

Associations of procalcitonin, C-reaction protein and Neutrophil-to-Lymphocyte Ratio with mortality in hospitalized COVID-19 patients in China

Jian-bo Xu ^{1†}, Chao Xu ^{2†}, Ru-bing Zhang ³, Meng Wu ², Chang-kun Pan ⁴, Xiu-jie Li ⁵, Qian Wang ⁶, Fang-fang Zeng ^{7*}, Sui Zhu ^{6*}

¹ Department of Critical Care Medicine, School of Clinical Medicine, Jiamusi University, No.348, Dexiang Street, Jiamusi 154000, Heilongjiang Province, China.

² Department of Neurology and Respirator Intensive Care Unit, Heilongjiang Provincial Hospital, No. 82, Zhongshan Road, Harbin 150036, Heilongjiang Province, China.

³ Department of Cardiology, School of Clinical Medicine, Jiamusi University, No.348, Dexiang Street, Jiamusi 154000, Heilongjiang Province, China.

⁴ Department of Critical Care Medicine, Jiamusi Tumor Hospital, No.37, Guanghua Road, Jiamusi 154000, Heilongjiang Province, China.

⁵ Department of Respiratory Medicine, Jiamusi Tumor Hospital, No.37, Guanghua Road, Jiamusi 154000, Heilongjiang Province, China.

⁶ Department of Medical Statistics, School of Medicine, Jinan University, No.601 Huangpu Road West, Guangzhou 510632, Guangdong Province, China.

⁷ Department of Epidemiology, School of Medicine, Jinan University, No.601 Huangpu Road West, Guangzhou 510632, Guangdong Province, China.

Supplementary Table S1. Risk factors associated with mortality in patients with COVID-19 by using univariate Cox model analysis

Variables	Survival (n=59)	Death (n=17)	HR	95% CI	P
Demographic					
Age, mean (SD), years	57.41 (14.97)	65 (11.49)	1.03	0.99 - 1.07	0.149
Sex (male vs female)	23 (38.98)	7 (41.18)	1.14	0.43 - 3.01	0.786
Time from illness onset to first hospital admission, median (IQR), days	7 (8)	7 (6)	0.96	0.87 - 1.05	0.344
Chronic heart disease (yes vs no)	6 (10.17)	1 (5.88)	0.55	0.07 - 4.13	0.558
Chronic lung disease (yes vs no)	2 (3.39)	0 (0)	0	0 - Inf ^{&}	0.998
Chronic kidney disease (yes vs no)	4 (6.78)	1 (5.88)	0.96	0.13 - 7.27	0.970
Diabetes (yes vs no)	9 (15.25)	6 (35.29)	1.93	0.71 - 5.23	0.196
Hypertension (yes vs no)	19 (32.2)	8 (47.06)	1.60	0.62 - 4.18	0.333
Cancer (yes vs no)	1 (1.69)	2 (11.76)	4.83	1.08 - 21.66	0.040
Clinical symptoms					
Fever (yes vs no)	50 (84.75)	14 (82.35)	0.55	0.15 - 1.94	0.350
Cough (yes vs no)	37 (62.71)	12 (70.59)	1.3	0.45 - 3.73	0.626
Headache (yes vs no)	2 (3.39)	0 (0)	0	0 - Inf ^{&}	0.998
Myodynia (yes vs no)	1 (1.69)	1 (5.88)	3.65	0.48 - 27.97	0.213
Chills (yes vs no)	6 (10.17)	2 (11.76)	1.18	0.27 - 5.22	0.823
Nausea and vomiting (yes vs no)	1 (1.69)	1 (5.88)	2.70	0.36 - 20.57	0.337
Chest distress or shortness of breath (yes vs no)	24 (40.68)	10 (58.82)	2.20	0.83 - 5.82	0.113
Complications					
ARDS (yes vs no)	9 (15.25)	16 (94.12)	39.05	5.16 - 295.25	<0.001
Hypohepatia (yes vs no)	7 (11.86)	6 (35.29)	2.86	1.04 - 7.87	0.042
Renal insufficiency	0 (0)	6 (35.29)	7.10	2.6 - 19.36	<0.001

(yes vs no)						
Heart failure (yes vs no)	2 (3.39)	5 (29.41)	4.77	1.64 - 13.85	0.004	
Shock (yes vs no)	3 (5.08)	12 (70.59)	14.03	4.90 - 40.18	<0.001	
Therapy						
Glucocorticoid (yes vs no)	42 (71.19)	17 (100)	3.02e+8	0 - Inf ^{&}	0.998	
Mechanical ventilation (yes vs no)	35 (59.32)	17 (100)	4.22e+8	0 - Inf ^{&}	0.997	
Immune globulin (yes vs no)	34 (57.63)	14 (82.35)	3.37	0.95 - 11.96	0.060	
Laboratory tests						
PCT, ng/mL (≥ 0.10 vs < 0.1)	0.11 (0.18)	0.25 (0.27)	12.82	1.68 - 97.8	0.014	
CRP, mg/L (≥ 52.14 vs < 52.14)	16.94 (61.71)	109.58 (126.7)	12.30	2.79 - 54.19	0.001	
NLR (≥ 3.59 vs < 3.59)	5.41 (7.84)	10.72 (9.67)	8.6	1.11 - 66.82	0.040	

[&] due to the absence of death.

COVID-19: coronavirus disease 2019; **HR:** hazard ratio; **95% CI:** confidence interval; **SD:** standard deviation; **IQR:** interquartile range; **ARDS:** acute respiratory distress syndrome; **PCT:** procalcitonin; **CRP:** C-reaction protein; **NLR:** neutrophil-to-lymphocyte ratio.