Supplementary Material

Long-term outcomes of COVID-19 convalescents: An 18.5-month longitudinal study in Wuhan

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Study population and severity classification

Convalescents in this study refer to patients who were admitted to the hospital and discharged after recovery. Detailed inpatient information of the participants was shown in Supplementary eTable 5. COVID-19 cases were diagnosed according to the 7th Trial Version of national guidelines released on March 3, 2020 (2020). Critical patients were defined as having acute respiratory distress syndrome and in the need of mechanical ventilation, and/or shock, and/or having complications of other organ failures. Severe patients were defined as respiratory rate ≥30/min, and/or oxygen saturation levels (SpO_2) at rest ≤93%, and/or arterial partial pressure of oxygen (PaO_2)/fraction of inspired oxygen (FiO_2) ≤300 mmHg, and/or pulmonary lesion progression >50% within 24 to 48 hours. Moderate patients were defined as having fever and respiratory symptoms and radiological findings of pneumonia. Mild patients were defined as having mild clinical symptoms with no sign of pneumonia on imaging. Given the limited number of mild and critical patients in this study, we defined mild participants as those who met either moderate or mild patients' standards and severe participants as those who met either critical or severe patients' standards.

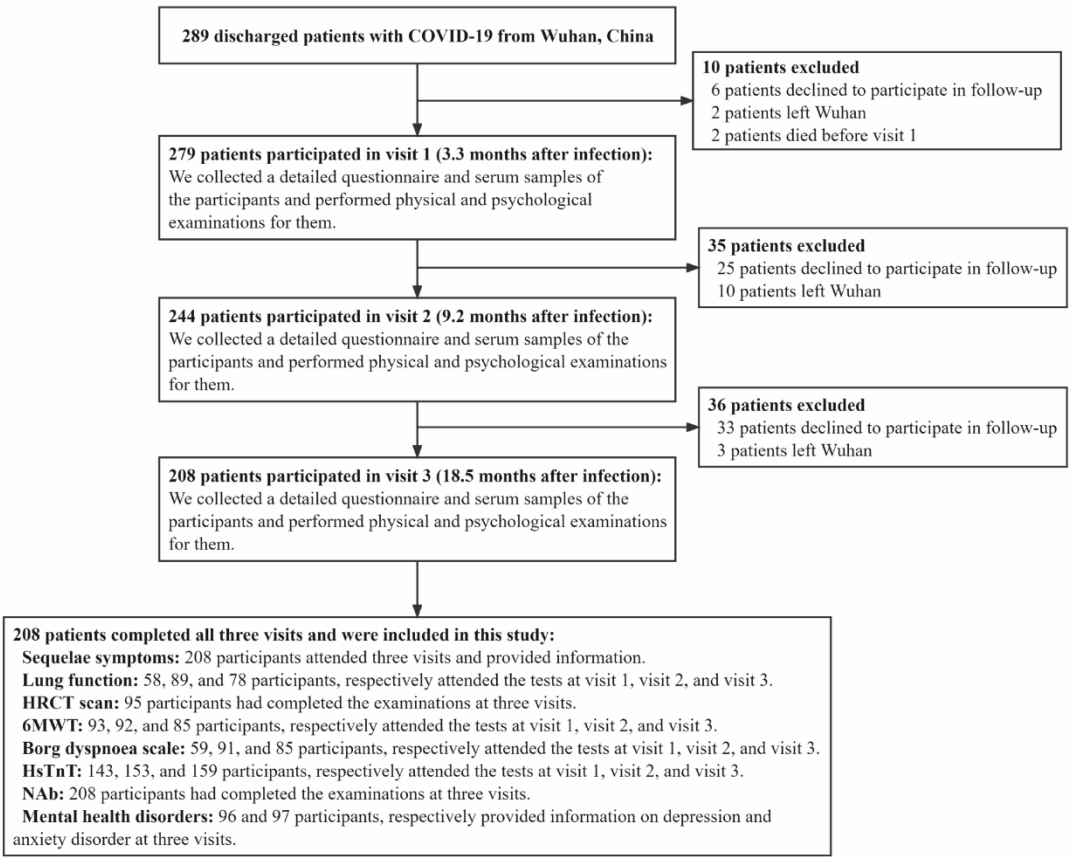
Admission and discharge criteria

Patients were confirmed and admitted to the hospital if they were positive for the real-time fluorescent (RT-PCR) test of COVID-19, and/or had highly homologous viral gene sequence to COVID-19, and/or were detected serum COVID-19 specific IgM and IgG (IgG is detectable or reaches 4-fold titration increase in convalescence compared with the acute phase) (2020). The patients could be discharged only if all the following criteria were met: normal body temperature for more than 3 days; obvious improved respiratory symptoms; obvious absorption of inflammation in pulmonary imaging; twice consecutive and negative nuclei acid tests on respiratory tract samples, with sampling interval no less than 24 hours (2020). The

hospitalization duration was defined as the interval between discharged date and the confirmed date.

Statistical analysis

Continuous variables were expressed as median (interquartile range) and compared by using the Mann-Whitney U test or Kruskal-Wallis test according to nonnormal distribution assessed by Shapiro-Wilk tests. Categorical variables were expressed as frequency (percentage) and compared with χ^2 test or Fisher's Exact test in group comparisons. Linear mixed model was established to calculate the fixed effects of repeated measures on log-transformed NT_{50} for serum SARS-CoV-2 NAb, adjusted for age (continuous), gender (male or female), and vaccination (vaccinated group or unvaccinated group). Random effects included days of the NAb test after symptom onset and days of the first shot of the COVID-19 vaccine since symptom onset of each participant. Generalized linear mixed models were established to explore the associations of any sequelae symptoms (categorical) with fixed effects. Each participant was included in random effect. For the age group (<60 years/≥60 years), we adjusted gender (male/female) and education (middle school or lower/college or higher). Comorbidities including hypertension (no/yes), diabetes (no/yes), and CVD (no/yes), and disease severity (mild/severe) were excluded due to the potential mediating effects. For gender, we adjusted age group, education, comorbidities, and disease severity. For education, we adjusted age group, gender, and disease severity. Comorbidities were excluded due to the potential mediating effects. For comorbidities (hypertension, diabetes, and CVD), we adjusted each for age group, gender, education, and comorbidities except itself. Disease severity (mild/severe) was excluded due to the potential mediating effects. Two-sided *P* values less than 0.05 were considered statistically significant. All data analyses were performed using R statistical software version 4.1.0 (The R Foundation for Statistical Computing).



eFigure 1. Flow chart of the study.

Figure Legend: The profile of the study.

HRCT, high-resolution chest CT; 6MWT, 6-minute walking test; hsTnT, highly-sensitive troponin T; NAb, neutralizing antibody.

eTable 1. Basic characteristics of convalescents according to disease severity.

Variables	Mild (N=146)	Severe (N=62)	*P* value
Age, years	58 (50, 64)	57 (50.3, 64.8)	0.862
Gender, n (%)			0.806
Male	71 (48.6)	29 (46.8)	
Female	75 (51.4)	33 (53.2)	
Education, n (%)			0.378
Middle school or lower	101 (69.2)	39 (62.9)	
College or higher	45 (30.8)	23 (37.1)	
Household income, n (%)			0.238
< 50000 RMB/year	79 (54.1)	28 (45.2)	
≥ 50000 RMB/year	67 (45.9)	34 (54.8)	
Cigarette smoking, n (%)			0.253
Never-smoker	126 (86.3)	57 (91.9)	
Ever-smoker	20 (13.7)	5 (8.1)	
Alcohol consumption, n (%)			0.499
Never-drinker	127 (87.0)	56 (90.3)	
Ever-drinker	19 (13.0)	6 (9.7)	
Comorbidity, n (%)			
Hypertension	58 (39.7)	17 (27.4)	0.091
Diabetes	16 (11.0)	7 (11.3)	0.944
CVD	10 (6.8)	4 (6.5)	1.000
Body mass index	24.6 (22.9, 27.0)	23.4 (22.0, 25.5)	0.010
Waist circumference	90 (83, 98)	91 (82, 95)	0.537
Duration from symptom onset to the last follow-up, months	18.4 (18.1, 19.0)	18.6 (18.3, 19.3)	0.010

Continuous variables were expressed as median (interquartile range) and compared with the Mann-Whitney U test. Categorical variables were expressed as frequency (percentage) and compared with χ^2 test or Fisher's Exact test.

eTable 2. Physical and psychological health status of convalescents during follow-up according to disease severity.

Variables	Mild (N=146)			Severe (N=62)		
	Visit 1 (3.3 months)	Visit 2 (9.2 months)	Visit 3 (18.5 months)	Visit 1 (3.3 months)	Visit 2 (9.2 months)	Visit 3 (18.5 months)
Sequelae symptoms						
Any symptoms, n (%)	77 (52.7)	63 (43.2)	59 (40.4)	52 (83.9) [b]	41 (66.1)	35 (56.5)
Cough, n (%)	28 (19.2) [a, b]	10 (6.8)	11 (7.5)	13 (21.0)	12 (19.4)	11 (17.7)
Fatigue or muscle weakness, n (%)	44 (30.1) [b]	30 (20.5)	24 (16.4)	29 (46.8) [a, b]	15 (24.2)	13 (21.0)
Sleep difficulties, n (%)	47 (32.2) [a, b]	27 (18.5)	24 (16.4)	22 (35.5)	13 (21.0)	10 (16.1)
Decreased appetite, n (%)	13 (8.9)	4 (2.7)	3 (2.1)	8 (12.9)	6 (9.7)	4 (6.5)
Diarrhea or vomiting, n (%)	18 (12.3)	8 (5.5)	9 (6.2)	3 (4.8)	1 (1.6)	1 (1.6)
Smell or taste disorder, n (%)	4 (2.7)	6 (4.1)	6 (4.1)	6 (9.7)	3 (4.8)	2 (3.2)
Dizziness or headache, n (%)	4 (2.7)	4 (2.7)	6 (4.1)	5 (8.1)	3 (4.8)	2 (3.2)
Sore throat, n (%)	4 (2.7)	4 (2.7)	3 (2.1)	6 (9.7)	7 (11.3)	3 (4.8)
Chest pain, n (%)	7 (4.8)	6 (4.1)	9 (6.2)	5 (8.1)	6 (9.7)	4 (6.5)
Lung function						
FEV_1%	94.6 (86.2, 107.7)	97.0 (86.9, 104.6)	97.0 (89.1, 105.7)	94.0 (79.2, 100.1)	89.0 (80.7, 102.0)	96.2 (87.1, 111.6)
FVC%	92.7 (84.4, 111.5)	94.2 (85.2, 104.8)	92.6 (83.0, 103.6)	89.6 (79.7, 99.4)	92.0 (80.2, 98.6)	93.8 (85.1, 104.5)
FEV_1/FVC%	82.9 (79.8, 85.0)	83.5 (80.9, 87.6)	85.6 (81.1, 88.9)	83.7 (81.8, 85.6)	82.6 (81.5, 85.4)	87.9 (82.3, 90.8)
FEF_{25-75}%	79.4 (70.6, 102.8)	88.3 (74.2, 100.8)	89.5 (75.5, 103.3)	85.8 (73.8, 92.6)	87.9 (69.5, 107.7)	101.9 (76.1, 114.9)
Chest CT						
CT abnormal of GGO, n (%)	46 (67.6) [a, b]	24 (35.3)	19 (27.9)	23 (85.2) [a, b]	14 (51.9)	9 (33.3)
CT scores of GGO	5.0 (3.0, 9.0) [a, b]	2.0 (0.0, 5.0) [c]	1.0 (0.0, 4.0)	7.0 (5.0, 13.5) [a, b]	4.0 (2.5, 6.0) [c]	2.0 (1.0, 4.5)
CT abnormal of RP, n (%)	41 (60.3) [a, b]	27 (39.7)	22 (32.4)	20 (74.1)	20 (74.1)	12 (44.4)
CT scores of RP	6.0 (3.0, 12.2) [a, b]	3.0 (2.0, 8.0)	2.0 (1.0, 6.0)	11.0 (6.0, 16.0) [a, b]	6.0 (4.5, 10.0)	4.0 (2.0, 8.0)
6-minute walk test						
Distance, m	517.4 (481.5, 555.5) [a, b]	562.2 (520.8, 605.4) [c]	533.0 (508.2, 559.5)	511.0 (471.9, 555.0) [a]	579.0 (536.6, 620.9)	542.0 (511.0, 605.0)
Predicted distance%	93.5 (86.2, 99.0) [a]	100.5 (95.0, 106.0)	96.5 (91.5, 104.0)	90.0 (81.5, 99.5) [a]	100.0 (93.2, 107.0)	94.0 (87.0, 100.0)
Borg dyspnea scale ≥1, n (%)	25 (56.8) [a, b]	9 (13.8) [c]	1 (1.7)	5 (33.3)	6 (23.1)	3 (12.0)
hsTnT (ng/L)	4.5 (3.0, 7.5)	4.7 (3.0, 7.0)	4.4 (3.0, 6.8)	3.9 (3.0, 7.4)	3.7 (3.0, 6.1)	3.6 (3.0, 5.2)
hsTnT ≥14 ng/L, n (%)	7 (7.0)	4 (3.8)	4 (3.4)	3 (7.0)	1 (2.1)	2 (4.7)
NT_{50} for serum SARS-CoV-2 NAb	768.0 (367.8, 1694.5) [a]	293.5 (140.2, 592.2) [c]	658.5 (284.0, 1283.2)	1001.5 (448.5, 2032.8) [a]	291.5 (160.5, 614.5) [c]	711.0 (346.5, 1243.5)
Unvaccinated group	944.5 (469.2, 1914.2) [a, b]	297.5 (138.2, 747.2)	234.0 (112.2, 484.8)	1235.5 (519.8, 2675.5) [a, b]	504.5 (247.8, 645.0)	333.0 (231.8, 518.8)
Vaccinated group	660.5 (289.2, 1393.5) [a]	293.5 (140.5, 586.8) [c]	837.5 (479.2, 1451.2)	851.0 (440.0, 1853.5) [a]	237.0 (144.8, 501.5) [c]	1059.0 (549.5, 1499.8)
Mental health disorders						
Depression, score	5.5 (2.0, 9.2) [b]	3.5 (1.0, 8.0) [c]	1.0 (0.0, 4.0)	4.0 (1.0, 8.2)	4.0 (1.0, 8.2)	2.0 (0.0, 4.2)
Depression score ≥5	39 (57.4) [b]	30 (44.1) [c]	16 (23.5)	14 (50)	13 (46.4)	7 (25)
Anxiety disorder, score	4.0 (0.0, 8.0) [b]	1.0 (0.0, 5.0)	0.0 (0.0, 4.0)	1.5 (0.0, 5.2)	2.0 (0.0, 5.0)	0.0 (0.0, 3.0)
Anxiety score ≥5	27 (39.1)	21 (30.4)	16 (23.2)	9 (32.1)	8 (28.6)	6 (21.4)

Data were expressed as median (interquartile range) or frequency (percentage). Kruskal-Wallis test was applied for group comparisons of continuous variables, and χ^2 test or Fisher Exact tests were performed to analyse the categorical variables. CT: computed tomography; FEV_1:

83 forced expiratory volume in one second; FVC: forced vital capacity; FEF_{25-75}: forced expiratory flow between 25% and 75% of vital capacity;
84 GGO, ground-glass opacity; RP, reticular pattern; hsTnT, highly-sensitive troponin T; NT_{50}, the half-maximal inhibitory concentration; NAb,
85 neutralizing antibody. [a] Significant difference between visit 1 and visit 2 groups (P <0.05). [b] Significant difference between visit 1 and visit 3
86 groups (P <0.05). [c] Significant difference between visit 2 and visit 3 groups (P <0.05).

eTable 3. Physical and psychological health status of convalescents in different disease severity during follow-up.

Variables	Visit 1 (3.3 months)			Visit 2 (9.2 months)			Visit 3 (18.5 months)		
	Mild	Severe	*P* value	Mild	Severe	*P* value	Mild	Severe	*P* value
Sequelae symptoms									
Any sequelae symptoms, n (%)	77 (52.7%)	52 (83.9%)	<0.001	63 (43.2%)	41 (66.1%)	0.004	59 (40.4%)	35 (56.5%)	0.048
Cough, n (%)	28 (19.2%)	13 (21.0%)	0.915	10 (6.8%)	12 (19.4%)	0.015	11 (7.5%)	11 (17.7%)	0.052
Fatigue, n (%)	44 (30.1%)	29 (46.8%)	0.032	30 (20.5%)	15 (24.2%)	0.689	24 (16.4%)	13 (21.0%)	0.560
Sleep difficulties, n (%)	47 (32.2%)	22 (35.5%)	0.764	27 (18.5%)	13 (21.0%)	0.824	24 (16.4%)	10 (16.1%)	1.000
Decreased appetite, n (%)	13 (8.9%)	8 (12.9%)	0.533	4 (2.7%)	6 (9.7%)	0.068	3 (2.1%)	4 (6.5%)	0.200
Diarrhea or vomiting, n (%)	18 (12.3%)	3 (4.8%)	0.165	8 (5.5%)	1 (1.6%)	0.285	9 (6.2%)	1 (1.6%)	0.287
Smell or taste disorder, n (%)	4 (2.7%)	6 (9.7%)	0.068	6 (4.1%)	3 (4.8%)	1.000	6 (4.1%)	2 (3.2%)	1.000
Dizziness or headache, n (%)	4 (2.7%)	5 (8.1%)	0.130	4 (2.7%)	3 (4.8%)	0.428	6 (4.1%)	2 (3.2%)	1.000
Sore throat, n (%)	4 (2.7%)	6 (9.7%)	0.068	4 (2.7%)	7 (11.3%)	0.018	3 (2.1%)	3 (4.8%)	0.366
Chest pain, n (%)	7 (4.8%)	5 (8.1%)	0.347	6 (4.1%)	6 (9.7%)	0.189	9 (6.2%)	4 (6.5%)	1.000
Lung function									
FEV_1%	94.6 (86.2, 107.7)	94.0 (79.2, 100.1)	0.338	97.0 (86.9, 104.6)	89.0 (80.7, 102.0)	0.208	97.0 (89.1, 105.7)	96.2 (87.1, 111.6)	0.870
FVC%	92.7 (84.4, 111.5)	89.6 (79.7, 99.4)	0.250	94.2 (85.2, 104.8)	92.0 (80.2, 98.6)	0.294	92.6 (83.0, 103.6)	93.8 (85.1, 104.5)	0.978
FEV_1/FVC%	82.9 (79.8, 85.0)	83.7 (81.8, 85.6)	0.399	83.5 (80.9, 87.6)	82.6 (81.5, 85.4)	0.739	85.6 (81.1, 88.9)	87.9 (82.3, 90.8)	0.338
$FEF_{25-75\%}$	79.4 (70.6, 102.8)	85.8 (73.8, 92.6)	0.613	88.3 (74.2, 100.8)	87.9 (69.5, 107.7)	0.985	89.5 (75.5, 103.3)	101.9 (76.1, 114.9)	0.287
Chest CT									
CT abnormal of GGO, n (%)	46 (67.6%)	23 (85.2%)	0.140	24 (35.3%)	14 (51.9%)	0.210	19 (27.9%)	9 (33.3%)	0.787
CT scores of GGO	5.0 (3.0, 9.0)	7.0 (5.0, 13.5)	0.029	2.0 (0.0, 5.0)	4.0 (2.5, 6.0)	0.042	1.0 (0.0, 4.0)	2.0 (1.0, 4.5)	0.061
CT abnormal of RP, n (%)	41 (60.3%)	20 (74.1%)	0.305	27 (39.7%)	20 (74.1%)	0.005	22 (32.4%)	12 (44.4%)	0.383
CT scores of RP	6.0 (3.0, 12.2)	11.0 (6.0, 16.0)	0.011	3.0 (2.0, 8.0)	6.0 (4.5, 10.0)	0.024	2.0 (1.0, 6.0)	4.0 (2.0, 8.0)	0.093
6-minute walk test									
Distance, m	517.4 (481.5, 555.5)	511.0 (471.9, 555.0)	0.963	562.2 (520.8, 605.4)	579.0 (536.6, 620.9)	0.425	533.0 (508.2, 559.5)	542.0 (511.0, 605.0)	0.274
Predicted distance%	93.5 (86.2, 99.0)	90.0 (81.5, 99.5)	0.253	100.5 (95.0, 106.0)	100.0 (93.2, 107.0)	0.784	96.5 (91.5, 104.0)	94.0 (87.0, 100.0)	0.382
Borg dyspnea scale ≥1, n (%)	25 (56.8%)	5 (33.3%)	0.203	9 (13.8%)	6 (23.1%)	0.350	1 (1.7%)	3 (12.0%)	0.074
hsTnT (ng/L)	4.5 (3.0, 7.5)	3.9 (3.0, 7.4)	0.513	4.7 (3.0, 7.0)	3.7 (3.0, 6.1)	0.145	4.4 (3.0, 6.8)	3.6 (3.0, 5.2)	0.057
hsTnT ≥14 ng/L, n (%)	7 (7.0)	3 (7.0)	1.000	4 (3.8)	1 (2.1)	1.000	4 (3.4)	2 (4.7)	0.662
NT_{50} for serum SARS-CoV-2 NAb	768.0 (367.8, 1694.5)	1001.5 (448.5, 2032.8)	0.144	293.5 (140.2, 592.2)	291.5 (160.5, 614.5)	0.902	658.5 (284.0, 1283.2)	711.0 (346.5, 1243.5)	0.450
Unvaccinated group	944.5 (469.2, 1914.2)	1235.5 (519.8, 2675.5)	0.569	297.5 (138.2, 747.2)	504.5 (247.8, 645.0)	0.430	234.0 (112.2, 484.8)	333.0 (231.8, 518.8)	0.215
Vaccinated group	660.5 (289.2, 1393.5)	851.0 (440.0, 1853.5)	0.182	293.5 (140.5, 586.8)	237.0 (144.8, 501.5)	0.640	837.5 (479.2, 1451.2)	1059.0 (549.5, 1499.8)	0.338
Mental health disorders									
Depression, score	5.5 (2.0, 9.2)	4.0 (1.0, 8.2)	0.249	3.5 (1.0, 8.0)	4.0 (1.0, 8.2)	0.903	1.0 (0.0, 4.0)	2.0 (0.0, 4.2)	0.654
Depression score ≥5	39 (57.4)	14 (50)	0.665	30 (44.1)	13 (46.4)	1.000	16 (23.5)	7 (25)	1.000
Anxiety disorder, score	4.0 (0.0, 8.0)	1.5 (0.0, 5.2)	0.231	1.0 (0.0, 5.0)	2.0 (0.0, 5.0)	0.863	0.0 (0.0, 4.0)	0.0 (0.0, 3.0)	0.681
Anxiety score ≥5	27 (39.1)	9 (32.1)	0.679	30 (44.1)	13 (46.4)	1.000	16 (23.5)	7 (25)	1.000

Data were expressed as median (interquartile range) or frequency (percentage). Mann-Whitney U test was applied for group comparisons of continuous variables, and χ^2 test or Fisher Exact tests were performed to analyse the categorical variables. CT: computed tomography; FEV_1:

90 forced expiratory volume in one second; FVC: forced vital capacity; FEF_{25-75}: forced expiratory flow between 25% and 75% of vital capacity;
91 GGO, ground-glass opacity; RP, reticular pattern; hsTnT, highly-sensitive troponin T; NT_{50}, the half-maximal inhibitory concentration; NAb,
92 neutralizing antibody.

eTable 4. Lung function, chest CT, and 6-minute walk test variation of the COVID-19 survivors during follow-up according to disease severity.

	Total population	Mild	Severe	*P* value
Lung function	**N=45**	**N=34**	**N=11**	
FEV_1%, Δ(v2-v1)	-0.005 (-0.093, 0.109)	-0.008 (-0.091, 0.114)	0.000 (-0.059, 0.047)	0.885
FEV_1%, Δ(v3-v1)	0.013 (-0.081, 0.138)	0.001 (-0.110, 0.137)	0.016 (-0.030, 0.151)	0.316
FVC%, Δ(v2-v1)	-0.014 (-0.110, 0.091)	-0.029 (-0.118, 0.142)	0.000 (-0.085, 0.039)	0.864
FVC%, Δ(v3-v1)	-0.023 (-0.119, 0.172)	-0.023 (-0.114, 0.183)	-0.007 (-0.125, 0.140)	1.000
FEV_1/FVC%, Δ(v2-v1)	0.000 (-0.036, 0.030)	-0.002 (-0.044, 0.026)	0.013 (-0.018, 0.046)	0.262
FEV_1/FVC%, Δ(v3-v1)	0.048 (-0.014, 0.080)	0.043 (-0.017, 0.077)	0.063 (0.016, 0.081)	0.267
$FEF_{25-75\%}$, Δ(v2-v1)	-0.022 (-0.118, 0.146)	-0.026 (-0.113, 0.105)	0.000 (-0.098, 0.223)	0.570
$FEF_{25-75\%}$, Δ(v3-v1)	0.085 (-0.046, 0.221)	0.039 (-0.051, 0.149)	0.322 (0.071, 0.388)	0.073
CT	**N=95**	**N=68**	**N=27**	
CT abnormal of GGO, Δ(v2-v1)	0.000 (-1.000, 0.000)	0.000 (-1.000, 0.000)	0.000 (-1.000, 0.000)	0.927
CT abnormal of GGO, Δ(v3-v1)	0.000 (-1.000, 0.000)	0.000 (-1.000, 0.000)	-1.000 (-1.000, 0.000)	0.284
CT scores of GGO, Δ(v2-v1)	-0.500 (-0.728, -0.408)	-0.500 (-0.771, -0.400)	-0.526 (-0.613, -0.477)	0.737
CT scores of GGO, Δ(v3-v1)	-0.765 (-1.000, -0.595)	-0.778 (-1.000, -0.560)	-0.727 (-0.833, -0.649)	0.513
CT abnormal of RP, Δ(v2-v1)	0.000 (0.000, 0.000)	0.000 (0.000, 0.000)	0.000 (0.000, 0.000)	0.049
CT abnormal of RP, Δ(v3-v1)	0.000 (-1.000, 0.000)	0.000 (-1.000, 0.000)	0.000 (-1.000, 0.000)	0.529
CT scores of RP, Δ(v2-v1)	-0.333 (-0.500, -0.146)	-0.314 (-0.500, -0.062)	-0.375 (-0.500, -0.258)	0.141
CT scores of RP, Δ(v3-v1)	-0.500 (-0.750, -0.222)	-0.456 (-0.750, -0.172)	-0.615 (-0.750, -0.367)	0.252
6-minute walk test	**N=84**	**N=60**	**N=24**	
Distance, m, Δ(v2-v1)	0.072 (0.018, 0.137)	0.073 (0.016, 0.148)	0.064 (0.029, 0.136)	0.984
Distance, m, Δ(v3-v1)	0.029 (-0.021, 0.091)	0.022 (-0.021, 0.100)	0.045 (-0.008, 0.088)	0.652
Predicted distance%, Δ(v2-v1)	0.071 (0.020, 0.133)	0.072 (0.017, 0.129)	0.070 (0.033, 0.138)	0.593
Predicted distance%, Δ(v3-v1)	0.034 (-0.026, 0.101)	0.033 (-0.031, 0.096)	0.040 (-0.010, 0.106)	0.513
Borg dyspnea scale	**N=51**	**N=39**	**N=12**	
Borg dyspnea scale ≥1, Δ(v2-v1)	0.000 (-1.000, 0.000)	0.000 (-1.000, 0.000)	0.000 (0.000, 0.000)	0.089
Borg dyspnea scale ≥1, Δ(v3-v1)	0.000 (-1.000, 0.000)	-1.000 (-1.000, 0.000)	0.000 (0.000, 0.000)	0.025

Data were expressed as median (interquartile range). Mann-Whitney U test was applied for group comparisons. Δ(v2-v1) refers to the variation between visit 2 and visit 1; Δ(v3-v1) refers to the variation between visit 3 and visit 1. CT: computed tomography; FEV_1: forced expiratory volume in one second; FVC: forced vital capacity; FEF_{25-75}: forced expiratory flow between 25% and 75% of vital capacity; GGO, ground-glass opacity; RP, reticular pattern.

eTable 5. Detailed inpatient information of the participants.

Variables	Total population (N=208)	Mild (N=146)	Severe (N=62)	*P* value
Wards, n (%)				<0.001
Medical ward	186 (89.4)	133 (91.1)	53 (85.5)	
Fangcang shelter hospitals	13 (6.2)	12 (8.2)	1 (1.6)	
ICU	9 (4.3)	1 (0.7)	8 (12.9)	
Length of total hospital stay, days, median (interquartile range)	27.0 (17.0, 35.0)	25.0 (15.2, 32.0)	29.0 (22.0, 37.0)	0.003
Length of medical ward stay	25.0 (14.0, 33.2)	23.0 (13.0, 30.0)	28.0 (18.2, 35.8)	0.029
Length of Fangcang shelter hospital stay	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.079
Length of ICU stay	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	<0.001
Treatment received during hospital stay, n (%)				
Oxygen therapy	162 (77.9)	106 (72.6)	56 (90.3)	0.008
Non-invasive ventilation	5 (2.4)	0 (0.0)	5 (8.1)	0.002
Invasive ventilation	1 (0.5)	0 (0.0)	1 (1.6)	0.298
Traditional Chinese medicine	190 (91.3)	135 (92.5)	55 (88.7)	0.541
Immune therapy	38 (18.3)	17 (11.6)	21 (33.9)	<0.001
Corticosteroids	23 (11.1)	9 (6.2)	14 (22.6)	0.001
Remdesivir	17 (8.2)	7 (4.8)	10 (16.1)	0.014
Interferon	12 (5.8)	7 (4.8)	5 (8.1)	0.347
COVID-19 convalescent plasma	5 (2.4)	3 (2.1)	2 (3.2)	0.636
Continuous renal replacement therapy (CRRT)	0 (0)	0 (0)	0 (0)	-
Other treatments	15 (7.2)	8 (5.5)	7 (11.3)	0.151

Continuous variables were expressed as median (interquartile range) and compared with the Mann-Whitney U test. Categorical variables were expressed as frequency (percentage) and were compared with χ^2 test or Fisher's Exact test.

103 **eTable 6. Physical and psychological health status of convalescents during follow-up according to the length of hospital stay.**

	Length of hospital stay<27 days (N=101)			Length of hospital stay≥27 days (N=107)		
	Visit 1	Visit 2	Visit 3	Visit 1	Visit 2	Visit 3
Sequelae symptoms						
Any sequelae symptoms, n (%)	51 (50.5)	48 (47.5)	45 (44.6)	78 (72.9) [a, b]	56 (52.3)	49 (45.8)
Cough, n (%)	16 (15.8)	11 (10.9)	14 (13.9)	25 (23.4) [a, b]	11 (10.3)	8 (7.5)
Fatigue or muscle weakness, n (%)	30 (29.7)	18 (17.8)	16 (15.8)	43 (40.2) [a, b]	27 (25.2)	21 (19.6)
Sleep difficulties, n (%)	29 (28.7)	18 (17.8)	16 (15.8)	40 (37.4) [a, b]	22 (20.6)	18 (16.8)
Decreased appetite, n (%)	8 (7.9)	3 (3.0)	4 (4.0)	13 (12.1)	7 (6.5)	3 (2.8)
Diarrhea or vomiting, n (%)	7 (6.9)	3 (3.0)	3 (3.0)	14 (13.1)	6 (5.6)	7 (6.5)
Smell or taste disorder, n (%)	2 (2.0)	4 (4.0)	4 (4.0)	8 (7.5)	5 (4.7)	4 (3.7)
Dizziness or headache, n (%)	3 (3.0)	3 (3.0)	5 (5.0)	6 (5.6)	4 (3.7)	3 (2.8)
Sore throat, n (%)	3 (3.0)	4 (4.0)	1 (1.0)	7 (6.5)	7 (6.5)	5 (4.7)
Chest pain, n (%)	6 (5.9)	6 (5.9)	7 (6.9)	6 (5.6)	6 (5.6)	6 (5.6)
Lung function						
FEV_1%	91.6 (79.2, 107.4)	90.8 (81.4, 101.5)	93.7 (86.0, 105.6)	94.7 (86.6, 104.9)	97.3 (87.7, 104.7)	100.4 (91.1, 108.4)
FVC%	91.5 (78.1, 108.5)	91.4 (82.7, 100.4)	90.2 (83.2, 101.8)	92.7 (84.8, 108.4)	93.8 (86.4, 104.5)	96.0 (86.6, 104.4)
FEV_1/FVC%	82.8 (81.0, 84.5)	82.2 (80.6, 85.6)	85.7 (82.2, 88.8)	83.5 (79.3, 85.4)	84.7 (81.4, 87.6)	85.3 (81.0, 90.2)
$FEF_{25-75\%}$	78.1 (69.8, 85.4)	78.0 (68.8, 107.9)	87.3 (73.2, 112.9)	85.8 (73.6, 97.2)	89.2 (76.1, 100.4)	93.1 (76.1, 109.6)
Chest CT						
CT abnormal of GGO, n (%)	26 (70.3) [a, b]	12 (32.4)	7 (18.9)	43 (74.1) [a, b]	26 (44.8)	21 (36.2)
CT scores of GGO	5.0 (3.0, 9.0) [a, b]	2.0 (1.0, 5.0) [c]	1.0 (0.0, 3.0)	6.0 (3.2, 11.8) [a, b]	3.0 (1.0, 6.0) [c]	1.5 (0.0, 4.0)
CT abnormal of RP, n (%)	25 (67.6) [b]	15 (40.5)	9 (24.3)	36 (62.1)	32 (55.2)	25 (43.1)
CT scores of RP	7.0 (3.0, 11.0) [a, b]	3.0 (2.0, 7.0)	2.0 (1.0, 4.0)	8.5 (4.0, 15.8) [a, b]	5.0 (2.0, 10.8)	4.0 (1.0, 8.0)
6-minute walk test						
Distance, m	511.0 (475.5, 558.5) [a]	566.8 (522.0, 607.2)	531.0 (508.0, 570.0)	520.5 (484.1, 554.0) [a, b]	563.8 (526.1, 609.9) [c]	535.0 (510.8, 566.2)
Predicted distance%	93.0 (85.5, 100.0) [a]	103.0 (96.0, 109.8)	98.0 (89.0, 103.0)	91.5 (86.0, 99.0) [a]	100.0 (93.2, 105.0)	95.0 (89.5, 101.5)
Borg dyspnea scale ≥1, n (%)	8 (47.1) [a, b]	3 (8.8)	1 (3.0)	22 (52.4) [a, b]	12 (21.1) [c]	3 (5.8)
hsTnT (ng/L)	4.7 (3.0, 7.2)	5.0 (3.1, 7.1)	4.5 (3.1, 6.8)	4.2 (3.0, 7.6)	3.9 (3.0, 6.4)	3.9 (3.0, 6.3)
hsTnT ≥14 ng/L, n (%)	4 (5.6)	2 (3.0)	4 (5.0)	6 (8.3)	3 (3.5)	2 (2.5)
NT_{50} for serum SARS-CoV-2 NAb	774.0 (341.0, 1806.0) [a]	250.0 (119.0, 541.0) [c]	570.0 (271.0, 1087.0)	922.0 (433.0, 1684.5) [a]	356.0 (200.5, 643.0) [c]	813.0 (378.0, 1452.0)
Unvaccinated group	1213.0 (679.2, 2081.2) [a, b]	297.5 (154.0, 573.2)	262.0 (114.5, 499.8)	910.5 (415.0, 1977.8) [a, b]	439.0 (201.8, 747.2)	301.5 (190.5, 483.5)
Vaccinated group	590.0 (234.5, 1649.0) [a]	228.0 (116.5, 510.0) [c]	698.0 (386.0, 1281.5)	922.0 (450.0, 1503.5) [a]	349.0 (197.5, 596.0) [c]	1040.0 (654.5, 1627.5)
Mental health disorders						
Depression, score	5.0 (1.0, 9.0) [b]	3.5 (1.0, 8.0) [c]	0.5 (0.0, 3.8)	5.0 (2.0, 8.8) [b]	4.0 (1.0, 7.8) [c]	2.0 (0.0, 5.0)
Depression score ≥5	20 (52.6) [b]	18 (47.4) [c]	6 (15.8)	33 (56.9) [b]	25 (43.1)	17 (29.3)
Anxiety disorder, score	3.0 (0.0, 6.0) [b]	0.5 (0.0, 3.8) [c]	0.0 (0.0, 0.0)	4.0 (0.0, 7.5)	3.0 (0.0, 5.0)	2.0 (0.0, 5.0)
Anxiety score ≥5	13 (34.2)	8 (21.1)	5 (13.2)	23 (39.0)	21 (35.6)	17 (28.8)

Data were expressed as median (interquartile range) or frequency (percentage). Kruskal-Wallis test was applied for group comparisons of continuous variables, and χ^2 test or Fisher Exact tests were performed to analyze the categorical variables. CT: computed tomography; FEV_1: forced expiratory volume in one second; FVC: forced vital capacity; FEF_{25-75}: forced expiratory flow between 25% and 75% of vital capacity; GGO, ground-glass opacity; RP, reticular pattern; hsTnT, highly-sensitive troponin T; NT_{50}, the half-maximal inhibitory concentration; NAb, neutralizing antibody. [a] Significant difference between visit 1 and visit 2 groups (P <0.05). [b] Significant difference between visit 1 and visit 3 groups (P <0.05). [c] Significant difference between visit 2 and visit 3 groups (P <0.05).

eTable 7. Physical and psychological health status of convalescents during follow-up according to the ICU stay record.

	Non-ICU (N=199)			ICU (N=9)		
	Visit 1	**Visit 2**	**Visit 3**	**Visit 1**	**Visit 2**	**Visit 3**
Sequelae symptoms						
Any sequelae symptoms, n (%)	122 (61.3) [a, b]	99 (49.7)	88 (44.2)	7 (77.8)	5 (55.6)	6 (66.7)
Cough, n (%)	39 (19.6) [a, b]	21 (10.6)	22 (11.1)	2 (22.2)	1 (11.1)	0 (0.0)
Fatigue or muscle weakness, n (%)	68 (34.2) [a, b]	43 (21.6)	34 (17.1)	5 (55.6)	2 (22.2)	3 (33.3)
Sleep difficulties, n (%)	65 (32.7) [a, b]	39 (19.6)	31 (15.6)	4 (44.4)	1 (11.1)	3 (33.3)
Decreased appetite, n (%)	21 (10.6) [b]	9 (4.5)	7 (3.5)	0 (0.0)	1 (11.1)	0 (0.0)
Diarrhea or vomiting, n (%)	21 (10.6)	9 (4.5)	10 (5.0)	0 (0.0)	0 (0.0)	0 (0.0)
Smell or taste disorder, n (%)	10 (5.0)	9 (4.5)	8 (4.0)	0 (0.0)	0 (0.0)	0 (0.0)
Dizziness or headache, n (%)	9 (4.5)	7 (3.5)	8 (4.0)	0 (0.0)	0 (0.0)	0 (0.0)
Sore throat, n (%)	9 (4.5)	9 (4.5)	4 (2.0)	1 (11.1)	2 (22.2)	2 (22.2)
Chest pain, n (%)	12 (6.0)	11 (5.5)	12 (6.0)	0 (0.0)	1 (11.1)	1 (11.1)
Lung function						
FEV_1%	94.3 (83.4, 107.5)	96.3 (86.3, 103.8)	95.1 (88.4, 107.1)	89.1 (80.4, 98.0)	101.0 (86.5, 105.3)	105.2 (98.3, 113.8)
FVC%	92.6 (84.2, 110.1)	93.4 (84.9, 103.5)	92.9 (83.2, 103.1)	88.8 (80.0, 97.0)	93.4 (86.2, 96.8)	99.9 (86.3, 111.2)
FEV_1/FVC%	83.0 (80.2, 85.7)	83.0 (80.8, 87.6)	85.7 (81.0, 89.1)	83.8 (80.9, 84.8)	84.2 (82.8, 85.3)	86.3 (82.9, 88.9)
$FEF_{25-75\%}$	81.2 (71.9, 105.7)	88.3 (69.8, 101.1)	91.2 (75.4, 110.0)	81.8 (71.9, 90.3)	97.8 (80.2, 112.0)	106.6 (83.4, 114.0)
Chest CT						
CT abnormal of GGO, n (%)	64 (71.9) [a, b]	34 (38.2)	25 (28.1)	5 (83.3)	4 (66.7)	3 (50.0)
CT scores of GGO	6.0 (3.0, 10.0) [a, b]	3.0 (1.0, 5.0) [c]	1.0 (0.0, 4.0)	10.5 (6.2, 14.8)	6.0 (3.8, 6.0)	3.5 (0.8, 5.5)
CT abnormal of RP, n (%)	57 (64.0) [b]	43 (48.3)	30 (33.7)	4 (66.7)	4 (66.7)	4 (66.7)
CT scores of RP	7.0 (4.0, 15.0) [a, b]	4.0 (2.0, 8.0) [c]	2.0 (1.0, 7.0)	10.0 (5.2, 11.8)	8.5 (3.5, 9.0)	5.5 (2.8, 8.2)
6-minute walk test						
Distance, m	511.0 (479.5, 554.0) [a, b]	562.2 (520.0, 605.4) [c]	532.0 (507.5, 565.0)	570.0 (538.8, 617.0)	616.5 (603.9, 627.6)	587.5 (543.8, 608.8)
Predicted distance%	92.0 (85.5, 99.0) [a, b]	100.0 (93.2, 106.0) [c]	96.0 (88.5, 103.0)	97.5 (89.0, 100.8)	102.0 (98.8, 106.0)	99.5 (92.2, 102.2)
Borg dyspnea scale ≥1, n (%)	29 (52.7) [a, b]	14 (16.5) [c]	3 (3.8)	1 (25.0)	1 (16.7)	1 (16.7)
hsTnT (ng/L)	4.5 (3.0, 7.3)	4.4 (3.0, 6.5)	4.1 (3.0, 6.7)	5.5 (3.0, 8.4)	3.6 (3.0, 9.1)	3.0 (3.0, 3.8)
hsTnT ≥14 ng/L, n (%)	10 (7.3)	5 (3.4)	6 (3.9)	0 (0.0)	0 (0.0)	0 (0.0)
NT_{50} for serum SARS-CoV-2 NAb	821.0 (394.0, 1817.0) [a]	294.0 (142.5, 595.0) [c]	685.0 (321.0, 1282.5)	641.0 (435.0, 1516.0)	281.0 (198.0, 518.0)	420.0 (279.0, 1110.0)
Unvaccinated group	1168.0 (522.5, 2215.5) [a, b]	425.0 (155.0, 760.0)	283.0 (123.5, 513.5)	435.0 (367.5, 833.5)	265.0 (231.5, 273.0)	279.0 (226.5, 292.0)
Vaccinated group	765.5 (341.0, 1491.8) [a]	283.0 (137.8, 583.0) [c]	910.0 (501.0, 1466.5)	1078.5 (506.8, 1710.2)	488.5 (261.0, 966.5)	869.0 (472.0, 1173.0)
Mental health disorders						
Depression, score	5.0 (2.0, 9.0) [b]	4.0 (1.0, 8.0) [c]	1.0 (0.0, 4.0)	2.0 (1.0, 7.5)	3.0 (0.5, 5.5)	3.0 (0.0, 5.5)
Depression score ≥5	50 (56.2) [b]	40 (44.9) [c]	20 (22.5)	3 (42.9)	3 (42.9)	3 (42.9)
Anxiety disorder, score	4.0 (0.0, 7.0) [b]	1.0 (0.0, 5.0)	0.0 (0.0, 4.0)	3.0 (0.5, 4.0)	1.0 (0.0, 3.5)	0.0 (0.0, 3.5)
Anxiety score ≥5	35 (38.9)	27 (30.0)	20 (22.2)	1 (14.3)	2 (28.6)	2 (28.6)

Data were expressed as median (interquartile range) or frequency (percentage). Kruskal-Wallis test was applied for group comparisons of continuous variables, and χ^2 test or Fisher Exact tests were performed to analyze the categorical variables. CT: computed tomography; FEV_1: forced expiratory volume in one second; FVC: forced vital capacity; FEF_{25-75}: forced expiratory flow between 25% and 75% of vital capacity; GGO, ground-glass opacity; RP, reticular pattern; hsTnT, highly-sensitive troponin T; NT_{50}, the half-maximal inhibitory concentration; NAb, neutralizing antibody. [a] Significant difference between visit 1 and visit 2 groups (P <0.05). [b] Significant difference between visit 1 and visit 3 groups (P <0.05). [c] Significant difference between visit 2 and visit 3 groups (P <0.05).

eTable 8. Basic characteristics of participants who were included and excluded.

Variables	Included population (N=208)	Excluded population (N=81)	*P* value
Age, years	58.0 (50.0, 64.3)	60.0 (52.0, 66.0)	0.236
Gender, n (%)			0.698
Male	100 (48.1)	41 (50.6)	
Female	108 (51.9)	40 (49.4)	
Education, n (%)			0.616
Middle school or lower	140 (67.3)	57 (70.4)	
College or higher	68 (32.7)	24 (29.6)	
Household income, n (%)			0.209
< 50000 RMB/year	107 (51.4)	35 (43.2)	
≥ 50000 RMB/year	101 (48.6)	46 (56.8)	
Cigarette smoking, n (%)			0.607
Never-smoker	183 (88.0)	73 (90.1)	
Ever-smoker	25 (12.0)	8 (9.9)	
Alcohol consumption, n (%)			0.523
Never-drinker	183 (88.0)	69 (85.2)	
Ever-drinker	25 (12.0)	12 (14.8)	
Comorbidity, n (%)			
Hypertension	75 (36.1)	32 (39.5)	0.586
Diabetes	23 (11.1)	12 (14.8)	0.379
CVD	14 (6.7)	6 (7.4)	0.839
Body mass index	24.3 (22.6, 26.5)	24.0 (22.4, 25.9)	0.341
Waist circumference	90 (83, 97)	91.0 (83.0, 96.0)	0.924
Duration from symptom onset to the last follow-up, months	18.5 (18.2, 19.1)	-	-

Continuous variables were expressed as median (interquartile range) and compared with the Mann-Whitney U test. Categorical variables were expressed as frequency (percentage) and compared with χ^2 test or Fisher's Exact test.

References

Diagnosis and treatment protocol for novel coronavirus pneumonia (trial version 7). 2020;133(9):1087-95.