

Relationship between Age, Gender, and Comorbid to Mortality of COVID-19 Patients

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ABSTRACT

Background: COVID-19 causes a lot of morbidity and mortality worldwide, including in Indonesia. Several factors are associated with the death of COVID-19 patients, including patient characteristics.

Objective: The study aims to determine the relationship between age, gender, and accompanying conditions with the mortality of COVID-19 patients at Panembahan Senopati Hospital, Bantul.

Methods: This type of research was retrospective descriptive, using patient medical record data from March 2020 to April 2022. A total of 1773 respondents were taken using the total sampling technique. The instrument is a data recap table to enter the data that has been obtained—statistical tests using the Gamma and Chi-Square tests.

Results: Most of the patients were old (27.4%), female (52.0%), had no comorbidities (51.7%), and left the hospital alive (79.8%). The bivariate test showed that between age, age, sex, and accompanying conditions with the mortality of COVID-19 patients, each p-value was < 0.001 , 0.005 , and < 0.001 .

Conclusion: Age, sex, and co-morbid conditions have a significant relationship with the mortality of COVID-19 patients at Panembahan Senopati Hospital, Bantul.

KEY WORDS

age, comorbidity, COVID-19, gender, mortality

INTRODUCTION

Until the end of January 2023, the number of sufferers of Corona Virus Disease 2019 (COVID-19) worldwide was recorded at 675,065,746, and 20,867,267 active cases. In addition, data shows that 6,761,322 death cases have been reported¹⁾. At the same time, Indonesia also recorded an additional 260 cases. Hence, the number of COVID-19 sufferers from the start of the pandemic was 6,730,016, with 160,814 deaths²⁾. COVID-19 is an infectious disease caused by infection with the severe acute respiratory syndrome coronavirus 2 (SARS-CoV2) virus³⁾, which primarily attacks the respiratory system with the main symptoms of cough, fever and shortness of breath⁴⁾.

The COVID-19 pandemic hit almost all countries; more than 180 countries have been affected by COVID-19 with mass death incidents. As cases progress worldwide, it is evident that people with previous chronic illnesses are more susceptible to contracting the virus and becoming worse. The SARS-CoV-2 virus is relatively new, with minimal data, so knowledge about treatment is also limited⁵⁾. COVID-19 patients can have symptoms ranging from mild to very severe. Patients with mild symptoms can recover in about one week. Conversely, in patients with severe symptoms, symptoms can last longer and cause death. Death can be caused due to alveolar damage by a virus attack causing progressive respiratory failure⁶⁾. Another thing is also caused by an uncontrolled increase in pro-inflammatory mediators, often called a cytokine storm. Cytokine storms exacerbate lung damage and trigger tissue fibrosis which causes functional failure and ends in death⁷⁾.

Patients with COVID-19 are at risk of death, and the chances increase with certain conditions that the patient has. Many factors affect the increased risk of death, such as age⁸⁾, gender^{9,10)}, co-morbidities^{11,12)} or all three¹³⁾. Patients over 50 years are more susceptible to death due to decreased body resistance, so they are weaker against infection with the COVID-19 virus⁸⁾. The male sex also has a higher death rate because female sex hormones protect the body more from infection¹⁰⁾. A person with a history of impaired immune system and chronic diseases such as diabetes, cardiovascular disorders, respiratory problems, kidney failure and liver failure causes the symptoms of COVID-19 to become more severe and the mortality rate high¹⁴⁾. Other research mentions COVID-19 patients with hypertension, obesity, chronic lung disease, diabetes, and cardiovascular disease as contributors to the worst prognosis and are most at high risk of causing death. These conditions cause patients to develop acute respiratory distress syndrome (ARDS) and pneumonia⁵⁾.

Most of the studies on the risk factors for the death of COVID-19 patients were carried out based on cohorts of COVID-19 patients who were hospitalized for reasons of easy access to electronic data through the medical record department¹⁵⁻¹⁷⁾. Panembahan Senopati Bantul Hospital is one of the houses with high cases of COVID-19 and is a referral hospital during the pandemic. No research has been conducted to determine the relationship between patient characteristics and the incidence of death in COVID-19 patients, so the authors want to know how age, gender, and accompanying conditions influence the incidence of mortality in COVID-19 patients at Panembahan Senopati Hospital, Bantul.

Received on June 15, 2023 and accepted on July 2, 2023

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Table 1. Frequency distribution of respondents (N = 1773)

Variable	Frequency	Percentage (%)
Age		
Infants	55	3,1
Toddlers	34	1,9
Pre-school	23	1,3
School age	22	1,2
Early Adolescence	15	0,8
Middle Adolescence	36	2,0
Late Adolescence	62	3,5
Early adulthood	247	13,9
Middle adulthood	307	17,3
Late adulthood	466	26,3
Old age	486	27,4
Elderly	20	1,1
Gender		
Male	851	48,0
Female	922	52,0
Comorbids*		
No	916	51,7
Diabetes Mellitus	351	19,8
Chronic Kidney Disease	102	5,8
Pregnant	142	8,0
Hypertension	367	20,7
Heart disorder	103	5,8
Stroke	14	0,8
Immune Disorders	17	1,0
COPD	8	0,5
Others	3	0,2
Mortality		
Yes	359	20,2
No	1414	79,8

*Multiple answer

METHODS

1. Study Design

This type of research is a quantitative study with a retrospective descriptive design. Data was collected at Panembahan Senopati Hospital, Bantul, on 13-19 April 2022.

2. Samples

The study population was COVID-19 patients recorded in medical records from 13 March 2020 to 19 April 2022. Samples were taken using a total sampling technique with inclusion criteria for inpatients and complete data. Outpatients were the exclusion criteria. The number of research samples was 1,773 people.

3. Instruments and Data Collection

The independent variables consisted of age, sex, and comorbid conditions, which were obtained from the patient's medical record. Age was calculated from birth to the first day of treatment. Age was categorized in years into infants (0-1), toddlers (1-3), children (3-7), school age (7-13), early adolescents (13-17), middle adolescents (17- 21), late adolescence (21-25), early adulthood (25-37), adult (37-49), late adult (49-61), old age (61-85), and elderly (85-97)⁽¹⁸⁾. Gender according to the identity on the identity card. Concomitant conditions are other conditions or diseases diagnosed by a doctor and written in the patient's medical record. One patient may experience more than one comorbid condition. The dependent variable is the incidence of death of COVID-19 patients, data on the patient's condition when leaving the hospital,

Table 2 Relationship between Age, Gender, and Comorbid with the Incidence of COVID-19 Mortality (N = 1773)

Variable	Mortality of COVID-19						p-value
	Yes		No		Total		
	f	%	f	%	F	%	
Age							
Infants	0	0,0	55	100,0	55	100,0	< 0,001
Toddlers	1	2,9	33	97,1	34	100,0	
Pre-school	0	0,0	23	100,0	23	100,0	
School age	0	0,0	22	100,0	22	100,0	
Early Adolescence	0	0,0	15	100,0	15	100,0	
Middle Adolescence	2	5,6	34	94,4	36	100,0	
Late Adolescence	3	4,8	59	95,4	62	100,0	
Early adulthood	19	7,7	228	92,3	247	100,0	
Middle adulthood	54	17,6	253	82,4	307	100,0	
Late adulthood	114	24,5	352	75,5	466	100,0	
Old age	160	32,9	326	67,1	486	100,0	
Elderly	6	30,0	14	70,0	20	100,0	
Gender							
Male	196	23,0	655	77,0	851	100,0	0,005
Female	163	17,7	759	82,3	922	100,0	
Comorbid							
Yes	226	26,4	631	73,6	857	100,0	< 0,001
No	133	37,0	783	85,5	916	100,0	

namely death or not death, obtained from the patient's medical record.

4. Data Analysis and Ethical Consideration

The researcher collected data after obtaining a statement of ethical eligibility from the Health Research Ethics Commission, Faculty of Health Sciences, Respati University, Yogyakarta, with number 013.3/FIKES/PL/III/2022 and a research permit from Panembahan Senopati Hospital, Bantul with number 070/1379. Data collection was carried out in the medical record section. Researchers obtained patient data soft files and entered the data into tables according to the variables in the Microsoft Excel program. Univariate data is presented in the form of a frequency distribution. Age bivariate test with the incidence of mortality using the Gamma test. Accompanying conditions are categorized into existing and absent from fulfilling the test using Chi-square. Test the sex with the incidence of mortality using the Chi-square test.

RESULTS

Table 1 shows that most of the patients were old (27.4%), female (52.0%), had no comorbidities (51.7%) and were discharged from the hospital alive (79.8%). Table 2 shows that the highest percentage of cases of patients dying was in old age (32.9%), male sex (23.0%), and patients with comorbidities as much as 26.4%. Bivariate tests show a relationship between age, sex, and co-morbid conditions with the incidence of death in COVID-19 patients, with a p-value < 0.001, 0.005, and < 0.001.

DISCUSSION

The study's results showed a relationship between age, gender, and disease conditions with the death of COVID-19 patients. This study's results align with previous studies proving that age and comorbid status are associated with mortality in COVID-19 patients⁽⁹⁾. The difference can be seen from the number of independent variables; the researchers added gender. Meta-analysis research shows that age is related to the incidence of death for COVID-19 patients; those aged > 50 years are at risk of death, especially > 60, and have a higher chance⁽²⁰⁾. Other systematic reviews and meta-analyses provide the same results as research,

age, gender, and comorbid diseases associated with death in COVID-19 patients. Males' gender, age ≥ 50 years, and having comorbid diseases are at higher risk of dying when exposed to COVID-19^{21,22}. In contrast to this study, Bismas *et al.* presented data on the probability of each disease causing death, kidney disease, cerebrovascular, cardiovascular, respiratory, diabetes mellitus, hypertension, and cancer, explained as diseases that increase the risk of death. A review by Salunkhe *et al.* showed that the percentage of deaths increased at age > 60 years, males, and history of hypertension.

As people age, a person will experience a decrease in health status. Declining health due to the ageing process will affect the quality of life. Increasing age can cause various diseases, decreased body function, balance, and risk of falling²³. Old age is more at risk of experiencing death, possibly due to excessive ACE2 expression due to decreased immunity and decreased organ function, which can result in death^{8,24}. Older people have a higher risk of developing COVID-19 than younger people²⁵. In old age, the immune system tends to weaken, making it more difficult to fight infections²³. To make matters worse, the decreased elasticity of lung tissue over time makes respiratory diseases such as COVID-19 a particular concern. As a result, the inflammatory process in older people can be more intense and cause organ damage²⁶. Complex COVID-19 treatment is also detrimental for people with old age because this age group is susceptible to drug reactions due to reduced organ function²⁷.

Apart from age, gender is also a factor associated with the death of COVID-19 patients. Men have a worse prognosis for the severity and chance of death when suffering from COVID-19 than women^{9,28,29}. Biological differences in men affect the body's ability to fight viral infections, including the COVID-19 virus. Sex hormones in women affect women's resistance to infection. Men express more of the ACE2 hormone, whereas SARS-CoV2 uses the protein hormone to enter the body, cause heart problems and can result in death^{29,30}. Previous studies obtained different results, which obtained data that gender was not associated with the risk of death for COVID-19 patients^{8,31}. The difference may be due to an imbalance in the number of samples between men and women in previous research samples, where the number of women was much more significant.

Comorbidities cannot be ignored as one factor influencing mortality in COVID-19 patients; previous data found that 88% of deaths are due to comorbidities¹¹. The existence of comorbidities dramatically influences the condition and severity of the symptoms felt. The risk of death will be greater because of the inadequate immune response when infection with the COVID-19 virus occurs³². This study supports previous research that comorbidities are related to the severity and mortality of COVID-19 patients³³⁻³⁶. This study categorizes comorbidities into presence and absence, in contrast to Yuanto *et al.*, who found that diabetes mellitus was the disease that caused the most deaths. Karya *et al.* conveyed different things that hypertension, diabetes mellitus and chronic kidney disease are the causes of severity and mortality in COVID-19 patients³⁴.

Masdalena *et al.* stated in their research results that cardiovascular disease, diabetes mellitus, kidney disease, and chronic obstructive pulmonary disease (COPD) are associated with the death of COVID-19 patients³⁵. Drugs used to treat cardiovascular disease contain ACE2, which is terrible for COVID-19 infection³³. Disruption of the immune response and the slow mechanism of cleaning the virus makes people with diabetes mellitus more susceptible to infection. Proinflammatory conditions also increase the risk of cytokine storms which are significantly at risk of causing shock in Acute Respiratory Distress Syndrome (ARDS)^{35,37}. In COPD patients, the risk of death is caused by the patient's respiratory organs worsening due to additional COVID-19 infection. COPD and COVID-19 infection further obstruct airflow in the respiratory system due to swelling and mucus or phlegm, resulting in difficulty breathing^{35,38}. In patients with kidney disease, oxygen deprivation and cytokine storms due to COVID-19 infection can attack the kidneys and increase the severity of kidney cell damage. Apart from that, a blood clotting process might block the renal passages, which also causes an increased risk of death³⁵.

This study has several areas for improvement, including missing data, which cannot be avoided due to the use of secondary data. The authors overcome this by deleting incomplete data. Furthermore, the researchers did not conduct a relationship test for co-morbidities with the incidence of death in COVID-19 patients. Despite these limitations, this study's large sample size is an advantage.

CONCLUSION

The study's results showed that most COVID-19 patients at Panembahan Senopati Hospital consisted of old age, female sex without accompanying conditions, and left the hospital alive. The results of the study also provide good evidence that age, gender, and disease conditions are related to the incidence of death in COVID-19 patients.

ACKNOWLEDGEMENTS

The researcher independently financed this research. Researchers would like to thank the Director of the Panembahan Senopati, Bantul, Yogyakarta, Indonesia, for permission to conduct research. Researchers also thank all hospital staff who have helped the research process.

CONFLICT OF INTEREST

There was no conflict of interest in this study.

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