Sex and age differences in the COVID-19 mortality in East Jakarta, Indonesia: Analysis of COVID-19 surveillance system

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Abstract

Demographic factors have been reported to worsen COVID-19 outcomes. However, there is limited evidence about the different effects of sex and age on COVID-19 death in East Jakarta, Indonesia. This study examined the association between sex and age with COVID-19 mortality. Using COVID-19 surveillance data of East Jakarta from March 2020 to December 2021, we calculated COVID-19 mortality and examined the risk of COVID-19 death by sex and age. The risk of COVID-19 death associated with sex and age was examined by using Multiple Logistic Regression. A total of 202.412 cases were analyzed and 1.9% of them died. The elderly had a 41.88-folds increased risk of COVID-19 mortality than younger patients (<45 years) (aOR 41.88; 95% CI 37.49-46.77; p-value <0.0001). Male had a higher risk of COVID-19 death compared to female (aOR 1.27; 95% CI 1.19-1.35; p-value <0.0001). Age and sex had a significant association with COVID-19 mortality. Adequate management of COVID-19 cases, particularly in the elderly and male patients, may reduce the severity of COVID-19 or even mortality.

Introduction

Since Coronavirus Disease 2019 (COVID-19) was declared as a Public Health Emergency of International Concern (PHEIC) by World Health Organization (WHO), Confirmed COVID-19 cases surpass 278 million with more than 5 million deaths reported worldwide.[1] The number of COVID-19 cases gradually increased compared to the previous week due to the emergence of a new variant, namely Omicron.[1] It is no different from the global situation, the COVID-19 situation in Indonesia also showed an increasing trend. At the end of 2021, the confirmed cases of COVID-19 reached more than 4 million cases, with active cases of nearly 5.000.[2] DKI Jakarta Province was Indonesia's epicenter of COVID-19 cases. This province contributed to almost 20% of total COVID-19 cases in Indonesia with a mortality rate of 1.57% of all confirmed cases.[2] East Jakarta was the area in DKI Jakarta that has the most cumulative COVID-19 cases.[3]

It has been known that COVID-19 is a big challenge faced by many countries, not only Indonesia. The continued rise in COVID-19 cases and death rates is a signal to recognize what steps can be taken to avoid serious consequences and deaths. Prior studies reported that age, sex, obesity, other comorbidities, such as hypertension, heart diseases, diabetes mellitus, and also laboratory parameters were identified as risk factors that increase the chance of dying from COVID-19.[4–9]

Among risk factors that have been investigated, demographic factors have a considerable influence in determining the severity of the risk of COVID-19 outcomes.[6,10,11] However, these results have not been well established, considering that contradictory studies are still found.[12] In East Jakarta, similar studies that are conducted to assess the different risks of mortality based on age and sex are limited, especially those that analyzed the big data from the surveillance system. Identifying the risk factors of COVID-19 mortality based on demographic factors is important for mapping the population at risk in the population. So, it will be useful for optimizing case management to promote better outcomes. Therefore, this study was designed to examine the relationship between age and sex with the mortality of COVID-19.

Materials and Methods

In this study, a secondary data analysis from COVID-19 surveillance in East Jakarta was performed. All confirmed COVID-19 cases between March 2020 and December 2021 that had a completed data on variable age, sex, and status outcome were included as study participants. Based on the national guideline, a person is confirmed as a case of COVID-19 if the result of the RT-PCR is positive.[13] The total number of data that were included in the analysis was 202,412 cases.

COVID-19 outcome was the dependent variable. A COVID-19 case was classified as deceased if the patient died.[13] COVID-19 cases were categorized as discharged if they met the completed isolation criteria.[13] The independent variables were sex (male and female) and age. Age was classified into three groups, namely < 45 years old, pre elderly (45-59 years old), and elderly (≥60 years old).[14,15] All variables, including age, sex, and outcome of COVID-19, were described by using descriptive analysis. It was presented in the distribution table that showed the number of frequencies and percentages. Bivariate analysis (the Chi-Square test) was performed to analyze the association of each independent variable (age and sex) with the outcome of COVID-19. Multiple Logistic Regression was performed out to determine the relationship

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between age, sex, and the outcome of COVID-19 as the dependent variable in this study.

Results

There were 202,412 COVID-19 patients in East Jakarta from March 2020 – December 2021 that were included in the analysis. Most COVID-19 patients in East Jakarta were <45 years old (66.4%). The number of elderlies that were confirmed as COVID-19 in East Jakarta reached 11.3%. The frequency of COVID-19 cases was higher in females than males. It was 51.9% and 48.1%, respectively. Based on the outcome, 1.9% of COVID-19 patients had died. The result of the descriptive analysis was showed in Table 1.

Based on bivariate analysis, it was found that age and sex had a significant association with the outcome of COVID-19 (p-value < 0.05). Those associations were also confirmed in the Multiple Logistic Regression test result. Older COVID-19 patients had a higher risk of deceased than younger patients. Pre-elderly COVID-19 patients (45 – 59 years) had a 9.02-fold risk of dying than patients < 45 years old (aOR 9.02; 95% CI 8.01 – 10.15; p-value: 0.0001). The elderly had 41.88 times higher of experience death (aOR 41.88; 95% CI 37.49 – 46.77; p-value 0.0001). In addition, the male patient was more likely to die than the female patient (Table 2).

Discussion

Based on the analysis of COVID-19 surveillance data, the mortality rate of COVID-19 in East Jakarta was shown to be higher than that of DKI Jakarta province and the national rate.[2] The difference in deaths due to COVID-19 may be caused by several factors, including differences in demographics, presence of underreporting, differences in testing strategies, health system readiness, and presence of comorbidities.[16-18] As we know, the case fatality rate (CFR) is calculated by dividing the number of COVID-19 cases that died by the number of confirmed cases of COVID-19.[16,17,19] This measure is commonly used to describe the severity of disease in the short term so it is sensitive enough to changes in the denominator.[16,17] The fewer confirmed cases of COVID-19, the greater the CFR number.[17,19] Conversely, the more confirmed cases of COVID-19, the smaller the CFR.[17,19]

This study reported that age was significantly associated with COVID-19 death cases. The elderly and pre-elderly showed a higher risk of dying than younger patients. This finding was consistent with other studies, both conducted with observational studies and systematic reviews.[6,7,10,20,21] Based on meta-analysis study, the median age of COVID-19 patients at high risk of death was 49 years and older, with the age group 65 years and older having the highest risk.[10] This age was classified as pre-elderly and elderly.[15] Immunity decreases with age so elderly patients have a greater chance of getting severity or even dying. It make older people susceptible to other infections and at great risk of experiencing side effects of drugs that they are consumed.[6,10] A previous study also reported that gene expression of angiotensin-converting enzyme 2 (ACE2) was higher in older than younger ages.[6] Angiotensin-converting enzyme 2 (ACE2) binds to the spike protein and facilitates the entry of SARS-CoV-2 into host cells.[22] The high level of ACE2 plays an important role in the development of COVID-19 disease.[23] The vigilance of this vulnerable elderly group has to be a concern in handling COVID-19. Ensuring that the elderly receive socialization about prevention efforts, specific protection, and health services is expected to reduce morbidity and mortality from COVID-19. There was a difference in the risk of death between male and female of COVID-19 patients. Males were reported to have a higher risk of dying than females. The risk of dying among male COVID-19 patients was about two times greater compared to females. [4,6,11,21,24] The different risk might be due to differences in lifestyle, hormone, and immune system.[4,6,11,21,24] Males tend to have poorer lifestyles than females, such as smoking, and alcohol consumption. Those lifestyles had been recognized as risk factors for developing comorbid that could worsen the outcome of COVID-19.[25,26] As found in the older age group, circulating ACE2 levels were also higher in male compared to female.[6] It makes males have a higher vulnerability to getting severity or even death.

Conclusions

Age and sex had a significant relationship with COVID-19 mortality. Older patients were at higher risk of dying from COVID-19 than younger patients. The

Table 1. Descriptive analysis of characteristics respondents and outcome of COVID-19.

Variable	Frequency (n)	Percentage (%)
Age		
<45 years old	134314	66.4
Pre-elderly (45–59 years old)	45282	22.4
Elderly (≥60 years old)	22816	11.3
Sex		
Male	97326	48.1
Female	105086	51.9
Outcome		
Discharge	198561	98.1
Deceased	3851	1.9
Total	202412	100.0

Table 2. Association between age and sex with outcome of COVID-19.

Variable	Outcome				Crude OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
	Deceased		Discharge					
	n	%	n	%				
Age						0,0001*		0,0001*
<45 years old	371	0.3	133943	99.7	Ref		Ref	
Pre-elderly (45-59 years old)	1104	2.4	44178	97.6	9.02 (8.02-10.15)		9.02 (8.01-10.15)	
Elderly (≥60 years old)	2376	10.4	20440	89.6	41.97 (37.58-46.87)		41.88 (37.49-46.77)	
Sex						0,0001*		0,0001*
Female	1758	1.7	103328	98.3	Ref			
Male	2093	2.2	95233	97.8	1.29 (1.21-1.38)		1.27 (1.19-1.35)	

study also found that male had a higher risk of dying from COVID-19 than female. Appropriate treatment of COVID-19 cases, especially among elderly and male patients, can reduce COVID-19 mortality.

References

1. World Health Organization. Weekly epidemiological update on COVID-19 - 28 December 2021 overview [Internet]. Geneva; 2021. Available from: https://www.who.int/publications/m/item/weekly-epidemiological-update-on-covid-19—-28-december-2021
2. Satuan Tugas Penanganan Covid-19. Analisis Data Covid19. Jakarta; 2021.
3. Dinas Kesehatan Provinsi DKI Jakarta. Info Covid-19 di Jakarta Minggu ini: 12-18 Desember 2021 [Internet]. Jakarta; 2021. Available from: https://corona.jakarta.go.id/storage/documents/info-mingguan-covid-19-dki-jakarta-12-18-desember-2021-61c2e7e9702bf.pdf
4. Ramírez-Soto MC, Arroyo-Hernández H, Ortega-Cáceres G. Sex differences in the incidence, mortality, and fatality of COVID-19 in Peru. PLoS One. 2021;16(6 June):10–9.
5. Rozaliyani A, Savitri AI, Setianingrum F, Shelly TN, Ratnasari V, Kuswindarti R, et al. Factors Associated with Death in COVID-19 Patients in Jakarta, Indonesia: An Epidemiological Study. Acta Med Indones. 2020;52(3):246–54.
6. Biswas M, Rahaman S, Biswas TK, Haque Z, Ibrahim B. Association of Sex, Age, and Comorbidities with Mortality in COVID-19 Patients: A Systematic Review and Meta-Analysis. Intervirology. 2021;64(1):36–47.
7. Zhang X Bin, Hu L, Ming Q, Wei XJ, Zhang ZY, Chen L Da, et al. Risk factors for mortality of coronavirus disease-2019 (COVID-19) patients in two centers of Hubei province, China: A retrospective analysis. PLoS One [Internet]. 2021;16(1 January):1–15. Available from: http://dx.doi.org/10.1371/journal.pone.0246030
8. Gopalan N, Senthil S, Prabakar NL, Senguttuvan T, Bhaskar A, Jagannathan M, et al. Predictors of mortality among hospitalized COVID-19 patients and risk score formulation for prioritizing tertiary care-An experience from South India. PLoS One [Internet]. 2022;17(2 February):1–16. Available from: http://dx.doi.org/10.1371/journal.pone.0263471
9. Azizmohammad Looha M, Rezaei-Tavirani M, Rostami-Nejad M, Janbazi S, Zarean E, Amini P, et al. Assessing sex differential in COVID-19 mortality rate by age and polymerase chain reaction test results: an Iranian multi-center study. Expert Rev Anti Infect Ther [Internet]. 2022;20(4):631–41. Available from: https://doi.org/10.1080/14787210.2022.2000860
10. Zheng Z, Peng F, Xu B, Zhao J, Liu H, Peng J. Risk factors of critical & mortal COVID-19 cases: A systematic literature review and meta-analysis. J Infect. 2020;(January).
11. Falahi S, Kenarkoohi A. Sex and gender differences in the outcome of patients with COVID-19. J Med Virol. 2021;93(1):151–2.
12. Xu Y, Dong J, An W, Lv X, Yin X. Clinical and computed tomographic imaging features of novel coronavirus pneumonia caused by SARS-CoV-2. J Infect. 2020;80(January):394–400.
13. Kementerian Kesehatan Republik Indonesia. Pedoman Pencegahan dan Pengendalian Coronavirus Disease (Covid-19). 5th ed. Jakarta: Kementerian Kesehatan RI; 2020.
14. Hu C, Li J, Xing X, Gao J, Zhao S, Xing L. The effect of age on the clinical and immune characteristics of critically ill patients with COVID-19: A preliminary report. PLoS One [Internet]. 2021;16(3 March):1–11. Available from: http://dx.doi.org/10.1371/journal.pone.0248675
15. Setyaningsih W, Pamungkas IG, Fauziah Q. Description of Perception, Attitude, and Behavior of the Pre-Elderly and Elderly towards the Prevention of Covid-19 Transmission in Jabodetabek [Internet]. Jakarta; 2021. Available from: https://repository.binawan.ac.id/1065/1/Manuscript Elderly and Perception of Covid 19 Transmission.pdf
16. Karnadi EB, Kusumahadi TA. Why Does Indonesia Have a High Covid-19 Case-Fatality Rate? JejakJournal Econ Policy. 2021;14(2):272–87.
17. Sipahutar T, Eryando T. COVID-19 case fatality rate and detection ability in Indonesia. Kesmas. 2020;15(2):14–7.
18. Onder G, Rezza G, Brusaferro S. Case-Fatality Rate and Characteristics of Patients Dying in Relation to COVID-19 in Italy. JAMA - J Am Med Assoc. 2020;323(18):1775–6.
19. Kim DH, Choe YJ, Jeong JY. Understanding and interpretation of case fatality rate of coronavirus disease 2019. J Korean Med Sci. 2020;35(12):1–3.
20. Sujarwoto S, Maharani A. Sociodemographic characteristics and health access associated with COVID-19 infection and death: a cross-sectional study in Malang District, Indonesia. BMJ Open. 2022;12(5):1–16.
21. Jin JM, Bai P, He W, Wu F, Liu XF, Han DM, et al. Gender Differences in Patients With COVID-19: Focus on Severity and Mortality. Front Public Heal. 2020;8(April):1–6.
22. Ikawaty R. Dinamika Interaksi Reseptor ACE2 dan SARS-CoV-2 Terhadap Manifestasi Klinis COVID-19. KELUWIH J Kesehat dan Kedokt. 2020;1(2):70–6.
23. Kaseb AO, Mohamed YI, Malek AE, Raad II, Altameemi L, Li D, et al. The impact of angiotensin-converting enzyme 2 (Ace2) expression on the incidence and severity of covid-19 infection. Pathogens. 2021;10(3).
24. Peckham H, de Gruijter NM, Raine C, Radziszewska A, Ciurtin C, Wedderburn LR, et al. Male sex identified by global COVID-19 meta-analysis as a risk factor for death and ITU admission. Nat Commun [Internet]. 2020;11(1):1–10. Available from: http://dx.doi.org/10.1038/s41467-020-19741-6
25. Dai M, Tao L, Chen Z, Tian Z, Guo X, Allen-Gipson DS, et al. Influence of Cigarettes and Alcohol on the Severity and Death of COVID-19: A Multicenter Retrospective Study in Wuhan, China. Front Physiol. 2020;11(December):1–6.
26. Bailey KL, Sayles H, Campbell J, Khalid N, Anglim M, Ponce J, et al. COVID-19 patients with documented alcohol use disorder or alcohol-related complications are more likely to be hospitalized and have higher all-cause mortality. Alcohol Clin Exp Res. 2022;46(6):1023–35.