Mortality in patients with COVID-19 versus non-COVID-19- related acute respiratory distress syndrome: A single center retrospective observational cohort study V.1

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ABSTRACT

The pathophysiology of coronavirus disease-2019 (COVID-19)-related acute respiratory distress syndrome (ARDS) varies from other pneumonia-related ARDS. We evaluated whether the mortality rates differed for COVID-19 and non-COVID-19-related ARDS in the Asian population in 2021. This single center retrospective observational cohort study included patients with COVID-19 and non-COVID-19-related ARDS that required invasive mechanical ventilation. The primary outcome was all-cause in-hospital mortality. The secondary outcomes included hospital length of stay, ICU length of stay, duration of mechanical ventilation, and ventilator-free days (VFDs) during the first 28 days. A 1:1 propensity score matching was performed to correct potential confounders by age, obesity or not, and ARDS severity.

1 Study population

This single center retrospective observational cohort study included patients with COVID-19 and non-COVID-19-related ARDS that required invasive mechanical ventilation.

All patients with COVID-19 had positive real-time polymerase chain reaction (RT-PCR) results for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, and the diagnosis of ARDS was based on the Berlin definition.

All patients with COVID-19 were unvaccinated.

This study was approved by Research Ethics Review Committee of Far Eastern Memorial Hospital (FEMH No.111214-E), and requirement for informed consent form was waived due to the retrospective nature of the study.

2 Data collection

Data between April 29, 2021 and August 3, 2021 for patients with COVID-19-related ARDS and January 1, 2021, and December 31, 2021 for patients with non-COVID-19-related ARDS were collected by reviewing the medical records in the Department of Critical Care Medicine, Far Eastern Memorial Hospital, Taipei, Taiwan.

The inclusion criteria were as follows:
(1) age ≥18 years;
(2) admitted to the medical ICU (MICU) between January 1, 2021 and December 31, 2021;
(3) diagnosed with pneumonia;
(4) required invasive mechanical ventilation; and (5) developed ARDS in the first 48 hours.

The exclusion criteria were as follows:
(1) transferred to another hospital;
(2) missing data; and
(3) trauma.

The clinical characteristics obtained were as follows: age, sex, body mass index (BMI), and obesity defined as BMI ≥ 30 kg/m^2; acute physiology and chronic health evaluation II scores and comorbidities including diabetes mellitus, chronic renal failure, cardiovascular disease, asthma, chronic obstructive pulmonary disease (COPD), and immunocompromised status; laboratory data such as leukocyte, neutrophil, lymphocyte, C-reactive protein (CRP), platelet, D-Dimer, and creatinine levels at the time of patient admission to the ICU.

“Symptoms for ICU admission day” was defined as the day from when patients with dyspnea, increased work of breathing or oxygen desaturation were admitted to the ICU.

Adjunctive therapy including prone positioning, recruitment maneuvers, inhaled nitric oxide, and extracorporeal membrane oxygenation use during mechanical ventilation were recorded.

The severity of the ARDS was defined by the ratio of arterial oxygen tension to the fraction of inspired oxygen (PaO_2/FiO_2); this was classified as mild (200 <PaO_2/FiO_2 ≤300 mmHg), moderate (100 <PaO_2/FiO_2 ≤200 mmHg), and severe (PaO_2/FiO_2≤100 mmHg) based on the Berlin definition. PaO_2/FiO_2ratio was collected within the first 48 hours after receiving invasive mechanical ventilation and followed-up.

The respiratory physiological parameters were collected when patients fulfilled the ARDS criteria with assist-control mode ventilation.
The initial tidal volume (V_T) was 6–10 mL/kg of predicted body weight (PBW) and positive end-expiratory pressure (PEEP) was set to a high FiO_2/low PEEP table to maintain a plateau pressure (Pplat) ≤ 30 cmH2O and the ventilator was adjusted according to the lung protective ventilation strategy after patients fulfilled the ARDS criteria.
Pplat was measured by inspiration-hold maneuver on the mechanical ventilator for 0.5–1 s.
Driving pressure was calculated as the difference between Pplat and PEEP.
Static compliance was the ratio of tidal volume to driving pressure.
Mean airway pressure (Pmean) was calculated by the peak inspiratory pressure (PIP), PEEP, and inspiratory to expiratory time ratio. Ventilatory ratio (VR) was calculated as

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The primary outcome was all-cause in-hospital mortality.
The secondary outcomes included hospital length of stay, ICU length of stay, duration of mechanical ventilation, ventilator-free days (VFDs) during the first 28 days.
VFD was considered as 0 if patients had died within 28 days.

3 Statistical analysis

Continuous variables were presented as median (interquartile range) and compared with the Mann-Whitney U test.

Categorical variables were presented as number (*n*) and proportion (%) and compared with the Chi-square or Fisher's exact test.

Kaplan-Meier survival curve was presented with cumulative incidence of 60-day mortality, and differences between COVID-19 and non-COVID-19-related ARDS were analyzed using the log-rank test.

A 1:1 propensity score matching was performed to correct potential confounders in the baseline characteristics by age, obesity or not, and ARDS severity; the univariate analysis results with p<0.1 was entered into the multivariate Cox proportional hazards model to identify risk factors influencing all-cause in-hospital mortality.

A *p*-value <.05 was considered statistically significant.
The statistical analyses were performed using SPSS 24.0 (IBM SPSS Statistics for Windows, Version 24.0, Armonk, NY: IBM Corp.).