

The Analysis of Risk Factors for Mortality in COVID-19 Patients at Sultan Syarif Mohamad Alkadrie General Hospital, Pontianak City

Analisis Faktor Risiko Kematian Pada Pasien Covid-19 Di RSUD Sultan Syarif Mohamad Alkadrie Kota Pontianak

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ABSTRACT

RSUD Sultan Syarif Mohamad Alkadrie recorded 308 COVID-19 related deaths in 2021. This study aims to identify risk factors for mortality in COVID-19 patients at the hospital. A quantitative study with a cross-sectional design was conducted with a sample of 2,068 patients treated from January to December 2021 using purposive sampling based on inclusion and exclusion criteria. Data analysis was performed using the chi-square test with a 95% confidence level. The results showed a significant relationship between age (p -value=0.000, PR=3.297), shortness of breath (p -value=0.000, PR=5.559), comorbid diabetes (p -value=0.000, PR=2.800), comorbid hypertension (p -value=0.000, PR=2.507), oxygen saturation (p -value=0.000, PR=5.611), and PCR/swab results (p -value=0.000, PR=3.900) with COVID-19 mortality. Variables that were not significantly associated included gender (p -value=0.807, PR=1.034) and length of stay (p -value=0.235, PR=0.844). Based on these findings, it is recommended that healthcare services focus on early management of mortality risk factors, such as age, comorbidities (diabetes and hypertension), and respiratory symptoms, with proper oxygen monitoring and therapy. Additionally, more attention should be given to elderly patients who are more vulnerable to mortality. Intensive monitoring, use of respiratory support, and appropriate oxygen therapy are essential to reduce COVID-19-related deaths.

ABSTRAK

RSUD Sultan Syarif Mohamad Alkadrie mencatat 308 kematian akibat COVID-19 pada tahun 2021. Penelitian ini bertujuan mengidentifikasi faktor risiko kematian pada pasien COVID-19 di rumah sakit tersebut. Desain penelitian kuantitatif menggunakan pendekatan cross-sectional dengan sampel 2.068 pasien yang dirawat antara Januari hingga Desember 2021 melalui teknik purposive sampling berdasarkan kriteria inklusi dan eksklusi. Analisis data menggunakan uji chi-square dengan tingkat kepercayaan 95%. Hasil penelitian menunjukkan hubungan signifikan antara usia (p -value=0,000, PR=3,297), gejala sesak napas (p -value=0,000, PR=5,559), komorbid diabetes (p -value=0,000, PR=2,800), komorbid hipertensi (p -value=0,000, PR=2,507), saturasi oksigen (p -value=0,000, PR=5,611), dan hasil swab/PCR (p -value=0,000, PR=3,900) dengan kematian pasien COVID-19. Variabel yang tidak berhubungan adalah jenis kelamin (p -value=0,807, PR=1,034) dan lama perawatan (p -value=0,235, PR=0,844). Berdasarkan temuan tersebut, disarankan agar layanan kesehatan lebih fokus pada penanganan dini faktor risiko kematian, seperti usia, penyakit penyerta (diabetes dan hipertensi), dan gejala pernapasan, dengan pemantauan oksigen dan terapi yang tepat. Selain itu, perhatian lebih perlu diberikan kepada pasien lanjut usia yang lebih rentan terhadap kematian. Upaya pemantauan intensif, penggunaan alat bantu pernapasan, dan pemberian terapi oksigen yang sesuai sangat diperlukan untuk mencegah kematian akibat COVID-19.



1. INTRODUCTION

Coronavirus Disease 2019 (COVID-19) is a novel disease that had never been identified in humans before. The virus responsible for COVID-19 is named SARS-CoV-2. The coronavirus is a zoonosis (transmitted between animals and humans)¹. The number of cases continued to rise over time. It was eventually confirmed that the transmission of this pneumonia could spread from human to human. On March 11, 2020, the World Health Organization (WHO) declared COVID-19 a global pandemic². From December 31, 2019, to January 3, 2020, cases rapidly increased, marked by the report of 44 cases. In less than a month, the disease spread to various other provinces in China, Thailand, Japan, and South Korea³. By March 29, 2020, there were 634,835 cases and 33,106 deaths globally. As of November 21, 2021, the total confirmed COVID-19 cases worldwide were 256,660,971, with 5,147,397 deaths (CFR 2.0%) across 204 affected countries and 151 countries with community transmission⁵.

In Indonesia, as of November 21, 2021, the Government of the Republic of Indonesia reported 4,253,412 confirmed COVID-19 cases and 143,739 deaths (CFR: 3.4%), with 4,101,547 recoveries⁵. Based on data from October 21, 2020, there were 373,109 confirmed COVID-19 cases in Indonesia, with a mortality rate of 3.4%⁶. COVID-19 was first reported in Indonesia on March 2, 2020, with two cases⁷. Data from March 31, 2020, showed 1,528 confirmed cases and 136 deaths⁸. The COVID-19 mortality rate in Indonesia was 8.9%, the highest in Southeast Asia^{6,9}. Studies in other countries have shown that various risk factors, history, and symptoms can influence the risk of death. Older age, diabetes, hypertension, and other factors can increase the risk of death several times over^{10,11}.

West Kalimantan, with its capital in Pontianak, has a Case Fatality Rate (CFR) of 2.5%, as updated on July 10, 2021. The Pontianak City Health Department, in West Kalimantan, recorded 21 deaths due to COVID-19 in the city by the end of November 2020. The data from the Pontianak City Health Department showed that among the 21 deaths, some were accompanied by comorbidities, and others were not¹².

Sultan Syarif Mohamad Alkadrie General Hospital in Pontianak is one of the referral hospitals in the city. From January to December 2021, RSUD reported 308 deaths due to COVID-19 and its complications. Based on medical records and patient safety reports, several symptoms and comorbidities contributed to the increased mortality risk. Therefore, this study aims to identify risk factors for mortality in COVID-19 patients.

2. METHODS

This study used a quantitative analytical research method with a secondary data analysis approach and a cross-sectional design to identify risk factors for mortality in COVID-19 patients¹³. The population of this study consisted of COVID-19 patients at RSUD Sultan Syarif Mohamad Alkadrie in Pontianak from January to December 2021, totaling 2,518 patients. The sample size was 2,068, selected using purposive sampling, consisting of patients who met the inclusion criteria. The inclusion criteria were all COVID-19 patients who were treated from January to December 2021 and had an initial antigen/PCR swab test result. The exclusion criteria were incomplete patient data. The research instrument used was a document study, which involved reviewing documents such as epidemiological investigation reports, doctors' diagnoses/medical records, and data on COVID-19 patients who died based on the risk factors recorded by the surveillance team.

3. RESULTS

All factors related to the death of COVID-19 patients at RSUD Sultan Syarif Mohamad Alkadrie in Pontianak were documented and subsequently analyzed. Below is the table showing the characteristics of the patients in this study:

Table 1. Characteristics of COVID-19 Patients

Characteristics	n= 2,068	%
Gender		
Male	946	45.7
Female	1,122	54.3
Age Range (Years)		
0-16	274	13.2
17-25	147	7.1
26-45	617	29.8
>45	1,030	49.8
Residence		
Pontianak City	1,427	69.0
Outside Pontianak	641	31.0

Source: Secondary Data, 2021

Based on the patient characteristics (Table 1), the largest proportion of respondents were female (54.3%) and male (45.7%). The age range of 0 to 16 years accounted for 13.2%, 17-25 years for 7.1%, and 26-45 years for 29.8%. Additionally, patients aged >45 years accounted for 49.8%. In terms of residence, 69.0% of patients were from Pontianak City, while 31.0% resided outside the city.

Table 2. Univariate Analysis

Variables	Frequency (2,068)	Percentage (%)
Gender		
Male	946	45.7
Female	1,122	54.3
Age (Years)		
≥ 45	1,048	50.7
< 45	1,020	49.3
Shortness of Breath		
Present	903	43.7
Absent	1,165	56.3

Variables	Frequency (2,068)	Percentage (%)
Comorbid Diabetes		
Present	354	17.1
Absent	1,714	82.9
Comorbid Hypertension		
Present	338	16.3
Absent	1,730	83.7
Oxygen Saturation		
< 95%	351	17.0
≥ 95%	1,717	83.0
Length of Stay		
< 7 Days	1,691	81.8
≥ 7 Days	377	18.2
Swab/PCR Results		
Positive	1,133	54.8
Negative	935	45.2
Patient Status		
Deceased	292	14.1
Recovered	1,776	85.9

Source: Secondary Data, 2021

Based on the univariate analysis (Table 2), the majority of COVID-19 patients were female (54.3%), while male patients accounted for 45.7%. Most of the patients were aged ≥45 years (50.7%), with those aged <45 years accounting for 49.3%. A larger proportion of patients did not experience shortness of breath (56.3%) compared to those who did (43.7%). Patients without comorbid diabetes (82.9%) outnumbered those with comorbid diabetes (17.1%). A higher number of patients had comorbid hypertension (83.7%) compared to those without comorbid hypertension (16.3%). The majority of patients had normal oxygen saturation (≥95%) at 83.0%, while 17.0% had oxygen saturation <95%. In terms of length of stay, more patients were treated for <7 days (81.8%) compared to those treated for ≥7 days (18.2%). Additionally, more patients had a positive Swab/PCR result (54.8%) compared to a negative result (45.2%). Furthermore, based on the table, most of the COVID-19 patients recovered (85.9%), while 14.1% of patients passed away.

Table 3. Bivariate Analysis

Variables	COVID-19 deaths				p-value	PR value (95%CI)
	Deceased		Recovered			
	n	%	n	%		
Gender						
Male	136	14.4	810	85.6	0.807	1,034 (0.836- 1.27)
Female	156	13.9	966	86.1		
Age						
≥ 45 Years	234	22.3	814	77.7	0,000	3,297 (2,985- 5,166)
< 45 Years	58	5.7	962	54.3		
Shortness of Breath						
Present	237	26.2	666	73.8	0,000	5,559 (4,201- 7,357)
Absent	55	4.7	1,110	95.3		
Comorbid Diabetes						
Present	107	30.2	247	69.8	0,000	2,800 (2,273- 3,450)
Absent	185	10.8	1,529	89.2		
Comorbid Hypertension						
Present	96	28.4	242	71.6	0,000	2,507 (2,023- 3,107)
Absent	196	11.3	1,534	88.7		
Oxygen Saturation						
< 95%	156	44.4	195	55.6	0,000	5,611 (4,598- 6,848)
≥ 95%	136	7.9	1,581	92.1		
Length of Stay						
< 7 Days	231	13.7	1,460	86.3	0.235	0.844 (0.652- 1.094)
≥ 7 Days	61	16.2	316	83.8		
Swab/PCR Results						
Positive	241	21.3	892	78.7	0,000	3,900 (2,920- 5,209)
Negative	51	5.5	884	94.5		

Source: Secondary Data, 2021

Based on the bivariate analysis (Table 3), the following factors are significantly associated with COVID-19 mortality: age ≥45 years, shortness of breath, comorbid diabetes, comorbid hypertension, oxygen saturation <95%, and positive Swab/PCR results. These factors have higher prevalence ratios, indicating an increased risk of

death. On the other hand, gender and length of hospital stay were not significantly associated with mortality, as their p-values were greater than α (0.05), suggesting no relationship with COVID-19 death risk.

4. DISCUSSION

Based on the chi-square analysis, no significant relationship was found between gender and COVID-19 mortality at RSUD Sultan Syarif Mohamad Alkadrie, Pontianak. However, other literature suggests that males are more likely to be infected than females. A meta-analysis linking gender with COVID-19 infection risk showed that males are 28% more likely to be infected compared to females. This aligns with findings regarding mortality, indicating that males have a 1.86% higher risk of death compared to females¹⁴. This aligns with findings regarding mortality, indicating that males have a 1.86% higher risk of death compared to females. Males are known to have higher ACE2 (Angiotensin-Converting Enzyme 2) expression, which is related to sexual hormones, making them more susceptible to SARS-CoV-2 infection. In contrast, females have fewer ACE2 receptors, partly due to having two X chromosomes, while males have only one X chromosome¹⁵. This difference is a key factor in their susceptibility to the coronavirus. The results of this study, which do not align with some previous studies, may be due to the imbalance in sample size, where there were fewer male patients compared to female patients.

This study aligns with the research by Nia Ayuni Putri et al. (2021), which found no relationship between gender and COVID-19 incidence¹⁶. Similarly, a study by Arum Puspita Sari (2021) also showed no significant relationship between gender and mortality in elderly COVID-19 patients¹⁷. Although this study did not find a relationship between gender and COVID-19 mortality, it is important to emphasize preventive measures. Everyone should remain vigilant and maintain physical distancing to help prevent the spread of the virus.

Relationship Between Age and COVID-19 Mortality

Based on the chi-square analysis, there is a significant relationship between age ≥ 45 years and COVID-19 mortality at RSUD Sultan Syarif Mohamad Alkadrie, Pontianak. According to the theory of functional consequences, the decline in various bodily functions is a consequence of aging¹⁸. This indicates that as elderly individuals age, they experience physical vulnerability, decreased physical activity, weakened immunity, and comorbidities, which make them more susceptible to diseases like COVID-19, leading to more severe outcomes and death. As age increases, elderly individuals are less able to fight infections, such as COVID-19, due to their weakened condition.

This study is consistent with research conducted by Satria, which stated that age is a risk factor for the death of 253 COVID-19 patients, with an odds ratio (OR) of 2.097¹⁹. Similarly, a study by Nur Afni and Sri Rahayu (2022) showed that 22 respondents aged >45 years died (71%), and 9 (29%) recovered, indicating that individuals aged >45 years have a 5.9 times higher risk of dying from COVID-19²⁰.

Therefore, it is recommended that elderly individuals undergo regular health check-ups and maintain healthy lifestyle behaviors. Additionally, elderly COVID-19 patients should be treated with special attention, isolated from other patients, and provided with intensive care.

Relationship Between Shortness of Breath Symptoms and COVID-19 Mortality

Based on the chi-square analysis, there is a significant relationship between shortness of breath symptoms and COVID-19 mortality at RSUD Sultan Syarif Mohamad Alkadrie, Pontianak. Shortness of breath can be a sign of severe COVID-19 infection and serves as an early indicator of the progression from mild to severe cases of the virus. Shortness of breath is one of the most common symptoms experienced by COVID-19 patients because the virus directly attacks and damages the lungs, rapidly affecting the airways and impairing oxygen exchange, making it difficult for the person to breathe. The immune system, in response to the viral attack, releases cells that spread inflammation, making it harder to breathe and potentially leading to the accumulation of toxins, which can cause additional complications.

This finding is consistent with a study by Santos et al. (2020) conducted in Brazil, which analyzed the survival of COVID-19 patients. The study concluded that shortness of breath significantly influences the risk of death in COVID-19 patients²¹. Similarly, a study by Margareth Dwiyanti Simatupang (2021) titled "Risk of Mortality in COVID-19 Patients and Its Contributing Factors" found that patients with shortness of breath have a 4.1 times higher risk of death compared to those without this symptom. In her study, 43% of COVID-19 patients with shortness of breath died, while only 8% of those without shortness of breath died. Therefore, COVID-19 patients with shortness of breath are more vulnerable to death than those without this symptom²². Given the risks associated with shortness of breath in patients, it is recommended to always provide oxygen and monitoring equipment for easier management if patients are treated at home.

Relationship Between Comorbid Diabetes and COVID-19 Mortality

Based on the chi-square analysis, there is a significant relationship between comorbid diabetes and COVID-19 mortality at RSUD Sultan Syarif Mohamad Alkadrie, Pontianak. COVID-19 patients with comorbid diabetes are at higher risk of death. This is because diabetes weakens the body's defenses or affects the immune system, making it harder for the body to fight off viruses or bacteria. The virus can develop more easily in patients with high blood glucose levels. Diabetic patients are more likely to experience severe complications, such as difficulty breathing. The number of COVID-19 deaths with comorbid diabetes in Indonesia is quite high, as many people are still suffering from diabetes.

The findings of this study align with research by Raden Muhammad Ali Satria (2020), titled "Risk Factors for Mortality in COVID-19 Patients with Comorbidities," which showed that patients with comorbid diabetes have a 4.384 times higher risk of death from COVID-19 than those without comorbid diabetes, with a p-value of 0.00¹⁹. Similarly, a study by Hirdes Harlan Yuanto (2021), titled "Correlation of Risk Factors for Mortality in COVID-19 Isolation Units," showed that comorbidities, particularly diabetes mellitus, were significantly associated with COVID-19 mortality ($p < 0.05$). Diabetes was the most common comorbidity and was the cause of death in 72 patients (23.6%)²³.

Therefore, it is important for the public to regularly check their blood glucose levels to prevent and treat diabetes, which will improve immune function and help the body fight viruses and bacteria. Public awareness about COVID-19 research findings is crucial, especially for at-risk groups, to encourage them to follow stricter health protocols, improve immunity, and manage comorbidities effectively.

Relationship Between Comorbid Hypertension and COVID-19 Mortality

Based on the chi-square analysis, there is a significant relationship between comorbid hypertension and COVID-19 mortality at RSUD Sultan Syarif Mohamad Alkadrie, Pontianak. COVID-19 patients with comorbid hypertension are twice as likely to develop severe symptoms, which increases their risk of death. As people with hypertension age, their immune system weakens, making them more susceptible to infections. Hypertension can also affect the functioning of other organs, worsening the patient's condition. Additionally, medications such as ACE inhibitors and ARBs used by hypertensive patients can increase ACE2 enzyme levels, which triggers severe symptoms of the virus.

Research has shown that hypertension significantly increases the risk of death in COVID-19 patients^{24,25}. A study found that patients with hypertension have a much higher risk of mortality compared to those without this comorbidity^{26,27,28}.

Therefore, COVID-19 patients with comorbid hypertension should adhere to health protocols to reduce severe symptoms and take antihypertensive medications as prescribed by their doctors. These patients should receive special attention to prevent transmission and be prioritized for vaccination to reduce the risk of death. Maintaining a clean and healthy lifestyle, regularly monitoring blood pressure, limiting sugar, salt, and fat intake, increasing fruit and vegetable consumption, and engaging in regular physical activity are important steps in managing hypertension and improving overall health.

Relationship Between Oxygen Saturation and COVID-19 Mortality

Based on the chi-square analysis, there is a significant relationship between oxygen saturation and COVID-19 mortality at RSUD Sultan Syarif Mohamad Alkadrie, Pontianak. This indicates that patients with oxygen levels below 95% at the time of initial examination are 5.6 times more likely to experience death. Low oxygen levels can lead to other symptoms such as shortness of breath, chest pain, and can be fatal. This condition is called hypoxia or respiratory failure due to widespread infection in the lungs. The viral infection causes fluid buildup in the lungs, making it difficult for oxygen to enter the body, especially in those with comorbidities that may lead to complications. Oxygen saturation levels are an indicator of the patient's heart and respiratory condition.

This finding is supported by research conducted by Mejia (2020), which also found that COVID-19 patients with low oxygen saturation (SpO₂) levels have a 1.86 times higher risk of death compared to those with higher SpO₂ levels. Furthermore, SpO₂ levels <90% were identified as the strongest predictor of COVID-19 mortality in Peru²⁹. Similarly, a study by Anna Nugrahani (2022), titled "Risk of Mortality in COVID-19 Patients (Retrospective Cohort Study in a COVID-19 Referral Hospital)," showed a significant difference between the low and high SpO₂ groups ($p < 0.01$). Low SpO₂ levels in COVID-19 patients were found to contribute 7.34 times to an increased risk of death³⁰.

Therefore, both hospitalized patients and those in self-isolation are advised to frequently monitor for hypoxemia and oxygen levels, even if they do not exhibit symptoms. It is recommended that self-isolated patients have an oximeter at home, as oxygen levels can gradually decrease without the patient realizing it. If oxygen saturation falls below 95%, patients should be immediately taken to a referral hospital for further management.

Relationship Between Length of Stay and COVID-19 Mortality

Based on the chi-square analysis, there is no significant relationship between the length of stay and COVID-19 mortality at RSUD Sultan Syarif Mohamad Alkadrie, Pontianak. The duration of hospitalization may affect COVID-19 mortality, as some patients enter the hospital after the incubation period has passed, and symptoms only appear at the middle or end of the incubation period. A good immune system can shorten the duration of hospitalization, resulting in a quicker recovery and avoiding prolonged stays. In contrast, mild symptoms may lead to a shorter recovery time, without extending the length of stay.

According to research by Sulantari and Wigid (2020), the shortest recovery time was 4 days, while the longest was 53 days, with a median of 16 days. They also found that males had a median recovery time of 15.5 days, while females had 13 days. For individuals with suspected COVID-19 without symptoms, isolation is recommended for 10 days, while individuals with symptoms should isolate for 10 days plus at least 3 days after symptom onset³¹. Similarly, Theresia Jamini's (2021) study found that 46.6% of respondents were hospitalized for less than or equal to 14 days, with elderly patients being the most frequent. Despite the 14-day hospital stay, it is important to consider age as a critical factor in predicting vulnerability to COVID-19 exposure. The study concluded that the majority of COVID-19 patients were hospitalized for fewer than 14 day³².

Therefore, confirmed COVID-19 patients should adhere to health protocols and follow doctors' recommendations to recover quickly, preventing unnecessary prolonged hospital stays that could be detrimental to both the hospital and the patients.

Relationship Between Swab/PCR Results and COVID-19 Mortality

Based on the chi-square analysis, there is a significant relationship between positive Swab/PCR results and COVID-19 mortality at RSUD Sultan Syarif Mohamad Alkadrie, Pontianak. This indicates that patients who test positive for the virus will experience various symptoms, as the COVID-19 virus enters the organs and systems of the body, damaging their functioning. This includes blood clotting and damage to blood vessels, which makes patients with positive Swab/PCR results 3.9 times more likely to experience severe symptoms or even sudden death. However, negative results can also lead to death, as the patient's condition can worsen despite the negative test result.

This finding is consistent with research by Kevin Sanjaya et al. (2021), which examined the epidemiological characteristics of COVID-19 patients in Kutai Kartanegara from July to December 2020. The study showed that the number of deaths increased each month, from no deaths in July to 28 deaths in December. By the end of the period, 94 deaths (1.96%) occurred out of 4,787 confirmed COVID-19 cases³³. Similarly, a study by R. Khaerunnisa et al. (2022) found that 100% of COVID-19 patients tested positive with the Swab Antigen test, and 69.5% of patients tested positive with the Swab PCR test after

entering the isolation room³⁴. Therefore, vaccination should be provided and mandated for the public to help build immunity against the virus, allowing individuals to stay productive while preventing the spread of the virus.

5. CONCLUSION

The results of this study show significant relationships between age, shortness of breath symptoms, comorbid diabetes, comorbid hypertension, oxygen saturation, and Swab/PCR results with COVID-19 mortality at RSUD Sultan Syarif Mohamad Alkadrie, Pontianak. However, no significant relationship was found between gender and length of stay with COVID-19 mortality.

Based on these findings, it is recommended that healthcare services focus on early management of key risk factors such as age, comorbidities (diabetes and hypertension), and respiratory symptoms, with proper oxygen monitoring and timely therapy. Additionally, more attention should be given to elderly patients, who are more vulnerable to mortality. Intensive monitoring, appropriate respiratory support, and oxygen therapy are crucial to prevent deaths from COVID-19.

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