

# Chronic Respiratory Diseases and Long term Effects of COVID-19

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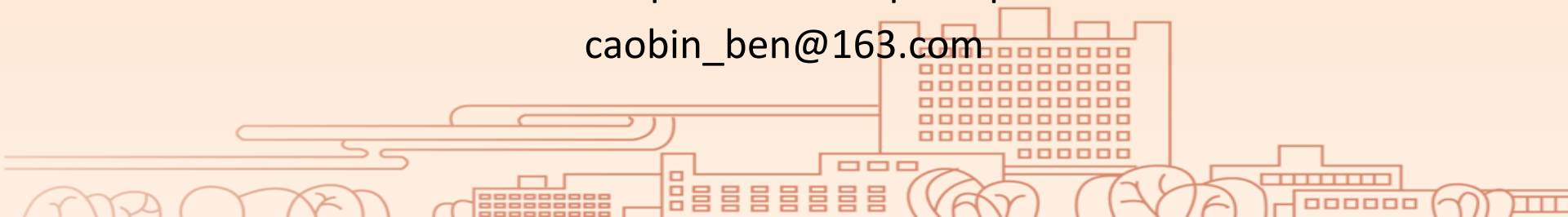
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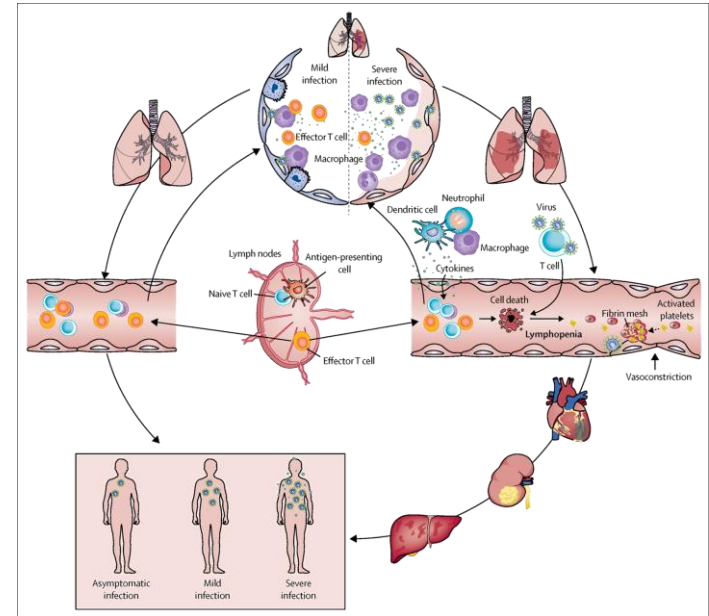
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# SARS-CoV-2 Viral sepsis—Observations and Hypotheses

## Multi-organ dysfunction

- Pneumonia, Respiratory failure, Acute respiratory distress syndrome
- Metabolic acidosis and internal environment disorders
- Acute kidney injury
- Acute cardiac injury
- .....



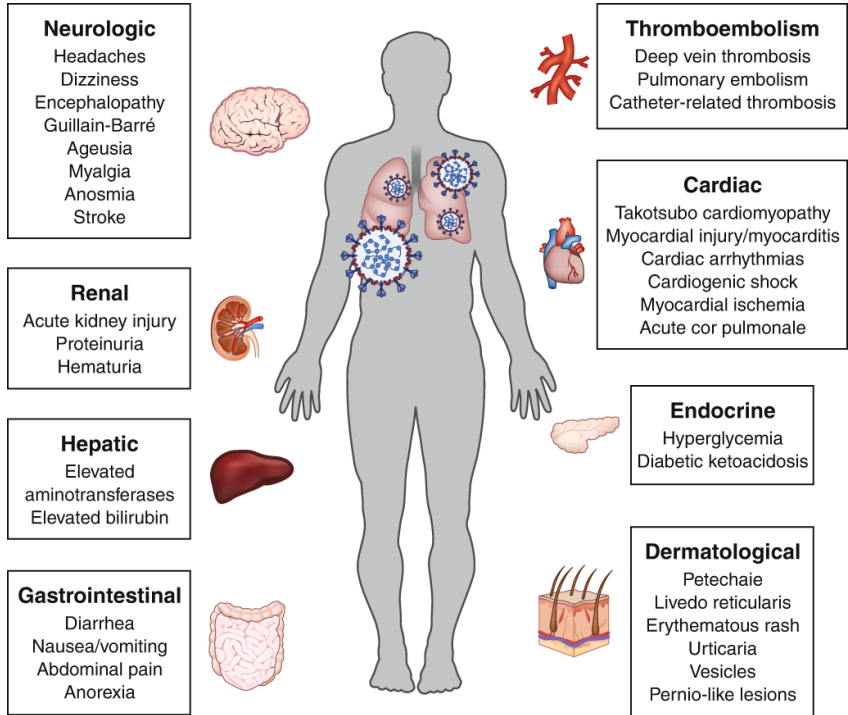
## — — Viral Sepsis

Ren L et al. *Chin Med J* 2020; 133(9):1015-1024

Huang C et al. *Lancet* 2020; 395(10223): 497-506

Li H et al. *Lancet*. 2020;395(10235):1517-1520

# Multiple organ dysfunction and complications in hospitalized patients



Complications	Prevalence
Pneumonia	75%
Acute respiratory distress syndrome	15%
Acute liver injury	19%
Cardiac injury	7%-17%
Thromboembolic events	10%-25%
Acute kidney injury	9%
Neurologic manifestations	8%
Acute cerebrovascular disease	3%
Shock	6%

Gupta A, et al. *Nat Med.* 2020; 26(7):1017-1032  
Wiersinga WJ, et al. *JAMA.* 2020; 324(8)

# Clinical questions

- Will the multiple organ dysfunctions persist or new onset damage post-acute occur?
- What are the clinical picture of the aftermath of COVID-19?

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## 6-month consequences of COVID-19 in patients discharged from hospital: a cohort study

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6-month consequences of COVID-19 in patients discharged from hospital: a cohort study

## ■ Objectives

- Describe the health consequences of patients with COVID-19 who have been discharged from hospital at 6 months after symptom onset.
- Identify the potential risk factors associated with the consequences, in particular disease severity.

# Inclusion & Exclusion criteria

## ■ Inclusion criteria

- All laboratory confirmed COVID-19 patients who were discharged from Jin Yin-tan Hospital (Wuhan city, China) from January 7, 2020 to May 29, 2020

## ■ Exclusion criteria

- Dead before this follow-up visit
- For whom follow-up would be difficult because of psychotic disorder, dementia, or re-admission to hospitals
- Unable to move freely due to concomitant osteoarthropathy disease or immobile before or after discharge due to diseases such as stroke or pulmonary embolism
- Declined to participate
- Unable to be contacted
- Living outside of Wuhan or in nursing or welfare homes

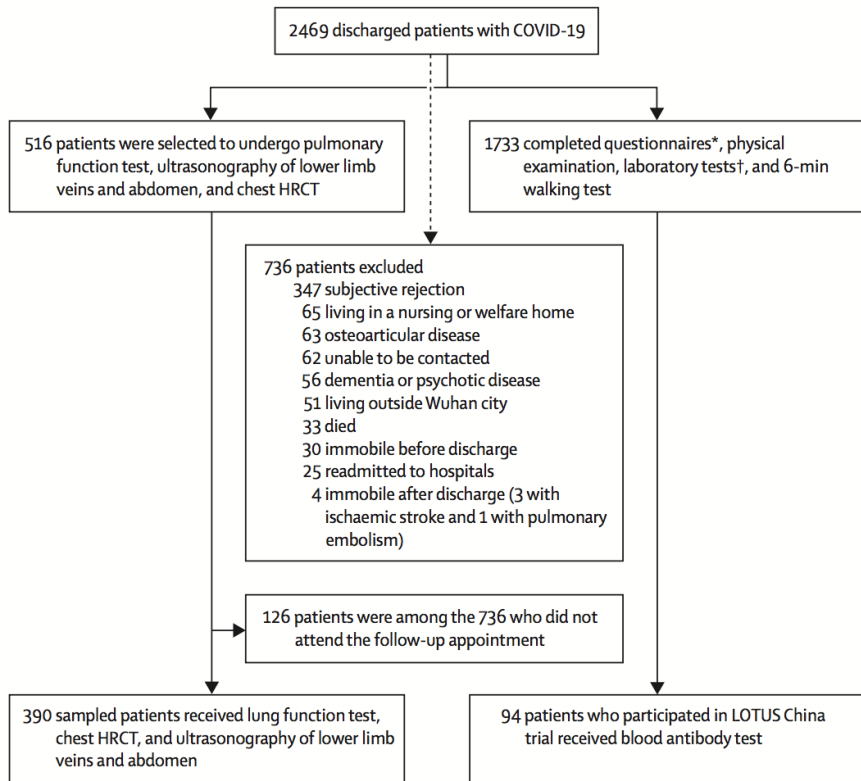
# Schedule

- The appointment for the follow-up visit was set by trained medical staff via telephone
- Follow-up was conducted in the outpatient clinic of Jin Yin-tan Hospital
- Examination items
  - ✓ Physical examination
  - ✓ Self-reported symptom questionnaire
  - ✓ mMRC dyspnea scale
  - ✓ EQ-5D-5L questionnaire & EQ-VAS
  - ✓ 6-min walking test
  - ✓ Blood test (include antibody test\*)
  - ✓ Chest HRCT #
  - ✓ Pulmonary function test#
  - ✓ Ultrasonography of lower limbs vein and abdomen#

\*: Participants who had been previously enrolled in the Lopinavir Trial for suppression of SARS-CoV-2 in China<sup>[1]</sup>.

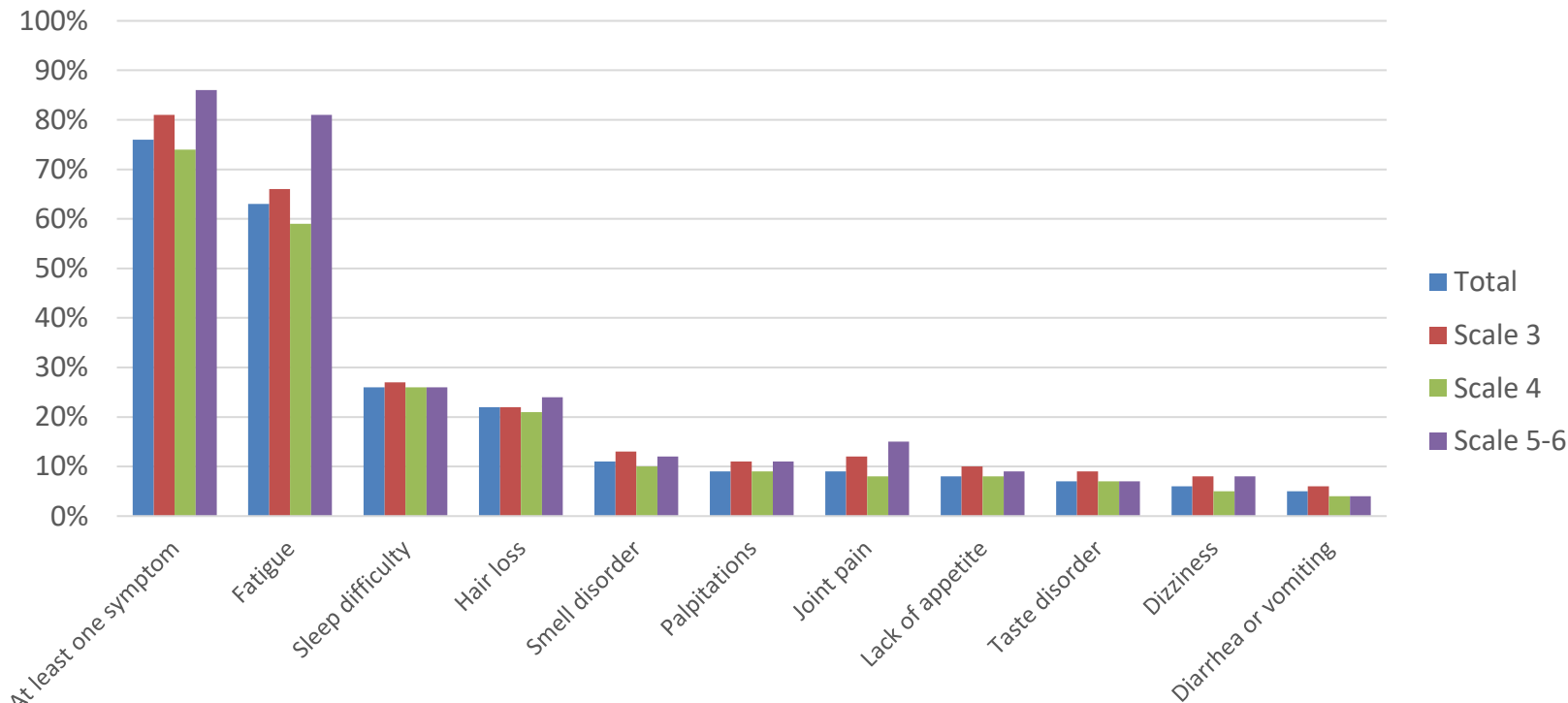
#: A stratified disproportional random sampling procedure according to severity scale was used to select patients to undergo special tests.

# Flow chart of COVID-19 patients discharged from Jin Yin-tan hospital during January 7, 2020 and May 29, 2020



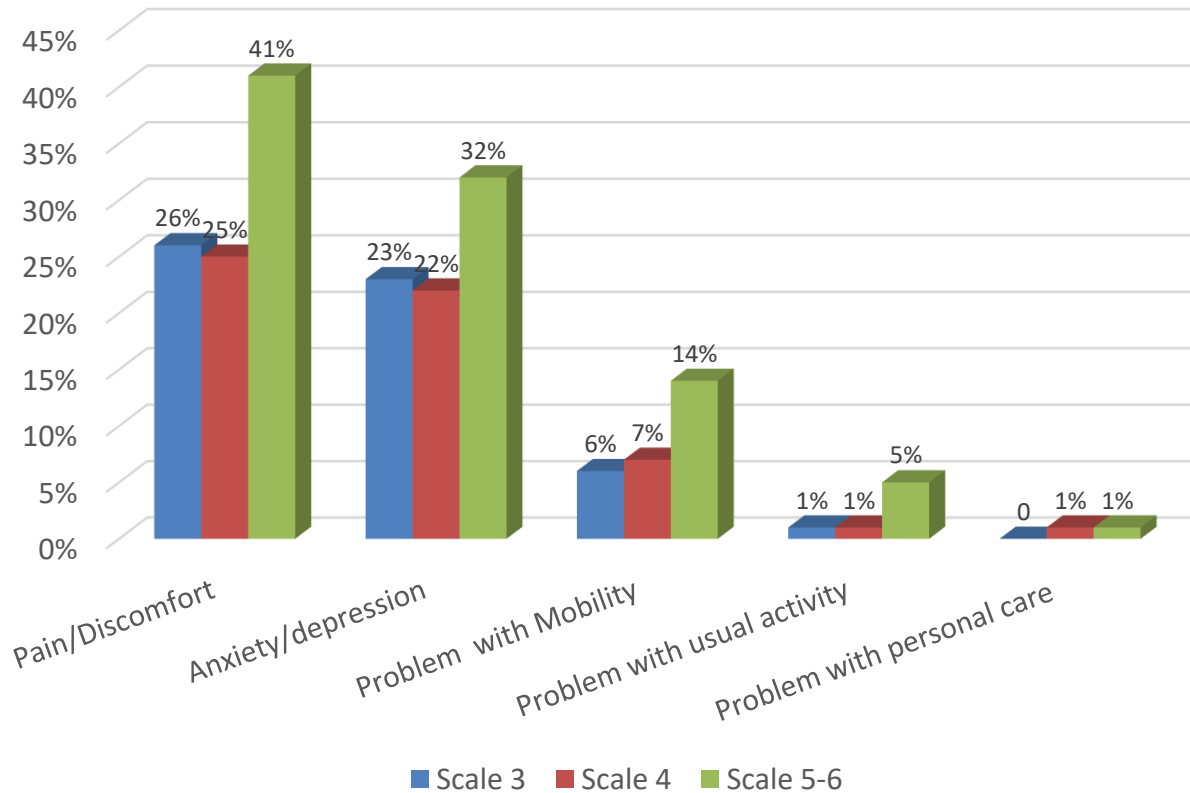
- 1733 enrolled
  - scale 3: 439
  - scale 4: 1172
  - scale 5-6: 122
- Median age: 57 years
- Median follow-up time
  - after symptom onset: 186 days
  - after hospital discharge: 153 days
- mortality after discharge: 1.3% (33/2469)

# Persisting symptoms at follow-up



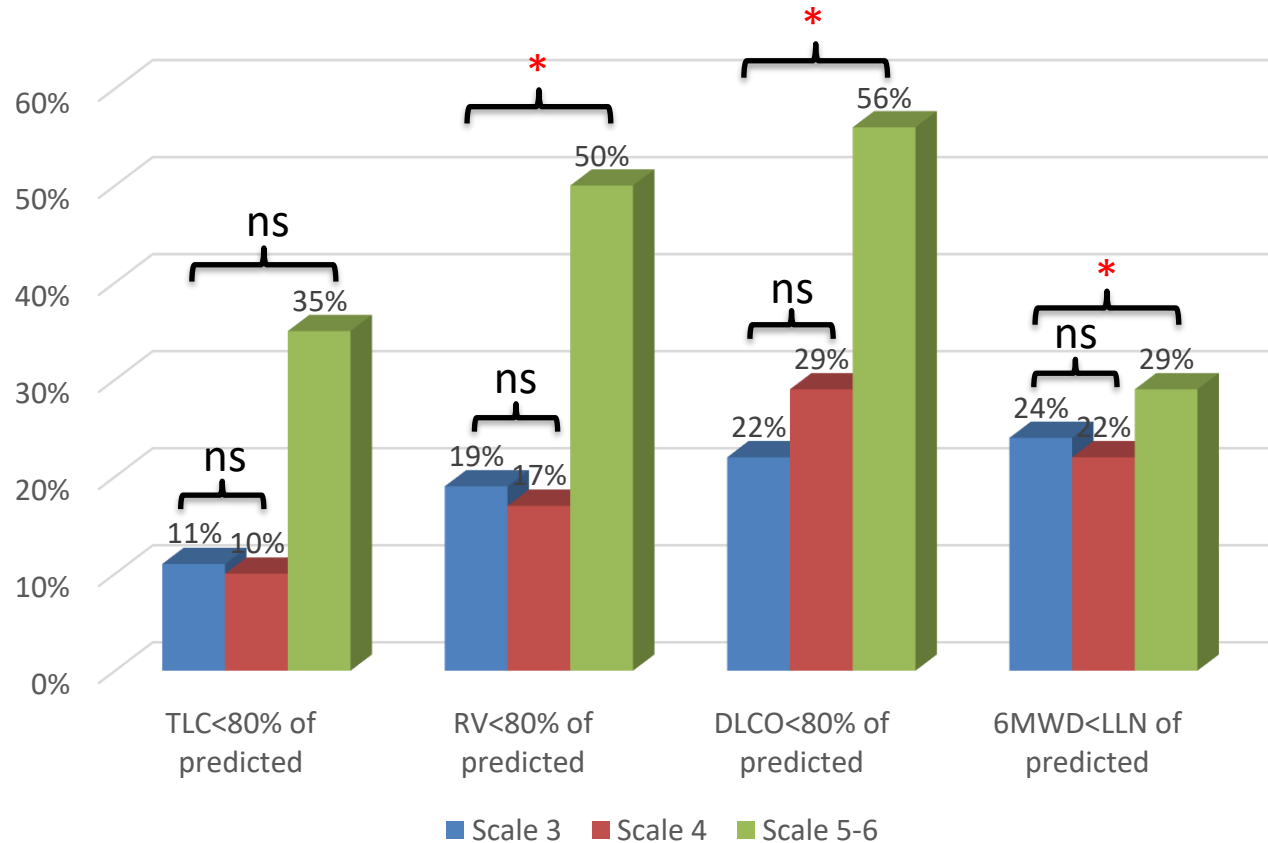
- More than 70% of patients reported at least one symptom.
- The most common symptoms are fatigue/muscle weakness(63%) and sleep difficulty(26%).

# EQ-5D-5L questionnaire



- More severe patients endorsed more problems
- More than 20% reported psychological complications
- More than 90% had no problems in mobility, usual activity and personal care at follow-up.

# Impaired lung function and exercise capacity



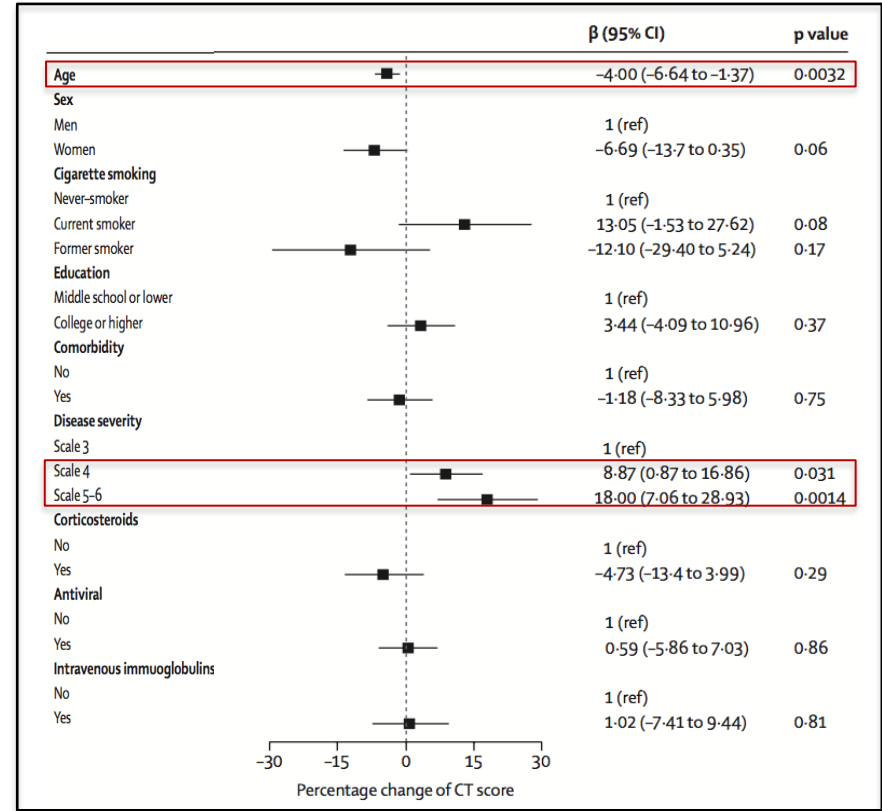
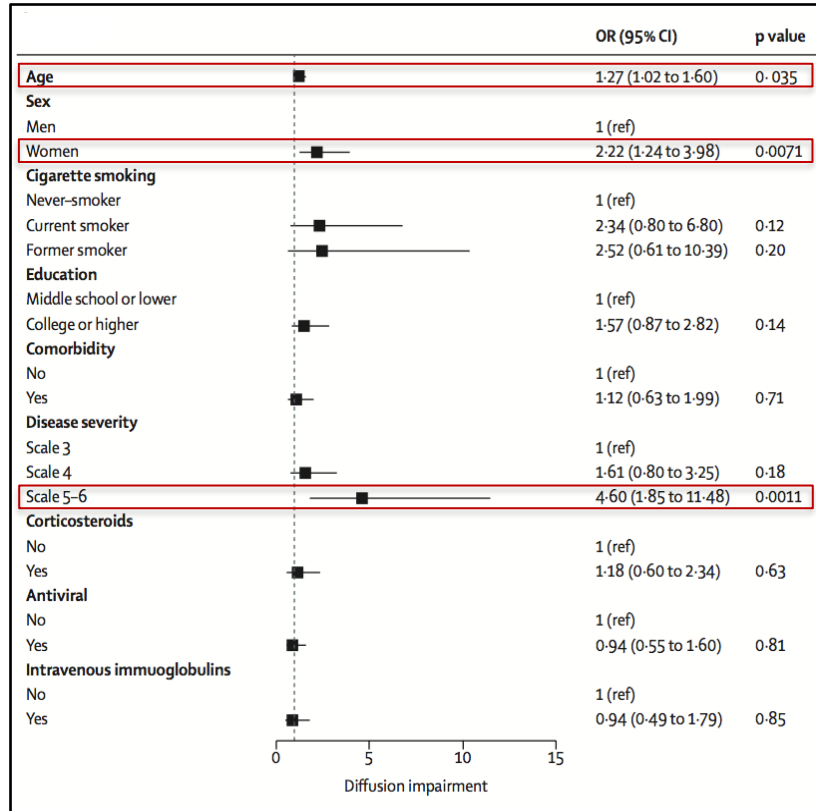
ns: no significant, \*:  $p < 0.05$ , LLN: lower limit of normal range.

# Lung CT image at follow-up

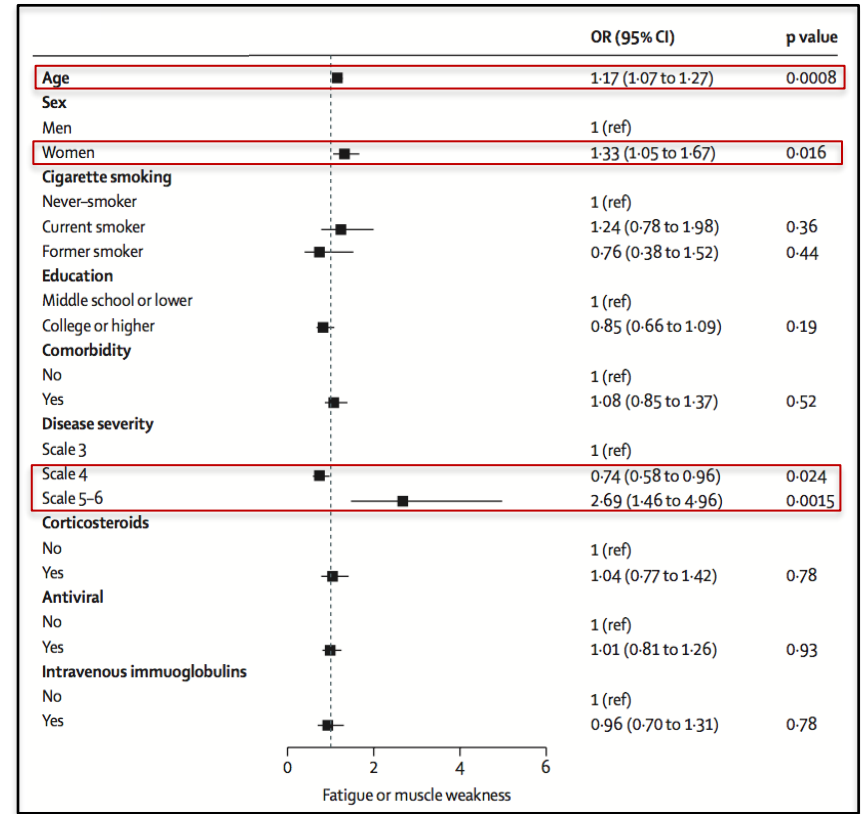
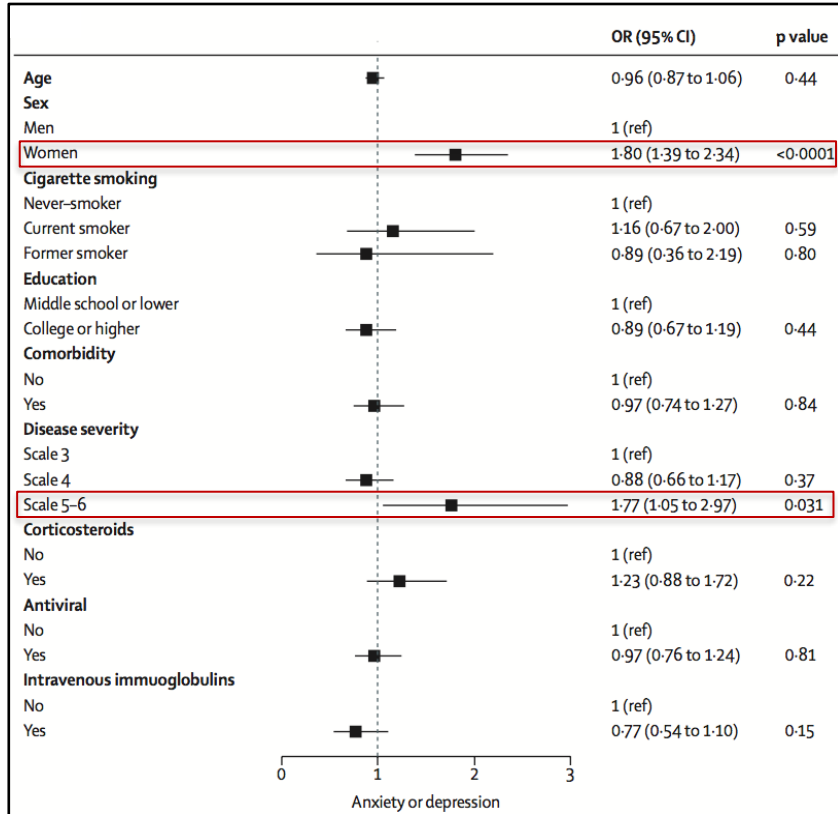
Characteristics	Scale 3	Scale 4	Scale 5-6
Number of patients	95	163	95
At least one abnormal CT pattern	49 (52%)	87/161 (54%)	50/92 (54%)
GGO	39 (41%)	78/161 (48%)	41/92 (45%)
Irregular lines	10 (11%)	24/161 (15%)	22/92 (24%)
Consolidation	0	4/161 (2%)	0
Interlobular septal thickening	1 (1%)	2/161 (1%)	0
Subpleural line	6 (6%)	5/161 (3%)	4/92 (4%)
Reticular pattern	0	1/161 (1%)	1/92 (1%)
Volume of lung lesions, cm <sup>3</sup>	1.6 (0.6-5.6)	3.3 (0.8-12.4)	29.1 (4.6-77.3)
Volume of consolidation, cm <sup>3</sup>	0.2 (0.1-0.4)	0.3 (0.1-1.0)	1.6 (0.2-4.4)
Volume of GGO, cm <sup>3</sup>	1.4 (0.6-4.7)	2.9 (0.7-10.0)	26.3 (4.3-73.3)
Volume ratio of lung lesion to total lung, %	0.0 (0.0-0.1)	0.1 (0.0-0.3)	0.7 (0.1-2.2)
Volume ratio of consolidation to total lung, %	0.0 (0.0-0.0)	0.0 (0.0-0.0)	0.0 (0.0-0.1)
Volume ratio of GGO to total lung, %	0.0 (0.0-0.1)	0.1 (0.0-0.2)	0.6 (0.1-1.9)
CT score	3.0 (2.0-5.0)	4.0 (3.0-5.0)	5.0 (4.0-6.0)

- At six-month after symptom onset, around half patients still have at least one abnormal CT pattern, GGO is the most common pattern.

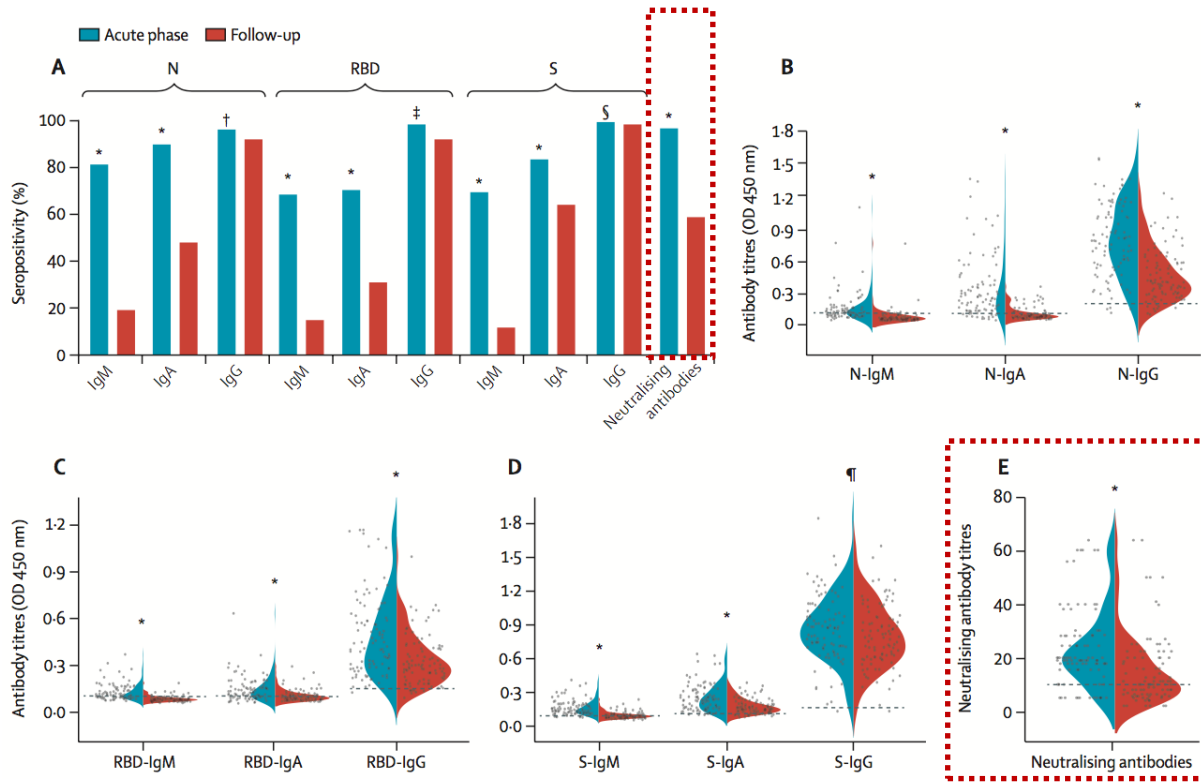
# Risk factors of diffusion impairment and CT score



# Risk factors of anxiety/depression and fatigue/muscle weakness



# Temporal changes of seropositivity and antibody titers against SARS-CoV-2



- The seropositivity and titer of neutralizing antibody are significantly lower compared with that at acute phase.
- The decline of neutralising antibodies raises concern for SARS-CoV-2 re-infection.

# Extrapulmonary organ manifestations

- For patients with lymphocyte count less than  $0.8 \times 10^9/L$  at acute phase, 97% had lymphocyte counts  $0.8 \times 10^9/L$  or more at follow-up.
- No deep venous thrombosis was observed in 390 patients who underwent ultrasonography at follow-up.
- 58 patients were newly diagnosed with diabetes at follow-up.
- 13% (107 of 822) of the patients who did not develop AKI during their hospital stay and presented with normal renal function, exhibited a decline in eGFR ( $<90 \text{ mL/min} \cdot 1.73 \text{ m}^2$ ) at follow-up.

# Summary

- At 6 months after illness onset, most patients had at least one symptom, with fatigue or muscle weakness being the most frequently reported symptom
- More severe patients during hospitalization had more severe lung diffusion capacity deterioration and chest imaging anomaly
- Critically ill patients deserve more attention during hospitalization and after discharge
- Longer and larger follow-up study are necessary to understand the full spectrum of health consequences of COVID-19, ranging from non-hospitalized patients, hospitalized patients to ICU survivors.
- Multidisciplinary, multicentre, and multinational collaborations are needed to face up the long COVID.

*Huang et al. Lancet. 2021.*

*Cortinovis M. The Lancet, 2021.*

*Facing up to long COVID. Lancet 2020. 17*

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