Risk Factor Analysis of Death due to COVID-19 with Comorbid Condition in the Community of the Wetland Environment in Banjar District

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ABSTRACT

Background. The prevalence of confirmed cases of COVID-19 is high and tends to continue to increase in Indonesia. Based on data, the Province of South Kalimantan, Indonesia in early mid-2021 experienced a high spike in cases, resulting in a large number of deaths, especially in Banjar Regency. Active COVID-19 cases in South Kalimantan in July 2021 were recorded at 5,279 (12.41%) out of 42,527 positive cases. Data compiled from the COVID-19 Task Force (Satgas) showed that Banjar Regency was the third highest area of the cumulative number of deaths, with as many as 47 people dying in one day. The results of many research on risk factors for COVID-19 cases vary widely. People with comorbidities are a very vulnerable group.

Objective. This study aims to identify the relationship between comorbid conditions and death based on data from COVID-19 admission in the Wetland Environment community in Banjar Regency, South Kalimantan, Indonesia in the years 2020-2021.

Methods. This is a retrospective analytical observational study which used purposive sampling. The data were collected from the case form report (CFR). The dependent variable in this study was inpatients at Ratu Zaleha Hospital who died and were diagnosed as positive for COVID-19, while the independent variables were age (productive/non-productive), tuberculosis, hypertension, diabetes mellitus, asthma, pneumonia, heart disease, COPD (lung disease), HIV/AIDS, chronic kidney disease (CKD), and stroke (CVA). Data were analyzed by univariate, bivariate, and multivariate analyses with logistic regression method to obtain adjusted OR.

Results. Out of 700 patients with confirmed COVID-19 infection, 273 (39%) had no comorbidity while 427 (61%) had at least one comorbid condition. There were 330 (47.1%) male patients and 370 (52.9%) female patients. There were 565 (80.7%) patients who belong in the productive age and 135 (19.35%) in the non-productive age. Results showed that age (p=0.002), asthma (p=0.026), chronic kidney disease (p=0.000), and heart disease (p=0.002) are significant risk factors of COVID-19 death in Banjar Regency.

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Conclusion. Based on our analysis of COVID-19-related deaths in Banjar Regency in Ratu Zaleha Hospital on the year 2020-2021, diabetes, pneumonia, kidney failure, and COPD were associated with increased mortality.

Keywords: COVID-19, comorbidity, mortality

INTRODUCTION

COVID-19 is an infectious disease caused by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2). SARS-CoV-2 can infect anyone and cause different symptoms or severity. COVID-19 patients with comorbidities have a higher mortality rate than patients without comorbid condition. This is supported by research which shows that 88% of deaths in SARS-CoV-2 positive patients are caused by a history of comorbidities.[1] Therefore, the government through the Ministry of Health pays serious and special attention, because if a person is confirmed to have COVID-19, there is a great potential for clinical deterioration, thereby increasing the risk of death.[2,3]

Based on data compiled by the COVID-19 Handling Task Force, as of October 13, 2020, hypertension is the comorbidity with the highest number of cases (52.1%) in COVID-19 patients in Indonesia, while diabetes mellitus came in second with 33.6%.[4,5] Previous studies have shown that the presence of one comorbidity will increase the risk by 3.4 times for developing acute respiratory distress syndrome (ARDS).[6,7] A literature review shows that hypertension is the most frequent comorbidity in COVID-19 patients in various countries such as China, Italy, and the United States. Diabetes is also the second most common comorbidity in countries such as China, South Korea, and the United States.[8,9]

Data from the World Health Organization (WHO) shows that the elderly experience more coronavirus infections that have an impact on severe infections and deaths than toddlers. In Indonesia, where the mortality rate increases with increasing age, the population aged 45-54 years is 8%, 55-64 years is 14%, and 65 years and over is 22%. Obstructive pulmonary disease and the presence of respiratory symptoms need to be studied properly and be used as basis for implementing further health policies related to priority health services for COVID-19 patients to suppress the increase in the prevalence of non-communicable diseases in the future. The government's policy for handling COVID-19 related to the prevalence of non-communicable diseases (NCD) is to provide circulars regarding steps to prevent COVID-19 disease and implementation of the Clean and Healthy Living Behavior (PHBS Program).[10]

Knowledge in determining health policy priorities is very important because with the increasing number of positive cases of COVID-19 in Indonesia, the number of deaths is also increasing.[11] Based on data from the COVID-19 distribution map by the Indonesian COVID-19 Task Force (task unit), at the end of December 2020, there were already 22,138 deaths due to COVID-19. This number of deaths will increase if health intervention efforts are not properly targeted at risk groups.[12] Based on the description above, it can be concluded that the clinical picture and comorbid factors in COVID-19 patients vary widely. Concerning this phenomenon, research on comorbid factors for mortality in the community is carried out to obtain an overview of what occurs, especially in communities in wetland environments.

This study aims to identify the relationship between comorbid conditions and death based on data from COVID-19 admission in the Wetland Environment community in Banjar Regency, South Kalimantan, Indonesia in the years 2020-2021. We analyze comorbid factors so that based on the information provided, we can make recommendations to the government on how to deal with COVID-19 and as a reference for other researchers who are interested in the same field.

METHODS

The study used an analytical retrospective observational. This research was conducted for three months (February-April 2022) at Ratu Zaleha Hospital located on Jl., Menteri Empat, Cindai Alus, Kec. Martapura, Banjar Regency, South Kalimantan Province, Indonesia. Based on the data, Ratu Zaleha Hospital is one of the COVID-19 referral hospitals in South Kalimantan where the research can be carried out because it has a population with diverse characteristics that can be sampled.

The population in this study were COVID-19 patients who were treated at the Ratu Zaleha Martapura Hospital with a total of 1,287 people. The sample of this study were outpatients who were diagnosed as positive or reactive by RT-PCR laboratory examination and antigen swab test at Ratu Zaleha Hospital Martapura. Purposive sampling technique was used. The inclusion criteria in this study are:

a) COVID-19 Inpatients with an age range of 15-70 years
b) Have comorbidities and not pregnant
c) Patients who have recovered or died due to COVID-19

Based on the sample results, 700 research samples were obtained. The data collection method is divided into three stages, namely licensing, implementation, and reporting. Licensing was carried out to several agencies such as the Kesbangpol Banjar district and the Ratu Zaleha Hospital with no. Licensing 890/190/RAZA and researchers are also required to follow the provisions of the hospital for data collection.

After obtaining permission, the implementation stage of data collection and processing started. Secondary data was obtained from the medical records of inpatients with COVID-19. The variable in this study were in-patients who were positive for COVID-19 and died at Ratu Zaleha Hospital. The independent variables of this study were age, tuberculosis, hypertension, diabetes mellitus, asthma,

pneumonia, heart disease, COPD (lung disease), HIV/AIDS, Chronic Kidney Disease (CKD), and stroke (CVA).

The instrument used in this study was a case form report containing data on medical record numbers, comorbidities, age, gender, and length of hospitalization based on medical records. This data does not contain the patient's name, address, and contact number to maintain patient confidentiality.

Statistical Analysis

The data were tested using univariate analysis to see a descriptive picture, and bivariate using the chi square test or fisher's test, to see the significance of statistical calculations between two variables using a CI limit of 0.05 (95%). Multivariate test using logistic regression method was used to obtain OR using the SSPS 25 program.

Ethical Consideration

Before the study, we sought approval from the Ethical Committee of Medical Research of Medical Faculty, Lambung Mangkurat University ethical review board with Approval number 995/KEPK-FK ULM/EC/XII/2021. This research complied with the declaration of the said ethical committee for medical research involving human subject. Informed consent has been submitted to the hospital and has been signed by the hospital. To maintain patient confidentiality, data do not include the patient's name, address, and contact number.

RESULTS

Baseline Characteristics

In this analysis, the frequency distribution of the dependent variable and the independent variable are presented descriptively.

Table 1 shows that 350 (50%) COVID-19 patients at Ratu Zaleha Hospital recovered while 350 (50%) died. Patients without comorbid condition were 273 (39%) and patients with at least one comorbid were 427 (61%). There were 330 (47.1%) male patients and 370 (52.9%) female patients. Five hundred sixty-five (80.7%) belong in the productive age group and 135 (19.3%) belong in the non-productive age group.

The findings of comorbid cases in patients with confirmed COVID-19, it shows that comorbidities are related to patients infected with COVID-19, where comorbidity is one of the factors and findings that can affect the condition and severity of symptoms felt by the patient to cause death.

Table 1. Frequency distribution of disease status of COVID-19 inpatients at Ratu Zaleha Hospital (2022)

Variable	(N)	Percentage (%)
Status		
Recovered	350	50.0
Died	350	50.0
Disease Status		
Without Comorbid	273	39.0
With Comorbid	427	61.0
Gender		
Male	330	47.1
Female	370	52.9
Age		
Productive (15-64)	565	80.7
Non-productive (65-100)	135	19.3

Bivariate Analysis

To find the relationship between the dependent variable and independent variable, a bivariate analysis was carried out with the results shown in Table 2.

Based on Table 2, it is known that from 700 patients observed, hypertensive patients were found to have 1.319 times more risk of dying than patients who did not have hypertension, and statistically significant (p=0.0315). The results also showed that from the 120 patients with diabetes observed, 90 (75%) recovered and 30 (25%) died. Patients with diabetes have a risk of dying at 1.8 times greater than in patients without diabetes.

As many as 12 patients with pneumonia were observed, four (33.3%) recovered and eight (66.7%) died. The data also showed that 12 COPD patients were observed, eight (66.7 %) of them recovered and four (33.3%) died. Patients with COPD have a 2.3 times higher risk of dying than non-COPD patients. As for the 30 patients with heart disease, 23 (76.7%) recovered and seven (23.3%) died. Patients with heart disease had a risk of dying 1.4 times higher than patients without heart disease.

Forty-five patients have kidney failure, 22 (48.9%) recovered and 23 (51.1%) died. Patients with kidney failure had a higher risk of dying 6.6 times higher than patients who did not have kidney failure. There were five patients with stroke, one (20%) recovered and four (80%) died. Patients with stroke had a very large risk of dying which was 19 times higher than patients without stroke.

Multivariate Analysis

Based on Table 3, the variables that were significantly related to the status of inpatients for COVID-19 were age, diabetes mellitus, asthma, heart disease, and kidney failure, The model formed is said to be feasible, because it fulfils the meaning of the model seen from the omnibus test value (p=0.000). Based on the Nagerkeke R Square value = 0.094, it means that the independent variable contained in the model can explain the incidence of COVID-19 patient status by 9.4%.

The results of multivariate analysis showed that patients with confirmed COVID-19 have comorbidities including age with OR=1.873 (95% CI OR 1.246-2.815), diabetes with OR= 1.409 (95% CI OR 1.002-1.982), asthma with OR= 0.112 (95% CI OR 0.14-0.910), and kidney failure with OR= 3.336 (95% CI OR 1.849-6.016).

DISCUSSION

According to the Centers for Disease Control and Prevention (CDC), 94% of COVID-19 deaths in the United States occur in patients with comorbidities. Patients who have these comorbidities require more attention because their conditions are more vulnerable so that when they contract COVID-19, it can have a fatal impact.[12]

Based on Table 1, there were more patients with comorbidities compared to non-comorbid patients. The data in the table also shows that hypertension and diabetes are the most common diseases suffered by hospitalized patients with COVID-19 at Ratu Zaleha Hospital. Data on people with HIV/AIDS was also found.

Results of the study showed that there were more patients in the productive age (15-64 years) than in the non-productive age. Results showed p-value = 0.002, from the p-value in the statistical test results obtained, the decision Ho is rejected ($p<0.05$), which means there was a relationship between age and the risk of death due to COVID -19 in Banjar Regency. Based on the results of the study by Ichsan, et al. the largest sample was the age group 26-45 years with as many as 47 people (43.1%) and the least was the group aged >60 years with as many as 6 people (5.5%). The high number

Table 2. Risk factors for death based on comorbid COVID-19 patients in Ratu Zaleha Hospital (2022)

Variable	Category	Hospitalization Status, COVID-19 patient				OR (95% CI)	*p*-Value
		Recovered		Expired			
		N	%	N	%		
Age	Productive	299	85.4	266	76.0	1.851 (1.260-2.721)	0.002
	Non- Productive	51	14.6	84	24.0		
Gender	Male	165	47.1	165	47.1	1.000 (0.743-1.346)	1.000
	Female	185	52.9	185	52.9		
Hypertension	Yes	103	29.4	91	26.0	0.843 (0.605-1.174)	0.353
	No	247	70.6	259	74.0		
Diabetes	Yes	90	25.7	113	32.3	1.377 (0.992 -1.912)	0.067
	No	260	74.3	237	67.7		
Tuberculosis	Yes	8	2.3	3	0.9	0.370 (0.097-1.405)	0.224
	No	342	97.7	347	99.1		
Asthma	Yes	9	2.6	1	0.3	0.109 (0.014-0.862)	0.026
	No	341	97.4	349	99.7		
Pneumonia	Yes	23	19.0	15	4.3	0.637 (0.326-1.242)	0.243
	No	327	93.4	335	95.7		
COPD	Yes	3	0.9	4	1.1	1.337 (0.297-6.019)	1.000
	No	347	99.1	346	98.9		
Heart Disease	Yes	14	4.0	36	10.3	2.752 (1.456-5.199)	0.002
	No	336	96.0	314	89.7		
CKD	Yes	16	4.6	52	14.9	3.643 (2.036-6.517)	0.000
	No	334	95.4	298	85.1		
Stroke	Yes	11	3.1	17	4.9	1.573 (0.726-3.409)	0.335
	No	339	96.9	333	95.1		
HIV/AIDS	Yes	2	0.6	1	0.3	0.499 (0.0455-5.524)	1.000
	No	348	99.4	349	99.7		

Table 3. Risk factors for death based on comorbid COVID-19 patients in Ratu Zaleha Hospital (2022)

Variable	B	SE	Wald	df	Sig.	Exp(B)	95% CI for EXP(B)	
							Lower	Upper
Age	0.343	0.174	3.891	1	0.049	1.409	1.002	1.982
Diabetes Mellitus	0.944	0.330	8.163	1	0.004	2.570	1.345	4.911
Asthma	-2.186	1.067	4.198	1	0.040	0.112	0.014	0.910
Heart Disease	0.944	0.330	8.163	1	0.004	2.570	1.345	4.911
CKD	1.205	0.301	16.026	1	0.000	3.336	1.849	6.016
Constant	-0.992	0.267	13.747	1	0.000	0.371		

of COVID-19 cases in the age range of 26-45 years found in this study is thought to be related to activities done outside the home such as going to the office, tourist attractions, gathering with friends and others which cause healthy people to have direct contact or be in the same room/environment with COVID-19 positive people.[13] In the process of direct contact, a healthy person accidentally touches a person infected with the SARS-CoV-2 virus, or the person touches surfaces and equipment touched by a person infected with the SARS-CoV2 virus. In general, these surfaces and equipment have been contaminated by large droplets containing the SARS-CoV-2 virus from COVID-19 patients, where the virus can remain stable for a period of time.[14] Although in theory, it is stated that people with old age have a greater risk of being infected with the SARS-CoV-2 virus and have a greater chance of transmitting the virus because of a decreased level of natural immunity, people in this age group tend to have lower mobility than people in the 26-45 year age group, so the risk of exposure is higher for people in that age group.[15]

As for asthma, it showed p-value = 0.026, from the p-value in the statistical test results, the decision Ho is rejected (p<0.05), which means there is a relationship between asthma and the risk of death from COVID-19. A person will be more susceptible to viral infections, because of asthma. Asthma is also one of the comorbidities in patients infected with COVID-19.[16] This is in line with the study of Zhao, et al., which explained that based on history, it is suspected that asthma is a potential risk factor for COVID-19.[17]

CKD study showed p-value = 0.000, from the p-value in the statistical test results, the decision Ho was rejected (p<0.05), which means there is a relationship between chronic kidney disease and the risk of death from COVID-19 in Banjar Regency. Williamson et al.'s study found that a history of CKD increased the risk of death by 3.33 (1.27-8.68) times higher. Stage 4-5 chronic renal failure had an increased risk of death by 2.52 (2.33-2.72) times. The disease process of the COVID-19 generally involves the release of inflammatory cytokines and the formation of antigen-antibody complexes that will affect cell membrane permeability. However, in patients with chronic renal failure, the glomerular filtration process has deteriorated, so that systemic inflammation due to COVID-19 can worsen kidney function. In addition, due to the presence of ACE2 receptors in the urogenital system, the COVID-19 virus can also easily stimulate inflammatory processes in the kidneys which will worsen the patient's condition.[18,19]

The results of the stroke study showed p-value = 0.335, from the p-value in the statistical test results, the decision Ho was accepted (p >0.05), which means there is no relationship between stroke and the risk of death from COVID-19 in Banjar Regency. According to Anastasia et al., age >55 years is a risk factor for acute ischemic stroke and the age group >65 years is susceptible to being exposed to the SARS-CoV-2 virus and has a fairly high mortality rate. This age group also has severe COVID-19 severity which causes many patients in this age group to require mechanical ventilator assistance and admission to the ICU.[20]

The results of the study on gender characteristics with a p-value = 1,00, from the p-value in the statistical test results, the decision Ho was accepted (p>0 0.05) which means that there is no relationship between gender and the risk of death from COVID-19 in Banjar Regency. This is not in line with the theory in Wenhan's research in 2020 which concluded that male sex is a risk factor for COVID-19 patients. This is because there are differences in the male immunological system which is more sensitive than women, and there are differences in lifestyle and smoking. It seems to be due to the fact that the disease is acquired in the community and men are more active outside the home due to working conditions and are more often in groups. therefore, they are more likely to be infected.[21,22]

The results of the study on hypertension showed p-value = 0.353, from the p-value in the statistical test results obtained the decision Ho was accepted (p>0.05), which means there is no relationship between hypertension and the risk of death from COVID-19. This is in line with research from Oktaviani et al. (2020), where the results of bivariate analysis using the Chi Square correlation statistical test obtained a p-value = 0.645 (p>0.05), indicating that there is no significant relationship between the history of hypertension on the incidence of suspected COVID-19 patients and mild-moderate symptoms in RSUD dr. H. Abdul Moeloek Lampung.[23]

The results of the diabetes study showed p-value = 0.067, from the p-value in the statistical test results, the decision Ho was accepted (p <0.05), which means there is no relationship between diabetes and the risk of death from COVID-19 in Banjar Regency. This is relevant to the study of Almeida-Pititto et al. which showed that diabetes will increase the risk of death by 2.50 (1.74-3.59) times higher. Patients with a history of diabetes have compromised immune systems due to chronic hyperglycemia and impaired immune modulation.[24] This is not in line with a study conducted by Parveen et al. which showed that diabetes caused the general health condition of COVID-19 patients to be worse. These results are supported by three different studies conducted by Hussain et al. and Bouhanick, Erener et al. which showed that diabetes is one of the important factors that influence the severity and mortality of COVID-19 patients.[25]

The results of the tuberculosis study showed p-value = 0.224, from the p-value in the statistical test results, the decision Ho was accepted (p>0.05), which means there is no relationship between tuberculosis and the risk of death from COVID-19 in Banjar Regency. The study of Faurin et al. showed TB patients infected with SARS-CoV-2 can present a poor clinical picture, especially if interruptions occur during tuberculosis (TB) treatment. Symptoms can be felt more severe if there has been damage to lung structure and function caused by previous TB.[16]

The results showed pneumonia with p-value = 0.243, from the p-value in the statistical test results, the decision Ho

was accepted (p >0.05), which means there is no relationship between pneumonia and the risk of death from COVID-19 in Banjar Regency. This is not in line with the study by Senewe which states that the comorbidity that most often occurs is pneumonia with cases of 18.2%.[26]

The results of COPD study showed that p-value = 1,000, from the p-value on the statistical test results, the decision Ho was accepted (p>0.05), which means there is no relationship between COPD and the risk of death from COVID-19 in Banjar Regency. Another study found that COVID-19 patients with a history of cardiovascular disease or chronic obstructive pulmonary disease (COPD) had a higher tendency to die. Studies by Guan et al. and Aslam & Mehra found that a history of COPD increased mortality by 2.68 (1.42–5.05) and 2.82 (1.92–4.14), respectively.[6,18] This is because the condition of the lungs that are already experiencing chronic inflammation and obstruction will worsen the condition of patients infected with COVID-19.[6]

The results of the HIV/AIDS study showed p-value = 1.00, from the p-value in the statistical test results, the decision Ho was accepted (p>0.05), which means there is no relationship between HIV/AIDS and the risk of death from COVID-19 in Banjar Regency. However, there are concerns about the increased risk of severe COVID-19 in HIV/AIDS patients because these patients lack immunity. Meanwhile, those infected with SARS-CoV-2 with a low CD4 cell count (<200 cells/l), high viral load, had an opportunistic infection within six months, and who had not received ART have been designated as a population at risk since the pandemic began.[26]

The result of multivariate analysis showed that the most dominant variable related to the death of COVID-19 in-patients is CKD with OR = 3.336 (95% CI OR 1.849-6.016) This means that COVID-19 patients who have a CKD have a greater risk of death (3.3 times) compared to patients who do not have a CKD.

Meanwhile, CKD patients who have diabetes are 2.5 times more likely to die than patients who are not diabetic, patients with asthma are 0.12 times more likely to die than patients who do not have asthma, and patients with heart failure have a higher risk of dying. 2.5 times more likely than patients without heart failure. Patients in the productive age group have a greater risk of dying 1.4 times compared to patients in the not productive age group. All of them are statistically significant (p< α).

The limitation of this study is that the researchers only examined secondary data in one hospital with 11 variables, so it is possible that there are many other variables that influence the death of COVID-19 patients. In addition, the relatively small number of samples, the short period of time, and lack of research personnel are also limiting factors in this study.

CONCLUSION

Patients with confirmed COVID-19 with a comorbid of asthma, heart disease and CKD have a higher risk of death than patients without these comorbidities. The most dominant comorbid factors were patients with a history of CKD. These findings are expected to be used as a basis for policy-making and educational program planning for governments strategies to improve the supervision and treatment of COVID-19 patients, especially in patients with comorbid conditions and other non-communicable diseases.

Statement of Authorship

All authors certified fulfillment of ICMJE authorship criteria.

Author Disclosure

All authors declared no conflicts of interest.

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