Clinical characteristics and risk factors for mortality in patients with coronavirus disease 2019 in intensive care unit: a single-center, retrospective, observational study in China

Fangfang Sai
Shanghai Jiao Tong University School of Medicine Affiliated Renji Hospital
Xiaolei Liu
Shanghai Jiao Tong University School of Medicine Affiliated Renji Hospital
Lanyu Li
Shanghai Jiao Tong University School of Medicine Affiliated Renji Hospital
Yan Ye
Shanghai Jiao Tong University School of Medicine Affiliated Renji Hospital
Changqing Zhu
Shanghai Jiao Tong University School of Medicine Affiliated Renji Hospital
Ying Hang
Shanghai Jiao Tong University School of Medicine Affiliated Renji Hospital
Conghua Huang
Shanghai Jiao Tong University School of Medicine Affiliated Renji Hospital
Lei Tian
Shanghai Jiao Tong University School of Medicine Affiliated Renji Hospital
Xinhui Xu
Shanghai Jiao Tong University School of Medicine Affiliated Renji Hospital
Huan Huang (renjihuanghuan@163.com)
Shanghai Jiao Tong University School of Medicine Affiliated Renji Hospital

Research

Keywords: COVID-19, mortality, lymphocyte count, ICU

DOI: https://doi.org/10.21203/rs.3.rs-46078/v1

Abstract

Background: Coronavirus disease 2019 (COVID-19) is a potentially life-threatening contagious disease which has spread all over the world. Risk factors for the clinical outcomes of COVID-19 pneumonia in intensive care unit (ICU) have not yet been well determined.

Methods: In this retrospective, single-centered, observational study, we consecutively included 47 patients with confirmed COVID-19 who were admitted to the ICU of Leishenshan Hospital in Wuhan, China, from February 24 to April 5, 2020. Clinical characteristics and outcomes were collected and compared between survivors and non-survivors. Multivariable logistic regression was used to explore the risk factors associated with death in patients of COVID-19.

Results: The study cohort included 47 adult patients with a median age of 70.55±12.52 years, and 30 (63.8%) patients were men. Totally 15 (31.9%) patients died. Compared with survivors, non-survivors were more likely to develop septic shock (6 [40%] patients *vs* 3 [9.4%] patients), disseminated intravascular coagulation (3 [21.4%] *vs* 0), and had higher score of APACHE II (25.07±8.03 *vs* 15.56±5.9*5*), CURB-65 (3[2-4] *vs* 2[1-3]), Sequential Organ Failure Assessment (SOFA) (7[5-9] *vs* 3[1-6]), higher level of D-dimer (5.74 [2.32-18] *vs* 2.05 [1.09-4.00]) and neutrophil count (9.4[7.68-14.54] *vs* 5.32[3.85-9.34]). SOFA score (OR 1.47, 1.01–2.13; p=0.0042) and lymphocyte count (OR 0.02, 0.00–0.86; p=0.042) on admission were independently risk factors for mortality. Patients with higher lymphocyte count (>0.63×10^9/L) and lower SOFA score ≤4 on admission had a significantly well prognosis than those with lower lymphocyte count (≤0.63×10^9/L) and higher SOFA score >4 in overall survival.

Conclusions: Higher SOFA score and lower lymphocyte count on admission were associated with poor prognosis of patients with COVID-19 in ICU. Lymphocyte count may serve as a promising prognostic biomarker.

Introduction

A novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was firstly isolated from a cluster of patients with pneumonia of unknown cause in Wuhan, China [1]. In February 2020, the virus and its associated disease were designated coronavirus disease 2019 (COVID-19), which has been declared a public health emergency of international concern by World Health Organization (WHO) [2]. It has been reported that the number of patients infected with SARS-Cov-2 has reached 5,137,100 globally, and 330,578 patients have died of COVID-19 till 22 May, 2020.

According to the WHO–China Joint Mission on COVID-19 report, 13.8% of the patients with laboratory-confirmed COVID-19 developed severe disease and 6.1% required intensive care[3].In a previous study of 1099 patients with laboratory-confirmed COVID-19 from 552 hospitals in 30 provinces, 5.0% were admitted into the ICU, 2.3% underwent invasive mechanical ventilation, and 1.4% died[4]. Two subsequent studies reported that 23%–26% of COVID-19 cases required ICU admission and the mortality rate varied

from 4.3–11%, while most patients in these studies were still hospitalized at the time of manuscript submission[5–6]. Increasing evidences revealed that the mortality of critically ill patients with SARS-CoV-2 pneumonia is considerable [7–8].

Certain epidemiological features and clinical characteristics of COVID-19 have been previously reported to be associated with the outcome. Older age with comorbidities was at high-risk of developing ARDS and death [7, 9]. A recent study from two designated hospitals in Wuhan demonstrated increasing odds of in-hospital death for patients with older age, higher Sequential Organ Failure Assessment (SOFA) score, and d-dimer greater than 1 μg/L on admission[10]. However, limited studies evaluated the risk factors for COVID-19 related death in ICU. Thus, in this retrospective study, we aimed to explore the risk factors for mortality by investigating the clinical and laboratory features and short-term outcomes of severe cases of COVID-19 from a designated hospital in Wuhan.

Methods

Study Design

All procedures described here have been approved by the ethics committee of Leishenshan Hospital. This single-center, retrospective study was conducted at Leishenshan Hospital (Wuhan, China), which is a designated hospital with 1600 beds, including two ICUs (A and B). All critically ill patients with confirmed COVID-19 admitted to B-ICU from February 24 to April 5 2020 were consecutively enrolled. Critically ill COVID-19 was defined as those admitted to ICU who required mechanical ventilation or had a fraction of inspired oxygen (FiO2) of at least 60% or complicated with septic shock and other organ failure [11]. All patients were diagnosed with COVID-19 pneumonia according to WHO interim guidance [12]. The primary outcome was 60-day mortality after ICU admission.

Data collection

All the patients' electronic medical records, nursing records, laboratory findings, and radiological examinations were reviewed. We collected data including demographics, underlying chronic diseases (chronic heart disease, chronic pulmonary disease, diabetes, malignancy, malnutrition, chronic liver disease and chronic kidney disease), laboratory findings, chest computed tomographic scans, treatment (including antiviral therapy, antibiotics, corticosteroid therapy, oxygen support, renal replacement therapy and extracorporeal membrane oxygenation), clinical complications (septic shock, acute respiratory distress syndrome [ARDS], secondary infection, acute kidney injury and acute cardiac injury) and outcome data during the hospital admission. The CURB-65, Sequential Organ Failure Assessment (SOFA), and Acute Physiology and Chronic Health Evaluation II scores (APACHE II) scores were evaluated on the day of ICU admission.Septic shock was defined according to the 2016 Third International Consensus Definition for Sepsis and Septic Shock [13]. Acute kidney injury was identified according to the Kidney Disease: Improving Global Outcomes definition [14]. Acute cardiac injury was diagnosed if serum levels of

cardiac biomarkers (eg, high-sensitive cardiac troponin I) were above the 99th percentile upper reference limit [15]. Acute respiratory distress syndrome (ARDS) was diagnosed according to the Berlin Definition [16]. Secondary infection was diagnosed if the patients had clinical symptoms or signs of nosocomial pneumonia or bacteraemia, and was combined with a positive culture of a new pathogen from a lower respiratory tract specimen (including the sputum, transtracheal aspirates, or bronchoalveolar lavage fluid, or from blood samples taken ≥ 48 h after admission) [17].

Statistical analysis

Continuous variables and categorical variables were presented as median (IQR), mean ± standard deviation and number (%),respectively. Continuous variables were compared using the Mann-Whitney *U* test. The chi-square test or Fisher's exact test was used to compare categorical variables. All significant variables with $p < 0.10$ in univariate analysis were considered to be candidates for entry into a forward stepwise multivariate logistic regression model. Forward stepwise selection was performed to develop the final model. The predictive performance of the lymphocyte count and SOFA at admission for outcome was assessed with the receiver operating characteristics (ROC) curves with Area Under Curve (AUC). Patient survival according to appropriated cutoff value of the lymphocyte count and SOFA score at admission were determined using the log-rank test and displayed using Kaplan–Meier curves. A *P* value less than 0.05 were considered statistically significant. All data were analyzed using the IBM SPSS Statistics for Windows (version 19.0). Odds ratio (OR) and 95% confidence interval (CI) was calculated to evaluate the strength of any association.

Results

Baseline characteristics

By April 5, 2020, 52 patients were admitted to B-ICU of Wuhan Leishenshan hospital. After excluding 5 patients without confirmed SARS-CoV-2 RNA or without complete information, we finally included 47 inpatients in this study (Table 1). The mean age was 70.55 ± 12.52 years (range 38 ~ 93 years). Among all included patients, 30 (63.8%) patients were male. Comorbidities were present in 40 (68.1%) patients, with hypertension being the most common comorbidity (n = 25 [53.2%]), followed by diabetes (n = 18 [38.3%]), and chronic kidney disease (n = 15 [31.9%]). The median APACHE II score of all patients was 18.6 ± 7.79. A total of 34 (72.3%) patients had findings of bilateral infiltrates on radiographic imaging.

Differences Of Clinical Characteristics Between Survivors And Non-survivors

The median SOFA score of non-survivors (7, IQR 5–9) was much higher than that of survivors (3, IQR 1–6). The median lymphocyte count of ICU patients was 0.77×10^9/L (IQR 0.54–1.29), which was 0.54×10^9/L (IQR 0.26–0.63) in non-survivors. Concentrations of C-reactive protein, procalcitonin, interleukin-6 (IL-6) and interleukin-1B (IL-1B) were significantly higher in non-survivors than those in survivors.

Compared with survivors, non-survivors were more likely to develop septic shock (6 [40%] *vs* 3 [9.4%]), and disseminated intravascular coagulation (3 [21.4%] *vs* 0).

Clinical Outcomes

For the primary outcome, 15 (31.9%) of 47 patients died in our study. ARDS (12; 25.5%), acute cardiac injury (12; 25.5%), acute kidney injury (10; 21.3%), were frequently observed in ICU patients. Three patients developed bloodstream infections during hospitalization, of which Klebsiella pneumoniae, Staphylococcus aureus and Enterococcus faecalis were identified. Invasive mechanical ventilation was performed to 13 (27.7%) patients, 9 of whom died. The median duration from admission to invasive mechanical ventilation and invasive mechanical ventilation to death were 6.0 (2.00–11.00) days, and 5.54 ± 5.98 days respectively. Two patients received extracorporeal membrane pulmonary oxygenation (ECMO) as rescue therapy, one of whom survived. Forty-five (95.7%) patients received intravenous antibiotics and 11 (23.4%) received systematic corticosteroid. Three patients (6.4%) received COVID recovery patient plasma treatment who all survive (Table 1).

Risk Factors Of Mortality

Univariate analysis revealed that variables of APACHE II, CURB-65, SOFA, ARDS, chronic heart disease, septic shock, lymphocyte count, neutrophil count were associated with death (table 2). In the multivariable logistic regression model, we found that SOFA score (OR = 1.47, 95% CI = 1.01–2.13, P = 0.04) and lymphocyte count at admission (OR = 0.02, 95% CI = 0.00-0.86, P = 0.04) were independent factors related to mortality (Table 2)

Predictive value of lymphocyte count and SOFA for survival

Baseline lymphocyte count was significantly higher in survivors than non-survivors. In survivors, lymphocyte count was lowest on admission and improved during hospitalization, whereas decreased continuously until death in non-survivors (Fig. 1).

AUC of lymphocyte count statistically significant in the group of survivors or non-survivors (AUC 0.865; 95% CI, 0.375–0.781; P < 0.0001). Optimal cutoff value of lymphocyte count was 0.63×10^9/L. Patients with higher lymphocyte count ($> 0.63 \times 10^9$/L) on admission had a significantly well prognosis than those with lower lymphocyte count ($\leq 0.63 \times 10^9$/L) in overall survival (P = 0.001) (Fig. 2).

AUC of SOFA score statistically significant in the group of survivors or non-survivors (AUC 0.860; 95% CI, 0.728–0.944; P < 0.0001). Optimal cutoff value of SOFA score was 4. Patients with lower SOFA score ≤ 4 on admission had a significantly well prognosis than those with higher SOFA score > 4 in overall survival (P = 0.001) (Fig. 3).

Discussion

In this retrospective study, we found that survivors and non-survivors differed in clinical characteristics and inflammatory indicators. Our findings demonstrated that survivors and non-survivors differed in clinical characteristics and inflammatory indictors. Higher SOFA score and lower lymphocyte count on admission were associated with higher odds of in-hospital death. More importantly, lymphocyte count at admission may serve as a predictive biomarker for survival in severe COVID-19 cases.

Age and comorbidity have previously been reported to be factors indicating poor outcome of COVID-19. The patients admitted to ICU were found to be older and have more comorbidities than those not admitted to ICU [5]. In addition, older age was confirmed to be associated with death in patients with COVID-19 in Zhou's study [10]. The median age of patients in this study was older than that of the above two studies and comorbidities were present in 68.1% of patients in our ICU. However, the mortality rate of COVID-19 patients in our cohort is 31.9%, which was numerically lower than that reported in other ICUs in Wuhan [7-8,10,18]. Moreover, age and complications seemed not to be independent risk factors for death in our cohort. There are several explanations for the varied mortality among studies. First, with the epidemic development, more medical resources were invested in Wuhan, more provisional ICUs were established, and the clinical capacity to treat patients has been greatly improved. Second, the median time from illness onset to admission was reduced. Third, the proportion of patients who required mechanical ventilation was lower in our ICU than that of above studies.

The SOFA and qSOFA assessments are useful diagnostic tools for predicting hospital mortality among adults with community-acquired pneumonia (CAP) and sepsis in the ICU [19-20]. Asai's study suggested that the combination of a qSOFA score ≥2 and a SOFA score ≥4 was an independent unfavorable prognostic factor for 30-day mortality among CAP patients [21]. SOFA criteria predicting infection-related in-hospital mortality in ICU patients performed better than SIRS criteria and qSOFA score [22]. For adult patients with COVID-19, higher SOFA score at admission was also reported to be one of the risk factors for death, which was confirmed in our study [10]. Non-survivors in our study had a mean SOFA of 7, which was higher than previously reported [10]. SOFA scores may accurately evaluate the severity of patients with COVID-19 in ICU, but further prospective studies are warranted to evaluate the role of SOFA in predicting outcome of patients outside the ICU.

Our findings suggested that lymphocytes may be a promising biomarker reflecting the treatment efficacy and prognosis. The respiratory and immune systems are the main targets of SARS-CoV attack, and extensive consolidation of the lung, diffuse alveolar damage and decreased immune function are the main causes of death. In the autopsy of patients with SARS, there was massive necrosis of splenic lymphoid tissue and localized necrosis in lymph nodes [23]. In patients with COVID-19, the novel coronavirus might also mainly act on lymphocytes, especially T lymphocytes [24]. Helper T cells, suppressor T cells and regulatory T cells in COVID-19 cases were all below normal level, and more obviously damaged in severe cases, which suggested a role for dysregulated immune responses in COVID-19 pathogenesis [24]. Zhou et al. reported that baseline lymphocyte count was significantly higher in survivors than non-survivors, and lymphocyte count improved during hospitalisation while severe

lymphopenia was observed until death in non-survivors [10], which was consistent with phenomenon found in our study. In the current study, lower lymphocyte count on admission was associated with mortality, and patients with higher lymphocyte count (>0.63×10^9/L) on admission had a significantly well prognosis than those with lower lymphocyte count (≤0.63×10^9/L) in overall survival. The concept that lymphocytes may serve as a potential therapeutic target deserves further investigation.

Our study has several limitations. First, it was a retrospective, single center study with relatively small sample size. Laboratory tests for example serum ferritin and lymphocyte subsets percentage were not performed in all patients. Second, the proportion of patients with comorbidities was higher than that reported in previous studies. In addition, some patients and their guardians gave up endotracheal intubation and mechanical ventilation. The abovementioned factors might affect the prognosis. Third, limited medical resources may delay hospitalization or admission for some patients in the early stage and several patients were transferred to other hospitals for comorbidities, which influenced the follow-up.

Conclusions

Old age and comorbidities are commonly seen in COVID-19 patients admitted to ICU. Higher SOFA score, and lower lymphocyte count on admission were risk factors for death of adult patients with COVID-19 in ICU. Lymphocyte count on admission may serve as a potential prognostic marker.

Declarations

Ethics approval

All procedures described here have been approved by the ethics committee of School of Medicine, Shanghai Jiaotong University.

Consent to participate

Not applicable.

Consent for publication

Not applicable.

Availability of data and materials

The datasets during and/or analyzed during the current study available from the corresponding author on reasonable request.

Conflicts of Interest

The authors have declared that no conflicts of interest exist.

Funding

None.

Authors' contributions

All authors have seen the manuscript and approved to submit to your journal. Contributions: (I) Conception and design: H Huang, X Xu; (II) Administrative support: C Zhu; (III) Provision of study materials or patients: H Huang, L Tian, Y Hang, CH Huang; (IV) Collection and assembly of data: X Liu, F Sai; (V) Data analysis and interpretation: X Liu, L Li, Y Ye; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

Acknowledgements

Not applicable.

References

1. Phelan AL, Katz R, Gostin LO. The novel coronavirus originating in Wuhan, China: challenges for global health governance. JAMA 2020; published online Jan 30. DOI: 10. 1001/jama.2020.1097.
2. World Health Organization. Coronavirus disease (COVID-19) outbreak https:// www.who.int.
3. WHO. Report of the WHO-China Joint Mission on coronavirus disease 2019 (COVID-19). Feb 28. 2020. https://www.who.int/ publications-detail/report-of-the-who-china-joint-mission-on- coronavirus-disease-2019-(covid-19) (accessed March 26, 2020).
4. Guan WJ, Ni ZY, Hu Y, et al. Clinical characteristics of coronavirus disease 2019 in China. N Engl J Med. 2020. DOI:10.1056/NEJMoa2002032. published online Feb 28.
5. 10.1001/jama.20 20.1585
   Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, Wang B, Xiang H, Cheng Z, Xiong Y, Zhao Y. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. JAMA 2020. https://doi.org/10.1001/jama.20 20.1585.
6. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, Qiu Y, Wang J, Liu Y, Wei Y, Yu T. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet. 2020;395:507–13.
7. Xiaobo Yang Y, Yu J, Xu H, Shu J, Xia H, Wu LY, Zhang Lu, Yu Z, Fang M, Wang TYu,Y, Pan S. Xiaojing Zou, Shiying Yuan, You Shang.Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. Lancet Respir Med 2020. Published Online Feb 21, https://doi.org/10.1016/ S2213-2600(20)30079-5.
8. Jianlei C, Cheng XHu,W, Yu L. Wen Jun Tu, Qiang Liu. Intensive Care Med.Published Online March 02, https://doi.org/10.1007/s00134-020-05987-7.

9. Chaomin Wu X, Chen Y, Cai J, Xia X, Zhou S, Xu H, Huang L, Zhang X, Zhou C, Du Y, Zhang J, Song S, Wang Y, Chao Z, Yang J, Xu X, Zhou D, Chen W, Xiong L, Xu F, Zhou J, Jiang C, Bai. Junhua Zheng, Yuanlin Song. Risk Factors Associated With Acute Respiratory Distress Syndrome and Death in Patients With Coronavirus Disease 2019 Pneumonia in Wuhan, China. JAMA Intern Med Published online March 13, 2020. doi:10.1001/jamainternmed.2020.0994.
10. Fei Zhou T, Yu R, Du G, Liu FY, Liu Z, Xiang J, Wang Y, Song B, Gu X, Guan L, Wei Y, Li H, Wu X, Xu J, Tu S, Zhang Y, Chen H. Bin Cao. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. Lancet 2020. Published Online March 9. https://doi.org/10.1016/ S0140-6736(20)30566-3.
11. New coronavirus pneumonia prevention and control program. (7th ed) (in Chinese). 2020. http://www.nhc.gov.cn/yzygj.
12. World Health Organization.Clinical management of severe acute respiratory infection when novel coronavirus (nCoV) infection is suspected: interim guidance. January 28. 2020. Accessed March 5, 2020. https://www.who.int/ publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-(ncov)-infection-is-suspected.
13. Shankar-Hari M, Phillips GS, Levy ML, et al; Sepsis Definitions Task Force. Developing a new definition and assessing new clinical criteria for septic shock: for the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). *JAMA*. doi:10.1001/jama.2016.0289.
14. Kidney Disease. Improving Global Outcomes (KDIGO) Acute Kidney Injury Work Group. DIGO Clinical Practice Guideline for Acute Kidney Injury. Kidney Int Suppl. 2012;2:1.
15. Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China [published January 24, 2020]. Lancet. doi:10.1016/ S0140-6736(20)30183-5.
16. Ranieri VM, Rubenfeld GD, Thompson BT, et al. Acute respiratory distress syndrome: the Berlin Definition. JAMA 2012; 307: 2526–33.
17. Garner JS, Jarvis WR, Emori TG, Horan TC, Hughes JM.CDC definitions for nosocomial infections, 1988. Am J Infect Control 1988; 16: 128–40.
18. Tao Chen D, Wu H, Chen W, Yang YD, Chen G, Ma K, Xu D, Yu H, Wang H, Wang T, Guo W, Chen J, Ding C, Zhang X, Huang J, Han M, Li S, Luo X. Jianping Zhao, Qin Ning.Clinical characteristics of 113 deceased patients with coronavirus disease 2019: retrospective study. BMJ. 2020;368:m1091|doi. 10.1136/bmj.m1091.
19. Raith EP, Udy AA, Bailey M, McGloughlin S, MacIsaac C, Bellomo R, et al. Prognostic accuracy of the SOFA Score, SIRS criteria, and qsofa score for in-hospital mortality among adults with suspected infection admitted to the intensive care unit. JAMA. 2017;317(3):290–300.
20. Ranzani OT, Prina E, Menéndez R, Ceccato A, Cilloniz C, Méndez R, et al. New Sepsis Definition (Sepsis-3) and community-acquired pneumonia mortality: a validation and clinical decision-making study. Am J Respir Crit Care Med. 2017;196(10):1287–97.
21. Nobuhiro Asai H, Watanabe A, Shiota H, Kato D, Sakanashi M, Hagihara Y, Koizumi Y, Yamagishi H, Suematsu. Hiroshige Mikamo. Efficacy and accuracy of qSOFA and SOFA scores as prognostic tools

for community-acquired and healthcare-associated pneumonia. International Journal of Infectious Diseases. 2019;84:89–96.

22. Erik, Solligård. Jan Kristian Damås. SOFA criteria predict infection-related in-hospital mortality in ICU patients better than SIRS criteria and the qSOFA. Evid Based Med. 2017;22(6):211.
23. Ding Y, Wang H, Shen H, Li Z, Geng J, Han H, Cai J, Li X, Kang W, Weng D, Lu Y, Wu D, He L, Yao K. The clinical pathology of severe acute respiratory syndrome (SARS): a report from China. J Pathol 2003; 200(3). DOI:10.1002/path.1440.
24. //doi.org /10.1093 / cid/ciaa248
    Qin C, Hu LZhou,Z, Zhang S, Yang S, Tao Yu, Xie C, Ma K, Shang K, Wang W. Dai-Shi Tian. Dysregulation of Immune Response in Patients With COVID-19 in Wuhan, China.Clin Infect Dis 2020. https: //doi.org /10.1093 / cid/ciaa248.

Tables

Due to technical limitations the Tables are available as download in the Supplementary Files.

Figures

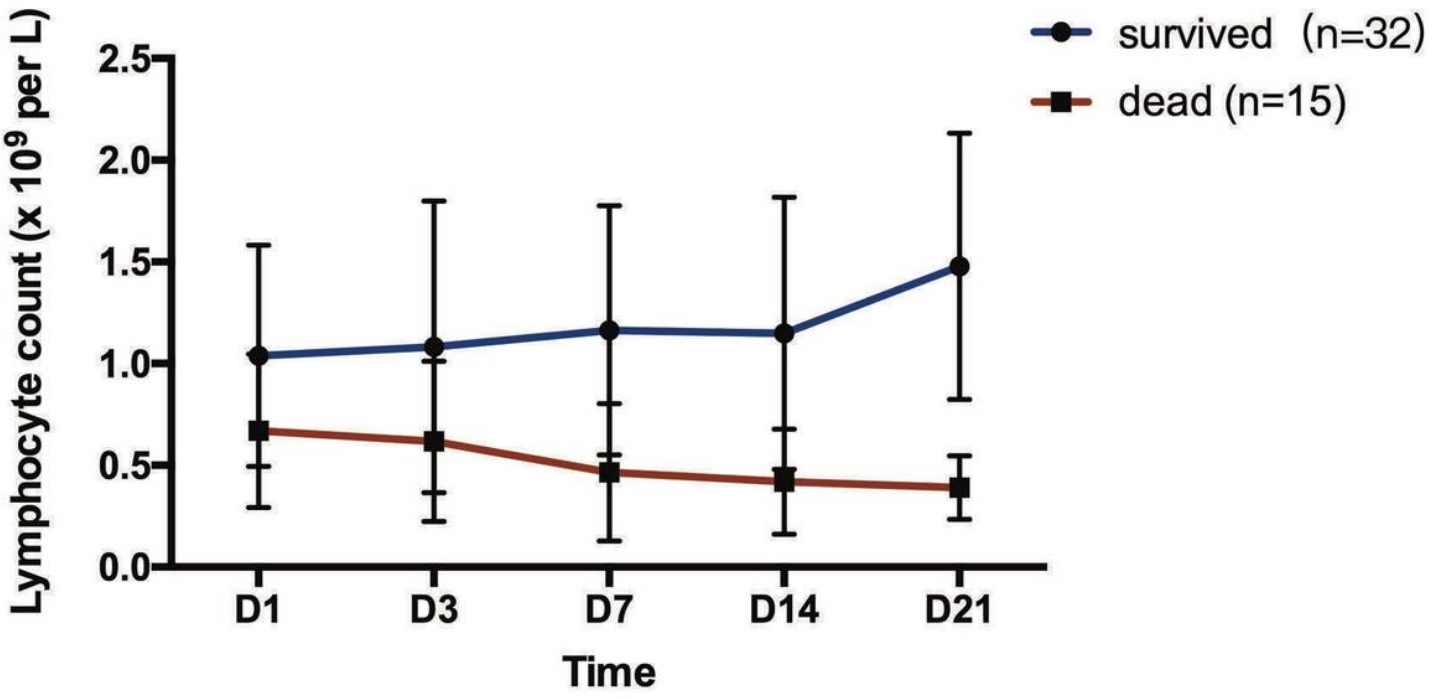

Figure 1

Temporal changes in lymphocyte count from illness onset in patients hospitalized with COVID-19

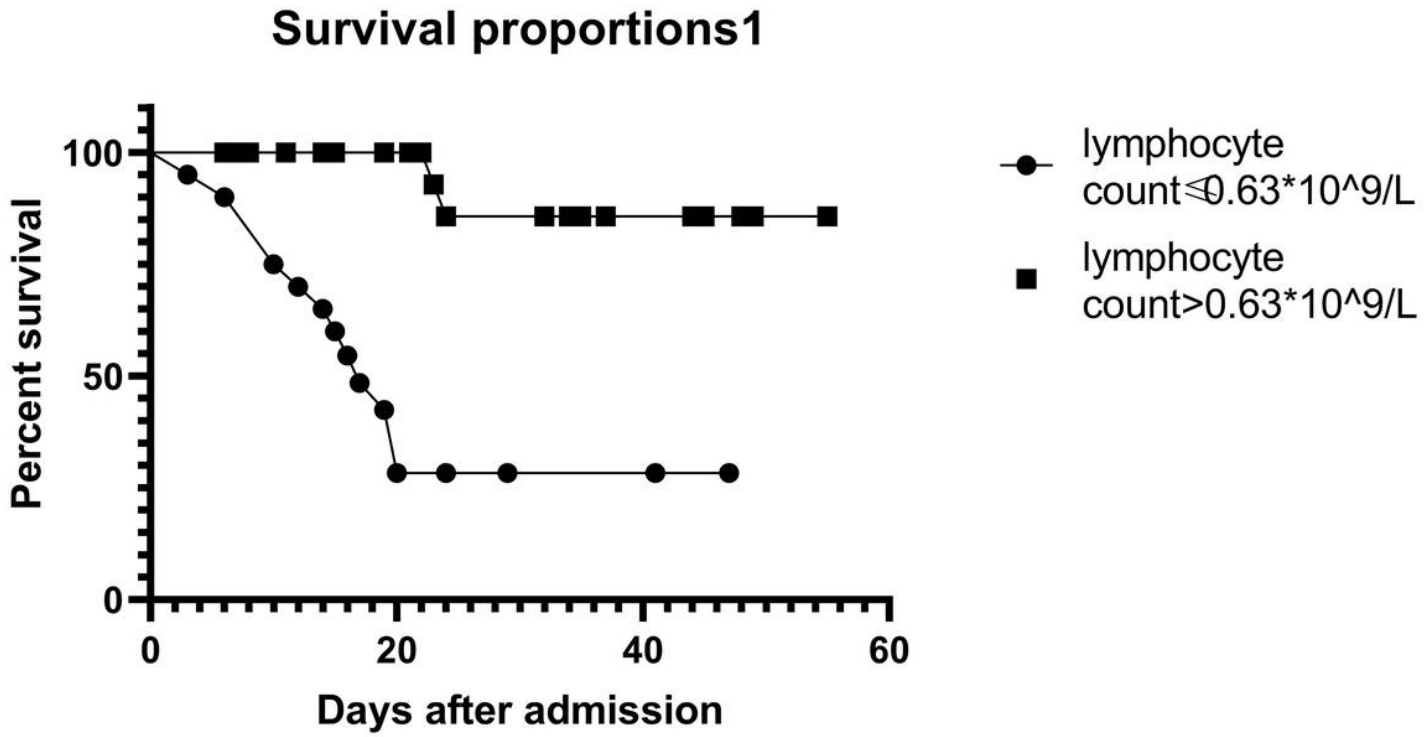

Figure 2

There was a significant difference in overall survival between the group with lymphocyte>0.63×109/L and the group with lymphocyte≤0.63×109/L

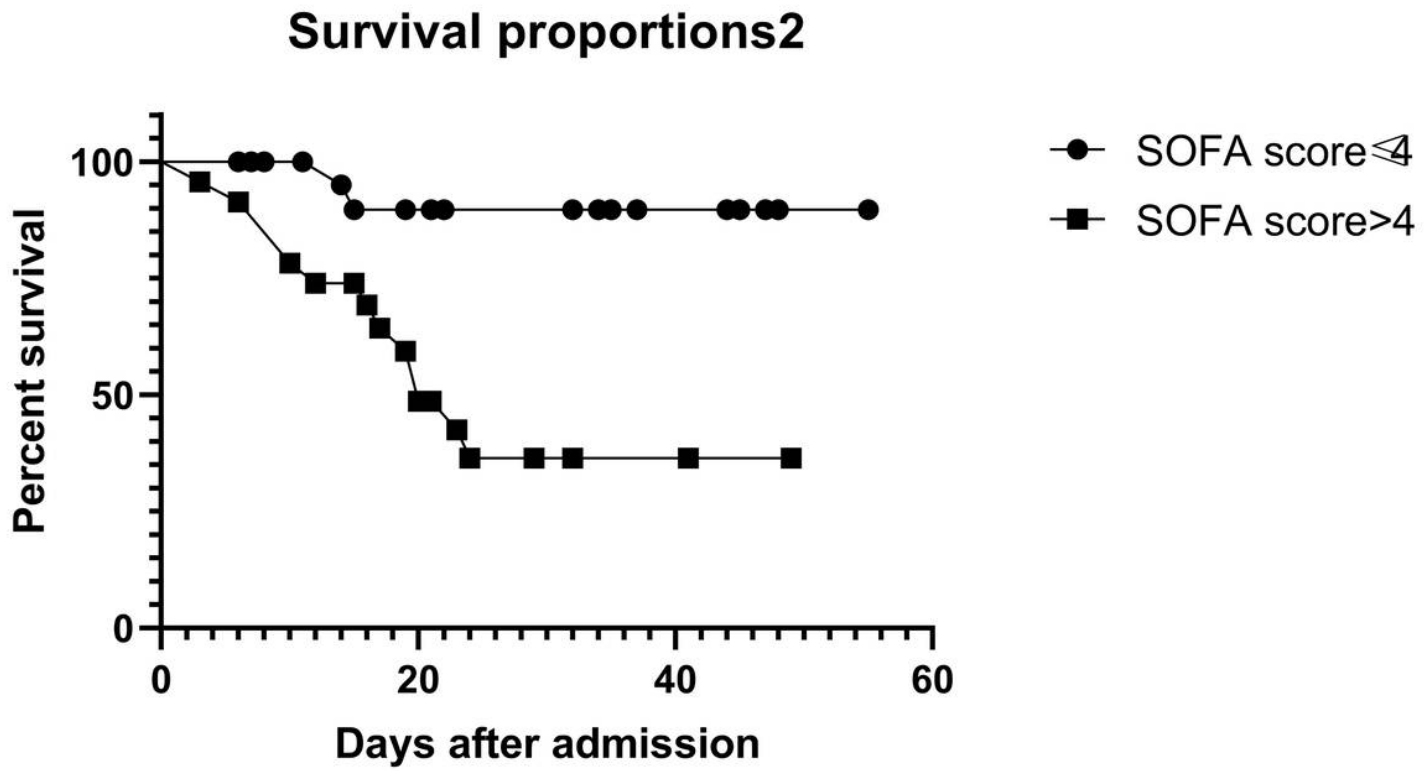

Figure 3

There was a significant difference in overall survival between the group with SOFA score≤4 and the group with SOFA score>4

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Table1.xlsx
- Table2.xlsx