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Research Article

Risk Factors Related to COVID-19 Deaths at Fatmawati Hospital in 2021

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ABSTRACT

Background: Coronavirus Disease 2019 (COVID-19) has a risk of death. The risk of death increases in patients with several factors, such as age, gender, and comorbidities. **Purposes:** This study aims to determine the risk factors for the cause of death in patients with COVID-19 at Fatmawati Hospital in 2021. **Methods:** This study uses a quantitative approach with a case-control design without matching with a ratio of 1:1. Cases were identified as deaths due to COVID-19 as many as 109, and controls were COVID-19 sufferers who lived or recovered during the treatment period as many as 109 respondents. Data were collected from medical record data and analyzed multivariately with logistic regression. **Result:** The bivariate modeling showed that Age, Diabetic, Pneumonia, and Acute Respiratory Syndrome (ARDS) have significantly affected COVID-19 mortality ($p \leq 0.05$). Multivariate modeling showed the ARDS variable (p=0.0001; OR=53.067) and age variable (p=0.028; OR=2.8) to be risk factors for COVID-19 death at Fatmawati Hospital Jakarta with an Attribute Risk (AR) value of 92,7% and the value of Population Attribute Risk (PAR) 58%. **Conclusion:** This model can predict 62.1% of COVID-19 deaths; the rest is due to other factors not studied in this study. ARDS is the dominant factor causing the death of COVID-19 at Fatmawati Hospital, Jakarta.

Keywords: ARDS, COVID-19, death

INTRODUCTION

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. Most people infected with the virus will experience mild to moderate respiratory illness and recover. However, some will become severe and require treatment. Older adults and those with certain diseases such as cardiovascular disease, diabetes, chronic respiratory diseases, or impaired immunity will increase the risk of severity and risk of death (1).

The increase in deaths due to COVID-19, in line with the increase in COVID-19 cases. As of December 2021, there are at least 276,436,619 confirmed cases of COVID-19 throughout the world with deaths reaching 5,374,744. The most confirmed cases in America, followed by Europe and third in Southeast Asia and Indonesia is one of the countries in Southeast Asia with the highest confirmed COVID-19 cases (2). Indonesia experienced a peak in COVID-19 cases in July 2021. One of the provinces with the highest COVID-19 cases is DKI Jakarta. The increase in COVID-19 cases seems to be directly proportional to the death cases in DKI Jakarta, which also experienced the highest peak of deaths on July 20, 2021, with 265 deaths (3).

One of the vertical referral hospitals directly under the Ministry of Health as a COVID-19 patient care hospital is the Fatmawati Central General Hospital (RSUP). At the time of the surge in cases in DKI Jakarta Province (July 2021), the percentage of bed occupancy for COVID-19 patients was 100%, with the number of deaths during July 2021 as many as 196 people (4).

Deaths due to COVID-19 are deaths that occur in patients due to death based on being infected with COVID-19 or deaths due to contributions from COVID-19 (5). The risk of death will increase in patients with comorbid or immune disorders due to disability and chronic diseases such as coronary heart disease, chronic obstructive pulmonary disease, and diabetes (6).

Complex comorbid pathophysiological mechanisms of hypertension, diabetes mellitus, and obesity in COVID-19 patients increase the severity and risk of death (7). However, old age, shortness of breath, pneumonia, and hypertension have a strong relationship with the incidence of death from COVID-19 (8). Another factor contributing to COVID-19 deaths is smoking history. Patients with a history of smoking are significantly at increased risk of COVID-19 severity (9). Other studies also mention that there is a strong relationship between hypertension, heart disease, kidney disease, chronic liver disease, and Diabetes Mellitus with the development of COVID-19 severity, which is at risk of causing death from COVID-19 (10).

Based on several previous research results, the increase in mortality among COVID-19 patients is influenced by several risk factors, such as old age and comorbidities that the patient already suffers from. Fatmawati Central General Hospital is one of the leading referral hospitals for COVID-19 patients, so further research is needed to determine which factors most influence death in COVID-19 patients. Therefore, researchers want to see the risk factors for causing death in people with COVID-19 at Fatmawati Central General Hospital in 2021.

METHODS

This type of research is quantitative research with analysis of case-control study design without matching with a comparison of cases and controls 1:1. This research was conducted in September 2021 at Fatmawati Central General Hospital during June-August 2021. The independent variables were age, sex, hypertension, heart disease, kidney disease, diabetes mellitus, pneumonia, Acute Respiratory Distress Syndrome (ARDS), and HIV/AIDS. While the dependent variable is death due to COVID-19.

Cases are identified as patients who died in treatment and control, i.e., recovered patients. The sample is calculated based on the hypothesis test formula with a 1:1 ratio control case design (11), 109 study samples were obtained for each group, bringing the total sample to 218 patients. Data was collected based on data from the Medical Record Installation of Fatmawati Hospital and analyzed in a multivariate manner with multiple logistic regression. This research has also passed an ethical feasibility test through the Health Research Ethics Commission of the Faculty of Public Health, University of Muhammadiyah Jakarta, and approved through an Ethical Clearance letter no. 10.349.B/KEPK-FKMUMJ/X/2021.

RESULTS

Table 1 shows that most patients (74%) were over 40 years old, 52% were female, 30% had diabetes mellitus, 22% had kidney disease, 16% had heart disease, 1% had HIV/AIDS, 57% had pneumonia and 40% had ARDS.

Table 1. Frequency Distribution of Risk Factors for Death Due to COVID-19 at Fatmawati Hospital

Variable	Frequence N=218			
	Case		Control	
	n	%	n	%
Age				
> 40 years old	91	56	71	44
≤ 40 years old	18	32	38	68
Gender				
Male	60	57	45	43
Female	49	43	64	57
Hypertension				
Hypertension	22	47	25	53
Not Hypertension	87	51	84	49
Diabetes				
Diabetes	46	70	20	30
Not Diabetes	63	41	89	59
Kidney Disease				
Kidney Disease	27	57	20	43
Not Kidney Disease	82	48	89	52
Heart Disease				
Heart Disease	17	50	17	50
Not Heart Disease	92	50	92	50
HIV/AIDS				
Positive HIV/AIDS	0	0	3	100
Negative HIV/AIDS	109	51	106	49
Pneumonia				
Pneumonia	74	59	52	41
Not Pneumonia	35	38	58	62
Acute Respiratory Distress Syndrome				
ARDS	82	93	6	6.8
Not ARDS	27	21	103	79

The influence of risk factors for death from COVID-19 can be seen in table 2. Table 2 shows that age, diabetes, pneumonia and ARDS significantly affect mortality from COVD-19 at Fatmawati Hospital ($p \leq 0.05$). Meanwhile, gender, hypertension, kidney disease and HIV/AIDS did not affect COVID-19 deaths.

Table 2. The Effect of Risk Factors on Death from COVID-19 at Fatmawati Hospital

Variable	Death by COVID-19				Total		OR	p value
	Death		Survive					
	n	%	n	%	N	%		
Age							2.71	*0.03
> 40 years old	91	56	71	44	162	100		
≤ 40 years old	18	32	38	68	56	100		
Gender							1.74	0.058
Male	60	57	45	43	105	100		
Female	49	43	64	57	113	100		
Hypertension							0.85	0.74
Hypertension	22	47	25	53	47	100		
Not Hypertension	87	51	84	49	171	100		
Diabetes							3.249	*0.0001
Diabetes	46	70	20	30	66	100		
Not Diabetes	63	41	89	59	152	100		
Kidney Disease							1.465	0.323
Kidney Disease	27	57	20	43	47	100		
Not Kidney Disease	82	48	89	52	171	100		
Heart Disease							1.00	1.00
Heart Disease	17	50	17	50	34	100		
Not Heart Disease	92	50	92	50	184	100		
HIV/AIDS							-	0.247
Positive HIV/AIDS	0	0	3	100	3	100		
Negative HIV/AIDS	109	51	106	49	215	100		
Pneumonia							2.40	*0.003
Pneumonia	74	59	52	41	125	100		
Not Pneumonia	35	38	58	62	93	100		
Acute Respiratory Distress Syndrome							52	*0.0001
ARDS	82	93	6	6,8	88	100		
Not ARDS	27	21	103	79	130	100		

Multivariate modeling was carried out to obtain a parsimony model in predicting deaths from COVID-19 at Fatmawati Hospital. This modeling was done by including all variables that had p values < 0.25 in bivariate analysis. The variables included as multivariate candidates are age, sex, diabetes, HIV / AIDS, pneumonia, and ARDS. Multivariate modeling of risk factors for death due to COVID-19 at Fatmawati Hospital can be seen in Tables 3 and 4.

Table 3. Multivariate Analysis Modeling of Risk Factors for Death Due to COVID-19 at Fatmawati Hospital

Variable	P Value				
	Model 1	Model 2	Model 3	Model 4	Model 5
Age	0.037	0.032	0.037	0.023	0.028
Gender	0.293	0.300	0.307	-	-
Diabetes	0.597	0.612	-	-	-
HIV/AIDS	0.999	-	-	-	-
Pneumonia	0.092	0.081	0.085	0.063	-
ARDS	0.000	0.000	0.000	0.000	0.000

Table 4 shows that age and ARDS as risk factors for death from COVID-19 at Fatmawati Hospital. This model was able to predict 62.1% of risk factors for death from COVID-19, the rest were influenced by other factors not studied in this study. ARDS was the dominant factor influencing deaths from COVID-19 (p=0.0001; OR 53.067; 95% CI 20.463-137.621). Patients with ARDS have a 53 times greater risk of dying from COVID-19. Attribute Risk ARDS was obtained at 92.7%. The risk of death from COVID-19 can be avoided by 92.7% if the patient does not experience ARDS.

Table 4. Risk Factor Model of Death Due to COVID-19 at Fatmawati Hospital

Variabel	Kategori	Nilai p	OR	95% CI	
				Lower	Upper
Age	>40 tahun ≤ 40 tahun	0.028	2.883	1.124	7.396
ARDS	ARDS Tidak ARDS	0.000	53.067	20.463	137.621

The calculation of Population Attribute Risk (PAR) was carried out to see the contribution of the dominant variable in influencing mortality from COVID-19 to the population. Population Attribute Risk (PAR) was obtained at 58%, thus ARDS contributed as a cause of death due to COVID-19 in the population by 58%.

DISCUSSION

Bivariate test using chi-square statistical test shows that diabetes and Pneumonia variables have a significant relationship in influencing deaths due to COVID-19. This is in line with research conducted by Rahayu et al.. It is explained that diabetes is a significant comorbid disease in which the pathophysiology of the COVID-19 virus can increase the mortality of COVID-19 patients with diabetes (7). In addition to Rozaliyani et al. explaining that Pneumonia has a significant effect on mortality in COVID-19 patients, the test results showed a value of OR= 2.46, which means that COVID-19 patients who have Pneumonia have a two times greater risk of death (8). However, in the multivariate test of this study with logistic regression, statistical tests showed that diabetes and Pneumonia did not have a significant relationship to mortality in COVID-19 patients, so both variables were considered disruptive variables in this study.

This study shows that age and ARDS are risk factors that cause COVID-19 death at Fatmawati Hospital. The ARDS variable is the dominant factor, with 53 times the risk odds. ARDS is one of the complications that often arise in COVID-19 patients that usually leads to death (12,13). ARDS is defined as a severe clinical lung condition associated with pneumonia and sepsis. ARDS is a rapidly progressive disorder and initially manifests clinically as shortness of breath (dyspnea and tachypnea), which then quickly turns into respiratory failure (14). ARDS triggered by COVID-19 pneumonia are commonly referred to as CARDS. The outcomes of ARDS patients caused by COVID-19 were worse than those of ARDS patients caused by other diseases (15).

COVID-19 patients who experience ARDS have a high mortality rate ranging from 50%-80% (16). Risk factors are worse in the older age group; the presence of concomitant diseases

such as hypertension, cardiovascular diseases and diabetes mellitus, low lymphocyte count, kidney, and increased D dimer levels. Deaths from COVID-19 ARDS were caused by respiratory failure (53%), combined respiratory failure with heart failure (33%), myocardial damage and circulatory failure (7%), or death due to unknown (15). Fauzi, et.al explained that ARDS has a significant relationship with the death rate due to COVID-19 (17).

The same thing was also conveyed by Handayani et al. (2020) that the condition of COVID-19 patients will be worse if the patient has ARDS, especially if accompanied by comorbidities, old age, and a history of lung disease before (18). ARDS has a high strength association with mortality due to the severity of COVID-19 suffered and reinforced other risk factors. Bakhtiar and Maranatha also mentioned that the risk factors determining the mortality of ARDS are increasing age, worsening multiorgan failure, the presence of pulmonary and non-pulmonary comorbidities, higher APACHE II (Acute Physiology and Chronic Health Evaluation) scores, and acidosis (14).

The high mortality of COVID-19 due to ARDS needs critical attention, so appropriate management is required to prevent deaths from ARDS. Although the risk of COVID-19 death increases with ARDS conditions, with proper management, the risk of COVID-19 death can be reduced. The key to success in managing ARDS in COVID-19 patients is to conduct early detection of cases, use of ventilators with high PEEP strategies, negative fluid balance symptomatic management and prevention of sepsis (1,19).

In addition to ARDS, the risk factor for causing COVID-19 death is age. The model shows that people over 40 have a 2.8 times higher risk of dying from COVID-19. The research results by Zhang et al (2021) showed a meaningful relationship between the age of COVID-19 patients and deaths from COVID-19 (12). Since the beginning of the pandemic, age has been established as the primary determinant of prognosis in COVID-19 patients. Based on preliminary Chinese statistics, the case fatality rate (CRF) increased sharply from age 60, reaching 14.8% in those older than 80 years (20).

The risk of death from COVID-19 increases as patients age. Bhopal (2020) showed that the risk of death will increase more than two times in individuals with an age of more than 50 years (21). The same can also be seen from data from the Central Diseases Control (CDC) COVID-19 Response Team in the United States, which also shows that of 80% of deaths due to COVID-19, the percentage of severity is in patients over 65 years old. The highest severity rate is in patients over 85 years old (22). The most significant increase in the risk of death was observed in patients aged 60 to 69 years compared to those aged 50 to 59 years (OR=3.13, 95% CI 2.61 to 3.76) (20). Another study by Ningrum and Syahrizal (2023) showed that older people have a 14 times greater mortality risk because of COVID-19 (23). Other studies have also shown that people between 45 and 60 are vulnerable to death from COVID-19. The risk of being infected with the virus increases when people reach the age of 40, associated with the condition of a person's immunity that tends to decrease so that susceptibility to pathogens is higher (24).

Age factors influence the immunity of the human body. In old age, the body's response to immunity will decrease (25). Individuals with advanced age become vulnerable groups or populations with acute or chronic congenital diseases. The disease resulted in worsening conditions due to COVID-19, and comorbid diseases suffered (26).

Age also has a significant influence on the occurrence of ARDS, causing death in COVID patients. Independent t-tests showed a significant association between age and ARDS. This is in line with the results of previous research conducted by Wu et al. (2020), which stated that older age has a higher risk of experiencing ARDS to death due to a decrease in the body's immune response (1). Therefore, elderly adult patients should be prioritized in the implementation of preventive measures.

CONCLUSION

Risk factors for causing COVID-19 deaths at Fatmawati Central General Hospital in 2021 are age and ARDS. The model was able to predict 62.1% of deaths due to COVID-19. Patients with ARDS aged >40 years have a higher risk of death from COVID-19 than those without ARDS and aged < 40 years. ARDS contributes 58% as the cause of death from COVID-19 in the population.

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CONFLICT OF INTEREST

We declare that we do not have a conflict of interest and do not have affiliations or relationships with any organization or entity that could raise biased questions or statements in the discussion and conclusion section of the paper.

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