

# The Relation Between Heart Failure and Severity COVID-19 Disease

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**Keywords:** COVID-19, Comorbid Impact, Heart Failure.

**Abstract:** This study aims to learn the relationship between heart failure and COVID-19 severity. This study aim to find out is there any correlation between patient with heart failure and COVID-19. This study employed a retrospective observational cohort research methodology. Analyzing a number of patient medical records based on preset categories and examining the convenience sampling employed in this study approach constituted the data collection technique. This research was conducted in one of this hospital in Bekasi. This study applies several criteria including: A) Inclusion criteria: all patients with heart failure with Covid 19 infection who were treated in the ICU or were not treated in the ICU, and patients aged 18 years or older. B) Exclusion criteria: pregnant individuals, autoimmune patients and cancer patients. The result of this study from 150 patient, 80 female and 70 male most of the patients who have confirmed infection with COVID-19 patients with comorbid heart failure generally have a history of hypertension. Cardiovascular damage with COVID-19 is associated patients with cardiovascular comorbidities are more susceptible to SARS-CoV-2 contamination and may have more extreme clinical symptoms, possibly because of the association with patients with ACE2 articulation in this collection than patients without cardiovascular comorbidities.

## 1 INTRODUCTION

Covid-19 is a medical problem brought on by the SARS-CoV-2 virus. Covid was first discovered in December 2021 in Wuhan, Hubei Province, China. SARS-CoV-2 is transmitted from bats (*Rhinolophus hipposideros*) to humans via zoonotic transmission. As of 1 June 2022, the global rate of confirmed COVID-19 cases has reached over 532 million, with a death rate of over 6.3 million. Covid-19 manifests with fever, cough, shortness of breath, diarrhea, headache, conjunctivitis, sneezing, and loss of smell and taste (Clekrin, 2020)

Heart disease is prevalent among Covid-19 patients (Ahsan, 2017). Several studies on heart disease in Covid infection found that the prevalence of patients with heart disease complications had a high morbidity rate, and according to some researchers, heart disease was caused by a variety of factors, including age, heredity, stress, excessive alcohol consumption, smoking, and an unhealthy lifestyle (Iwashima, 2019).

### 1.1 Covid-19

Covid disease 2019 is an additional intolerable

infection brought on by Severe Acute Respiratory Syndrome Corona Infection 2 (SARS-CoV-2) (Jayanama, 2021). Originally, the disease was known as the 2019 Covid Novel (2019-nCoV). Coronavirus was identified for the first time in 2019 in Wuhan, Hubei, China (L, 2020). The World Health Organization declared Covid-19 a pandemic on March 11, 2022. (Al-Awwal, N, 2020).

Coronaviruses are members of the family Coronaviridae (Shi, S, 2020). In China, the virus began to spread between mid-January and late January (T., Chen, 2020). Covid-19 is a crown-shaped RNA virus with a diameter between 60 and 140 nanometers. It is transmitted via inhalation, specifically through coughing and sneezing. By inhalation, the Covid-19 virus enters the human nasal system and begins to replicate. Covid-19's primary receptor is ACE2 Coronavirus, which is classified as a zoonotic virus, meaning it can be transmitted from animals to humans (L, 2020)

### 1.2 Heart Failure

In addition to complications associated with Covid-19 infection, such as pneumonia, Covid-19 can cause damage to numerous organs, including the heart

(Shi, S, 2020). In addition to the injuries caused by Covid-19, many patients have a history of heart disease prior to contracting the virus, so the prognosis caused by Covid-19 will have a negative impact (Wang, T, 2020).

Cardiovascular damage is a condition characterized by irregularities in the design or capacity of the heart that prevents it from working optimally in that state in all body tissues (Kikuchi, T, 2019). Coronary disease is a disease with a high mortality and morbidity rate in Indonesia that is on the rise. CHF (Chronic Heart Failure) causes aspiration failure, which results in accumulation of alveolar fluid, and pneumonia caused by Covid-19 disease can also cause accumulation of fluid in the lungs, which can destroy the estimated Covid-19 contamination. The leading causes are pressure, heredity, congenital coronary disease, and cardiomyopathy (Jayanama, K, 2021).

### 1.3 Role of Heart Failure Pathophysiology in Covid-19

The renin-angiotensin skeleton (RAS) leads to cardiovascular disorders such as hypertension, heart disease, and cardiovascular damage (Zheng, Y, 2020). The SRA comprises of angiotensinogen, renin, angiotensin II, angiotensin II receptors (AT1 and AT2), and angiotensin-changing over compound (ACE).

It has been determined that ACE is a compound that catalyzes the conversion of angiotensin I to angiotensin II, which is involved in vasoconstriction and expansion of circulating pressure. Within the past two decades, a second ACE homologue, ACE2, has been identified (J. H., 2011). This material is a counterregulatory chemical that can convert angiotensin II into vasodilator angiotensin, thereby reducing the effects of vasoconstriction, sodium maintenance, and fibrosis.

## 2 RESEARCH METHODS

This study employed a retrospective observational cohort research methodology. Analyzing a number of patient medical records based on preset categories and examining the convenience sampling employed in this study approach constituted the data collection technique.

This study was conducted at Sentra Medika Cikarang Hospital. The study was conducted from July through August of 2022. A) Inclusion criteria: all patients with heart failure with Covid 19 infection

who were treated in the ICU or were not treated in the ICU, and patients aged 18 years or older. B) Exclusion criteria: pregnant individuals, autoimmune patients and cancer patients.

### 2.1 Participant

The participants in this study were 150 patients who had heart failure and were infected with covid 19, which was in accordance with the inclusion that had been set.

### 2.2 Data Analysis

The result of the research that was carried out at the sentra medika cikarang hospital, sample taken was 150 patients patients who had heart failure and were infected with covid 19.

The data was then analyzed in groups using excel software and then the data was distributed using SPSS statistical software version 25 to see a relation between the severity of heart failure patients infected with Covid-19 with the man withney, chis squared, the kaplan mayer method

### 2.3 Instrument

This study uses medical record data patient who had heart failure and were infected with covid 19 was 150 patients.

### 2.4 Ethical Approval

Ethical approval was obtained prior to conducting the study. The ethical approval was sourced from the health research ethics committee of the Universitas 17 Agustus 1945, Jakarta, with the approval letter No.39/KEPK- UTA45JKT/EC/EXP/07/2022

## 3 RESULT

Table 1: Correlation Age and Blood Pressure with Clinical Outcome.

| Factor                    | Mean                                      | p-value |
|---------------------------|---|---------|
| Age                       | Survive = 34 (50.67) Dead = 114 (57)      | 0.0001* |
| Blood Pressure Before ICU | Survive = 34 (150.50) Dead = 114 (149.81) | 0.905*  |
| Blood Pressure After ICU  | Survive = 34 (137) Dead = 114 (135.53)    | 0.951*  |

\* Mann Whitney

Table 2: Correlation between Diagnosis with Clinical Outcome.

| Factor      | Survive (n = 36)  | Dead (n = 114)  | p-Value |
|-------------|---|---|---------|
| Comorbidity | Diabetes = 6<br>Hypertension = 11<br>Without Comorbidity = 19 | Diabetes = 1<br>Hypertension = 42<br>Without Comorbidity = 71 | 0.002 # |
| Grade       | Moderate = 14<br>Severe = 10<br>Critical illness = 12         | Moderate = 8<br>Severe = 13<br>Critical Illness = 93          | 0.0001# |
| CT-Scan     | Pile up = 15<br>Spread = 21                                   | Pile up = 52<br>Spread = 62                                   | 0.705   |

# Chi-squared

Whitney method to determine the relationship between age and blood pressure and clinical outcomes (Pitidhambhorn, D, 2021).

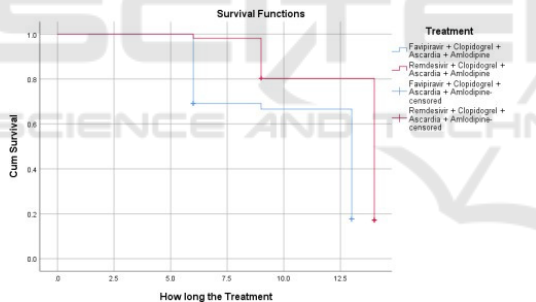


Figure 1: The Kaplan Meier Survival Analysis.

Frequently, abnormal blood pressure is connected with the occurrence of heart failure, which can be deadly, and heart failure is still a disease with a high mortality rate, heart failure being comorbid with old age (Micheal, & Ramatillah, 2022). Heart failure is a prime example of a life-threatening condition that requires rapid medical assistance and special treatment (Ramatillah, D.L, 2021). Heart failure is the inability of the heart to properly and adequately pump blood throughout the body (Ramatillah, D.L, 2021). Significant correlation ( $p = 0.0001$ ) Favirapir + Clopidogrel + Ascardia + Amlodipine (Survive = 25.5%). Remdesivir + Clopidogrel + Ascardia + Amlodipine (Survive = 21.4%)

## 4 DISCUSSION

In examining the association between age and blood pressure in COVID-19 (Laila, D,2021) patients with comorbid heart disease, it was discovered that many patients died due to advanced age and were susceptible to abnormal blood pressure and additional comorbidities due to precipitating factors such as decreased organ function. Who do not perform well when utilizing the Mann-

In the case of patients with a history of comorbid diseases being infected with Covid-19, there is a strong correlation. Patients with a history of comorbid diseases are extremely susceptible to Covid-19 infection due to a weakened immune system and a decline in the quality of body organ functions (King, M, 2012).

Several comorbid disorders, such as hypertension and diabetes, are frequently observed in COVID-19-infected patients. Diabetes is a set of metabolic diseases characterized by hyperglycemia that results from abnormalities in insulin secretion, insulinaction, or both (Vaduganathan, M, 2020)

Diabetes remains a risk factor for morbidity and death in COVID-19 patients,yet many people with diabetes who are infected with COVID-19 are nonetheless able to survive (Micheal, & ramatillah, 2022), as are Covid-19 patients with a history of hypertension.

hypertension is high blood pressure and is indicated by systolic blood pressure > 140 mmHg or diastolic blood pressure > 90 mmHg (Micheal, & ramatillah, 2022). The risk of hypertension (Zheng, Y, 2020) for determining the diagnosis of heart failure patients infected with COVID-19 has particular handlers including medical supporting examinations including CT-scans, ECGs, Swab tests, PCR, X-rays, blood pressure checks, and blood sampling examinations (Micheal, & ramatillah, 2022).

From the data obtained, it can be said, "In the provision of pharmacological therapy in treating heart failure patients infected with Covid19, the administration of drug combinations is very calculated to support the patient's recovery. in the administration of antiviral,

antiplatelet, calcium channel blockers (CCBS) or calcium antagonists. favipirafivir and remdasivir are useful as antivirals for patients with Covid19, favipirafir is a strongselective inhibitor derived from favipirafir which is a strong selective inhibitor derived from influenza virus RNA polymarse and can enter the viral RNA chains(Shereen, M, 2020)

In patients with the group using favipirafir, it

showed a shorter treatment period while remdesivir was useful as an antiviral which had benefits as clinical manifestations of patients infected with Covid19, therapy using remdesivir was generally used in patients with severe categories and several comorbid diseases (Shereen, M, 2020).

The administration of antiplatelet drugs in heart failure patients functions as blood thinners based on data obtained by antiplatelet drugs such as clopidogrel and aspirin, clopidogrel and aspirin itself are widely prescribed by doctors as recommended drugs to function to reduce the risk of heart attack by thinning the blood and preventing clotting blood (N, 2020).

Most of the patients who have confirmed infection with COVID-19 patients with comorbid heart failure generally have a history of hypertension (Vaduganathan, M, 2020). As a treatment therapy patients are given pharmacological therapy with a calcium channel blocker or calcium antagonist drug class, the hypertension drug commonly used is amlodipine, amlodipine itself has 2 types of doses, namely amlodipine 5 mg and amlodipine 10 mg, amlodipine has a mechanism of action by inhibiting calcium influxes into smooth muscle cells in blood vessels and myocardium cells, amlodipine is also indicated for the treatment of hypertension and angina, the effect of giving amlodipine at the right dose for patients Hypertension can cause a decrease in supinated and orthostatic blood pressure (Micheal, & ramatillah, 2022)

There is an relation between cardiovascular and COVID-19 adverse events, an association between patients with cardiovascular comorbidities who are more immune to disease with SARS-CoV-2 and may face more extreme clinical adverse events as a result of association with ACE2 articulation in these encounters contrasted with patients without cardiovascular comorbidities

## 5 CONCLUSION

Due to the uncontrolled pandemic, which has resulted in a large number of people being affected by the outbreak, the increase of COVID-19 cases remains of particular concern to all of us. The case of the elderly who have been exposed to heart failure and other comorbidities does not prevent the possibility of COVID-19 infection.

The association between heart failure and COVID-19 is dependent on age, therapy provided, comorbidities, and the severity of COVID-19; age and therapy are significant determinants in success

and recovery. Doctors prescribe the antiviral medications favipirafir and remdesivir to patients with a high risk of death. As well as aspirin and clopidogrel, amlodipine is used to control blood pressure in COVID-19-infected heart failure patients (N, 2020).

Cardiovascular damage with COVID-19 is associated, in particular, patients with cardiovascular comorbidities are more susceptible to SARS-CoV-2 contamination and may have more extreme clinical symptoms, possibly because of the association with patients with ACE2 articulation in this collection than patients without cardiovascular comorbidities (Jayanama, K, 2021).

The results of this study can be used by further researchers as research material and a research reference, as well as a consideration for expanding further exploration, and I hope that future scientists will have the choice to make this research more comprehensive.

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