Jurnal Berkala Epidemiologi
Volume 12 No 3. September 2024. 230 – 237
p-ISSN: 2301-7171; e-ISSN: 2541-092X

DOI: 10.20473/jbe.v12i32024.230 – 237
https://e-journal.unair.ac.id/JBE/index
Email: jbe@fkm.unair.ac.id / jbepid@gmail.com

JBE Jurnal Berkala EPIDEMIOLOGI

Jurnal Berkala
EPIDEMIOLOGI
PERIODIC EPIDEMIOLOGY JOURNAL

ORIGINAL ARTICLE

ANALYSIS OF RISK FACTORS FOR DEATH IN PATIENTS WITH COVID-19 IN 2021 AT UNIVERSITAS AIRLANGGA HOSPITAL

Analisis Faktor Risiko Kematian Pada Penderita COVID-19 Tahun 2021 di Rumah Sakit Universitas Airlangga

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ARTICLE INFO

Article History:
Received, April, 19th, 2024
Revised form, May, 29th, 2024
Accepted, July, 1th, 2024
Published online, September, 15th, 2024

Keywords:
COVID-19;
Oxygen Saturation;
Comorbidity;
SDGs

Kata Kunci:
COVID-19;
Saturasi Oksigen;
Komorbid;
SDGs

ABSTRACT

Background: Coronavirus Disease 2019 (COVID-19) is an infectious disease caused by SARS-CoV2, first detected in China in 2019. This disease causes respiratory infections and significantly impacts global health. **Purpose**: This study aims to analyze the risk factors for mortality in COVID-19 patients at Universitas Airlangga Hospital in 2021. **Methods**: This observational analytical study uses a case-control design, including 168 samples with 64 cases and 64 controls. Secondary data from patient medical records at Universitas Airlangga Hospital, including age, gender, education, comorbidities, oxygen saturation, and length of stay. Chi-square tests analyzed the data with a 95% confidence level (α=5%). **Results**: The analysis revealed significant associations between COVID-19 mortality and several factors. Age (p=0.01; OR=3.24; 95%CI=1.57-6.65), gender (p=0.01; OR=2.2; 95%CI=1.17-4.02), education (p=0.00; OR=2.40; 95%CI=1.11-5.40), comorbidities (p=0.08; OR=2.50; 95%CI=1.26-4.91), and oxygen saturation (p=0.00; OR=5.40; 95%CI=117.10-2490.06) were significantly associated with COVID-19 mortality. Oxygen saturation was the most influential factor (p=0.00; OR=901.73; 95%CI=120.75-6733.48) associated with mortality. **Conclusion**: Age, gender, education, comorbidities, and oxygen saturation significantly affect COVID-19 mortality rates. This study highlights the importance of monitoring and managing these risk factors in managing COVID-19 at Universitas Airlangga Hospital.

How to Cite: Artanti, K. D., Atikasari, F., Solehan, Z. A., Wulaningrum, P. A., Effendi, W. I., & Li, C. Y. (2024). Analysis of risk factors for death in patients with COVID-19 in 2021 at Universitas Airlangga Hospital. *Jurnal Berkala Epidemiologi*, *12*(3), 230–237. https://dx.doi.org/10.20473/jbe.v12i32024.230–237

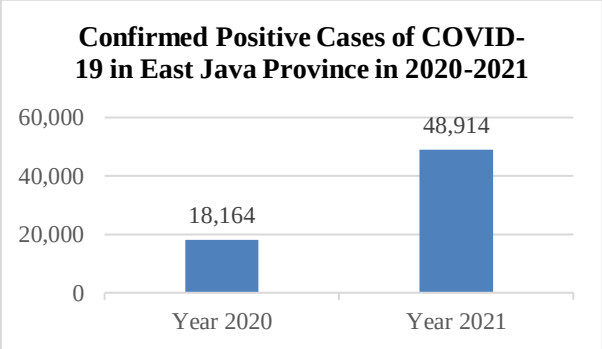
ABSTRAK

Latar belakang: *Coronavirus Disease 2019 (COVID-19) adalah penyakit menular yang disebabkan oleh SARS-CoV2, pertama kali terdeteksi di China pada tahun 2019. Penyakit ini menyebabkan infeksi saluran pernapasan dan memiliki dampak besar pada kesehatan global* ***Tujuan:*** *Penelitian ini bertujuan untuk menganalisis faktor risiko kematian pada penderita COVID-19 di Rumah Sakit Universitas Airlangga tahun 2021.* ***Metode:*** *Penelitian ini menggunakan pendekatan observasional analitik dengan desain kasus-kontrol, menggunakan 168 sampel yang terdiri dari masing-masing 64 kasus dan kontrol. Data sekunder diambil dari rekam medis pasien di RS Universitas Airlangga antara lain meliputi usia, jenis kelamin, pendidikan, komorbid, saturasi oksigen, dan lama opname. Uji Chi-square digunakan untuk menganalisis data dengan tingkat kepercayaan 95% (α=5%).* ***Hasil:*** *Analisis menunjukan asosiasi yang signifikan terhadap mortalitas COVID-19 dengan beberapa faktor. Usia (p-value=0.001; OR=3.24; 95%CI=1.572-6.659), jenis kelamin (p-value=0.013; OR=2.2; 95%CI=1.171-1.4.029), edukasi (p-value=0.000; OR=2.4; 95%CI=0.110-0.540), komorbid (p-value=0.008; OR=2.5; 95%CI=1.264-4.918), adan saturasi oksigen (p-value=0.000; OR=540; 95%CI=117.105-2490.063) secara signifikan berhubungan dengan mortalitas COVID-19. Saturasi oksigen (p-value=0.000; OR=901.730; 95%CI=120.757-6733.488) menjadi faktor yang paling berpengaruh terhadap mortalitas COVID-19 .* ***Simpulan:*** *Usia Jenis Kelamin, pendidikan, komorbid, dan saturasi oksigen memengaruhi laju mortilitas COVID-19. Penelitian ini menekankan pentingnya pengawasan dan penanganan faktor risiko ini dalam manajemen COVID-19 di RS Universitas Airlangga.*

INTRODUCTION

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-COV2) resulting in Coronavirus Disease 2019 (COVID-19) emerged in Wuhan City, China, in early December 2019 and spread rapidly across China. COVID-19 quickly spread almost worldwide to become a pandemic. Cases were first reported in Wuhan, which then spread in just a few months, with the number of infections and deaths increasing rapidly (1). The first COVID-19 case was announced in Indonesia by President Joko Widodo on March 2, 2020 (2).

The Ministry of Health of the Republic of Indonesia reported COVID-19 cases in Indonesia on October 25, 2022. There were 6,472,664 positive confirmed cases, with daily additions of 1,703 cases, 158,454 dead cases (2.40%), and 18,685 active cases (0.30%) (3). This means that COVID-19 cases still exist and are still a problem for people in Indonesia.



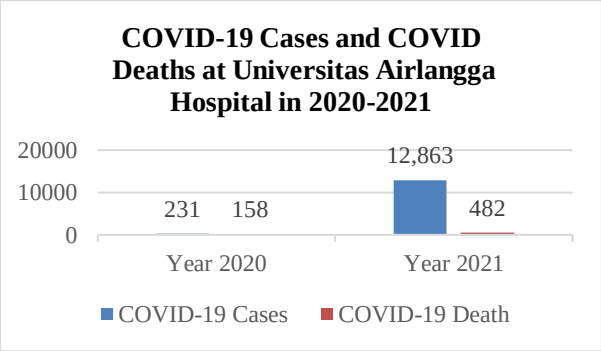
Source: East Java Health Profile 2020-2021

Figure 1. COVID-19 Case Graph in East Java 2020-2021

According to reports from the health profile of East Java Province in 2020 and 2021, East Java is one of the many provinces experiencing the COVID-19 pandemic. The number of positive confirmed cases of COVID-19 in 2020 is 84,152 (30.70%), and in 2021, is 315,913 (12.55%). The number of positive confirmed cases of COVID-19

in Surabaya City has also increased. In 2020 the number of COVID-19 cases in Surabaya City was 18,164 and increased in 2021 to 48,914 (4). The increasing number of positive confirmed cases of COVID-19, followed by an increase in the prevalence of COVID-19 deaths. According to the East Java health profile data, the Case Fatality Rate (CFR) in 2020 was 6.92%; in 2021, it increased to 7.57%. The increase in CFR is thought to be due to several risk factors: age, gender, education, comorbidities, oxygen saturation, vaccine status, virus variants, working hours of health workers, healthcare facilities, and length of stay.

The Ministry of Indonesia reported COVID-19 cases in Indonesia on October 25, 2022 there were 6,472,664 positive confirmed cases with daily additions of 1,703 cases, 158,454 confirmed cases died (2.40%), and 18,685 active cases (0.30%). According to reports from the medical records of Universitas Airlangga Hospital in 2020 and 2021, the number of positive confirmed cases of COVID-19 in 2020 was 231 and the number of COVID-19 cases in 2021 was 12,863. The number of COVID-19 deaths in 2020 was 158, and the number of COVID-19 deaths in 2021 was 482.



Source: Medical Records of Universitas Airlangga Hospital 2020-2021

Figure 2. COVID-19 Cases and COVID-19 Deaths Graph at Universitas Airlangga Hospital 2020-2021

Several previous studies have revealed that age, gender, education, comorbidities, oxygen saturation, and length of stay have an influence on the risk of death in patients with COVID-19. This study provides a more structured understanding of the factors influencing the mortality rate in COVID-19 patients at Universitas Airlangga Hospital, Surabaya. Research in Italy states that older patients have a more significant risk of death than young people, where it is stated that old age is ≥64 years (5). COVID-19 can affect anyone, including women and men. Research in Saudi Arabia states that COVID-19 cases in men have more frequent symptoms (48.20%) compared to women (45.70%). COVID-19 patients with comorbidities can have a poor prognosis (1). Several metabolic and infectious diseases impact the severity of COVID-19 and play an essential role in establishing complex symptoms (6). In COVID-19, some patients have low oxygen saturation without feeling breathless. This condition is called happy hypoxia. The highest prevalence of 65% was reported in a French study, where oxygen saturation less than 95% was defined as happy hypoxia (7).

This study aimed to analyze the risk factors for death in patients with COVID-19 in 2021 at Universitas Airlangga Hospital. It focused on observing various factors that can affect the mortality rate of patients and providing a deeper understanding of the patterns and characteristics of this disease in Universitas Airlangga Hospital.

METHODS

The type of research used is an analytical observational quantitative approach with a case-control research design. The sample size of cases and controls was 1, 1 with a total sample of 84 case samples and 84 control samples. This study used a purposive sampling technique. Research data were obtained through secondary data from medical records at Universitas Airlangga Hospital Surabaya in 2021. The research was conducted at Universitas Airlangga Hospital from January to May 2023. Researchers chose this location because Universitas Airlangga Hospital is one of the COVID-19 referral hospitals in Surabaya City, East Java. Thus, researchers can meet the data collection needs of the research topic.

The risk factors determined by the researchers are as follows: age, gender, education, comorbidities, oxygen saturation, and length of stay. The data collected includes independent variables such as data on education, gender, age, comorbidities, oxygen saturation, and length of stay for COVID-19 patients, as well as dependent variables in the form of events after suffering from COVID-19, namely improving or experiencing death. The data that has been collected will be processed in a computer application. Then, the code is given to classify and facilitate the process of entering and analyzing data. Variables are categorized according to value. After coding, data cleaning was carried out to ensure the completeness and accuracy of the data. Data presentation and analysis were done through a computer program with statistical analysis using the Chi-square test

with a 95% confidence level and multiple logistic regression test with the backward method.

Each variable examined in the study was subject to univariate analysis. The results will be displayed in a frequency distribution table for each research variable. Variables analyzed univariately include age, gender, education, comorbidities, oxygen saturation, and length of stay for COVID-19 patients.

Bivariate analysis was conducted to understand the correlation between the test variables and the incidence of death in COVID-19 patients through the chi-square test. In addition to knowing the relationship between the test variables and the incidence of death in COVID-19 patients, this study also analyzed the riskiest factors between the test variables and the incidence of death in COVID-19 patients through the 95% Confidence Interval (CI) value and Odds Ratio (OR). In this study, the incidence of death was cross-tabulated with age, gender, education, comorbidities, oxygen saturation, and length of stay of COVID-19 patients.

The test used is the multiple logistic regression test. Variables with a p-value <0.25 in the bivariate analysis will be included in the multiple logistic regression test for multivariate analysis. Multiple logistic regression analysis was used to analyze the most significant influence of the independent variables on the dependent variable.

The Research Ethics Committee of Universitas Airlangga Hospital has issued a certificate of ethical clearance for this study (No. 007/KEP/2023).

RESULTS

Univariate analysis in this study was conducted to describe the characteristics of each variable studied. The respondents' characteristics included age, gender, educational status, comorbid status, oxygen saturation, and length of stay for COVID-19 patients. The results of this analysis are presented in the form of a frequency distribution table. For example, the distribution of respondents by age showed that most respondents were under 60 years old, which amounted to 72%, while the distribution by gender showed that most respondents were male, which amounted to 53.60%. The results of the secondary data analysis obtained are shown in Table 1.

Table 1
Frequency Distribution of Respondent Characteristics

Variable	Category	n	%
Age	≥60 years	47	27.29
	<60 years	121	72.02
Sex	Male	90	53.57
	Female	78	46.42
Education	Low Education	40	23.80
	High Education	128	76.19
Comorbid	Yes	52	30.95
	No	116	69.04
Oxygen Saturation	Low (<95%)	85	50.59
	Normal (95%-100%)	83	49.40
Length of Hospitalization	>14 days	39	23.21
	≤14 days	129	76.78

DISCUSSION

Age

This study revealed a significant relationship between the elderly group and the incidence of death from COVID-19. This finding is consistent with the results of previous studies, which also showed that advanced age plays a vital role in increasing the risk of death from these infections (8). With a significant p-value (p = 0.00) and odds ratio (OR) of 3.24, this study confirms that individuals aged >60 years have a 3.24 times greater risk of dying from COVID-19 than individuals aged <60 years, with a 95% confidence interval (CI) = 1.57-6.66.

Compared with previous studies, this study's results align with their findings, showing that advanced age is positively associated with COVID-19 mortality (8,9). However, this comparison requires attention to the differences in study methodology, respondent population, and control factors used in each study. Variability in demographic settings, public health policies, and levels of virus exposure in different geographic locations may contribute to differences in results between studies.

Table 2
Results of Bivariate Analysis of Risk Factors for COVID-19 Patients with Mortality

Risk Factors		COVID-19 patients who died		COVID-19 Patients Who Do Not Die		Total		*p-value*	OR 95%CI
		n	%	n	%	n	%		
Age	≥60 years	33	39.30	14	16.70	47	28.00	0.00	3.24 (1.57–6.66)
	<60 years	51	60.70	70	83.30	121	72.00		
Sex	Male	53	63.10	37	44.00	90	53.60	0.01	2.17 (1.17–4.03)
	Female	31	36,90	47	56.00	78	46.40		
Education	Low Education	10	11.90	30	35.70	40	23.80	0.01	0.24 (0.11–0.54)
	High Education	74	88.10	54	64.30	128	76.20		
Comorbid	Yes	34	40.50	18	21.40	52	31.00	0.01	2.49 (1.26–4.92)
	No	50	59.50	66	78.60	116	69.00		
Oxygen Saturation	Low (<95%)	81	96.40	4	4.80	85	50.60	0.00	5.40 (117.10–2490.06)
	Normal (95%-100%)	3	3.60	80	95.20	83	49.40		
Length of Hospitalization	>14 days	19	22.60	20	23.80	39	23.20	0.85	0.94 (0.46–1.91)
	≤14 days	65	77.40	64	76.20	129	76.8		

Table 3
Multivariate Analysis Results with Multiple Logistic Regression Tests

Independent Variable		B	*p-value*	OR	95% CI for (B)	
					Lower	Upper
Age	≥60 years <60 years	0.67	0.44	1.96	0.36	10.71
Sex	Male Female	1.35	0.13	3.87	0.66	22.66
Education	Low Education High Education	-2.37	0.02	0.09	0.01	0.72
Comorbid	Yes No	0.36	0.67	1.44	0.27	7.74
Oxygen Saturation	Low (<95%) Normal (95%-100%)	6.80	0.00	901.73	120.76	6733.49

The results of this bivariate analysis reinforce the understanding that advanced age plays a vital role as a risk factor for the incidence of death due to COVID-19. The consistency of findings with other studies confirms the importance of unique prevention and protection strategies for this age group in pandemic counter measures.

Sex

The findings of this study also highlight a significant association between gender and the incidence of death due to COVID-19. It was found that in the male group, most respondents (63.10%) experienced death, while in the female group, most respondents (56%) did not experience death.

Statistical analysis confirmed the association, with the calculation result of p-value ≤0.05 (p = 0.01) and odds ratio (OR) of 2.17. This means that the male gender has a 2.17 times greater risk of dying from COVID-19 compared to the female gender, with a 95% confidence interval between 1.17–4.03. These results support the findings of previous studies, which also showed that male gender is significantly associated with the incidence of death due to COVID-19 (10–14). This study reflects the consistency of findings across contexts and populations, adding confidence to the role played by gender factors in the risk of death due to this viral infection.

Education

This study revealed a significant relationship between education level and the incidence of death due to COVID-19. Where it was found that patients who did not experience death from COVID-19 in individuals with low education levels were 35.70% while in individuals with high education levels were 64.30%. This finding is in line with research conducted in North Sulawesi in 2020, which emphasizes that education level plays a role in influencing preventive behavior against COVID-19 (15), with the results of the calculation of p-value <0.05 (p=0.01) and an OR value of 0.24 with a 95% confidence interval between 0.11-0.54. Individuals with the highest level of education tend to have a better awareness and understanding of preventive measures, which can minimize the risk of death from viral infections.

While education was identified as significant in relation to the incidence of COVID-19 deaths, the study noted that other factors, such as age, gender, and vaccination status, also influence disease prevention behavior. This demonstrates the complexity of interrelated factors in dealing with a pandemic and that a holistic, multidimensional approach is needed in designing prevention and mitigation strategies (16).

Comorbid

This study revealed a significant correlation between the presence of comorbidities and the incidence of death from COVID-19. The results of this study are consistent with the findings of a study conducted in Bogor City in 2021, which showed that the presence of comorbidities increases the risk of death from COVID-19 (15), with a calculated p-value <0.05 (p=0.01) and an OR value of 2.49 with a 95% confidence interval between 1.26-4.92. Comparison with previous studies reinforces these findings, confirming that comorbidities such as cardiovascular disease play a significant role in determining the severity and risk of death in COVID-19 patients (17–20). COVID-19 patients with concomitant diabetes mellitus are at a higher risk of death if they are over the age of 65, if they are male, and if they have severe symptoms (14).

Oxygen Saturation

Bivariate analysis in this study highlighted a strong relationship between the level of oxygen saturation in patients with COVID-19 and the incidence of death from the disease. The analysis resulted in a p-value calculation <0.05 (p=0.00) and an OR value of 540 with a 95% confidence interval between 117.10-2490.06. These findings align with research conducted at Bhayangkara Bondowoso Hospital, which shows that low oxygen saturation levels are associated with the recovery rate from COVID-19 (21).

The multivariate analysis conducted in this study reinforced the finding that oxygen saturation level was the most influential risk factor for mortality caused by COVID-19 with a B value = 6.80; p-value = 0.00; OR = 901.73; and 95%CI = 120.76-6733.49. While the results may be intuitive, as low oxygen saturation reflects the severity of respiratory disease, this study provides strong empirical support for the relationship. Previous studies have shown low oxygen saturation to be a significant risk factor in increasing mortality rates in COVID-19 patients (21–23).

CONCLUSION

Based on the results of the analysis of risk factors for death in COVID-19 patients at Universitas Airlangga Hospital, Surabaya, in 2021, it shows that age, gender, education, comorbidities, and oxygen saturation are associated with an increase in death cases in COVID-19 patients in 2021. The factor that has the most influence on COVID-19 mortality is the oxygen saturation factor. Suggestions for health services are expected to prioritize intensive examination and treatment for patients with low oxygen saturation. For the community, it is hoped that they can be more aware of the existence of COVID-19 disease. Recommendations are aimed at future researchers to examine other risk factors that are thought to be a factor in COVID-19 death.

CONFLICT OF INTEREST

There are no conflicts of interest in this paper.

AUTHOR CONTRIBUTION

ZAS and FA: Do the research concept and write the original draft preparation. KDA: Provides direction, revision, and final approval. PAW and WIE: Supervise collection data and manuscript review. CYL: Reviewing, editing, and revision.

ACKNOWLEDGMENTS

The authors want to thank the supervisor who helped and assisted in writing this article so it can be published and Universitas Airlangga Hospital to provide the data.

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