Predictors of COVID-19 Mortality in ICU Patients in Mongolia: A Single Center Retrospective Observational Study

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BACKGROUND

The emergence of coronavirus disease 2019 (COVID-19) has led to high demand for intensive care services worldwide. COVID-19 is a multisystemic disease that can lead to a broad spectrum of severity, from asymptomatic infection to severe respiratory disease and multiorgan failure. The mortality rate is exceedingly high among COVID-19 patients admitted to intensive care units (ICUs). While predictors of developing severe or critical COVID-19 are established in the literature, more data is needed to better inform predictors of mortality for patients admitted to an ICU setting.

PURPOSE

This study examined the differences between survivors and nonsurvivors among critically ill COVID-19 patients admitted to the ICU at the University Hospital of Mongolia.

ICU nurses from Ulaanbaatar and Tuv provinces attend a hands-on skills session as part of a series of trainings on updates and best practices in care and management of severe and critical COVID-19.

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METHODS

This single center retrospective observational study was conducted at University Hospital in Mongolia. It included a total 219 critically ill patients with COVID-19, admitted and cared for in the ICU over the course of nine months (April 18, 2021, to February 28, 2022.) Statistical analysis was performed using SPSS software. First, the characteristics of the ICU patients who died and those who survived were compared using the chi-square test for categorical variables and t-test for continuous variables, with a p-value of 0.05 considered significant. Finally, a backward selection Cox multivariate regression analysis was done using mortality as a dependent variable.

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RESULTS

A total of 2,110 patients were admitted to the hospital with COVID-19 during the study period. Of this number, 219 (10.33%) were admitted to the ICU. Among patients admitted to the ICU, 184 (84%) survived and 35 (16%) died. Mean age was 62.22±16.08, female patients were 113 (51.6%), mean body mass index (BMI) was 28.54±5.87, average length of hospital stay was 17.58±8.82 days, and average length of ICU stay was 11.81±8.49 days (Table 1). In the multivariate Cox regression analysis, age (HR 1.04, 95% CI 1.011-1.076), multidrug-resistant (MDR) sepsis (HR 4.81, 95% CI 2.3-10.06), cancer (HR 5.23, 95% CI 1.97-13.86), and APACHE score[1] (HR 1.15, 95% CI 1.57-1.252) were independently associated with mortality (Table 1). Patients' gender, BMI, and comorbidities such as hypertension, diabetes, and chronic obstructive pulmonary disease did not predict mortality.

Table 1. Predictors of Mortality in COVID-19 Patients in the ICU

Parameters		Total N=219	Survived N=184	Died N=35	P-value
Demographics and Hospital Stay					
Age		62.22±16.1	60.17±28.75 (84%)	73.24±13.3 (16%)	**0.001**
Gender	Male	106	94 (42.9%)	12 (5.5%)	0.068
Gender	Female	113	90 (41.1%)	23 (10.5%)	0.068
BMI		28.54±5.87	28.75±5.82	27.55±6.14	0.960
ICU total stay (days)		11.81±8.49	10.92±7.4	16.37±11.78	0.001
Duration from onset of symptoms of illness to admission to hospital (days)		5.43±4.13	5.28±3.3	6.24±7.07	**0.001**
Duration from onset of symptoms of illness to admission to ICU (days)		7.69±5.16	7.52±4.81	8.51±6.7	**0.012**
Initial APACHE II score			7.85±4.55	16.2±8.8	**0.005**
APACHE II score 48 hours after hospital admission			8.97±4.36	12.69±7.89	**0.05**
Comorbidities					
Hypertension		124 (56.6%)	99 (45.2%)	25 (11.4%)	0.054
Cardiac disease		35 (16%)	27 (12.3%)	8 (3.7%)	0.226
Diabetes		23 (23.7%)	19 (26.8%)	4 (15.4%)	0.24
Kidney disease		20 (9.1%)	10 (4.6%)	10 (4.6%)	**0.001**
Liver disease		27 (12.3%)	22 (10%)	5 (2.3%)	0.701
Cancer		19 (8.7%)	11 (5.0%)	8 (3.7%)	**0.001**
Coronary artery disease		4 (4.1%)	2 (2.8%)	2 (7.7%)	0.28
Diabetes		53 (24.29)	45 (20.5%)	8 (3.7%)	0.84
Chronic obstructive pulmonary disease		10 (4.6%)	8 (3.7%)	2 (0.9%)	0.723
Cerebrovascular disease		8 (3.7%)	5 (2.3%)	3 (1.4%)	0.091
MDR sepsis		20 (9.1%)	2 (0.9%)	18 (8.2%)	**0.001**

[1] APACHE II (Acute Physiology and Chronic Health Evaluation II) is a severity-of-disease classification system with a final score of 0 to 71, with higher scores corresponding to more severe disease and a higher risk of death. It is determined within 24 hours of admission to an intensive care unit (ICU). Source: APACHE II Severity-of-disease classification system – GlobalRPH.

SIGNIFICANCE

This study is the first to evaluate predictors of COVID-19 mortality among critically ill patients admitted to ICUs in Mongolia and will help guide policies and better treatment decisions. In addition, these results contribute to global scientific knowledge on this topic.

CONCLUSIONS

Age, elevated APACHE score, and certain comorbidities including kidney disease, cancer, and MDR sepsis were independent risk factors for mortality in COVID-19 patients admitted to the ICU in Mongolia. This study suggests several factors that predict severe or critical COVID-19, such as obesity, diabetes, and cardiovascular disease, do not concurrently predict mortality once patients are admitted to the ICU.

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