

Original Article

COVID-19 Mortality Characteristics During First to Third Pandemic Wave in Malang

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ARTICLE INFO

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<https://doi.org/10.21776/ub.crjim.2022.003.02.5>

Received on Oct, 05 2022;

Revised on Oct, 14 2022;

Accepted on Oct, 21 2022.

ABSTRACT

Background: The epidemic of SARS-CoV-2 has spread worldwide for about one and half years, including in Indonesia, with several waves in cases and mortality rates. A descriptive pattern of Covid 19 inpatients in Saiful Anwar General Hospital Malang needed to improve health service quality and reduce mortality rates.

Aim: Determine the descriptive pattern of inpatients Covid 19 in the internal medicine ward in Saiful Anwar General Hospital from March 2020 until February 2022.

Methods: This descriptive study was conducted from March 2020 to July 2021 and used convenience sampling due to sample availability. A total of 137 hospitalized patients in December 2020, 387 in July 2021, and 113 in February 2022 patients were included with information about age, sex, medical diagnosis, comorbid, and outcome, which was obtained from medical records. Descriptive analysis was used to explore frequency distribution and analysis.

Results: We found several factors associated with the frequency of SARS-CoV-2 cases. Factors associated with mortality in the first wave on December 2020 are the degree of pneumonia covid, the temperature at admission, lymphopenia, and NLR ratio. Factors associated with mortality in the second wave on July 2021, predominantly delta type variant of Covid 19, are comorbid, degree of pneumonia covid, leukocyte and lymphopenia, D dimer value, CRP value, urea, and creatinine. Factors associated with mortality in the third wave on February 2022, predominantly omicron type variant of covid 19, are comorbid and degree of pneumonia covid. Overall, these results emphasize the role of comorbidity as a possible driver of the COVID-19 case fatality rate.

Conclusion: During three waves of Covid 19 in Indonesia, the highest case fatality rate was the Delta variant in July 2021, where more factors significantly affected case mortality including comorbid and low coverage vaccine status.

Keywords: COVID-19, characteristics, mortality, first wave, second wave, third wave.

INTRODUCTION

Since the COVID-19 pandemic from early December 2019 until early June 2021, around the world, there have been more than 2.6 million new cases per week compared to the previous week, and at this time, more than 54,000 new deaths. Globally, more than 183 million cases and nearly 4 million deaths have been recorded.⁽¹⁾ In Southeast Asia, the number of new cases recorded was more than one million new cases and more than 23,000 deaths. The highest number in Indonesia is 40280 new cases (14.7 new cases per 100,000), with the highest death rate of 1187 deaths (0.4 new deaths per 100,000, an increase of 12%).⁽²⁾ Especially in Indonesia, the wave of cases occurred in November - December 2020, had sloped but then increased again in June - July 2021.⁽³⁾ The average new case is around 40 thousand cases per day. Along with the sharp spike in COVID-19 cases, it was also accompanied by a sharp increase in mortality or deaths caused by COVID-19. The wave of death also occurred in December 2020 and June - July 2021.

METHODS

Design and Subjects of Study

The subjects of this study were 137 patients in December 2020, 387 patients in July 2021, and 113 patients in February 2022. All subjects were Covid 19 patients admitted in incovit, Department of Internal Medicine, RSUD Dr. Saiful Anwar Malang. This descriptive study was conducted from March 2020 to July 2021 and used convenience sampling due to sample availability.

Basic Data Collection

Data were obtained from medical records and direct examination of patients, including demographic data, clinical data (degree of covid 19, onset of disease, history of clinical manifestations since diagnosis, length of hospitalization, comorbid, vaccination status), and laboratory findings (leukocyte, lymphopenia, thrombocyte, D-dimer, neutrophil-lymphocyte ratio, C-Reactive protein, urea, creatinine).

Statistical Analysis

Overall statistical tests & table generation were performed using IBM SPSS for Windows version 23.0. Comparisons among groups were analyzed using an independent (unpaired) T-test, while non-parametric data were analyzed using the Mann-Whitney test. Comparison between categorical variables was using the chi-square test. The statistical test is significant if the p-value <0.05. In addition, parametric data is presented as mean \pm SD, while non-parametric data is presented in the median (25-75th percentile).

RESULTS

Characteristic of Subjects During First Wave in 2020, Second Wave in 2021, and Third Peak in 2022

A total of 137 subjects with Covid 19 in December 2020 aged 28.3 ± 6.5 years old. There were 387 subjects with Covid 19 in July 2021. A total of 113 subjects suffered from Covid 19 in February 2022. The primary characteristics of the study subjects are presented in Table 1.

Table 1. Correlation Between Variable and Patient Outcome Wave 1, 2, and 3

Data COVID-19 Wave 1, 2, and 3														
Variable		Persen of total cases	Sex — n(%)		Age – n(%)		With Comorbid — n(%)		Degree of covid-19— n(%)		Temperature — n(%)			
			Male	Female	<60 Yrs	≥60 Yrs	No	Yes	Mild-Moderate	Severe-Critically Ill	Normal	Fever		
			December 2020 (Wave 1) - Alpha Incoming Data : 201 px Covid-19 (+) : 137 px Covid-19 (-) / exclude : 64 px)											
Outcome	Outpatient	111(81)	70(51.1)	41(29.9)	35(25.5)	27(19.7)	77(56.2)	34(24.8)	86(62.8)	25(18.2)	46(33.6)	11(8.0)		
Outcome2	Dead	26(19)	14(10.2)	12(8.8)	9(6.6)	10(7.3)	16(11.7)	10(7.3)	15(10.9)	11(8.0)	18(13.1)	0(0.0)		
Total	(N= 137)	137(100.0)	84(61.3)	53(38.7)	44(32.1)	37(27.0)	93(67.9)	44(32.1)	101(73.7)	36(26.3)	64(46.7)	11(8.0)		
Uji Chi-Square			p= 0.385	OR= 1.463	p= 0.487	OR= 1.440	p= 0.441	OR= 1.415	p= 0.039	OR= 2.523	p= 0.044			
			Juli 2021 (Wave 2) Delta Incoming Data : 429 px Covid 19 (+) : 387 px Covid-19 (-) / exclude : 42 px)											
Outcome	Outpatient	166(42.9)	85(22)	81(20.9)	110(28.4)	56(14.5)	76(19.6)	90(23.3)	45(11.6)	121(31.3)	118(30.5)	37(9.6)		
Outcome2	Dead	221(57.1)	109(28.2)	112(28.9)	136(35.1)	85(22)	76(19.6)	145(37.5)	6(1.6)	215(55.6)	154(39.8)	48(12.4)		
Total	(N= 387)	387(100.0)	194(50.1)	193(49.9)	246(63.6)	141(36.4)	152(39.3)	235(60.7)	51(13.2)	336(86.8)	272(70.3)	85(22)		
Uji Chi-Square			p= 0.714	OR= 1.078	p= 0.339	OR= 1.228	p= 0.023	OR= 1.611	p< 0.001	OR= 13.326	p= 0.981	OR= 0.994		
			February 2022 (Wave 3) Omicron Incoming Data : 167 px Covid 19 (+) : 112 px Covid-19 (-) / exclude : 55 px)											
Outcome	Outpatient	82(72.6)	40(35.4)	41(36.3)	46(40.7)	36(31.9)	39(34.5)	43(38.1)	56(49.6)	26(23)	65(57.5)	11(9.7)		
Outcome2	Dead	30(26.5)	14(12.4)	16(14.2)	14(12.4)	16(14.2)	6(5.3)	24(21.2)	9(8)	21(18.6)	24(21.2)	3(2.7)		
Total	(N= 112)	112(100)	54(47.8)	57(50.4)	60(53.1)	52(46)	45(39.8)	67(59.3)	65(57.5)	47(41.6)	89(78.8)	14(12.4)		
Uji Chi-Square			p= 0.799	OR= 1.115	p= 0.375	OR= 1.460	p= 0.008	OR= 3.628	p< 0.001	OR= 5.026	p= 0.661	OR= 0.739		
Data COVID-19 Wave 1, 2, and 3														
Variable		Persen of total cases	Leukocytes — n(%)		Lymphopenia — n(%)		Thrombocytes (PLT) — n(%)		D-Dimer — n(%)		Netrophil-Lymphocyte Ratio (NLR) — n(%)		C-Reactive Protein (CRP)-n(%)	
			Normal / Leukopenia	Leukocytosis	No	Yes	Normal	Increase Thrombocytes	Normal	Increase D-Dimer	Normal	Increase CRP	Normal	Increase CRP
			December 2020 (Wave 1) - Alpha Incoming Data : 201 px Covid-19 (+) : 137 px Covid-19 (-) / exclude : 64 px)											
Outcome	Outpatient	111(81)	35(25.5)	24(17.5)	20(14.6)	22(16.1)	11(8.0)	48(35)	6(4.4)	22(16.1)	13(9.5)	34(24.8)	1(0.7)	47(34.3)
Outcome2	Dead	26(19)	7(5.1)	10(7.3)	2(1.5)	13(9.5)	2(1.5)	15(10.9)	1(0.7)	13(9.5)	0(0.0)	13(9.5)	0(0.0)	13(9.5)
Total	(N= 137)	137(100.0)	42(30.7)	34(24.8)	22(16.1)	35(25.5)	13(9.5)	63(46)	7(5.1)	35(25.5)	13(9.5)	47(34.3)	1(0.7)	60(43.8)
Uji Chi-Square			p= 0.185	OR= 2.083	p= 0.019	OR= 0.169	p= 0.507	OR= 1.719	p= 0.366	OR= 2.727	p= 0.032		p= 0.600	
			Juli 2021 (Wave 2) Delta Incoming Data : 429 px Covid 19 (+) : 387 px Covid-19 (-) / exclude : 42 px)											
Outcome	Outpatient	166(42.9)	110(28.4)	36(9.3)	48(12.4)	59(15.2)	22(5.7)	129(33.3)	21(5.4)	112(28.9)	27(7.0)	78(20.2)	6(1.6)	116(30)
Outcome2	Dead	221(57.1)	102(26.4)	70(18.1)	39(10.1)	85(22)	29(7.5)	156(40.3)	12(3.1)	153(39.5)	13(3.4)	108(27.9)	1(0.3)	136(35.1)
Total	(N= 387)	387(100.0)	212(54.8)	106(27.4)	87(22.5)	144(37.2)	51(13.2)	285(73.6)	33(8.5)	265(68.5)	40(10.3)	186(48.1)	7(1.8)	252(65.1)
Uji Chi-Square			p= 0.002	OR= 2.097	p= 0.036	OR= 1.773	p= 0.779	OR= 0.917	p= 0.020	OR= 2.391	p= 0.003	OR= 2.876	p= 0.038	
			February 2022 (Wave 3) Omicron Incoming Data : 167 px Covid 19 (+) : 112 px Covid-19 (-) / exclude : 55 px)											
Outcome	Outpatient	82(72.6)	40(35.4)	26(23)	14(12.4)	38(33.6)	13(11.5)	52(46)	3(2.7)	31(27.4)	13(11.5)	39(34.5)	6(5.3)	34(30.1)
Outcome2	Dead	30(26.5)	13(11.5)	12(10.6)	5(4.4)	18(15.9)	6(5.3)	19(16.8)	2(1.8)	16(14.2)	4(3.5)	17(15)	0(0)	17(15)
Total	(N= 112)	112(100)	53(46.9)	38(33.6)	19(16.8)	56(49.6)	19(16.8)	71(62.8)	5(4.4)	47(41.6)	17(15)	56(49.6)	6(5.3)	51(45.1)
Uji Chi-Square			p= 0.457	OR= 1.420	p= 0.634	OR= 1.326	p= 0.677	OR= 0.792	p= 0.790	OR= 0.774	p= 0.586	OR= 1.417	p= 0.091	

Table 1. Correlation Between Variable and Patient Outcome Wave 1, 2, and 3 (cont)

Data COVID-19 Wave 1, 2, and 3										
Variable		Persen of total cases	Ureum — n(%)		Creatinin — n(%)		Length of Hospitalization — n(%)		Vaccinated — n(%)	
			Normal	Increase Ureum	Normal	Increase Creatinin	≤5 days	>5 days	No	Yes
December 2020 (Wave 1) - Alpha			Incoming Data : 201 px		Covid-19 (+) : 137 px		Covid-19 (-) / exclude : 64 px)			
Outcome	Outpatient	111(81)	7(5.1)	33(24.1)	23(16.8)	18(13.1)				
Outcome2	Dead	26(19)	2(1.5)	10(7.3)	10(7.3)	3(2.2)				
Total	(N= 137)	137(100.0)	9(6.6)	43(31.4)	33(24.1)	21(15.3)				
Uji Chi-Square			p = 0.947	OR = 1.061	p = 0.180	OR = 0.383				
Juli 2021 (Wave 2) Delta			Incoming Data : 429 px		Covid 19 (+) : 387 px		Covid-19 (-) / exclude : 42 px)			
Outcome	Outpatient	166(42.9)	33(8.5)	101(26.1)	99(25.6)	36(9.3)	44(11.4)	122(31.5)	134(34.6)	17(4.4)
Outcome2	Dead	221(57.1)	17(4.4)	152(39.3)	84(21.7)	87(22.5)	158(40.8)	63(16.3)	188(48.6)	24(6.2)
Total	(N= 387)	387(100.0)	50(12.9)	253(65.4)	183(47.3)	123(31.8)	202(52.2)	185(47.8)	322(83.2)	41(10.6)
Uji Chi-Square			p= 0.001	OR = 2.921	p < 0.001	OR = 2.848	p < 0.001	OR = 0.144	p= 0.0985	OR = 1.006
February 2022 (Wave 3) Omicron			Incoming Data : 167 px		Covid 19 (+) : 112 px		Covid-19 (-) / exclude : 55 px)			
Outcome	Outpatient	82(72.6)	9(8)	41(36.3)	27(23.9)	23(20.4)	26(23)	22(19.5)	39(34.5)	43(38.1)
Outcome2	Dead	30(26.5)	2(1.8)	19(16.8)	7(6.2)	14(12.4)	18(15.9)	12(10.6)	17(15)	13(11.5)
Total	(N= 112)	112(100)	11(9.7)	60(53.1)	34(30.1)	37(32.7)	44(38.9)	34(30.1)	56(49.6)	56(49.6)
Uji Chi-Square			p = 0.368	OR = 2.085	p = 0.112	OR = 2.348	p = 0.613	OR = 0.788	p = 0.393	OR = 0.694

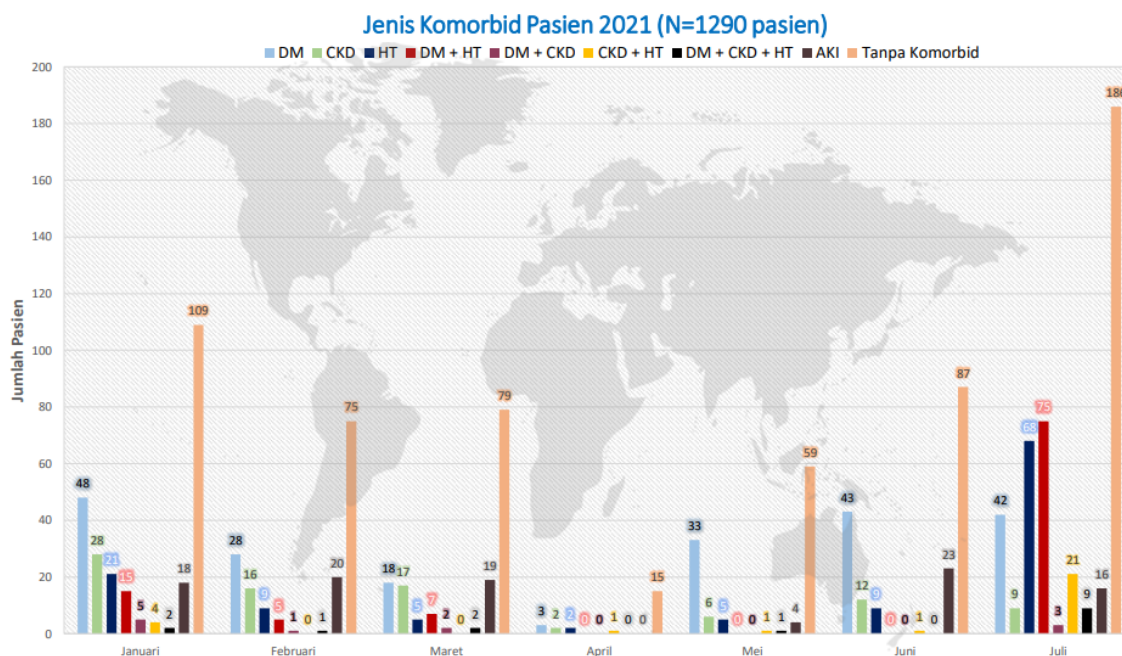


Figure 1. Type Comorbid of Patient in Second Wave COVID-19

Based on Figure 1, there are 8 types of comorbidities recorded such as (1) Diabetes Mellitus (DM), (2) chronic kidney disease (CKD), (3) Hypertension (HT), (4) Diabetes Mellitus (DM) with hypertension (HT), (5) Diabetes Mellitus (DM) with Chronic Kidney Disease (CKD), (6) Chronic Kidney Disease (CKD) with Hypertension (HT), (7) Diabetes Mellitus (DM), Chronic Kidney Disease (CKD), and Hypertension (HT), (8) Acute Kidney Disease (AKI) and (9) Non-Comorbid.

Based on the type comorbid of the patient in 2021 known that most of the patient at RSUD Dr. Saiful Anwar Hospital was patients without comorbid, but from the 8 types of comorbidities recorded, most were dominated by comorbid Diabetes Mellitus (DM) in January, February, April, May, and June. Furthermore, in July, the patient was dominated by comorbid Diabetes Mellitus (DM) with hypertension (HT). Then, the patient with comorbid Acute Kidney Disease (AKI) were dominated in March.

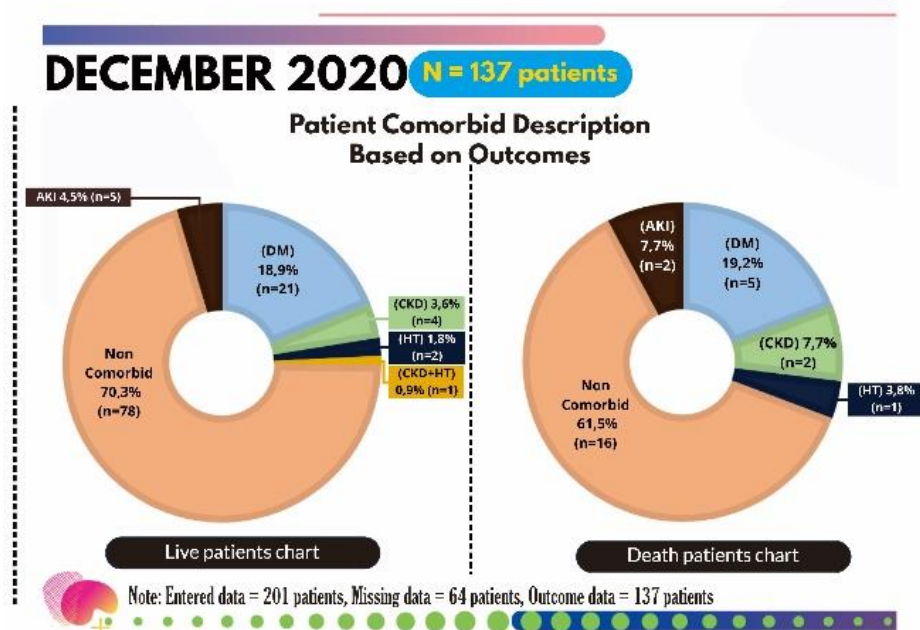


Figure 2. Type Comorbid Comparison of Living Patient and Died in December 2020

Based on Figure 2, the patients who lived sequentially ranked from the highest number to the smallest number are (1) 70.3% (n = 78 patients non-comorbid), (2) 18.9% (n=21) patients with Diabetes Mellitus (DM), (3) 4.5% (n=5) patients with Acute Kidney Disease (AKI),

(4) 3.6% (n=4) patients with Chronic Kidney Disease (CKD), (5) 1.8% (n=2) patients with Hypertension (HT), (6) 0.9% (n=1) patient have comorbid Diabetes Mellitus (DM) and Hypertension (HT).

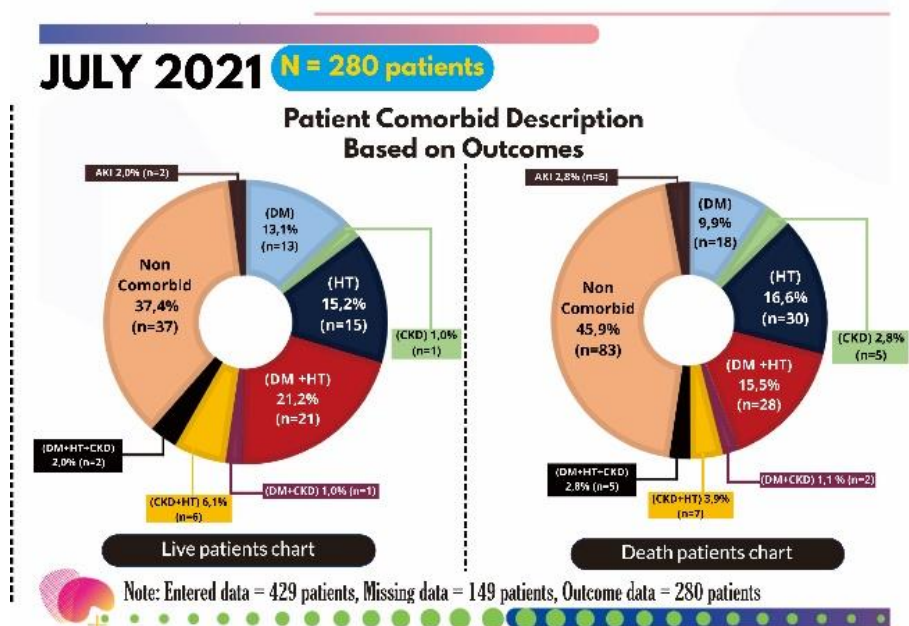


Figure 3. Type Comorbid Comparison of Living Patient and Died in July 2021

Based on Figure 3, the patients who lived sequentially ranked from the highest number to the smallest number are (1) 37.4% (n = 37 patients non-comorbid, (2) 21.2% (n=21) patients with Diabetes Mellitus (DM) and Hypertension (HT) comorbid, (3) 15.2% (n=15) patients with Hypertension (HT), (4) 13.1% (n=13) patients have comorbid Diabetes Mellitus (DM), (5) 6.1% (n=6) patients with Chronic Kidney Disease (CKD) and Hypertension (HT), (6) 2.0% (n=2) patients have comorbid Acute Kidney Disease (AKI) and comorbid combinations of Diabetes Mellitus (DM), Chronic Kidney Disease (CKD), and Hypertension (HT), and (7) 1.0% (n=1) patient has Chronic Kidney Disease (CKD), and Diabetes Mellitus (DM) comorbid.

Almost similar to living patients, dead patients were sequentially ranked from the

highest number to the smallest number is (1) patients with non-comorbid 45.9% (n = 83), (2) patients have comorbid Hypertension (HT) by 16,6% (n=30), (3) patients have comorbid Diabetes Mellitus (DM) and Hypertension (HT) by 15.5% (n=28), (4) patients have comorbid Diabetes Mellitus (DM) by 9.9% (n=18), (5) patients have a comorbid Chronic Kidney Disease (CKD) with Hypertension (HT) by 3.9% (n=7), (6) patients have comorbid Acute Kidney Disease (AKI), patients have comorbid Chronic Kidney Disease (CKD), as well as comorbid combinations of Diabetes Mellitus (DM), Chronic Kidney Disease (CKD), and Hypertension (HT) have the same number were 2.8% (n=5), and (7) comorbid Diabetes Mellitus (DM) and Chronic Kidney Disease (CKD) patients had the same number were 1.1% (n=2)

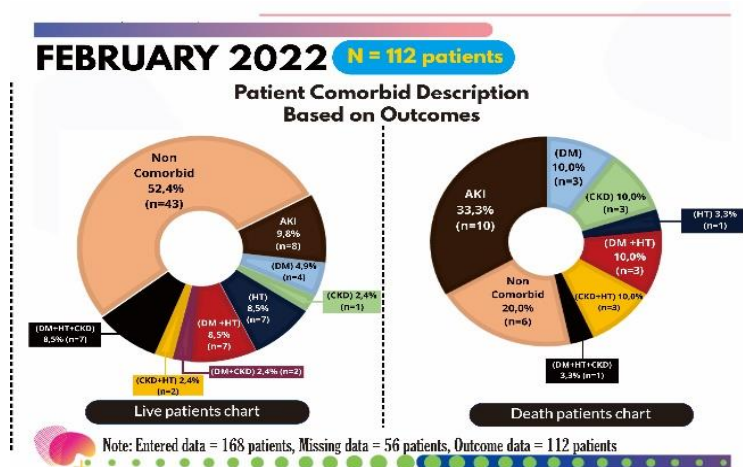


Figure 4. Type Comorbid Comparison of Living Patient and Died in February 2022

Based on Figure 4, the patients who lived sequentially ranked from the highest number to the smallest number are (1) 52.4% (n = 43 patients non-comorbid, (2) 9.8% (n=8) patients have comorbid Acute Kidney Disease (AKI), (3) 8.5% (n=7) patients with Hypertension (HT), comorbid combinations of Diabetes Mellitus (DM) and Hypertension (HT), along comorbid combinations of Diabetes Mellitus (DM), Chronic Kidney Disease (CKD), and

Hypertension (HT) (4) 4.9% (n=4) patients have comorbid Diabetes Mellitus (DM), (5) 2.4% (n=2) patient with comorbid Chronic Kidney Disease (CKD), patient with comorbid combinations of Chronic Kidney Disease (CKD) and Hypertension (HT), along comorbid combinations of Diabetes Mellitus (DM) and Chronic Kidney Disease (CKD).

DISCUSSIONS

Reviewing cases of COVID-19 in 2020, both in Indonesia and abroad, there should be many things that can be learned to prevent the spread of cases, and many strategies have also been carried out to prevent the spread from getting more comprehensive, but there are still several spikes in the number of cases of COVID-19, namely in November – December 2020, and a real spike in June – July 2021, and February 2022.

By observing the difference in the pattern of cases, people should have started to adapt to the new everyday life and get used to implementing strict health protocols. It should be noted that the daily chart shows the pattern of the number of daily and monthly cases and the number of mortality.⁽³⁾ An explanation for the occurrence of several spikes in cases and an increase in the number of mortality is also because several new variants of this coronavirus have been obtained.

SARS-CoV-2 Variant

The variant of concern is a variant of the coronavirus that increases transmission and mortality, such as: alpha, beta, gamma, and delta (cov19 weekly epi update). The SARS-CoV-2 alpha variant, also known as lineage B.1.1.7, was first recognized in the UK in September 2020. This concern variant is about 43 – 90% more contagious than earlier variants in the UK. This variant is also associated with a two-thirds increase in case of fatality rates over the previous virus in the unvaccinated population.⁽³⁻⁵⁾

Another variant of concern is the beta variant of SARS-CoV-2, lineage B.1.351. with about 50% more communicability than the previous variant. The prevalence of this variant is

higher among young people without specific health conditions and often causes serious illness in some cases than the other variants. However, this variant has no evidence of a significant increase in severity and mortality. The Delta variant of SARS-CoV-2, known as lineage B.1.617.2, was discovered in India in late 2020. The secondary attack rate was 51 – 67% higher than the Alpha variant. The Gamma SARS-CoV-2 variant, as a lineage P.1., was first detected in Brazil in January 2021. This study shows that this variant is more infectious about 2 times (1.7 – 2.4 times). However, there is also no evidence of a significant increase in severity and mortality attributable to this variant.⁽³⁾ From a public health study in the UK itself, it was found that the case fatality rate after a 28-day evaluation in June 2021 was the Alpha variant of 2%, the beta variant of 1.5%, and the delta variant of 0.3%.⁽⁵⁾ At the same time, the latest mutation is the omicron variant.

The case fatality rate is the number of deaths caused by a particular disease in a certain period divided by the number of cases. According to a report from the Chinese Center for Disease Control and Prevention, the overall CFR of coronavirus disease 2019 in China as of February 2020 was 2.3% (1023 deaths from 44672 confirmed cases)⁽⁶⁾. According to COVID-19 data in Indonesia as of Wednesday, July 28, 2021, the case fatality rate (Case Fatality Rate) in Indonesia is 2.7%⁽³⁾. This figure is higher than the world average (2.14%) and the case fatality rate in Asia (1.44%)⁽⁶⁾.

Differences in mortality rates between countries can be caused by differences in comorbid cases, demographics, and socioeconomic variables in each country. Previous reports have shown that two factors contribute to the poor prognosis of COVID-19, namely age

and the presence of comorbid diseases. So, countries with many elderly people and a higher number of comorbid incidents will be more likely to experience higher mortality rates. In a study using data from the European Center for Disease Prevention and Control, it was found that countries with cardiovascular comorbidity rates, cancer, chronic lung disease, and a history of smoking at the age of more than 70 years were associated with higher cases of COVID-19 mortality.⁽⁶⁾

This paper found several factors associated with mortality in covid 19 patients. Factors associated with mortality in the first wave on December 2020 are the degree of pneumonia covid, the temperature at admission, lymphopenia, and NLR ratio. Factors associated with mortality in the second wave on July 2021, predominantly delta type variant of Covid 19, are comorbid, degree of pneumonia covid, leukocyte and lymphopenia, D dimer value, CRP value, urea, and creatinine. Factors associated with mortality in the third wave on February 2022, predominantly omicron type variant of covid 19, are comorbid and degree of pneumonia covid. In this third wave, almost patients have had covid vaccinated, so they have a better prognosis than other times.

The previous studies had report about every wave characteristics, first wave had mild disease; in second wave had young patients with severe disease and the worst-case fatality rate; and third wave had older patients with comorbidities. Considering clinically significant differences were age (waves 2 vs wave 3), the severity of illness at admission (in wave 2 were about 10% lower than those in wave 1 and wave 3), and hypertension (wave 2 were more than 10% lower than those in waves 3 and 1). In the multivariable analysis using a relative risk

regression model in which the effects of other factors such as age and comorbidities were controlled, wave 2 and wave 3 had less risk of death than wave 1. The median duration from symptom onset to hospitalisation was shortened from seven days during wave 1 to four days during wave 3. Furthermore, wave 3 comprised a smaller percentage of patients who were on invasive or non-IMV or on ECMO at admission (Wave 1: 2:7% [143] vs wave 3: 1:1% [174]).⁽⁷⁾

Another previous study reports the outcome and date of outcome were collected separately and ascertained from MCCD (available for 749 of 752 deaths, 99.6%).⁽⁸⁾ The number of deaths during the first wave is consistent with numbers previously reported for the same catchment area and period.⁽⁹⁾ However, it has been observed that during the first epidemic wave in the UK there was a larger mortality within care homes, so it is possible that we have underestimated the number of deaths in the first wave.⁽¹⁰⁾ This differential misclassification of outcome could have led to an overestimation of the effect of the second wave. In addition, temporal effects could also have explained some of the observed differences between waves, as fatality rates are known to be higher during winter months, when the second wave unfolded.

The severity of covid 19 was the most factor associated with mortality through all peak cases of covid 19. It means if patients arrived late, hospitalized would tend to have a poor prognosis, so it would be better to monitor every covid 19 patient early. Leukocyte and lymphopenia were associated with mortality during the first and second peak of Covid 19, and comorbid were associated with mortality during the second and third peak of Covid 19.

Various theories try to explain the cause of the high mortality rate in Indonesia, namely from the health system, ranging from basic and advanced health care systems, drugs and health supplies, health information systems, community empowerment, and others.

Similarly, it is common knowledge that comorbidities or comorbidities can aggravate the severity of COVID-19 and ultimately contribute to the mortality of COVID-19 cases. The six main morbidities are age-related, whereas age increases the risk of death will increase, including high blood pressure, respiratory disease, cardiovascular disease, CKD, and obesity. Most of these factors have a positive relationship, although not linear, except for obesity and diabetes, where at some point, the strength of the relationship decreases with increasing age. Obesity and diabetes appear to be relevant risk factors for COVID-19 fatality rates in people under 60.^(4,6) Although it is generally known that the mortality rate from COVID-19 increases with age, it is known that in developing countries, there is also a higher mortality rate in young adults than in developed countries. Some of the possible causes are the dense living environment leading to a faster spread, less access to clean environments such as water and clean air, and also the risk of working primarily in the informal sector.⁽¹¹⁾

This study found that the factors causing death were significantly more in wave 2 of covid 19, namely comorbid status, degree of Covid 19, leukocytes value, D dimer value, lymphopenia, Neutrophil – Lymphocyte Ratio (NLR). C-Reactive Protein value, urea, creatinine, and length of hospitalization.

CONCLUSION

The average death rate or case fatality of COVID-19 in the world is 2.14%, while the case fatality rate in Indonesia exceeds the average of 2.7%. In general, it is known that the risk of COVID-19 mortality will increase with age and the presence of comorbid diseases. In certain countries, a higher mortality rate is possible due to a more significant proportion of elderly people and a higher prevalence of comorbid diseases, although it is possible that there will be differences in cases where the case fatality rate can occur at a younger age. In the three waves of Covid 19 in Indonesia, the highest case fatality rate was during the Delta variant in July 2021, where more factors significantly affected case mortality.

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