

## Analysis of Risk Factors for Covid - 19 Patients Using Mechanical Ventilation at Abdul Moeloek Hospital, Lampung in 2021

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### ABSTRACT

Considering the number of confirmed cases of COVID-19 which continues to increase, the Ministry of Health has issued Circular Letter Number HK 02.01/Menkes/ concerning Increasing the Capacity for Treatment of COVID-19 Patients in Hospitals Providing COVID-19 Services Issued 11/2021. This especially applies to patients on ventilators or in isolation rooms. This study aims to analyze the risk factors for COVID-19 patients using ventilators at Abdul Moerok Hospital, Lampung in 2021. This research is a quantitative study with a cross-sectional design. The research was conducted at Abdul Moerok Regional Hospital from September 2022 to January 2023. The study population was 2,152 COVID-19 patients who were treated in hospital rooms and hospital wards. The sample was 337 people. Medical records are used as research instruments. Data were analyzed using univariate, bivariate and multivariate analysis. Respondents within 8 days after giving birth were 249 people (73.9%), 207 people (61.4%) did not experience complications, 250 people (74.2%) had oxygen saturation >90%, and 128 people used a ventilator: people (38.0%). Relationship between age (p 0.001), gender (p 0.011), duration of Covid-19 disease (p 0.031), Covid-19 patients (p 0.001), and oxygen saturation (p 0.001), ventilator use in Covid-19 patients. Oxygen saturation is the variable that has the greatest influence on the incidence of mechanical ventilation in Covid-19 patients, with a p-value of 0.001 and an OR of 68.285. It is hoped that the public will increase their knowledge so that they can avoid risk factors that can reduce oxygen saturation and maintain lung function

## Introduction

A seventh coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was discovered in January 2020 during a recent pneumonia outbreak in Wuhan, Hubei province, China. Since then, this virus has spread throughout the world, infecting 4,806,299 people and killing 318,599 as of May 20, 2020 (Ciotti et al., 2020) . In 2003, cases of pneumonia caused by the new corona virus also occurred in Guangdong province, southeast China, with a case fatality rate (CFR) of 10-15%. In 2012, a similar outbreak occurred in the Middle East, where the intermediate host was thought to be dromedaries, and the mortality rate reached 37% (Wu et al., 2020) .

Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2) was officially named coronavirus disease 2019 (Covid-19) by the World Health Organization (WHO) on February 11, 2020 (Wu et al., 2020).

The corona virus disease (Covid-19), which is transmitted through droplets, has various clinical symptoms, ranging from asymptomatic acute respiratory illness, respiratory failure requiring treatment in an intensive care unit, to multiple organ dysfunction syndrome (MODS). A total of 81% of patients had a CFR of 2.3%, and 5% of patients experienced respiratory failure, septic shock, and MODS resulting in a CFR of 50%. Some patients experience symptoms of hypoxic well-being, a condition in which the patient is



deprived of oxygen, the saturation is low ( $SpO_2 < 90\%$ ), but there is no significant respiratory disturbance and clinical symptoms are usually good. A previous study by Grasselli et al. (2020) shows that 9–11% of Covid-19 patients require ICU support, the CFR is 26%, and only 16% are discharged from the ICU. Among patients admitted to intensive care units, 99% required respiratory support, including 88% mechanical ventilation and 11% non-invasive ventilation (Widysanto et al., 2020). Factors associated with COVID-19 include gender, where men have a higher risk than women.

Based on age, advanced age, and the presence of comorbidities such as diabetes mellitus (DM), severe asthma, and other diseases. In terms of ethnicity, black and South Asian people have a higher risk than white people (Williamson et al., 2021). The fatality rate (CFR) of COVID-19 varies between 1% and 7%. This deviation depends on the steps taken regarding Covid-19, including: b. Screening. Large-scale screening, such as South Korea or Switzerland, produces a CFR of less than 1%, but in countries where screening is only performed on inpatients, the denominator is much smaller and the CFR can reach 5% or more (Vincent & Taccone, 2020). The severity of coronavirus disease (Covid-19) varies depending on age and underlying medical conditions (hypertension, DM, cardiovascular disease, etc.). The main cause of death of patients infected with the new coronavirus is most likely acute respiratory distress syndrome (ARDS). When interpreting the CFR, it is important to identify risk factors leading to death from Covid-19. Respiratory failure was the main cause and cause of death in the last pandemic, namely the Spanish Flu in 1918 (Vincent & Taccone, 2020)

People of all ages, with or without pre-existing immunity, can reach the critical stages of ARDS. The Berlin Criteria define ARDS as acute hypoxic respiratory failure resulting from an acute infection, such as a respiratory viral infection, that appears on x-ray as bilateral pulmonary infiltrates without cardiogenic or hydrostatic causes. Cohort studies report that up to 85% of Covid-19 patients meet the definition of ARDS based on the Berlin criteria and providing supportive interventions for ARDS significantly improves oxygenation and vital capacity (Huang et al., 2020). ;Torres Acosta & Singer, 2020. Vincent & Taccone, 2020).

Coronavirus disease 2019 (Covid-19) with ARDS has a different clinical picture compared to other ARDS patients, with more obvious symptoms of oxygen deprivation (hypoxia) and some studies show that mechanical ventilation appears to last twice as long as in COVID-19 patients . other ARDS patients (Wicky et al., 2021).

The pathophysiology of novel coronavirus infection involves activation of the immune system and blood system. Tumor necrosis factor ( $TNF-\alpha$ ) produces interleukin (IL)-6 and IL-8, followed by a cytokine storm.

This can trigger a coagulation cascade through endothelial and tissue factor (TF) pathways as well as activation of systemic inflammation. Apart from that, Covid-19 also binds to the angiotensin-converting enzyme 2 (ACE-2) receptor. These receptors are widely distributed in the endothelium as well as in the alveolar epithelial cells of the lung and the mucous membranes of the nasopharynx and mouth. Vascular smooth muscle cells in peripheral organs such as the brain, intestines, liver and kidneys. This shows that the clinical spectrum of Covid-19 is not limited to local pneumonia, but is a multisystem disease involving various organs and has the potential to cause systemic complications (Robba et al., 2020). studied by Cui et al.

After Covid-19 patients were hospitalized, it was revealed that some patients, especially elderly men, experienced MODS. MODS often occurs alongside underlying medical conditions such as high blood pressure, heart disease, and other illnesses. During the clinical examination, the patient showed indicators of inflammation, electrolyte and D-dimer abnormalities, decreased absolute lymphocyte count, increased troponin T and decreased oxygenation index, which are risk factors for multiple organ failure requiring treatment. patients in intensive care units (Cui et al., 2021).

ARDS patients can be treated with ventilators designed to provide oxygen to patients during illness. An adequate oxygen supply is necessary for severe and potentially fatal disease during the ARDS stage.

Therefore mechanical ventilation is necessary. If a patient requires a ventilator and a ventilator is not available, the patient's life may be at risk (King et al., 2020). Coronavirus disease 2019 (Covid-19) with ARDS has a different clinical picture compared to other ARDS patients, with more obvious symptoms of oxygen deprivation (hypoxia) and some studies show that mechanical ventilation appears to last twice as long as in COVID-19 patients . other ARDS patients (Wicky et al., 2021). The increasing number of ARDS



cases caused by the new coronavirus has increased the need for ventilators in hospitals and hospital wards around the world, but unfortunately hospitals do not have adequate ventilation. A report from Imperial College London estimates that 30% of patients hospitalized with coronavirus require a ventilator.

In recently published research, Yang et al. described their experience treating Chinese COVID-19 patients in Wuhan, China, and found that 56% of patients required non-invasive ventilation on admission, 76% of the total number of patients required invasive ventilation (Iyengar et al., 2020). On March 2 2020, the Indonesian government announced the first case of coronavirus infection in Jakarta.

Previously, the government through the Ministry of Health had attempted to optimize the 100 referral hospitals stipulated in Minister of Health Decree Number 414 of 2007 concerning the Designation of Referral Hospitals for Treatment of Bird Flu. Furthermore, with the Decree of the Minister of Health Number 169 of 2020 concerning the Establishment of Referral Hospitals for the Treatment of Certain Infectious Diseases, the government has again established 132 Referral Hospitals (Ministry of Health of the Republic of Indonesia, 2020).

In connection with the increasing number of confirmed cases of Covid-19, the Ministry of Health of the Republic of Indonesia issued Circular Letter Number HK 02.01/Menkes/11/2021 concerning Increasing the Capacity for Treatment of Covid-19 Patients in Hospitals Providing Covid-19. 19 Services. The number of hospitals in Indonesia is 2,979 with a total of 81,032 beds prepared for Covid-19 patients which are used for isolation rooms and wards. Nationally, the hospital bed occupancy rate reached 64.83%, but if you look specifically at each city or province, there are several areas where the hospital bed occupancy rate ranges from 80% to 88%. Like DKI Jakarta which only has 63 beds (Rokom, 2021).

Lampung Province has 36 hospitals as Covid-19 referral hospitals, including Abdul Moeloek Regional Hospital. The number of available beds for Covid-19 patients in Lampung is recorded at 35 ventilator units, at Abdul Moeloek Regional Hospital there are 25 units. There are 600 hospital beds without ventilators (Admin Persi, 2021; Indonesian Ministry of Health, 2020).

Abdul Moeloek Regional Hospital has a total of 625 beds, 223 isolation room beds, and 25 beds equipped with ventilators. The number of employees at Abdul Moeloek Regional Hospital is 1,633 people, including 617 non-medical personnel and 1,016 medical personnel, 26 sub-specialists, 94 specialist doctors, 168 doctors and 534 medical personnel, according to AM RSUD data. (2018). Abdul Moeloek Regional General Hospital is a Class A regional hospital that accepts referrals from all hospitals, both state and private. As the final referral hospital, RSUD Abdul Moeloek of course also accepts referrals for Covid-19 cases that cannot be handled by category C or B hospitals. During 2021, RSUD Abdul Moeloek treated 2,152 Covid-19 patients, including 50 people. Intensive care. wards and no less than 302 patients died due to Covid-19 (Abdul Moeloek Hospital, 2021).

Based on the information above which shows that the clinical course of Covid-19 can worsen, requiring treatment in the intensive care unit, and that it is Covid-19, researchers are interested in conducting prospective research with the topic "Analysis of Risk Factors for Covid-19. Patients using ventilators at Abdul Moeloek Hospital, Lampung in 2021.

The aim of the research is to analyze the risk factors for Covid-19 patients using mechanical ventilation at Abdul Moeloek Hospital, Lampung in 2021.

## Method

This study used a retrospective and quantitative cohort design. This research was carried out from September 1 2022 to January 1 2023 at Abdul Moeloek Regional Hospital using secondary medical record data. The population of this study was 2,152 Covid-19 patients treated in the inpatient rooms and wards of Abdul Moeloek Regional Hospital in 2021 with a sample of 337 patients calculated using the Slovin formula with an overall sampling technique. The inclusion criteria are Covid-19 patients who were treated in the inpatient rooms and rooms of Abdul Moeloek Regional Hospital during 2021 and the exclusion criteria are Covid-19 patients who were treated outside of 2021 . Data were analyzed using univariate analysis to determine the frequency distribution of each variable, bivariate analysis to determine the relationship between dependent and independent variables and multivariate analysis to determine which variable was most dominant.

## Results

### Univariate Analysis



Table 1 Results of univariate analysis

Variable	Number (n)	%
<b>Age</b>		
Teenagers (10-19 years)	6	1.8
Adult (20-60 years)	273	81.0
Seniors (60+ year)	58	17.2
<b>Gender</b>		
Man	198	58.8
Woman	139	41.2
<b>Disease History</b>		
CAD	4	1.2
CHD	1	0.3
CHF	6	1.8
chronic kidney disease	11	3.3
dengue fever	2	0.6
Typhoid fever	8	2.4
Typhoid fever	8	2.4
Dyspepsia	11	3.3
DM	38	11.3
Dyspepsia	2	0.6
Hepatitis	2	0.6
Hypertension	23	6.8
HIV	4	1.2
Cancer	3	0.9
Cataract	3	0.9
LUNG TB	4	1.2
There isn't any	207	61.4
<b>Total</b>	<b>337</b>	<b>100.0</b>
<b>Mechanical Ventilation</b>		
Use	128	38.0
Don't use	209	62.0
<b>Suffering from Covid-19 for a long time</b>		
Means	19.87	
median	16.00	
Std. Deviation	13,385	
Minimum	1	
Maximum	71	
<b>O2 saturation</b>		
Means	94.39%	
median	98.00%	
Std. Deviation	7.51%	
Minimum	54.00%	
Maximum	100.00%	

Based on the table above, there are 6 Covid-19 patients at Abdul Moeloek Hospital, Lampung in 2021, aged 10-19 years (1.8%), adults aged 20-59 years as many as 273 people (81.0%) and elderly people aged 60 years and over. . as many as 58 people (17.2%). There were 198 men (58.8%) and 139 women (41.2%).



The comorbidities most frequently suffered by respondents were Diabetes Mellitus (DM) as many as 38 people (11.3%) and Hypertension (HT) as many as 23 people (6.8%). people with an average of 19.87 days. The highest level of oxygen saturation for respondents was 100% and the lowest was 54%. Respondents who used mechanical ventilation were 128 people (38.0%) and without mechanical ventilation were 209 people (62%).

### Bivariate Analysis

Table 2 Relationship between age of Covid-19 patients and use of mechanical ventilation

Age	Use of Mechanical Ventilation				Total		P	OR (95%CI)
	No Ventilator		With Ventilator					
	N	%	N	%	N	%		
Teenager	4	57.1	3	42.9	7	100	0.001	
Mature	150	55.1	122	44.9	272	100		
Old	55	94.8	3	5.2	58	100		
Amount	209	62.0	128	38.0	337	100		

The results of data analysis based on the table above obtained a *p-value* of 0.001, less than 0.05, which means that statistically there is a significant relationship between the age of Covid-19 patients and the use of mechanical ventilation in Abdul Moeloek Hospital, Lampung in 2021 .

Table 3 Relationship between gender of Covid-19 patients and use of mechanical ventilation

Gender	Use of Mechanical Ventilation				Total		P	OR (95%CI)
	No Ventilator		With Ventilator					
	N	%	N	%	N	%		
Woman	134	67.7	64	32.3	198	100	0.011	1,787 (1.14 - 2.79)
Man	75	54.0	64	46.0	139	100		
Amount	209	62.0	128	38.0	337	100		

The results of data analysis based on the table above obtained a *p-value* of 0.11 so it can be concluded that statistically there is a significant relationship between the gender of Covid-19 patients and the use of mechanical ventilation at Abdul Moeloek Hospital, Lampung in 2019. 2021 . Based on the results of the difference in proportions test, the OR value was 1.787 (1.14-2.79). It can be explained that male respondents have a risk of using mechanical ventilation of 1.78 times compared to female respondents.

Table 4 Relationship between duration of suffering from Covid-19 and use of mechanical ventilation

Suffering from Covid-19 for a long time	Use of Mechanical Ventilation				Total		P	OR (95%CI)
	No Ventilator		With Ventilator					
	N	%	N	%	N	%		
≤8 days	63	71.6	25	28.4	88	100	0.031	1,778 (1.0-3.0)
>8 days	146	58.6	103	41.4	249	100		
Amount	209	62.0	128	38.0	337	100		

The results of data analysis based on the table above obtained a *p-value* of 0.031, which means that statistically there is a significant relationship between the duration of suffering from Covid-19 and the use of mechanical ventilation at Abdul Moeloek Hospital, Lampung in 2021. Based on the results of the difference in proportions test, an OR value of 1 was obtained. .78 (1.0-3.0). It can be explained that respondents who suffered from Covid-19 >8 days had a risk of using mechanical ventilation 1.78 times compared to those who suffered from Covid-19 <8 days.

Table 5 Relationship between comorbidities in Covid-19 patients and the use of mechanical ventilation

Concomitant Diseases	Use of Mechanical Ventilation				Total		P	OR (95%CI)
	No Ventilator		With Ventilator					
	N	%	N	%	N	%		
Without comorbidities	167	80.7	40	19.3	207	100	0.001	8,748 (5.28-14.50)
With comorbidities	42	32.3	88	67.7	130	100		
Amount	209	62.0	128	38.0	337	100		

The results of data analysis based on the table above obtained a *p-value* of 0.001 so it can be concluded that statistically there is a significant relationship between the history of comorbidities in Covid-19 patients and the use of mechanical ventilation at Abdul Moeloek Hospital, Lampung in 2021 . Based on the results of the difference in proportions test, the OR value was 8.75 (5.28-14.50). It can be explained that respondents who have a history of comorbidities have a risk of using mechanical ventilation of 8.75 times compared to those who do not have comorbidities.

Table 6 Correlation of Oxygen Saturation Levels in Covid-19 Patients with the Use of Mechanical Ventilation

Oxygen Saturation Level	Use of Mechanical Ventilation				Total		P	OR (95%CI)
	No Ventilator		With Ventilator					
	N	%	N	%	N	%		
>90%	202	80.8	48	19.2	250	100	0.001	48,095 (20.9-110.75)
<90%	7	8.0	80	92.0	87	100		
Amount	209	62.0	128	38.0	337	100		

The results of data analysis based on the table above obtained a *p-value* of 0.001, which means that statistically there is a significant relationship between the oxygen saturation level of Covid-19 patients and the use of mechanical ventilation at Abdul Moeloek Hospital, Lampung. in 2021 . The highest use of mechanical ventilation in Covid-19 patients was in patients with a saturation level <90%, namely 80 people. The results of the analysis above also show an *Odds Ratio* (OR) = 48.095, which means that patients with an oxygen saturation level of <90% have a 48 times chance of using mechanical ventilation compared to patients with an oxygen saturation level of >90% .

## Multivariate Analysis

Table 7 Final Multivariate Model

Variable	P-value	OR	95%CI	
age	0.001			
age (1)	0.025	19,212	1,452	254,247
age (2)	0,000	20,336	3,970	104.178
JK	0.104	1,766	0.890	3,504
Long_time_covid	0.124	1,964	0.831	4,644
Accompanying diseases	0,000	5,221	2,656	10,266
Oxygen Saturation	0,000	68,285	19,459	239,622

Based on the table, it is known that the variables that are risk factors for using mechanical ventilation are the age variable (p-value 0.000), infectious diseases (p-value 0.000) and the oxygen



saturation variable (p-value 0.000). Judging from the most dominant factor after being controlled by several other variables that are most related to the use of mechanical ventilation, namely the oxygen saturation variable with a p-value of 0.000 and OR 68.285 (CI 95% 19.459-239.622) which means that respondents who experience a negative attitude have a chance of 68.285. . the use of mechanical ventilation was times greater after controlling for several other variables.

## Discussion

### The relationship between the age of Covid-19 patients and the use of mechanical ventilation

One of the dominant factors in disease severity and risk of death is age. Reports from Italy and China at the start of the pandemic recorded a *case fatality rate* (CFR) of 15-20% in patients aged >80 years, while for those aged <50 years the CFR decreased to <1% (Torres Acosta & Singer, 2020) . Worldwide, the evidence regarding ARDS and age is consistent. The incidence of ARDS increases with age, starting from 16/100,000 people/year in 15-19 year olds increasing to 306/100,000 people/year in patients over 75 years old (Montenegro et al., 2021). Older age is also associated with a number of comorbidities (Papadopoulos et al., 2021) .

This theory is in line with research results which show that there is a statistically significant relationship between the age of Covid-19 patients and the use of ventilators at Abdul Moeloek Hospital, Lampung in 2021.

In accordance with the results of research conducted by Ferrando et al (2020) on 742 Covid 19 patients suffering from ARDS and using indoor ventilators, the results show that the average age of the patients is elderly. According to Wang et al., in 2020 impairment of cellular immunity and humoral immunity increases with age and may lead to less control of viral replication. It is generally accepted that age-related decline in the adaptive immune response and the presence of underlying pathology place older patients at increased risk of infection. Maturation and biological changes caused by aging are related to the body's response to pulmonary and extrapulmonary injury and may explain differences in ARDS prevalence and outcomes in certain age groups ( Schouten et al., 2019 ).

The results show that the relationship between the age of Covid-19 patients and the use of ventilators at Abdul Moeloek Hospital in Lampung is still 32.6% older .

### Relationship between gender of Covid-19 patients and use of mechanical ventilation

The theory above is in line with this research that statistically there is a significant relationship between the gender of Covid-19 patients and the use of ventilators at Abdul Moeloek Hospital, Lampung in 2021.

These results are in line with the results of research conducted by Ferrando et al., (2020) on 742 Covid 19 patients suffering from ARDS, the proportion of male patients who used ventilators was higher than women. Acute respiratory distress syndrome (ARDS) occurs more frequently in men than women and is associated with hypogonadism, which can create a permissive environment that leads to poor outcomes in men.

In men, testosterone (T) which is formed by Leydig cells in the testicles plays a role in the formation and functioning of the male reproductive system. However, T levels decrease by about 0.4% to 2% every year starting at age 30, causing a condition called hypogonadism. A decrease in serum T levels occurs with increasing age (Papadopoulos et al., 2021).

Based on the results of the gender relationship between Covid-19 and the use of ventilators at Abdul Moeloek Regional Hospital, Lampung, there are still 32.3% of women who use ventilators, possibly because these patients have other factors that encourage these patients to use mechanical aids. ventilation.

### **Association between long periods of suffering from Covid-19 and the use of mechanical ventilation**

This hypothesis shows that the longer a person is infected with Covid 19, the higher the possibility of damage to vital organs. In this study, there was a statistically significant relationship between the duration of Covid-19 disease and the use of ventilators at Abdul Moeloek Hospital, Lampung in 2021.

The immune response to Covid-19 infection Covid-19 generally includes two reasons. The first requires an endogenous and protective immune response to eliminate the virus and prevent disease progression to more severe stages. The second is the disruption of the immune response that occurs when the virus attacks, causing the disease to become more severe.

This second model shows severe damage to organs with high ACE2 levels, such as the heart, kidneys, intestines and lungs, with type II alveolar pneumocytes being the main target of Covid 19. The damage caused to these tissues triggers the renin angiotensin aldosterone system RAAS) and causes inflammation in the lung parenchyma through the activity of macrophages and granulocytes which causes ARDS (Dhawan et al., 2020).

Due to the long-term relationship between Covid-19 and the use of ventilators at Abdul Moeloek Hospital in Lampung, 28.4% of patients are still being treated.

### **Association between underlying comorbidities (comorbidities) and the use of mechanical ventilation**

This theory is in line with research results which show a statistically significant relationship between the history of comorbidities in Covid-19 patients and the use of ventilators at Abdul Moeloek Hospital, Lampung in 2021.

A meta-analysis study of 30 research sources, research results show that diabetes is associated with more severe disease that causes death, worsening of Covid 19 infection and ARDS, as well as disease progression in Covid 19 patients.

The relationship between diabetes and worsening disease in a person is related to age and hypertension (Huang et al., 2020). The presence of comorbidities such as hypertension and diabetes mellitus (DM) is a risk factor for ARDS and even death in Covid 19 patients (Montenegro et al., 2021). Hypertension is a chronic disease suffered by 31.1% of adults worldwide in 2010. Hypertensive patients show increased ACE2 due to genetic factors related to polymorphisms and the use of ACE inhibitors or angiotensin receptor blockers (ARB). This can increase the vulnerability and severity of Covid 19 (Pranata et al., 2020).

Several studies have reported an association between the severity of Covid 19 and diabetes. This also involves ACE2 (Abdi et al., 2020; Huang et al., 2020).

Based on the results of the relationship between comorbidities in Covid-19 patients and the use of ventilators at Abdul Moeloek Hospital in Lampung, there are still 19.3% who do not have comorbidities who use ventilators. This may be caused by the patient having other factors. Advise the patient to use mechanical ventilation.

### **The relationship between oxygen saturation in Covid-19 patients and the use of mechanical ventilation**

The research results show that there is a significant relationship between the oxygen saturation level of Covid-19 patients and the use of ventilators at Abdul Moeloek Hospital, Lampung in 2021. According to statistics, this variable has a direct relationship with ventilator use. mechanical ventilation, where patients with low oxygen saturation levels are 32 times more likely to use mechanical ventilation than patients with normal oxygen saturation levels. This is also proven by research conducted by Fernando Mejia, Carlos Medina and colleagues in 2020 in Peru





using the cohort study method (Cayetano Hospital) where there were 396 samples with an average age of 60 years with oxygen saturation  $<90 > 90$  years with age over 60 years.

This study concluded that oxygen saturation is a predictor of death in COVID-19 patients, so the main focus should be given to early treatment of hypoxia (Mejia et al., 2020).

ARDS (card) Covid 19 sufferers will experience difficulty breathing with an increase in respiratory frequency  $\geq 30$  times/minute, hypoxemia  $SpO_2 \leq 92\%$   $PaO_2/FiO_2 \leq 300$  mmHg even though they receive oxygen. Typically, ARDS presents with symptoms of hypoxemia associated with dynamic pulmonary compliance.

Hypoxemia is thought to be caused by loss of the hypoxic pulmonary vasoconstriction (HPV) reflex and disruption of blood flow regulation in the pulmonary system, causing ventilation/perfusion (VA/Q) mismatches and the possibility of pulmonary capillary microthrombosis (Fatoni and Rakhmatullah, 2021).

As a result, the relationship between the oxygen saturation of Covid-19 patients and the use of ventilators at Abdul Moeloek Hospital in Lampung remains at 19, with a saturation of  $>90$  in patients using ventilators, possibly because these patients have other factors that require the patient to have oxygen saturation. to use a ventilator.

### Multivariate analysis

Based on the research results, the variables that are risk factors for using mechanical ventilation are the age variable (p value 0.000), infectious diseases (p value 0.000) and the oxygen saturation variable (p value 0.000).

Evaluated based on the most dominant factor after controlling for several other variables that are most related to the use of mechanical ventilation, namely the oxygen saturation variable with a p-value of 0.000 and OR 68.285 (CI 95.459-239.622), meaning that respondents with a negative attitude are 68.285 times more likely to using mechanical ventilation after controlling for several other variables.

This is also proven by research conducted by Fernando Mejia, Carlos Medina and colleagues in 2020 in Peru using the cohort study method (Cayetano Hospital) where there were 396 samples with an average age of 60 years with oxygen saturation  $<90 > 90$  years with age over 60 years.

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### Conclusion

Based on the results of the research conducted, it can be concluded that 249 people (73.9%) needed 8 days, of which 207 people (61.4%) had no comorbidities, 250 people (74.2%) had an oxygen saturation level ( $> 90\%$ ) and 128 people (38.0%) used a ventilator. There is a significant relationship between age (p value 0.001), gender (p value 0.011), duration of Covid-19 disease (p value 0.031), Covid-19 patients (p value 0.001), oxygen saturation (p value 0.001) on the use of

mechanical ventilation in Covid 19 patients. Oxygen saturation is the variable that most influences the frequency of use of mechanical ventilation in Covid 19 patients, p value 0.001 and OR 68.285. It is hoped that the public will increase their knowledge so that they can maintain lung function by avoiding risk factors that can reduce oxygen saturation.

### Thank-you note

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