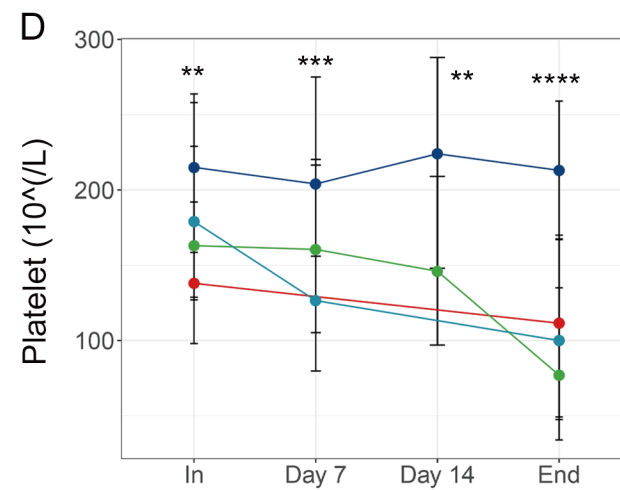
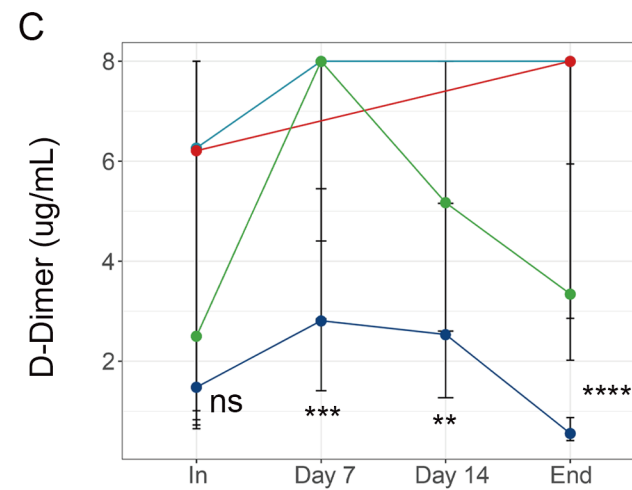
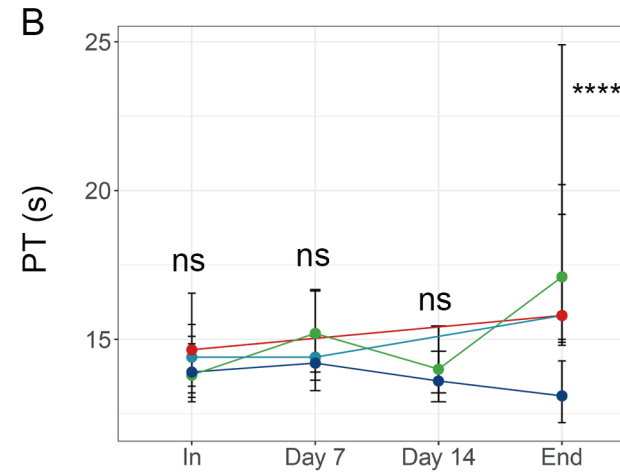
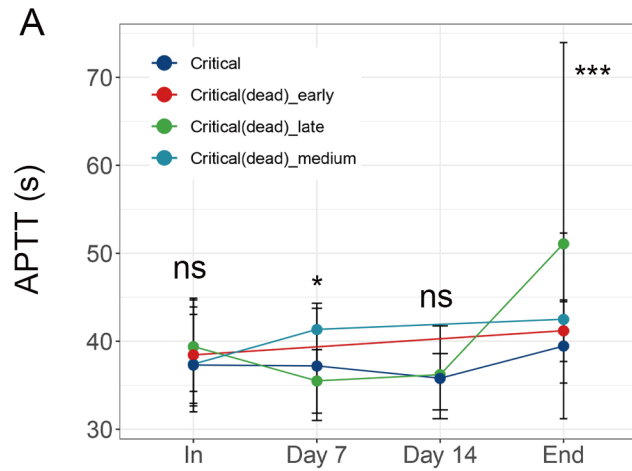


Supplementary Figure Legend:

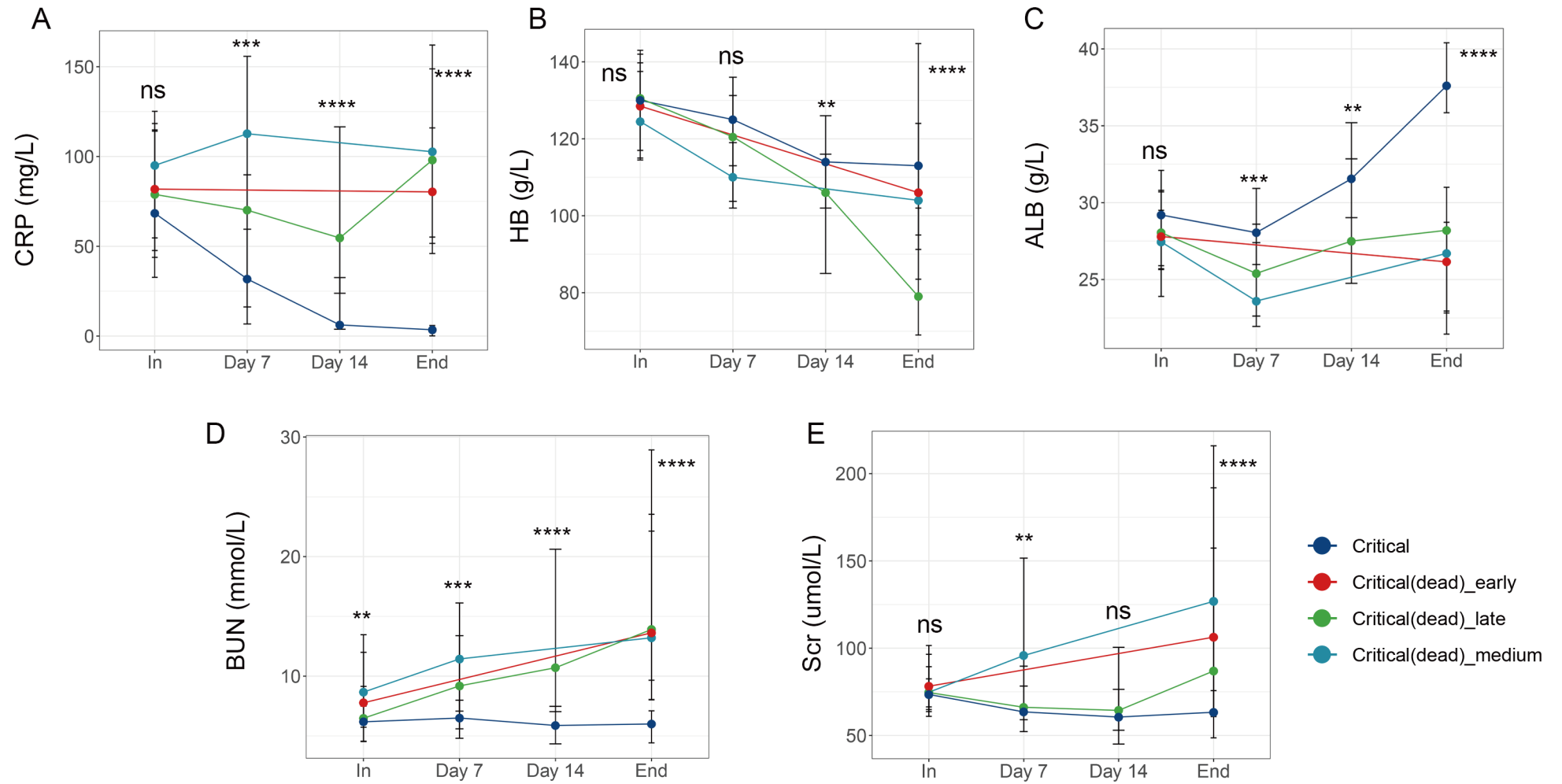
Supplementary Figure 1: Temporal changes in coagulation related indicators from illness onset in critical COVID-19 patients with different course of disease. A: APTT, activated partial thromboplastin time; B: PT, prothrombin time; C: D-Dimer; D: Platelet. \*:  $P < 0.05$ ; \*\*:  $P < 0.01$ ; \*\*\*:  $P < 0.001$ ; \*\*\*\*:  $P < 0.0001$ ; ns:  $P \geq 0.05$ .

Supplementary Figure 2: Temporal changes in laboratory markers from illness onset in critical COVID-19 patients with different course of disease. A: CRP, C-reactive protein; B: HB, hemoglobin; C: ALB, albumin; D: BUN, blood urea nitrogen; E: Scr, serum creatinine. \*:  $P < 0.05$ ; \*\*:  $P < 0.01$ ; \*\*\*:  $P < 0.001$ ; \*\*\*\*:  $P < 0.0001$ ; ns:  $P \geq 0.05$ .

# Supplementary Figure 1



# Supplementary Figure 2



**Supplementary Table 1: Laboratory information of the whole cohort at admission**

	Total (n=753)	Moderate (n=32)	Severe(n=493)	Critical (n=47)	Critical(dead)_early (n=66)	Critical(dead)_medium (n=51)	Critical(dead)_late (n=64)	P-value
<b>Blood routine</b>								
WBC count, 10 <sup>9</sup> /L	5.97(4.58-8.05)	5.3(4.54-6.16)	5.5(4.36-6.97)	8.27(4.98-10.12)	9.36(6.55-11.73)	8.5(6.48-12.93)	7.65(5.2-10.63)	<0.0001
Hemoglobin, g/dL	126(115-137)	129.5(119.75-138.25)	125(115-136)	130(117-142)	128.5(117-139.75)	124.5(114.5-137.5)	130.5(115-143)	0.406
Platelet, 10 <sup>9</sup> /L	209.5(155-269.25)	233(178.75-260.5)	218.5(165-279.25)	215(158.5-258)	138(98-192)	179(127-263.75)	163(128.75-229)	<0.0001
Neutrophil, 10 <sup>9</sup> /L	4.08(2.97-6.56)	3.2(2.7-3.94)	3.68(2.76-5.08)	6.93(3.82-9.07)	8.02(5.49-10.71)	7.22(5.28-11.88)	6.51(4.33-9.39)	<0.0001
Lymphocyte, 10 <sup>9</sup> /L	0.98(0.64-1.43)	1.4(0.84-1.83)	1.12(0.82-1.56)	0.72(0.46-1)	0.61(0.38-0.76)	0.54(0.39-0.81)	0.53(0.4-0.74)	<0.0001
<b>Coagulation</b>								
D-Dimer, mg/L	0.62(0.29-2.5)	0.32(0.19-0.8)	0.47(0.24-1.05)	1.48(0.72-8)	6.21(0.83-8)	6.27(1.01-8)	2.5(0.65-8)	<0.0001
PT, s	13.2(12.6-14.2)	12.9(12.62-13.73)	13(12.4-13.7)	13.9(13.2-14.85)	14.65(13.43-16.55)	14.4(13.05-15.5)	13.8(12.9-15.1)	<0.0001
APTT, s	36.7(33.1-40.75)	36.8(35.3-39.88)	36.2(33.1-39.8)	37.3(32.65-43.05)	38.45(31.98-44.9)	37.4(32.95-43.9)	39.4(34.3-44.7)	0.0363
FIB, g/L	4.4(3.25-5.24)	NA	NA	4.49(3.5-5.29)	3.75(2.16-5.04)	4.58(2.89-5.56)	4.53(3.72-5.19)	0.0667
<b>Liver</b>								
AST, U/L	32(23-47)	23(17.75-31.25)	28(21-41)	38(28-59)	47(35.5-66.75)	46.5(31-66.75)	43(28.75-55)	<0.0001
ALT, U/L	33(21-54)	21.5(18.75-37.25)	32(20-51)	40(26-65)	41(30-56)	41(25.5-84.25)	33(23.75-49)	0.0007
Total protein, g/L	62.6(59.1-66.5)	65.1(61.88-67.33)	63(59.4-66.95)	61.4(58.45-65.25)	61.2(57.65-65.65)	61.75(56.78-65.18)	61.65(58.68-64.08)	0.0168
ALB, g/L	31.1(27.7-35.2)	35.15(32.1-39.75)	32.2(28.8-36.6)	29.2(25.7-32.1)	27.8(25.65-30.7)	27.45(23.9-29.5)	28.05(25.9-30.8)	<0.0001
<b>Renal</b>								
BUN, mmol/L	4.9(3.73-6.81)	4.2(3.35-4.84)	4.46(3.42-5.76)	6.18(4.56-7.5)	7.77(5.96-13.46)	8.66(5.73-11.99)	6.48(4.53-9.14)	<0.0001
Scr, umol/L	68.75(57.2-82.55)	67.9(57.08-78.85)	65.3(56-78.35)	73.5(64.85-82.45)	78.2(63.65-101.55)	74.75(66.38-96.5)	74.6(60.95-89.4)	<0.0001
Cystatin C, mg/L	0.96(0.8-1.29)	NA	NA	0.92(0.79-1.08)	1.03(0.84-1.36)	0.97(0.84-1.35)	0.95(0.77-1.19)	0.3397
<b>Myocardial</b>								
LDH, U/L	269(197-396.25)	185.5(147.75-225.75)	230(185.75-306)	371(266.5-610.5)	564.5(466-677.75)	513.5(399.25-619.75)	445(343.5-588)	<0.0001
CK, U/L	79(48-167)	53.5(41.25-100)	69(46-118)	122(77-312.75)	242(109.5-514)	110.5(58-196.25)	108(56-242)	<0.0001
<b>Inflammation</b>								
CRP, mg/L	28.33(4.73-74.27)	5.44(2.45-24.41)	15.1(3.46-44.8)	68.43(32.69-114.09)	81.83(43.84-114.81)	95.03(54.66-125.16)	78.9(47.64-118.36)	<0.0001
PCT, ng/mL	0.09(0.05-0.2)	0.05(0.04-0.1)	0.07(0.05-0.12)	0.16(0.11-0.27)	0.42(0.21-1.17)	0.44(0.14-1.05)	0.25(0.12-0.44)	<0.0001
ESR, mm/h	44(26-68)	28(21-47)	38(23-64.5)	72(44.5-81.5)	62(46-72)	62(24.05-79)	72(46-105)	0.0003
Serum Ferritin, ng/mL	577.27(271.89-	116.89(107.76-	474.81(210.65-	593.32(398.2-	1809.36(690.67-	1419.64(1183.98-	1316.72(998.44-	<0.0001

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1191.77)

396.18)

777.4)

1909.33)

2000)

2000)

1793.2)

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WBC, white blood cell; PT, prothrombin time; APTT, activated partial thromboplastin time; FIB, fibrinogen; ALB, albumin; BUN, blood urea nitrogen; Scr, serum creatinine; LDH, lactate dehydrogenase; CK, creatine kinase; CRP, C-reactive protein; PCT, procalcitonin; ESR, erythrocyte sedimentation rate.

The P-value referring to the comparison of the 5 groups (Severe, Critical, Critical(dead)\_early, Critical(dead)\_medium, Critical(dead)\_late). A P-value of <0.05 is statistically significant.

**Supplementary Table 2: Demographic and clinical findings between different groups of non-survivors**

	Early (n=66)	Medium (n=51)	Late (n=64)	P-value	early vs. medium	early vs. late	medium vs. late
Age	68.5(60.5-78)	68(62.5-72)	68.5(61.75-77)	0.9642			
<b>Sex</b>							
Male	43(65.2%)	35(68.6%)	48(75%)				
Female	23(34.8%)	16(31.4%)	16(25%)	0.4671			
<b>Comorbidities</b>							
Total	52(78.8%)	39(76.5%)	50(78.1%)	0.9547			
Diabetes	16(24.2%)	16(31.4%)	11(17.2%)	0.2053			
Hypertension	33(50%)	20(39.2%)	31(48.4%)	0.4702			
Cancer	10(15.2%)	2(3.9%)	8(12.5%)	0.142			
Cardiac Disease	11(16.7%)	7(13.7%)	16(25%)	0.2631			
<b>Symptoms</b>							
Fever	51(77.3%)	43(84.3%)	52(81.2%)	0.6262			
Cough	41(62.1%)	34(66.7%)	51(79.7%)	0.0808			
Fatigue	36(54.5%)	29(56.9%)	38(59.4%)	0.8568			
Dyspnea	44(66.7%)	22(43.1%)	34(53.1%)	0.0365	0.0436	0.228	0.3488
Chest tightness	15(22.7%)	12(23.5%)	26(40.6%)	0.0459	1	0.0377	0.0723
Anorexia	17(25.8%)	13(25.5%)	17(26.6%)	0.9904			
Asthma	18(27.3%)	11(21.6%)	15(23.4%)	0.7597			
Myalgia	9(13.6%)	13(25.5%)	19(29.7%)	0.0779			
Diarrhea	12(18.2%)	7(13.7%)	13(20.3%)	0.6492			
Shiver	8(12.1%)	10(19.6%)	12(18.8%)	0.4712			
<b>Complications</b>							
ARDS	66(100%)	51(100%)	64(100%)	-			
Hypoproteinemia	45(68.2%)	49(96.1%)	64(100%)	<0.0001	0.0002	<0.0001	0.1945
Shock	66(100%)	51(100%)	64(100%)	-			
Liver Injury	44(66.7%)	41(80.4%)	57(89.1%)	0.0075	0.214	0.0086	0.2901
Heart Injury	34(51.5%)	28(54.9%)	41(64.1%)	0.3325			
Thrombocytopenia	23(34.8%)	32(62.7%)	49(76.6%)	<0.0001	0.0046	<0.0001	0.1496
Anemia	15(22.7%)	25(49%)	52(81.2%)	<0.0001	0.0035	<0.0001	0.0005

DIC	12(18.2%)	19(37.3%)	36(56.2%)	<0.0001	0.0505	<0.0001	0.06
Coagulation disorders	12(18.2%)	20(39.2%)	42(65.6%)	<0.0001	0.0132	<0.0001	0.0121
AKI	10(15.2%)	24(47.1%)	29(45.3%)	0.0001	0.0004	0.0004	1
Infection	5(7.6%)	10(19.6%)	24(37.5%)	0.0002	0.0917	0.0001	0.0626
Venous thrombosis	2(3%)	3(5.9%)	9(14.1%)	0.0528			
Gastrointestinal hemorrhage	4(6.1%)	4(7.8%)	7(10.9%)	0.5959			
Arrhythmia	4(6.1%)	0(0%)	1(1.6%)	0.1073			
AMI	3(4.5%)	1(2%)	1(1.6%)	0.5363			
<b>Treatment</b>							
Oxygen inhalation	47(71.2%)	42(82.4%)	51(79.7%)	0.3092			
Non-invasive ventilation	37(56.1%)	30(58.8%)	39(60.9%)	0.852			
Invasive ventilation	10(15.2%)	30(58.8%)	50(78.1%)	<0.0001	<0.0001	<0.0001	0.0406
ECMO	0(0%)	1(2%)	2(3.1%)	0.3703			
CRRT	4(6.1%)	12(23.5%)	21(32.8%)	0.0006	0.0188	3.00E-04	0.3055
<b>Drug</b>							
Antibiotics	54(81.8%)	51(100%)	62(96.9%)	0.0003	0.0032	0.0132	0.5021
Anticoagulation	11(16.7%)	24(47.1%)	52(81.2%)	<0.0001	0.0005	0	0.0002
<b>Anti-virus</b>							
Arbidol	51(77.3%)	41(80.4%)	56(87.5%)	0.3058			
Recombinant human interferon	9(13.6%)	19(37.3%)	21(32.8%)	0.0075	0.0127	0.0184	0.6949
Lopinavir and Ritonavir	11(16.7%)	23(45.1%)	32(50%)	0.0001	0.0015	0.0002	0.7075
<b>Corticosteroids</b>							
Total	42(63.6%)	43(84.3%)	53(82.8%)	0.0103	0.0309	0.0309	1
Dexamethasone	7(10.6%)	6(11.8%)	1(1.6%)	0.0693			
Methylprednisolone	33(50%)	36(70.6%)	40(62.5%)	0.0705			
<b>Others</b>							
Albumin	20(30.3%)	45(88.2%)	60(93.8%)	<0.0001	<0.0001	<0.0001	0.3348
Gamma-globulin	19(28.8%)	30(58.8%)	44(68.8%)	<0.0001	0.002	<0.0001	0.3284

ARDS, acute respiratory distress syndrome; DIC, disseminated intravascular coagulation; AKI, acute kidney injury; AMI: acute myocardial infarction; ECOM, extracorporeal membrane oxygenation; CRRT, continuous renal replacement therapy. A P-value of <0.05 is statistically significant.

**Supplementary Table 3: Laboratory findings between different groups of non-survivors**

	Total (n=753)	Early (n=66)	Medium (n=51)	Late (n=64)	P-value	early vs. medium	early vs. late	medium vs. late
<b>Blood routine</b>								
WBC count, 10 <sup>9</sup> /L	5.97(4.58-8.05)	9.36(6.55-11.73)	8.5(6.48-12.93)	7.65(5.2-10.63)	0.1005			
Hemoglobin, g/dL	126(115-137)	128.5(117-139.75)	124.5(114.5-137.5)	130.5(115-143)	0.5524			
Platelet, 10 <sup>9</sup> /L	209.5(155-269.25)	138(98-192)	179(127-263.75)	163(128.75-229)	0.0656			
Neutrophil, 10 <sup>9</sup> /L	4.08(2.97-6.56)	8.02(5.49-10.71)	7.22(5.28-11.88)	6.51(4.33-9.39)	0.1375			
Lymphocyte, 10 <sup>9</sup> /L	0.98(0.64-1.43)	0.61(0.38-0.76)	0.54(0.39-0.81)	0.53(0.4-0.74)	0.8828			
<b>Coagulation</b>								
D-Dimer, mg/L	0.62(0.29-2.5)	6.21(0.83-8)	6.27(1.01-8)	2.5(0.65-8)	0.1175			
PT, s	13.2(12.6-14.2)	14.65(13.43-16.55)	14.4(13.05-15.5)	13.8(12.9-15.1)	0.0394	0.033	0.6805	0.6987
APTT, s	36.7(33.1-40.75)	38.45(31.98-44.9)	37.4(32.95-43.9)	39.4(34.3-44.7)	0.8362			
FIB, g/L	4.4(3.25-5.24)	3.75(2.16-5.04)	4.58(2.89-5.56)	4.53(3.72-5.19)	0.0517			
<b>Liver</b>								
AST, U/L	32(23-47)	47(35.5-66.75)	46.5(31-66.75)	43(28.75-55)	0.2125			
ALT, U/L	33(21-54)	41(30-56)	41(25.5-84.25)	33(23.75-49)	0.0891			
Total protein, g/L	62.6(59.1-66.5)	61.2(57.65-65.65)	61.75(56.78-65.18)	61.65(58.68-64.08)	0.9262			
ALB, g/L	31.1(27.7-35.2)	27.8(25.65-30.7)	27.45(23.9-29.5)	28.05(25.9-30.8)	0.4333			
<b>Renal</b>								
BUN, mmol/L	4.9(3.73-6.81)	7.77(5.96-13.46)	8.66(5.73-11.99)	6.48(4.53-9.14)	0.041	0.0657	1	0.1353
Scr, umol/L	68.75(57.2-82.55)	78.2(63.65-101.55)	74.75(66.38-96.5)	74.6(60.95-89.4)	0.4765			
Cystatin C, mg/L	0.96(0.8-1.29)	1.03(0.84-1.36)	0.97(0.84-1.35)	0.95(0.77-1.19)	0.432			
<b>Myocardial</b>								
LDH, U/L	269(197-396.25)	564.5(466-677.75)	513.5(399.25-619.75)	445(343.5-588)	0.0113	0.0113	0.0084	0.605
CK, U/L	79(48-167)	242(109.5-514)	110.5(58-196.25)	108(56-242)	0.0072	0.0072	0.0193	0.0222
<b>Inflammation</b>								
CRP, mg/L	28.33(4.73-74.27)	81.83(43.84-114.81)	95.03(54.66-125.16)	78.9(47.64-118.36)	0.5355			
PCT, ng/mL	0.09(0.05-0.2)	0.42(0.21-1.17)	0.44(0.14-1.05)	0.25(0.12-0.44)	0.0468	0.0627	1	0.2334
ESR, mm/h	44(26-68)	62(46-72)	62(24.05-79)	72(46-105)	0.4413			
Serum Ferritin, ng/mL	577.27(271.89-1191.77)	1809.36(690.67-2000)	1419.64(1183.98-2000)	1316.72(998.44-1793.2)	0.5404			

WBC, white blood cell; PT, prothrombin time; APTT, activated partial thromboplastin time; FIB, fibrinogen; ALB, albumin; BUN, blood urea nitrogen; Scr, serum creatinine; LDH, lactate dehydrogenase; CK, creatine kinase; CRP, C-reactive protein; PCT, procalcitonin; ESR, erythrocyte sedimentation rate. A P-value of <0.05 is statistically significant.