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The Relationship Between The Characteristics of COVID-19 Patients To Predict Mortality in The COVID-19 ICU Special Care

Maulana Taufik[1*], Dadik Wahyu Wijaya[2], Andriamuri Primaputra Lubis[2]
[1]Study Program of Anesthesiology and Intensive Care, Faculty of Medicine, University of Sumatera Utara
[2]Departemen of Anesthesiology and Intensive Care, Faculty of Medicine, Universitas Sumatera Utara, RSUP H. Adam Malik Medan

***Corresponding Author**: Maulana Taufik, E-mail: mortazaq@gmail.com

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ABSTRACT

Introduction: The SARS-CoV-2 epidemic is sweeping the world with several waves of infections continuing. In some COVID-19 patients, this condition can develop into ARDS (acute respiratory distress syndrome) which requires ICU care with a mortality rate of 50-65 and the need for mechanical ventilation reaches 97%. The aim of this research was to know characteristics of COVID-19 patients to predict mortality in the Negative Pressure Isolation Room COVID 19 ICU at H. Adam Malik General Hospital
Method: Retrospective research method with secondary data sources of COVID-19 Negative Pressure Isolation Room ICU (RITN) patients at RSUP H. Adam Malik Medan for the period May 2021 – July 2021.The data collected was in the form of patient data including name, gender, age, medical record number, comorbidities, NLR, D-Dimer, Fibrinogen, PF ratio, use of oxygen supplementation, and length of ICU stay. Chi Square statistical analysis was used for categorical data, while the T-test or Mann Whitney was used for numerical data. Then between the variables an ANOVA test was carried out to assess the comparison of clinical characteristics with mortality.
Results: The results of this study indicate a higher mortality rate in women41 people (57.7%), 56-65 years age group 26 people (36.6%), patients using ventilators 51 people (71.8%), comorbid hypertension 33 people (46.5%)), Moderate PF Ratio were 44 people (62%) and Length of stay <10 days were 55 people (77.5%). The mean fibrinogen value in COVID-19 patients who died was 658.96 ± 674.98, as well as the D-dimer value of 658.96 ± 674.98 and NLR of 11.06 ± 3.23 which showed a significant increase compared to patients Survivors of COVID-19 ($p<0.05$).
Conclusion: A significant relationship was found between gender, age, breathing apparatus, D-dimer, Fibrinogen, NLR and length of stay with mortality of COVID-19 patients treated in the COVID Negative Pressure Room (RITN) ICU

Keywords
Characteristics of Covid-19 Patients, severe degree of COVID-19, ICU, Negative Pressure Isolation Room, Mortality

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INTRODUCTION

The current SARS-CoV-2 epidemic is the third time a zoonotic coronavirus has infected humans over the past 18 years. As of March 24 2020, the number of confirmed cases and deaths of COVID-19 pneumonia in China was 81218 which shows that the death rate of COVID-19 is 4%.[1] As of January 2021, the number of people diagnosed with COVID-19 worldwide exceeded the number 86.7 million; while the case fatality rate in 222 countries and territories is 2.17%. The first case of COVID-19 was reported in Indonesia on March 2 2020 and as of January 8 2021, there were 818,386 confirmed cases and 23,947 deaths (CFR 2.92%).[2]

Some COVID-19 patients can develop ARDS (acute respiratory distress syndrome), heart failure and pulmonary embolism. ARDS is the most common etiology in COVID-19 patients to be admitted to the ICU. The average ICU admission occurs around 10 days after the onset of symptoms and 14 days after COVID-19 infection. The mortality rate for COVID-19 in the ICU is double that for other causes of viral pneumonia that require ICU.[3] The recorded prevalence of COVID ICU patients in China with ICU death within 28 days was 39% for (ICU population 344 patients), even reaching 97% in the subgroup of 100 patients requiring IMV.[4] Most patients admitted to the COVID ICU due to ARDS will eventually require prolonged mechanical ventilation (VM) and increase mortality. Reported mortality rates in ICU patients with severe COVID-19 range from 50-65%, and in patients requiring VM the rate is as high as 97%.[5-7]

In Patients. COVID-19 occurs a series of inflammatory processes in the body. Some evidence shows that the exacerbation of disease in COVID-19 is closely related to dysregulation and excessive cytokine release which is characterized by increased C-reactive protein (CRP), interleukin (IL) 6, and ferritin. Procalcitonin production is associated with the presence of bacterial endotoxins and inflammatory cytokines such as TNF, IL-1B and IL-6, so that procalcitonin can be used to predict respiratory tract infections with bacterial or viral etiology. Research on 1,735 research subjects with community acquired pneumonia (CAP) showed that the accuracy of procalcitonin in differentiating bacterial and viral infections reached 70%, with a sensitivity of 80.9% and a specificity of 51.6%.

METHOD

This research is analytic in nature with a retrospective research method with secondary data sources obtained from negative pressure ICU medical records. The research population isall patients treated for COVID ICU Negative Pressure (RITN) at RSUP HAM sourced from secondary medical record data. The number of samples obtained according to the calculation is 100 samples that have met the inclusion and exclusion criteria.

RESULTS

This research is analytic in nature with a retrospective research method with secondary data sources obtained from the Negative Pressure ICU (RITN) medical record data at RSUP HAM for the period March 2021 – July 2021. The research sample in this study was 100 samples.

Table 1 shows that there are 47 (47%) males, and 53 (53%) females. In the age distribution in the research range 18-35 years there were 15 people (15%), for the age range 36-45 years there were 17 people (17%), for the age range 46-55 years there were 31 people (31%), the age range 56-65 years as many as 37 people (37%). As for the outcome, 71 patients (71%) died, while 29 people left the Covid 19 ICU with negative results. The assistive devices used by the patients during their treatment were 19 people (19%) NRM, 26 people (26%) HFNC and 55 people (55%) using ventilators. In co-morbid patients, there were 25 people (25%) with DM, 25 people (25%) had DM co-morbidities, 10 people (10%) had asthma co-morbidities, 6 people (6%) had CKD co-morbidities, 4 people (4%) had comorbid COPD had 5 people (5%) comorbid pulmonary TB. For mild PF ratio, there were 14 people (14%), 63 patients with moderate PF, and 23 patients with severe PF (23%). The average NLR value in the study sample was 7.08 ± 3.32, the average Fibrinogen value was 590.82 ± 439 and D. Dimer was 1509 ± 1305.

Table 2. shows an overview of Covid-19 mortality in terms of gender. As for the male sex, positive for Covid-19 experienced the death of 30 people (42.3%) out of 47 men and those who left the COVID-19 ICU with negative PCR results were 17 (58.6%). Meanwhile, 41 women (57.7%) died and 12 people left the COVID-19 ICU with negative PCR results. It was also explained in the table that the significant value of the relationship from mortality to sex was significant ($p < 0.05$).

In Table 4, an overview of the Covid-19 Mortality is obtained for the breathing apparatus used. In the NRM use group who tested positive for Covid-19, 3 people (4.2%) died and 16 (58.6%) left for outpatient treatment. Whereas in the group using the HFNC who were positive for Covid-19, 17 people (23.9%) died and

9 (31.4%) left for outpatient treatment. 51 people died (71.8%) and 29 people left for outpatient treatment. It is also shown in the table that the significance value of the relationship between mortality and breathing apparatus is significant (p<0.05).

Table 1. Sample Characteristics

Characteristics	n (%)
Gender n(%)	
Man	47 (47)
Woman	53 (53)
Age n(%)	
18 – 35 Years	15 (15)
36 – 45 Years	17 (17)
46 – 55 Years	31 (37)
56 – 65 Years	37 (37)
external	
DIE	71 (71)
Out of ICU Care	29 (29)
Device	
NRM	19 (19)
HFNC	26 (26)
VENTI	55 (55)
Comorbid	
There isn't any	13 (13)
DM	25 (25)
Hypertension	37 (37)
Asthma	10 (10)
CKD	6 (6)
COPD	4 (4)
Pulmonary TB	5 (5)
PF Ratio	
Mild > 200 mm Hg	14 (14)
Moderate 100 – 200 mm Hg	63 (63)
Weight < 100	23 (23)
NLR Mean ± SD	7.08 ± 3.32
Fibrinogen	590.82 ± 439
D Dimer	1509 ± 1305

Table 2. Covid-19 Mortality by Gender

	n (%)		P
Gender	Die	Get out of ICU	
Male	30 (42.3)	17 (58.6)	0.02
Woman	41 (57 ,7)	12 (41.4)	

Table 3. Covid-19 Mortality by Age Group

	n (%)		P	
Age	Die	Get out of ICU		
18 – 35 Years	10 (14,1)	17 (58.6)	0.01	
36 - 45 Years	12 (16 9)	12 (41.4)		0.04
46 - 55 Years	23 (32.4)	8 (27.6)		0.02
56 - 65 Years	26 (36.6)	11 (37.9)		0.03

Table 3. shows an overview of Covid-19 mortality in terms of age. In the 18-35 year-old group who tested positive for Covid-19, 10 people (14.1%) died and 17 (58.6%) left the ICU COVID-19 with negative PCR results. Whereas in the age group 36-45 years who were positive for Covid-19, 12 people died (16.9%) and those who left the ICU COVID-19 with negative PCR results were 12 (41.4%), then the age group 46- 55 years who were positive for Covid-19 experienced the death of 23 people (32.4%) and those who came out of the COVID-19 ICU with negative PCR results were 8 (27.6%) and finally in the age group 56-65 years who were positive for Covid -19 died as many as 26 people (36.6%) and 11 (37.9%) left for outpatient treatment.

Table 4. Covid-19 Mortality of Respirators

Breathing apparatus	n (%)		P
	Die	Get out of ICU	
NRM	3 (4,2)	16 (55.2)	0.00
HFNC	17 (23.9)	9 (31)	0.04
VENTI	51 (71.8)	29 (100)	0.01

Table 5. Covid-19 Mortality to Comorbids

Comorbid	n (%)		P
	Die	Get out of ICU	
There isn't any		13 (44.8)	0.001
DM	20 (28.2)	5 (17,2)	0.04
hypertension	33 (46.5)	4 (13,8)	0.000
Asthma	9 (12,7)	1(3,4)	0.001
CKD	4 (5,6)	2 (6,9)	0.00
COPD	2(2,8)	2 (6,9)	0.01
Pulmonary TB	3 (4.2%)	2 (6,9)	0.02

In Table 5, an overview of Covid-19 Mortality is obtained for the Comorbidities in the patient. In the patient group with co-morbid DM who was positive for Covid-19, 20 people (28.2%) died and 5 (17.2%) left for outpatient treatment. Whereas in the hypertension group positive for Covid-19, 33 people (46.5%) died and 4 (31.4%) left for outpatient treatment. 9 people (12.7%) and 1 (3.4) came out for outpatient treatment. Furthermore, in the group of patients who had CKD who were positive for Covid-19, 4 people (5.6%) died and 2 people who got out for outpatient treatment (6.9%).

Table 6. Covid-19 Mortality to PF Ratio

PF ratio	N(%)		P
	Die	Get out of ICU	
Mild > 200 mm Hg	5 (7)	9 (31)	
Moderate 100 – 200 mm Hg	44 (62)	19 (65.5)	0.04
Weight < 100	22 (31)	1 (3,4)	

Table 6. shows an overview of the Covid-19 mortality against the PF ratio used. In the Mild Ratio PF group who were positive for Covid-19, 5 people (7%) died and 9 (31%) left for outpatient treatment. Meanwhile, in the Moderate PF Ratio group, 44 people (62%) who were positive for Covid-19 died and 19 (56%) left for outpatient treatment. 22 people (31%) and 1 (3.4) came out for outpatient treatment. It is also shown in the table that the significance value of the relationship between mortality and breathing apparatus is significant ($p < 0.05$).

Table 7. Covid-19 Mortality to Fibrinogen values

	Mean ± SD		P
	Get out of ICU	Die	
Firbinogen	562.9 ± 296.85	**658.96 ± 674.98**	0.02

Table 7. shows an overview of Covid 19 mortality in terms of fibrinogen values. It was found that in patients who went home for outpatient treatment, the average Fibrinogen value was 562.9 ± 296.85 and in patients who died there was a Fibrinogen value of 658.96 ± 674.98. The table shows that there is a significant relationship between the mortality of Covid 19 patients and the Fibrinogen value ($p < 0.05$).

DISCUSSION

Various studies have reported high mortality among COVID-19 patients treated in the Intensive Care Unit (ICU). The ICU accepts critically ill patients and supports patients through critical phases. Approximately 10–15% of COVID-19 patients require hospitalization, and 20–30% of patients who are hospitalized develop severe or life-threatening symptoms. Reported mortality rates for COVID-19 patients are 20–40% among hospitalized patients and 30–88% among critically ill patients admitted to the ICU, but these rates vary widely between countries and regions.[8-11]

The mortality rate of COVID-19 patients treated in the Negative Pressure ICU (RITN) at RSUP HAM in the 18-35 year age group was 10 patients (14.1%), the 36-45 year age group was 12 patients (16.9%) , the age group of 46-55 years were 23 patients (32.4%) and the age group 56-65 years were 26 patients (36.6%). A significant relationship was found between age and mortality of COVID-19 patients treated in the Negative Pressure ICU (RITN) at RSUP HAM ($p<0.05$). 30 male COVID-19 patients who died (42.3%) while 41 female patients (57.7%) died and the results of the bivariate test found a significant relationship between gender and mortality of hospitalized COVID-19 patients. in the COVID Negative Pressure ICU (RITN) at RSUP HAM ($p<0.05$).[12]

Based on the type of oxygen supplement used, 3 patients (4.2%) died with use, 17 people (23.9%) in the HFNC group and 51 patients (71.8%) used mechanical ventilation. The results of the analysis showed a significant relationship between oxygen supplementation and mortality of COVID-19 patients treated in the Negative Pressure ICU at RSUP HAM ($p<0.05$). At the time of hospital admission, the Mean + (SD) BMI was in the obese range (ie, 30.8 [8.5]), and about a quarter of the patients were receiving supplemental oxygen.

In a 2020 cohort study conducted at 3 teaching hospitals in the United States. Of 217 critically ill patients, the mortality for patients requiring mechanical ventilation was 35.7% (59/165), with 4.8% of patients (8/165) still on a ventilator at the time of this report. Mortality was significantly associated with older age, lower body mass index, chronic kidney disease, higher Sequential Organ Failure Assessment score, lower PaO2/Fio2 ratio, higher d-dimer, higher C-reactive protein. higher, and acceptance of mechanical ventilation, vasopressors, renal replacement therapy, or vasodilator therapy. Nearly half of COVID-19 patients who received Invasive Mechanical Ventilation died based on reported CFR, but methods of reporting variable CFRs resulted in varying CFRs among studies. Reported CFRs were higher in older patients and in early pandemic epicenters, which may have been influenced by limited ICU resources.[13-14]

CONCLUSION

A significant relationship was found between gender, age, breathing apparatus, D-dimer, Fibrinogen, NLR and length of stay with mortality of COVID-19 patients treated in the COVID Negative Pressure (RITN) ICU.

DECLARATIONS

Ethics approval and consent to participate. Permission for this study was obtained from the Ethics Committee of Universitas Sumatera Utara.

CONSENT FOR PUBLICATION

The Authors agree to publication in Journal of Society Medicine.

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This research has received no external funding.

AUTHORS' CONTRIBUTIONS

All authors significantly contribute to the work reported, whether in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas. Contribute to drafting, revising, or

critically reviewing the article. Approved the final version to be published, agreed on the journal to be submitted, and agreed to be accountable for all aspects of the work.

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