Supplementary Table S1. Demographics, comorbidities, and biometrical characteristics of critically ill COVID-19 patients.

	COVID-19 patients (n=217)	
Female gender, n (%)	66	(30.4)
Age, median (min-max)	68	(32–102)
Clinical features		
BMI 25–30, n (%)	148/186*	(79.5)
BMI 30–35, n (%)	31/186*	(16.7)
BMI >35, n (%)	8/186*	(4.3)
Comorbidities		
Hypertension, n (%)	101/215*	(47)
Dyslipidaemia, n (%)	55/215*	(25.6)
COPD, n (%)	10/225*	(4.7)
Neoplasia, n (%)	15/215*	(7)
CD, n (%)	30/215*	(14)
CKD, n (%)	9/215*	(4,2)
DM, n (%)	28/215*	(13)
Thyroid dysfunction, n (%)	6/215*	(2,8)
ICU prognostic indicators		
SOFA score (>5), n (%)	83	(38.2)
SOFA score points, median (min-max)	5	(2–11)
APACHE II score (>14), n (%)	140	(64.5)
APACHE II score points, median (min-max)	15	(3–24)
Time duration between symptoms onset and hospital admission, median (min-max)	5	(1–15) / 186*
Time duration between hospital admission and outcome, median (min-max)	20	(4–137) / 186*
Clinical characteristics		
pO2 on air (%), median (min-max)	56	(40.5–85) / 186*
Pulmonary embolism, n (%)	2	(0.9)
Myositis, n (%)	3	(1.4)
Cognitive dysfunction, n (%)	18	(8.3)
Laboratory findings		
Hyperferritinaemia (>250 μg/l), n (%)	154/191*	(80.6)
Ferritin levels, median (min-max)	556.2	(38-25466)
D-dimers, n (%)	55/194*	(28.4)
D-dimer levels, median (min-max)	1.38	(0.1–17.6)
CRP (>0.5 mg/dl), n (%)	208/214*	(97.2)
CRP levels, median (min-max)	11.4	(0.3–41.1)
Creatinine (>1.4 mg/dl), n (%)	22/216*	(10.2)
Creatinine levels, median (min-max)	0.9	(0.4–5.8)
HbA1c (>6.5), n (%)	34/150*	(22.7)
HbA1c levels, median (min-max)	6	(4.5-13)
Treatment		
Azythromycin before hospitalisation, n (%)	39/186*	(21)
Dexamethasone after intubation, n (%)	186/186*	(100)

*BMI: Body Mass Index; COPD: chronic obstructive pulmonary disease; CD: cardiovascular disease; CKD: chronic kidney disease; DM: diabetes melitus; SOFA: Sequential Organ Failure Assessment score; APACHE II: acute physiology and chronic health evaluation II; CRP: C-reactive protein; HbA1c: haemoglobin A1c.

Supplementary Table S2. Comparison between critically ill COVID-19 patients with at least one autoantibody and without.

	Patients negative in autoantibodies (n=43)		Patients positive in at least one autoantibody (n=174)		*p*-value
Female gender, n (%)	13	(30.2)	53	(30.5)	0.977
Age, median (min-max)	67	(47-87)	69	(32-102)	0.927
Covid-19 IgG antibodies, n (%)	28	(65.1)	150	(86.2)	**0.001**
Titres of Covid-19 IgG antibodies, median (min-max)	4.3	(0.1–10.1)	7.8	(0.1–11.4)	**0.014**
Activity of neutralising SARS-CoV-2 RBD antibodies, n (%)	33	(76.7)	159	(91.4)	**0.007**
Titres of neutralising SARS-CoV-2 RBD antibodies, median (min-max)	79	(12-97)	91	(4-100)	**0.018**
Clinical features					
Death, n (%)	23	(53.5)	83	(47.7)	0.497
Time duration between symptoms onset and hospital admission, median (min-max)	5	(1–10) / 36*	5	(1–15) / 150*	0.859
Time duration between hospital admission and outcome, median (min-max)	23	(5–137) / 36*	19	(4–120) /150*	0.275
BMI 25–30, n (%)	29/36*	(80.6)	119/150*	(79.3)	0.870
BMI 30–35, n (%)	5/36*	(13.9)	26/150*	(17.3)	0.618
BMI >35, n (%)	2/36*	(5.6)	6/150*	(4)	0.653
Comorbidities					
Hypertension, n (%)	20/41*	(48.8)	81	(46.6)	0.797
Dyslipidaemia, n (%)	10/41*	(24.4)	45	(25.9)	0.846
COPD, n (%)	4/41*	(9.8)	6	(3.4)	0.084
Neoplasia, n (%)	5/41*	(12.2)	10	(5.7)	0.145
CD, n (%)	5/41*	(12.2)	25	(14.4)	0.718
CKD, n (%)	2/41*	(4.9)	7	(4)	0.806
DM, n (%)	8/41*	(19.5)	20	(11.5)	0.170
Thyroid dysfunction, n (%)	0/41*	(0)	6	(3.4)	0.598
ICU prognostic indicators					
SOFA score (>5), n (%)	14	(32.6)	69	(39.7)	0.391
SOFA score points, median (min-max)	5	(3-11)	5	(2-11)	0.673
APACHE II score (>14), n (%)	30	(69.8)	110	(63.2)	0.422
APACHE II score points, median (min-max)	15	(6-22)	15	(3-24)	0.301
Clinical characteristics					
pO2 on air (%), median (min-max)	57.5	(40.5–75) / 36*	55.2	(42–85) / 150*	**0.037**
Pulmonary embolism, n (%)	0	(0)	2	(1.1)	1
Myositis, n (%)	0	(0)	3	(1.7)	1
Cognitive dysfunction, n (%)	4	(9.3)	14	(8)	0.761
Laboratory findings					
Hyperferritinaemia (>250 µg/l), n (%)	29/37*	(78.4)	125/154*	(81.2)	0.700
Ferritin levels, median (min-max)	602.2	(74.9–14959)	546.9	(38–25466)	0.887
D-dimers, n (%)	15/40*	(37.5)	40/154*	(26)	0.150
D-dimer levels, median (min-max)	1.7	(0.4–10)	1.3	(0.1–17.6)	0.555
CRP (>0.5 mg/dl), n (%)	42	(97.7)	166/171	(97.1)	0.832
CRP levels, median (min-max)	12.5	(0.5-32)	10.3	(0.3-41.1)	0.126
Creatinine (>1.4 mg/dl), n (%)	8	(18.6)	14/173*	(8.1)	**0.041**
Creatinine levels, median (min-max)	1	(0.4–5.8)	0.9	(0.4–4.2)	0.473
HbA1c (>6.5), n (%)	8/26*	(30.8)	26/124*	(21)	0.278
HbA1c levels, median (min-max)	6.1	(4.5–10.6)	6	(4.5–13)	0.611
Treatment					
Azythromycin before hospitalisation, n (%)	7/36*	(19.4)	32/150*	(21.3)	0.803
Dexamethasone after intubation, n (%)	36/36*	(100)	150/150*	(100)	1

* Available data; BMI: Body Mass Index; COPD: chronic obstructive pulmonary disease; CD: cardiovascular disease; SOFA: Sequential Organ Failure Assessment score; APACHE II: acute physiology and chronic health evaluation II; CRP: C-reactive protein; HbA1c: haemoglobin A1c.

Supplementary Table S3. Characteristics of critically ill COVID-19 patients with two consecutive blood samples available for analysis.

	Total (n=60)
Female gender, n (%)	15 (25)
Age, median (min-max)	68 (42–90)
Outcome, n (%)	30 (50)
Clinical features	
Time duration between symptoms onset and hospital admission, median (min-max)	5 (1-15)
Time duration between hospital admission and outcome, median (min-max)	42 (16–137)
BMI 25–30, n (%)	50 (83.3)
BMI 30–35, n (%)	8 (13.3)
BMI >35, n (%)	2 (3.3)
Comorbidities	
Hypertension, n (%)	31 (51.7)
Dyslipidaemia, n (%)	17 (28.3)
COPD, n (%)	5 (8.3)
Neoplasia, n (%)	4 (6.7)
CD, n (%)	12 (20)
CKD, n (%)	3 (5)
DM, n (%)	8 (13.3)
Thyroid dysfunction, n (%)	2 (3.3)
ICU prognostic indicators	
SOFA score (>5), n (%)	7 (11.7)
SOFA score points, median (min-max)	4.5 (3-6)
APACHE II score (>14), n (%)	47 (78.3)
APACHE II score points, median (min-max)	17 (11–24)
Clinical characteristics	
pO2 on air (%), median (min-max)	58 (42-85) / 186*
Pulmonary embolism, n (%)	1 (1.7)
Myositis, n (%)	1 (1.7)
Cognitive dysfunction, n (%)	5 (8.3)
Laboratory findings	
Hyperferritinaemia (>250 μg/l), n (%)	48/59* (81.4)
Ferritin levels, median (min-max)	490.4 (38–14959)
D-dimers, n (%)	3/59* (5.1)
D-dimer levels, median (min-max)	1 (0.1–10)
CRP (>0.5 mg/dl), n (%)	59/59* (100)
CRP levels, median (min-max)	14.2 (0.6–39)
Creatinine (>1.4 mg/dl), n (%)	12 (20)
Creatinine levels, median (min-max)	1 (0.4–2.8)
HbA1c (>6.5), n (%)	14/57* (24.6)
HbA1c levels, median (min-max)	6 (4.5–10.2)
Treatment	
Azythromycin before hospitalisation, n (%)	8 (13.3)
Dexamethasone after intubation, n (%)	60 (100)

*Available data; BMI: Body Mass Index; COPD: chronic obstructive pulmonary disease; CD: cardio-vascular disease; SOFA: Sequential Organ Failure Assessment score; APACHE II: acute physiology and chronic health evaluation II; CRP: C-reactive protein; HbA1c: haemoglobin A1c.

Supplementary Table S4. Pattern and titre of antinuclear antibodies (ANA).

	Patients (n=217)	Controls (n=117)
ANA, N (%)	**105 (48.4)**	**25 (21.4)**
Type		
Fine speckled pattern, n (%)	74 (34.1)	21 (17.9)
Speckled pattern, n (%)	22 (10.1)	0 (0)
Fine speckled cytoplasmic pattern, n (%)	3 (1.4)	2 (1.7)
Speckled cytoplasmic pattern, n (%)	4 (1.8)	0 (0)
Nucleolar pattern, n (%)	1 (0.5)	2 (1.7)
Vimentin pattern, n (%)	1 (0.5)	0 (0)
Titre		
1:160, n (%)	66 (30.4)	15 (12.8)
1:320, n (%)	33 (15.2)	5 (4.3)
1:640, n (%)	6 (2.8)	5 (4.3)

Supplementary Table S5. Pattern and titre of antineutrophil cytoplasmic antibodies (ANCA).

	Patients (n=217)	Controls (n=117)
ANCA, n (%)	**30 (13.8)**	**14 (12.0)**
P-ANCA, n (%)	**13 (6.0)**	**12 (10.3)**
1:20, n (%)	4 (1.8)	2 (1.7)
1:40, n (%)	1 (0.5)	4 (3.4)
1:80, n (%)	5 (2.3)	3 (2.6)
1:160, n (%)	1 (0.5)	0 (0)
1:320, n (%)	1 (0.5)	2 (1.7)
1:640, n (%)	1 (0.5)	1 (0.9)
C-ANCA, n (%)	**17 (7.8)**	**2 (1.7)**
1:20, n (%)	5 (2.3)	0 (0)
1:40, n (%)	9 (4.1)	0 (0)
1:80, n (%)	0 (0)	1 (0.9)
1:160, n (%)	2 (0.9)	1 (0.9)
1:320, n (%)	0 (0)	0 (0)
1:640, n (%)	1 (0.5)	0 (0)

Supplementary Table S6. Myositis-related autoantibodies.

	Patients (n=203)	Controls (n=117)
Myositis-related autoantibodies, n (%)	22 (10.8)	1 (0.9)
Mi-2a, n (%)	1 (0.5)	0 (0)
Mi-2β, n (%)	0 (0)	0 (0)
TIF1γ, n (%)	3 (1.5)	0 (0)
MDA5, n (%)	1 (0.5)	0 (0)
NXP2, n (%)	1 (0.5)	0 (0)
SAE1, n (%)	0 (0)	0 (0)
Ku, n (%)	5 (2.5)	0 (0)
PM-Scl100, n (%)	2 (1)	0 (0)
PM-Scl75, n (%)	4 (2)	0 (0)
Jo-1, n (%)	1 (0.5)	0 (0)
SRP, n (%)	0 (0)	0 (0)
PL-7, n (%)	2 (1)	1 (0.9)
PL-12, n (%)	4 (2)	0 (0)
EJ, n (%)	0 (0)	0 (0)
OJ, n (%)	3 (1.5)	0 (0)

Supplementary Table S7. Titres of autoantibodies in seropositive severe COVID-19 patients.

Autoantibodies	Titres
ANA [median dilution (min-max)]	160 (80–1280)
ANCA [median dilution (min-max)]	40 (20–640)
C-ANCA [median dilution (min-max)]	40 (20–640)
P-ANCA [median dilution (min-max)]	80 (80–640)
ENAs [median intensity (min-max), low 11–25, moderate 26–50, high >50]	28 (21–72)
Myositis related autoantibodies [median intensity (min-max), low 11–25, moderate 26–50, high >50]	32 (21–116)
Anti-CCP [median I.U. (min-max), cut-off limit: 20 I.U.]	21 (31.5–468)
Anti-dsDNA [median I.U. (min-max), cut-off limit: 16 I.U.]	24 (17.6–48.4)
Anti-TPO, [median I.U. (min-max), cut-off limit: 100 I.U.]	183 (101–4099)
Anti-β2-GPI IgG [median I.U. (min-max), cut-off limit: 100 I.U.]	125.5 (101–445)
Anti-β2-GPI IgM [median I.U. (min-max), cut-off limit: 100 I.U.]	182.5 (105–1114)
Anti-CL IgG [median I.U. (min-max), cut-off limit: 100 I.U.]	240.5 (127–744)
Anti-CL IgM [median I.U. (min-max), cut-off limit: 100 I.U.]	188 (102–664)
Anti-TPO, [median I.U. (min-max), cut-off limit: 100 I.U.]	183 (101–4099)
Anti-TG, [median I.U. (min-max), cut-off limit: 0.6 I.U.]	1.2 (0.7–2.9)