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# Determinants Of Mortality Of Covid-19 Patients

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## ABSTRACT

**Objective:** In Covid-19 patients, age, and underlying disease (hypertension, diabetes, heart disease) were found to be the most critical risk factors for Covid-19 death. This study aimed to analyze the mortality determinants of Covid-19 patients.

**Method:** The research respondents were 50,2% people from the total population. Sampling technique using purposive sampling. Data analysis used Cochran's and Mantel-Haenszel Statistics. Results: The results showed that Comorbid disease is a determinant of mortality in Covid-19 patients with p-value = 0.011 (p <0.05) and OR value = 3.1. Acute respiratory distress syndrome (ARDS) is a determinant of mortality for Covid-19 patients with p-value = 0.002 (p<0.05) and OR value = 0.2.

**Conclusion:** The comorbid disease is a risk factor for mortality of Covid-19 patients at Bahteramas Hospital, Southeast Sulawesi Province, with a risk of 3.1 times higher than those without comorbid diseases. Acute Respiratory Distress Syndrome (ARDS) is a protective factor that can reduce mortality risk by 0.2 times in Covid-19 patients. The participation of the government Health Service and Hospitals will further enhance promotive and preventive efforts by not neglecting the curative and rehabilitative efforts so that efforts to reduce Covid-19 cases can be achieved.

**Keywords:** *Coronavirus, comorbid, acute respiratory distress syndrome*

## INTRODUCTION

The COVID-19 pandemic was the first identified coronavirus pandemic in December 2019 in Wuhan, China (WHO, 2020). Indonesia, for the first time, confirmed a case of COVID-19 on 2 March 2020.

WHO stated that Europe had become the global centre of the Coronavirus pandemic. Europe has had more cases and deaths from COVID-19 than China. According to WHO, there are more than 136 thousand Coronavirus cases in at least 123 countries and territories. Of these, nearly 81 thousand cases are in mainland China. Italy, the European country worst affected by the Coronavirus, is now recorded to have more than 15 thousand cases.

Data to the Task Force for the Acceleration of Handling Covid-19, the number of confirmed cases of Covid-19 in Indonesia to date is 4,266,195 cases with 144,129 deaths. The province with the highest number of Covid-19 cases, namely Jakarta, with 866,907 cases

(20.3%) with 13,607 deaths, followed by West Java with 709,032 cases (16.6%) with 14,756 deaths, Central Java with 487,015 cases (11.4%) with 30,292 deaths, for Southeast Sulawesi it is at number 30 with 20,173 cases (0.5%) with 528 deaths. (Covid-19 Handling Task Force, 2021).

Kendari City has the highest positive confirmation of all regencies/cities. In 2020, as many as 3,875 cases and 50 people died, and in 2021 there will be an addition of positive confirmed cases in Kendari City, as many as 3,839 cases, with death cases increasing by 45 people (Profile of the Health Office Southeast Sulawesi Province, 2020).

Bahteramas Hospital is a referral centre for Covid-19 cases in all districts/cities. Confirmed cases of Covid-19 treated at the Bahteramas Hospital in 2020 were 854 people, and 82 cases died. In 2021 there were 845 confirmed cases of Covid-19, and 173 cases died (Hospital Bahteramas, 2021).

In Covid-19 patients, underlying diseases (hypertension, diabetes, heart disease) were found to be the most critical risk factors for Covid-19 death (Senewe et al., 2021). Another possible cause of death is acute respiratory distress syndrome (ARDS). In research in China, several pathological findings of Covid-19 related to ARDS exist. The research investigated the pathological characteristics of patients who died due to Covid-19 (Rachmawati et al., 2021). This study aimed to determine the mortality determinants of Covid-19 patients at Bahteramas Hospital, Southeast Sulawesi Province.

## MATERIALS AND METHODS

This type of research is an observational analytic study with a case-control study design. This research was conducted at the Bahteramas Hospital, Southeast Sulawesi Province, in April 2022. the case population in the study were patients who had died from covid 19 recorded in 2021 at the Bahteramas Hospital. The control population is confirmed Covid 19 patients who have not died recorded in 2021 at the Bahteramas Hospital. Totalling 845 people, with a sample of 88 respondents consisting of 44 cases and 44 control, Obtained using the formula for case-control Lemeshow et al. 1997. Sampling technique by purposive sampling. Analysis using the odds ratio (OR) test by looking at the lower and upper limit values. The data is presented as a frequency distribution table accompanied by a narrative.

## RESULT

***Frequency Distribution Based on Characteristics of Respondents***

The characteristics of respondents in Table 1 :

**TABLE 1:** Frequency Distribution Based on Characteristics of Respondents

| Characteristics | **Case** | | **Control** | |
|---|---|---|---|---|
| | **n** | **%** | **n** | **%** |
| **Education** | | | | |
| Primary School | 5 | 11.4 | 3 | 6.8 |
| Junior High School | 5 | 11.4 | 6 | 13.6 |
| Senior High School | 24 | 54.5 | 23 | 52.3 |
| College | 10 | 22.7 | 12 | 27.3 |
| **Work** | | | | |
| Housewife | 9 | 20.5 | 13 | 29.5 |
| Private Sector Employee | 2 | 4.5 | 4 | 9.1 |
| Student | 1 | 2.3 | 0 | 0 |
| Fisherman 1 | 1 | 2.3 | 0 | 0 |
| Pension | 14 | 31.8 | 6 | 13.6 |
| Farmer | 4 | 9.1 | 1 | 2.3 |
| Civil Servant | 5 | 11.4 | 8 | 18.2 |
| Self-Employed | 8 | 18.2 | 8 | 18.2 |

| Characteristics | **Case** **n** **%** | **Control** **n** **%** |
|---|---|---|
| **Total** | **88** | **100** |

*Source: Primer Data, 2022*

The educational characteristics of respondents in Table 1 show that most of them graduated from senior high school, case group, namely 24 people (54.5%), and Control group, namely 23 people (52.3%), while the lowest was 5 people graduated from elementary school and Junior High School (11.4%). The job characteristics of the respondents in Table 1 show that most of them work as pension for the case group, which is 14 people (31.8), while the lowest work is fishermen and students, each of which is 1 person (2.3%).

***Frequency Distribution Based on Comorbid disease and Acute Respiratory Distress Syndrome (ARDS)***

The distribution of respondents based on comorbid diseases and *Acute Respiratory Distress Syndrome* (ARDS) in Table 2

**TABLE 2:** Frequency Distribution by Comorbid Disease and *Acute Respiratory Distress Syndrome* (ARDS)

| **Variable** | **n** | **%** |
|---|---|---|
| **Comorbid Disease** | | |
| High Risk | 46 | 52,3 |
| Low Risk | 42 | 47,7 |
| ***Acute Respiratory Distress Syndrome* (ARDS)** | | |
| High Risk | 45 | 51,1 |
| Low Risk | 43 | 48,9 |
| **Total** | **88** | **100** |

*Source: Primer Data, 2022*

Shows that most of them have comorbid diseases (high risk), as many as 46 people (52.3%), while those who do not have comorbid diseases (low risk) are 42 people (47.7% ). The distribution of respondents based on Acute Respiratory Distress Syndrome in Table 2 shows that most of them experienced acute respiratory distress syndrome (ARDS) as many as 45 people (51.1%), while those who did not experience acute respiratory distress syndrome (ARDS) were 43 people (48,9%).

***Analysis of risk factors by Comorbid Disease Acute Respiratory Distress Syndrome (ARDS)***

The distribution of respondents based on the relationship between comorbid diseases and mortality of Covid-19 patients in Table 3 :

**TABLE 3:** Analysis risk factor by Comorbid Disease *Acute Respiratory Distress Syndrome* (ARDS)

| Variable | Sampel | | | | Total | | Hasil Uji Statistik |
|---|---|---|---|---|---|---|---|
| | Casus | | Control | | | | |
| | n | % | n | % | n | % | |
| **Comorbid Disease** | | | | | | | |
| High Risk | 29 | 65,9 | 17 | 38,6 | 46 | 52,3 | OR = 3,1; CI=95%; LL-UL = 1,286- 7,329 |
| Low Risk | 15 | 34,1 | 27 | 61,4 | 42 | 47,7 | |
| **Total** | **44** | **100** | **44** | **100** | **88** | **100** | |
| ***Acute Respiratory Distress Syndrome* (ARDS)** | | | | | | | |
| High Risk | 15 | 34,1 | 30 | 68,2 | 45 | 51,1 | OR = 0,24 CI=95%; LL-UL =0,099-0,587 |
| Low Risk | 29 | 65,9 | 14 | 31,8 | 43 | 48,9 | |
| **Total** | **44** | **100** | **44** | **100** | **88** | **100** | |

*Source: Primer Data, 2022*

Based on statistical tests using the Odds Ratio (OR) test, the Odds Ratio (OR) value for a comorbid disease is 3.1. It can be said that comorbid diseases have a 3.1 times higher risk of mortality compared to those who do not have comorbid diseases. A confidence interval of 95% (CI) obtained a lower limit value of 1.286 and an Upper limit value of 7.329, each including the number one. The alternative hypothesis (Ha) is accepted, and the OR is significant. The Lower Limit value means that COVID-19 patients with comorbid diseases are at least 1.337 times more at risk of causing mortality and, at the most, 7,329 times more at risk of causing mortality in Covid-19 patients in the Bahteramas Hospital Province Southeast Sulawesi.

Based on statistical tests using the Odds Ratio (OR) test, the Odds Ratio (OR) value for acute respiratory distress syndrome is 0.24. The value obtained by OR < 1 indicates that acute respiratory distress syndrome (ARDS) is a protective factor or has a negative relationship to the mortality of Covid-19. So, it can be concluded that acute respiratory distress syndrome (ARDS) is a non-significant protective factor for the mortality of Covid-19 patients. The interpretation of the analysis of the significant risk of ARDS on the mortality of Covid-19 patients is that acute respiratory distress syndrome (ARDS) can reduce the risk by 0.2 times for the mortality of Covid-19 patients at the Bahteramas Hospital, Southeast Sulawesi Province.

## DISCUSSION

### *Comorbid Disease*

Risk factors for patients with comorbid chronic diseases known as comorbidities can increase the risk of death in patients infected with Covid-19 (Permatasari, Mawaddah, & Amani, 2021). Several comorbid factors are commonly found in Covid-19 patients: hypertension, heart disease, diabetes mellitus, COPD, tuberculosis, kidney disease, and autoimmune (Guan et al., 2020). This study concluded that comorbid disease is a risk factor for mortality of Covid-19 patients at Bahteramas Hospital, Southeast Sulawesi Province. From the analysis of the relationship between comorbid diseases and mortality of Covid-19 patients, from 44 case groups, 29 people died because they had comorbid diseases, including hypertension, diabetes mellitus, Chronic Kidney Disease (CKD), heart, and pulmonary TB. Hypertension, diabetes mellitus, and Chronic Kidney Disease lower the patient's immune system. At the same time, other diseases such as heart and lung cause decreased organ function to the risk of causing death. Because comorbid diseases can significantly impact weakness or organ damage, people with comorbidities affected by Covid-19 will have severe symptoms but die. It was because it was influenced by other factors such as age, the delay in the patient seeking medical treatment at the health facility, and the patient has respiratory distress syndrome (ARDS), a severe symptom of Covid-19 that causes respiration disturbances. (Rahayu et al, 2021).

### *Acute Respiratory Distress Syndrome*

Acute Respiratory Distress Syndrome (ARDS) is an acute and diffuse inflammatory lung injury resulting in increased pulmonary vascular permeability, increased pulmonary resistance, and loss of air-filled lung tissue, with hypoxemia and bilateral opacity on imaging, which is associated with increased shunting, increased physiological dead space, and reduced lung compliance (Senewe et al., 2021)

There are two principal findings of the research: Comorbid disease is a determinant of mortality in

Covid-19, and Acute respiratory distress syndrome (ARDS) is a determinant of mortality for Covid-19 patients.

The results of this study, Table 3, concluded that acute respiratory distress syndrome (ARDS) is a protective factor or a factor that can reduce the risk of mortality in Covid-19 patients. Based on the study results, ARDS is a protective factor because ARDS with low risk in the case group has a higher presentation than those with high risk. It means that ARDS risk factors have a low presentation as a cause of mortality in Covid-19 patients. In addition, based on the results of ARDS research, it can be from comorbid diseases, which can worsen if someone is exposed to Covid-19.

From the analysis of the relationship between acute respiratory distress syndrome (ARDS) and mortality of Covid-19 patients from 44 case groups, 15 people died experiencing acute respiratory distress syndrome (ARDS). This acute respiratory disorder occurs because fluid accumulates in the sacs, and this fluid buildup prevents the lungs from being filled with sufficient air, conveying an important message. Acute respiratory distress syndrome (ARDS) is a determinant of mortality for Covid-19 patients but can reduce the risk of mortality in Covid-19 patients.

As a result of ARDS or severe Covid-19 symptoms, the oxygen flowing in the bloodstream is minimal, and the body's organs cannot function normally due to lack of oxygen, so the patient experiences shortness of breath. If you don't get proper medical treatment, ARDS or severe Covid-19 symptoms can impact death. Twenty-nine people did not experience acute respiratory distress syndrome (ARDS). Still, the patient died because of being influenced by other factors such as age, and delay in medical treatment, because the patient was afraid to go to a health facility. It could be caused by having a chronic disease, thereby increasing the risk or danger of infection and complications due to the Coronavirus.

Meanwhile, of 44 people in the control group, 30 experienced acute respiratory distress syndrome (ARDS) but did not die. It was because it was influenced by other factors such as young age. Hence, they had good endurance and speed in handling medical treatment so that acute respiratory distress syndrome (ARDS) that occurs in patients can be adequately treated. It is in line with research conducted by Soedarsono et al. (2020) that in this study, the value of the Ventilatory ratio and Vd/Vt are variables that significantly have a relationship with mortality in COVID-19 patients with ARDS can be used as predictors of mortality in the first 24 hours of patients diagnosed. In this study, the degree of ARDS significantly increased mortality according to the severity of ARDS. In COVID-19 patients with severe ARDS, 42 subjects (74%) died. The same study suggests that COVID-19 with ARDS has a worse outcome than ARDS due to other causes.

Another critical finding Is that the Coronavirus that enters the body of a person with Covid-19 often attaches to the upper respiratory tract. After the infection, the patient will experience inflammation, as is his body's natural immune response. The symptoms of ARDS can include cough, sore throat, and fever. In some cases, the Coronavirus will exit the upper respiratory tract, move in the lungs, attack the alveoli, and trigger ARDS. Gradually, the virus-infected alveoli will collapse as lung function decreases and there is a lack of oxygen in the blood. At the same time, this injury causes acute inflammation.

The last crucial finding is the combination of acute inflammation plus low oxygen levels can be fatal because it triggers organ failure. ARDS in people with severe Covid-19 usually appears 8 days after the initial symptoms, which is in line with previous reports that ARDS appears on the 8th or 9th day after the onset of symptoms. Respiratory rate and SpO2 are critical parameters in the early recognition of ARDS. A person's indicators require further evaluation if they have any of the following conditions: respiratory rate 30 breaths/min; SpO2 92%; and PaO2/FiO2 300 mmHg6. In addition, blood tests can also help enforce Covid-19 with ARDS. In Singapore, it was reported that C-reactive protein levels, blood neutrophil counts, and lymphopenia were more common in patients requiring invasive mechanical ventilation for Covid-19 patients with ARDS. The Berlin criteria are used to establish the diagnosis of ARDS in Covid-19 patients. In a cohort study, Arecent reported that 85% of ICU patients with Covid-19 met the Berlin Criteria definition of ARDS and that supportive interventions for ARDS, such as low tidal volume and prone ventilation, significantly

improved significantly oxygenation and lung compliance (Dewi & Irfan, 2021).

## CONCLUSION

The comorbid disease is a risk factor for mortality of Covid-19 patients at Bahteramas Hospital, Southeast Sulawesi Province, with a risk of 3.1 times higher than those without comorbid diseases. Acute Respiratory Distress Syndrome (ARDS) is a protective factor that can reduce mortality risk by 0.2 times in Covid-19 patients.

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