8)	0.00
IL-6, pg/ml	<7	4.7(2.2-20.3)	48.4(12.6-154.1)	4.2(1.9-16.4)	0.00
IL-8, pg/ml	<62	10.2(6.7-19.9)	22.0(14.0-28.4)	9.3(6.4-18.6)	0.00
IL-10, pg/ml	<9.1	4.9(4.0-4.9)	4.9(4.0-10.0)	4.9(4.0-4.9)	0.60
TNF-α, pg/ml	<8.1	7.5(5.6-10.1)	13.0(8.3-23.3)	7.3(5.6-9.4)	0.00

Data are median (IQR), n (%), or n/N (%), where N is the total number of patients with available data. p values comparing survivor with non-survivor were calculated by  $\chi^2$  test, Fisher's exact test, or Mann-Whitney U test, as appropriated. Covid-19, coronavirus disease 2019.

**Table S3. Risk factors associated with fatality**

	Univariable OR (95% CI)	p value	Multivariable OR (95% CI)	p value
<b>Demographics and clinical characteristics</b>				
Age, years*	1.07(1.02-1.11)	0.006	1.063(1.006-1.124)	0.031
<65	1 (ref)	..	..	..
≥65	4.17(1.34-13.02)	0.014	..	..
Female sex (vs male)	0.45(0.13-1.52)	0.196	..	..
Comorbidity present (vs not present)				
Diabetes	0.88(0.18-4.34)	0.871	..	..
Hypertension	2.30(0.75-7.03)	0.120	..	..
Coronary heart disease	6.54(0.85-50.54)	0.072	..	..
Other	1.39(0.43-4.50)	0.582	..	..
Current smoker	0.96(0.11-8.63)	0.974		
<b>Laboratory findings</b>				
White blood cell count, × 10 <sup>9</sup> /L	1.29(1.07-1.56)	0.008	..	..
<4	0.84(0.09-7.43)	0.873	..	..
4-10	1 (ref)	..	..	..
>10	5.03(1.44-17.54)	0.011	..	..
Neutrophil count, × 10 <sup>9</sup> /L*	1.33(1.11-1.59)	0.002	..	..
Lymphocyte count, × 10 <sup>9</sup> /L*	0.17(0.04-0.79)	0.024	..	..
Platelet count, × 10 <sup>9</sup> /L	0.98(0.97-0.99)	0.001	..	..
<125	16.93(4.66-61.51)	0.000	..	..
≥125	1 (ref)	..	..	..
Lactate dehydrogenase, U/L*	1.01(1.00-1.02)	0.000	1.010(1.005-1.015)	0.000
≤225	1 (ref)	..	..	..
>225	5.97(0.75-47.77)	0.092	..	..
D-dimer, µg/mL	1.14(1.04-1.25)	0.007	..	..
≤0.5	1 (ref)	..	..	..
>0.5 to ≤1	0.96(0.06-16.21)	0.980	..	..
>1	10.97(1.35-89.34)	0.025	..	..
Prothrombin time, s	1.08(0.96-1.21)	0.210	..	..
<14.5	1 (ref)	..	..	..
≥14.5	6.45(1.88-22.14)	0.003	..	..
Hypersensitive troponin I, pg/mL	1.00(0.99-1.01)	0.313	..	..
≤34.2	1 (ref)	..	..	..
>34.2	11.67(3.15-43.26)	0.000	..	..

NT-proB-type natriuretic peptide (BNP), pg/mL	1.00(1.00-1.00)	0.706	..	..
<241	1 (ref)	..	..	..
≥241	35.61(4.41-287.68)	0.001	..	..
Albumin, g/L	0.82(0.71-0.93)	0.003	..	..
<35	8.00(1.70-37.60)	0.008	..	..
≥35	1 (ref)	..	..	..
Alanine aminotransferase, U/L	0.97(0.93-1.02)	0.204	..	..
≤41	1 (ref)	..	..	..
>41	0.34(0.04-2.81)	0.319	..	..
Creatinine, μmol/L	1.00(0.99-1.01)	0.535	..	..
≤104	1 (ref)	..	..	..
>104	7.62(2.10-27.68)	0.002	..	..
Blood urea nitrogen, mmol/L	1.12(1.02-1.23)	0.018	..	..
≤9.5	1 (ref)	..	..	..
>9.5	18.16(4.36-75.62)	0.000	..	..
Procalcitonin, ng/mL*	1.86(0.82-4.20)	0.138	..	..
High-sensitivity C-reactive Protein (hs-CRP), mg/L*	1.01(1.00-1.02)	0.005	..	..
IL-2R, U/ml*	1.003(1.001-1.004)	0.001	..	..
IL-6, pg/ml*	1.02(1.01-1.04)	0.002	..	..
TNF-α, pg/ml*	1.19(1.06-1.34)	0.005	..	..

OR=odds ratio. \*Per 1 unit increase.

**Table S4. CT features of patients with Covid-19**

	Week 1 ( $\leq 7$ d) after symptom onset		Week 2 ( $> 7$ d, $\leq 14$ d)	Week 3 ( $>14$ d, $\leq 21$ d)	Week 4 ( $>21$ d, $\leq 28$ d)
	Survivor (n=21)	Non-Survivor (n=11)	Survivor (n=22)	Survivor (n=25)	Survivor (n=23)
<b>Severity score of each lobe</b>					
Right upper lobe	1 (0-1.5)	3 (2-4) ***	2 (1-2)	1 (0.5-2)	1 (0-2)
Right middle lobe	0 (0-1)	2 (1-2)	1 (0-1)	0 (0-1)	0 (0-1)
Right lower lobe	1 (1-3)	3 (3-4)	2.5 (1-3)	1 (1-2.5)	1 (1-2)
Left upper lobe	1 (0-1.5)	3 (1-4)	1.5 (0-3)	1 (0-2)	1 (0-2)
Left lower lobe	1 (0-2.5)	4 (3-5) ***	2 (1-3.25)	1 (1-2.5)	1 (0-2)
<b>Total severity score</b>	4 (2-9.5)	15 (9-19) ****	8 (4-12.25) *	5 (3-10)	4 (2-9)
<15	20 (95.24%)	4 (36.36%) ***	19 (86.36%)	23 (92%)	22 (95.65%)
$\geq 15$	1 (4.76%)	7 (63.64%)	3 (13.64%)	2 (8%)	1 (4.35%)
<b>Number of involved lobes</b>	3 (1.5-5)	5 (4-5) **	4.5 (3-5)	4 (3-5)	3 (2-5)
<5	14 (66.67%)	2 (18.18%) *	11 (50%)	15 (60%)	14 (60.87%)
$\geq 5$	7 (33.33%)	9 (81.82%)	11 (50%)	10 (40%)	9 (39.13%)
<b>Lung involvement</b>					
No involvement	2 (9.52%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Unilateral	4 (19.05%)	0 (0%)	0 (0%)	4 (16%)	3 (13.04%)
Bilateral	15 (71.43%)	11 (100%) *	22 (100%)	21 (84%)	20 (86.96%)
<b>Patterns of opacification</b>					
Ground glass opacity	20 (95.24%)	10 (90.91%)	21 (95.45%)	18 (72%) *	20 (86.96%)
Crazy-paving pattern	2 (9.52%)	5 (45.45%) **	5 (22.72%)	3 (12%)	4 (17.39%)
Consolidation	9 (42.86%)	9 (81.82%) *	15 (68.19%)	14 (56%)	1 (4.35%) **
Reticulation	0 (0%)	2 (18.18%) *	3 (13.64%)	9 (36%) **	15 (65.22%) ***
Pleural effusion	1 (4.76%)	3 (27.27%)	1 (4.55%)	0 (0%)	0 (0%)

<b>Distribution of opacification</b>					
No lesion	2 (9.52%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Peripheral	10 (47.62%)	8 (72.73%)	13 (59.09%)	18 (72%)	17 (73.91%)
Random	6 (28.57%)	0 (0%) *	2 (9.09%)	0 (0%) **	0 (0%) **
Diffuse	3 (14.29%)	3 (21.27%)	7 (31.82%)	7 (28%)	6 (26.09%)
<b>Time between symptom onset and CT scan</b>	4 (2.5-5)	5 (2-6)	11.5 (9-13.25)	18 (16-20)	26 (24-28)

Data are median (IQR), n (%).  $\chi^2$  test, Mann-Whitney U test and Fisher's exact test were used to compare the values of survivors in Week 1 with those of non-survivors, and with those of survivors in Week 2, 3, 4, respectively. \*\*\*\*,  $p < 0.0001$ ; \*\*\*,  $p < 0.001$ ; \*\*,  $p < 0.01$ ; \*,  $p < 0.05$ .

**Table S5. Risk factors associated with fatality of the subset of patients with CT severity scores within the first week after symptom onset**

	Univariable OR (95% CI)	p value	Multivariable OR (95% CI)	p value
<b>Demographics</b>				
Age, years*	1.06(1.01-1.13)	0.027	..	..
<b>Laboratory findings on admission</b>				
Lymphocyte count, × 10 <sup>9</sup> /L*	0.53(0.09-3.03)	0.474	..	..
Lactate dehydrogenase, U/L	1.01(1.00-1.02)	0.003	..	..
≤225	1 (ref)	..	..	..
>225	6.15(0.66-57.60)	0.111	..	..
D-dimer, µg/mL	9.30(1.85-46.74)	0.007	..	..
≤0.5	1 (ref)	..	..	..
>0.5 to ≤1	..	..	..	..
>1	23.33(1.99-273.29)	0.012	..	..
Hypersensitive troponin I, pg/mL	1.00(0.99-1.01)	0.411	..	..
≤34.2	1 (ref)	..	..	..
>34.2	7.50(1.14-49.26)	0.036	..	..
<b>CT findings within the first week after symptom onset</b>				
Total severity score*	1.39(1.12-1.72)	0.003	1.544(1.004-2.374)	0.048
<15	1 (ref)	..	..	..
≥15	35.00(3.32-368.57)	0.003	..	..
Number of involved lung lobes	1.366(1.003-1.860)	0.048	..	..
<5	1 (ref)	..	..	..
=5	9.00(1.52-53.40)	0.016	..	..

OR=odds ratio. \*Per 1 unit increase.

**Table S6. Demographics and baseline characteristics of the subset of patients included in the analysis of CT within the first week after symptom onset**

	Total (n=32)	Non-survivor (n=11)	Survivor (n=21)	p value
<b>Characteristics</b>				
Age, years	58(40-70)	69(57-78)	51(33-70)	0.020
<65	20 (62%)	5 (45%)	15 (71%)	0.149
≥65	12 (38%)	6 (55%)	6 (29%)	
Sex				0.266
Female	13 (41%)	3 (27%)	10 (48%)	
Male	19 (59%)	8 (73%)	11 (52%)	
Any Comorbidity	13 (41%)	6 (55%)	7 (33%)	0.246
Diabetes	5 (16%)	2 (18%)	3 (14%)	0.773
Hypertension	9 (28%)	5 (45%)	4 (19%)	0.115
Coronary heart disease	1 (3%)	1 (9%)	0 (0%)	0.344
Chronic obstructive pulmonary disease	1 (3%)	1 (9%)	0 (0%)	0.344
Malignancy	0 (0%)	0 (0%)	0 (0%)	..
Chronic liver disease	1 (3%)	0 (0%)	1 (5%)	1.000
Other	8 (25%)	4 (36%)	4 (19%)	0.283
Current smoker	3 (9%)	1 (9%)	2 (10%)	0.968
<b>Symptoms and signs</b>				
Fever	30 (94%)	10 (91%)	20 (95%)	0.631
Highest temperature, °C	38.6(38.0-39.0)	38.6(37.6-39.0)	38.5(38.0-39.0)	0.611
Chills	7 (22%)	3 (27%)	4 (19%)	0.593
Cough	23 (72%)	9 (82%)	14 (67%)	0.365
Sputum	8 (25%)	5 (45%)	3 (14%)	0.053
Dyspnea	16 (50%)	5 (45%)	11 (52%)	0.710
Hemoptysis	2 (6%)	1 (9%)	1 (5%)	0.631
Chest pain	2 (6%)	1 (9%)	1 (5%)	0.631
Headache	3 (9%)	1 (9%)	2 (10%)	0.968
Fatigue	8 (25%)	2 (18%)	6 (29%)	0.519
Nausea	1 (3%)	0 (0%)	1 (5%)	1.000
Diarrhea	5 (16%)	3 (27%)	2 (10%)	0.189
Myalgia	7 (22%)	3 (27%)	4 (19%)	0.593
Systolic pressure, mm Hg	129.0(114.0-144.0)	144.0(125.0-171.0)	126.0(112.0-139.0)	0.074
Heart rate, beats per minute	95.0(81.0-110.0)	103.0(86.0-111.0)	86.0(80.0-109.0)	0.367
Respiratory rate	20.0(20.0-24.0)	24.0(20.0-25.0)	20.0(20.0-22.0)	0.022
>20 breaths per min	14 (44%)	8 (73%)	6 (29%)	0.017

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Time from symptom onset to hospital admission, days	10.0(7.0-13.0)	8.0(6.0-14.0)	10.0(7.0-13.0)	0.639
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Data are median (IQR), n (%), or n/N (%), where N is the total number of patients with available data.  $\chi^2$  test, Fisher's exact test, or Mann-Whitney U test were used to compare the values between survivors and non-survivors as appropriate.

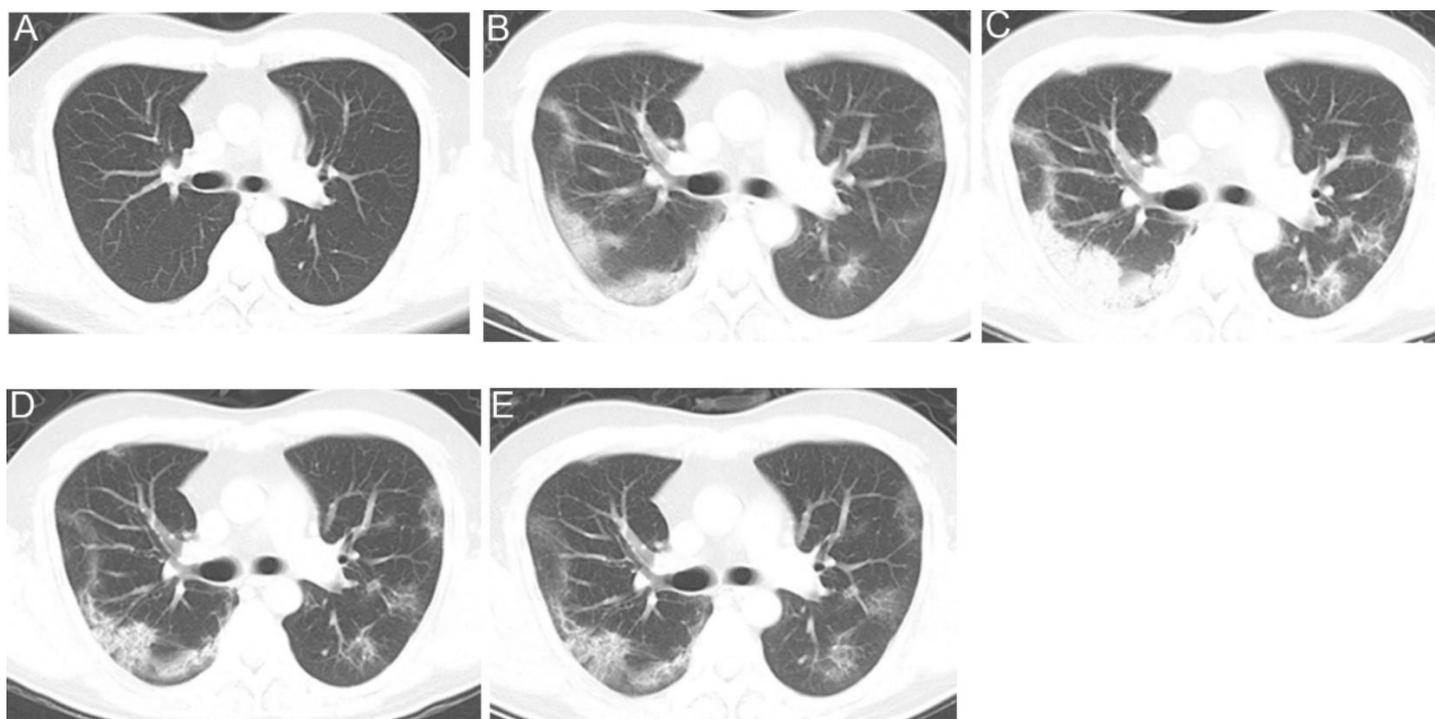
**Table S7. Laboratory findings of the subset of patients included in the analysis of CT within the first week after symptom onset**

	Normal range	Total (n=32)	Non-survivor (n=11)	Survivor (n=21)	p value
White blood cell count, × 10 <sup>9</sup> /L	4.00-10.00	5.2(4.2-8.3)	9.1(6.2-11.8)	4.7(4.1-5.4)	0.000
<4		4 (13%)	0 (0%)	4 (19%)	0.002
4-10		23 (72%)	6 (55%)	17 (91%)	
>10		5 (15%)	5 (45%)	0 (0%)	
Neutrophil count, × 10 <sup>9</sup> /L	1.80-6.30	3.5(2.8-6.9)	8.0(3.5-11.3)	2.9(2.7-4.3)	0.000
Lymphocyte count, × 10 <sup>9</sup> /L	1.10-3.20	0.8(0.5-1.2)	0.7(0.4-1.5)	0.9(0.6-1.2)	0.307
<1·1		22 (69%)	8 (73%)	14 (67%)	0.725
≥1·1		10 (31%)	3 (27%)	7 (33%)	
Hemoglobin, g/L	130.0-175.0	126.5(120.0-140.0)	120.0(110.0-135.0)	129.0(122.5-141.5)	0.113
Platelet count, × 10 <sup>9</sup> /L	125.0-350.0	162.0(124.0-242.0)	124.0(87.0-242.0)	175.0(133.8-287.0)	0.066
<125		8/31 (26%)	6 (55%)	2/20 (10%)	0.007
≥125		23/31 (74%)	5 (45%)	18/20 (90%)	
Lactate dehydrogenase, U/L	135-225	328.0(197.5-541.8)	570.0(440.0-671.0)	261.0(194.5-379.5)	0.001
≤225		9 (28%)	1 (9%)	8 (38%)	0.083
>225		23 (72%)	10 (91%)	13 (62%)	
D-dimer, μg/mL	≤0·5	0.9(0.5-2.0)	2.3(1.6-22.0)	0.6(0.4-0.9)	0.000
≤0·5		8 (25%)	1 (9%)	7 (33%)	0.000
>0·5 to ≤1		11 (34%)	0 (0%)	11 (52%)	
>1		13 (41%)	10 (91%)	3 (15%)	
Prothrombin time, s	11.5-14.5	14.8(13.8-15.4)	15.5(14.8-17.7)	14.3(13.4-15.0)	0.005
<14.5		14 (44%)	2 (18%)	12 (57%)	0.035

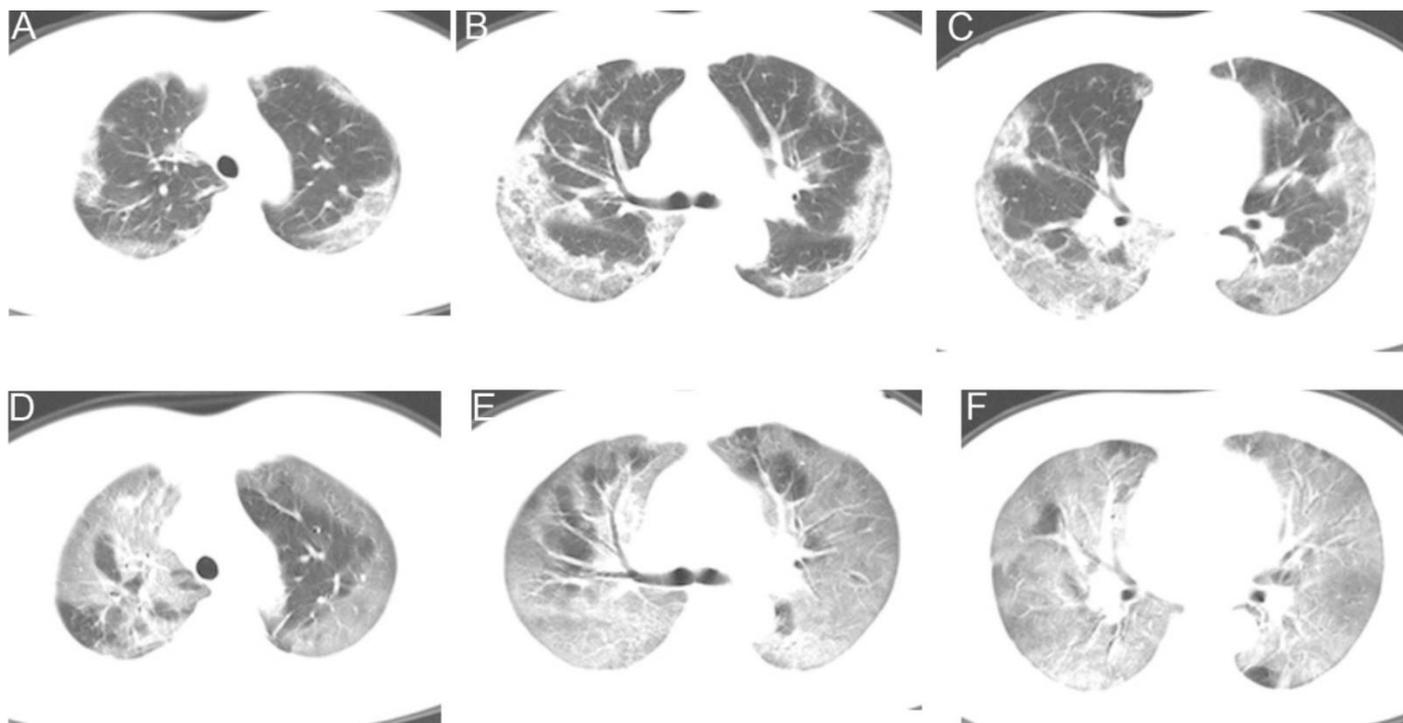
≥14.5		18 (56%)	9 (82%)	9 (43%)	
International Normalized Ratio, INR	0.80-1.20	1.15(1.05-1.20)	1.21(1.14-1.45)	1.09(1.01-1.17)	0.005
Hypersensitive troponin I, pg/mL	≤34.2	11.0(4.2-27.0)	23.1(13.0-204.7)	6.0(2.3-13.2)	0.005
	≤34.2	24/31 (77%)	6 (55%)	18/20 (90%)	0.024
	>34.2	7/31 (23%)	5 (45%)	2/20 (10%)	
NT-proB-type Natriuretic Peptide (BNP), pg/mL	<241	192.0(71.0-702.5)	777.0(348.5-2847.0)	90.5(58.8-194.5)	0.000
	<241	17/30 (57%)	0 (0%)	17/20 (85%)	0.000
	≥241	13/30 (43%)	10 (100%)	3/20 (15%)	
Albumin, g/L	35-52	33.4(30.1-39.5)	31.5(28.2-34.2)	36.0(32.2-39.9)	0.034
	<35	18 (56%)	9 (82%)	9 (43%)	0.035
	≥35	14 (44%)	2 (18%)	12 (57%)	
Alanine aminotransferase, U/L	≤41	19.5(13.0-28.5)	17.0(14.0-29.0)	20.0(12.0-27.5)	0.725
	≤41	28 (87%)	10 (91%)	18 (86%)	0.673
	>41	4 (13%)	1 (9%)	3 (14%)	
Aspartate aminotransferase, U/L	≤40	30.0(19.3-43.0)	34.0(24.0-54.0)	24.0(19.0-36.0)	0.271
	≤40	24 (75%)	7 (64%)	17 (81%)	0.283
	>40	8 (25%)	4 (36%)	4 (19%)	
Total bilirubin, μmol/L	≤26	7.9(6.2-10.3)	7.5(6.6-9.8)	8.1(6.0-10.9)	1.000
Creatinine, μmol/L	59-104	68.0(61.3-87.8)	100.0(62.0-164.0)	67.0(59.5-76.0)	0.088
	≤104	27 (84%)	6 (55%)	21 (100%)	0.002
	>104	5 (16%)	5 (45%)	0 (0%)	
Blood urea nitrogen, mmol/L	3.6-9.5	4.7(3.3-8.4)	9.2(5.4-13.7)	4.0(3.3-5.2)	0.008
	≤9.5	26 (81%)	6 (55%)	20 (95%)	0.005
	>9.5	6 (19%)	5 (45%)	1 (5%)	
Potassium, mmol/L	3.50-5.10	4.1(3.5-4.5)	4.4(3.6-5.3)	4.0(3.5-4.3)	0.208
	<3.5	7 (22%)	2 (18%)	5 (24%)	0.042

3.5-5.1		22 (69%)	6 (55%)	16 (76%)	
>5.1		3 (9%)	3 (27%)	0 (0%)	
Sodium, mmol/L	136-145	139.0(136.4-141.9)	138.7(137.2-142.6)	139.1(135.6-141.7)	0.938
<136		7 (22%)	2 (18%)	5 (24%)	0.363
136-145		24 (75%)	8 (73%)	16 (76%)	
>145		1 (3%)	1 (9%)	0 (0%)	
Calcium, mmol/L	2.20-2.55	2.1(2.0-2.2)	2.0(1.9-2.2)	2.1(2.0-2.2)	0.081
<2.2		25 (78%)	10 (91%)	15 (71%)	0.205
≥2.2		7 (22%)	1 (9%)	6 (29%)	
Procalcitonin, ng/mL	<0.05	0.05(0.03-0.18)	0.32(0.11-0.60)	0.04(0.02-0.06)	0.000
<0.05		17 (53%)	1 (9%)	16 (76%)	0.000
≥0.05		15 (47%)	10 (91%)	5 (24%)	
High-sensitivity C-reactive Protein (hs-CRP), mg/L	<1	52.2(9.6-114.7)	102.1(51.3-194.8)	27.0(5.5-71.1)	0.009
<3		4 (13%)	0 (0%)	4 (19%)	0.272
≥3		28 (87%)	11 (100%)	17 (81%)	
IL-1β, pg/ml	<5	4.9(4.7-4.9)	4.9(4.2-4.9)	4.9(4.7-4.9)	0.652
IL-2R, U/ml	223-710	514.0(292.5-744.5)	1076.5(671.8-1699.5)	454.5(270.3-563.0)	0.005
IL-6, pg/ml	<7	4.5(1.4-22.6)	65.1(11.3-154.1)	3.3(1.4-16.7)	0.019
IL-8, pg/ml	<62	10.2(6.1-18.9)	27.6(14.1-64.9)	9.4(5.7-15.9)	0.010
IL-10, pg/ml	<9.1	4.9(4.0-4.9)	8.3(4.9-17.0)	4.9(4.0-4.9)	0.081
TNF-α, pg/ml	<8.1	7.0(4.9-9.6)	21.3(13.2-28.9)	5.7(3.8-7.9)	0.000

Data are median (IQR), n (%), or n/N (%), where N is the total number of patients with available data.  $\chi^2$  test, Fisher's exact test, or Mann-Whitney U test were used to compare the values between survivors and non-survivors as appropriate.



**Figure S1.** Transverse CT images of a 38-year-old man with Covid-19. A, Normal CT images on the day when the patient had initial symptoms (day 1). B, day 9 after symptom onset, bilateral and peripheral ground-grass opacity associated smooth interlobular and intralobular septal thickening (crazy-paving pattern). C, day 15 after symptom onset, peripheral predominant consolidation pattern with air bronchograms in right upper and lower lobes. D, day 23 after symptom onset, previous opacifications were dissipated into ground-grass opacities and irregular interlobular and intralobular septal thickening (reticulation pattern). E, day 30 after symptom onset, further resolution of the lesions, ground-glass opacities and reticulation patterns remained.



**Figure S2.** Transverse CT images of a 41-year-old woman with Covid-19. A-C, day 6 after symptom onset, multifocal consolidations and ground-glass opacities affecting the bilateral, subpleural lung parenchyma associated with crazy-paving pattern. D-F, day 10 after symptom onset, bilateral extensive ground-glass opacities, involving nearly the entire lower lobes and right middle lobe, and most of the upper lobes, giving a white lung appearance, with air bronchograms and crazy-paving pattern. The patient died 8 days after this scan.

## **Author Contributions**

KL and GZ conceptualized the study design. KL, SC, DC, YF, CC collected demographic, clinical, and laboratory data. ZW and NW interpreted the images of CT scans. KL, DC, YF and GZ analysed the data. KL and GZ interpreted the results. GZ wrote the manuscript with all authors providing feedback for revision. All authors read and approved the final report.

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## **Declaration of interests**

The authors have no competing interests to declare.

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