Original Research

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THE IMPACT OF THE COVID-19 PANDEMIC ON MATERNAL MORTALITY ATTRIBUTES

Dampak Situasi Pandemi COVID-19 Terhadap Karakteristik Kematian Maternal

Dyah Ayu Fatmaningrum[1], *Wahyul Anis[1], Muhammad Ardian Cahya Laksana[2]
[1]School of Midwifery, Faculty of Medicine, Universitas Airlangga, Indonesia
[2]Department of Obstetrics Gynaecology, Faculty of Medicine, Universitas Airlangga, Indonesia
Correspondence*:
Address: Jl. Mayjend. Prof. Dr. Moestopo 47, Surabaya, Indonesia | e-mail: wahyul.anis@fk.unair.ac.id

Abstract

Background: The COVID-19 pandemic is a challenge for mothers to access health services in Indonesia. Patient management, referral processes, and maternal screening protocols are the reasons for this issue.
Aims: This study aimed to analyze maternal mortality trends in East Java Province before and during the COVID-19 pandemic.
Methods: This study was conducted using retrospective observation with a cross-sectional design, and samples were selected using a total sampling technique. The number of maternal deaths in East Java was 520 in 2019 and 565 in 2020. The independent variable in this study is the number of maternal deaths, and the dependent variables include age, gravida, place of death, rescue relay, time of death, and maternal complications. The variables of age, place of death, rescue relay, and gravida were assessed using the Chi-square test.
Results: Statistical tests showed a *ρ* value of 0.195 for age; 0.916 for place of death; 0.646 for rescue relay; and 0.048 for gravida.
Conclusion: Maternal mortality showed different trends before and after the pandemic in East Java. Significant differences in maternal mortality rate are influenced by gravida status.

Keywords: maternal mortality, pandemic, COVID-19

Abstrak

Latar Belakang: *Situasi pandemi menjadi tantangan bagi ibu untuk mendapatkan pelayanan kesehatan di Indonesia. Manajemen pasien, proses rujukan, dan protokol skrining ibu adalah salah satu penyebabnya.*
Tujuan: *Penelitian ini bertujuan untuk menganalisis perbedaan angka kematian ibu di Provinsi Jawa Timur sebelum pandemi COVID-19 tahun 2019 dan selama pandemi COVID-19 tahun 2020.*
Metode: *Observasi retrospektif dilakukan dengan menggunakan desain potong lintang, dan sampel dipilih melalui teknik total sampling. Variabel independen penelitian ini adalah jumlah kematian ibu dan variabel dependennya meliputi usia, gravida, tempat kematian, estafet penolong, waktu kematian, dan komplikasi ibu. Variabel usia, tempat kematian, estafet penolong dan gravida dikaji menggunakan uji Chi Square.*
Hasil: *Uji statistik menunjukkan nilai ρ 0,195 pada variabel umur; nilai ρ 0,916 pada tempat kematian menunjukkan; nilai ρ 0,646 pada variabel bantuan berkelanjutan; dan nilai ρ 0,048 pada variabel gravida.*
Kesimpulan: *Terdapat perbedaan jumlah kematian ibu di Provinsi Jawa Timur sebelum dan selama pandemi COVID-19. Perbedaan signifikan tingkat kematian ibu yang signifikan dipengaruhi oleh status gravida.*

Kata kunci: *kematian ibu, pandemi, COVID-19*

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Introduction

The sustainable development goals 3.1 (SDGs) reducing the worldwide maternal mortality ratio (MMR) to less than 70 is targeted by 2030. The number of maternal mortality in some regions worldwide could impede the country's socio-economic development and result in unequal access to medical services (WHO, 2019). Maternal mortality is a serious public health concern in developing countries including Indonesia (Girum and Wasie, 2017). In Indonesia, the national maternal mortality rate was consistently at a high level (WHO, 2019). East Java is one of the regions with the highest maternal mortality rate in Indonesia, and it consists of 45 regencies/cities.

The World Health Organization on January 30, 2020 announced that COVID-19 outbreak was a public emergency of international focus. Due to this pandemic, health care systems worldwide have been focused on increasing the capacity of hospitals to anticipate abundance of patients due to the impacts of COVID-19 (Ombere, 2021). By the end of 2020, there were more than 4 million COVID-19 cases causing at least one million deaths (WHO, 2020b). On July 8, 2020, East Java was reported to have the highest number of COVID-19 cases in Indonesia (WHO, 2020b). The COVID-19 pandemic poses new challenges, especially maternal mortality, for the community, government and health workers. Therefore, many policies have been issued by the government.

The maternal mortality rate has increased throughout the world (Chmielewska *et al.*, 2021; de Carvalho-Sauer *et al.*, 2021; Mendez-Dominguez *et al.*, 2021). Based on the results of the CDC survey in June 2020, 8,207 cases of COVID-19 were found in pregnant women, about 9% of whom were of reproductive age (Ellington, 2021). In Pakistan, the maternal mortality rate increased over the past decade. Previously, the rate was 70 per 100,000 live births, but it was increasing to 186 per 100,000 live births in Pakistan (Siddiqui and Ali, 2022).

Pregnant women with comorbidities are considered at a greater risk of experiencing severe diseases, morbidity, and mortality (POGI, 2020). COVID-19 likely increases the risk of premature birth, preeclampsia, stillbirth, neonatal death, and maternal death (Marchand *et al.*, 2022). It is more threatening that 1.30% of 11,758 pregnant women infected with COVID-19 died, and and 20% of the postpartum women, had comorbidities (Karimi *et al.*, 2021).The Indonesian Ministry of Health has changed health guidelines for checking pregnancy, childbirth, and postpartum during the COVID-19 pandemic, for example, delay in pregnancy programs and routine pregnancy examinations for suspect and positive confirmed mothers, and change in mode of second-trimester pregnancy examination (Ministry of health Republic of Indonesia, 2020b).

The government has to allocate more funds to manage COVID-19 cases among pregnant women, since it needs additional accommodation for isolation rooms, PPE, and medicines whose supplies are below the standard. Hospitals have currently faced two big issues: patient management and funding; as response to patient management, initial screening protocol for referred pregnant women is carried out. The patient referral system in Indonesia is unable to provide emergency services due to COVID-19 (Do *et al.*, 2021). Based on this problem, maternal mortality rates in East Java were examined to identify the difference before and during the pandemic.

According to the Decree of Indonesian Ministry of Health No. HK.01.07/MENKES/2020 concerning the Designation of Referral Hospitals for the Management of Certain Emerging Infectious Diseases, several hospitals have been designated as referral hospitals in Indonesian regions. Hospitals which could not accommodate the number of patients will suffer much from this pandemic. Based on the issues, maternal mortality rates between 2019-2020 were further analyzed.

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Method

A retrospective observation was conducted using a cross-sectional design. All maternal mortalities in East Java were collected using a total sampling technique. The research was conducted from July-September 2021. Data on maternal mortality during January 1, 2019-December 31, 2020 were collected from the East Java Provincial Health Office. The data were then tested using the Chi-Square test.

Result and Discussion

The COVID-19 pandemic has destroyed various aspects of human life, of which are maternal and neonatal health. The World Health Organization initiated lockdown policies in various countries to minimize its spread (WHO, 2020a). It also has reduced mobility both regionally, locally, and internationally, causing travelers to be in quarantine (Onyeaka *et al.*, 2021).

In 2020, the number of maternal deaths (565 deaths) in East Java increased, a lot more than in 2019 (520 deaths). Out of 38 regencies/cities in East Java from January 2019 to December 2020, 1,085 maternal deaths were identified. Figure 1 shows the districts and cities in East Java with high maternal mortality rates. Increased maternal mortality rates occurred in 21 out of 38 districts/cities in East Java in 2020.

The World Health Organization collaborated with the Indonesian Ministry of Health to conduct a rapid health assessment in 34 provinces in April-May 2020, The assessment showed that around 46% of health facilities delayed antenatal care (Ministry of Health Republic of Indonesia and United Nations International Children's Emergency Fund (UNICEF), 2020). A quantitative study in West Jakarta, Indonesia showed that the Large-Scale Social Restriction Policy (PSBB) reduced maternal visits (Fitrianingrum, Sabarinah and Pratomo, 2021). Similar trends were found in Sangurara Primary Healthcare Center, Palu in March-May 2020 (Hutagaol, Arini and Mujianti, 2021). As a result, prevention of pregnancy complications in pregnant women has declined.

The government put efforts to minimize the spread, and improve early COVID-19 treatment, and management (Ali and Shahil Feroz, 2020), However, the pandemic has devastated the health system much. Its impacts include limited access to health services, stress, maternal anxiety, and so on (Chmielewska *et al.*, 2021). Among adults, most of whom were women, 42.6% were worried about COVID-19 infection (Wolf *et al.*, 2020)

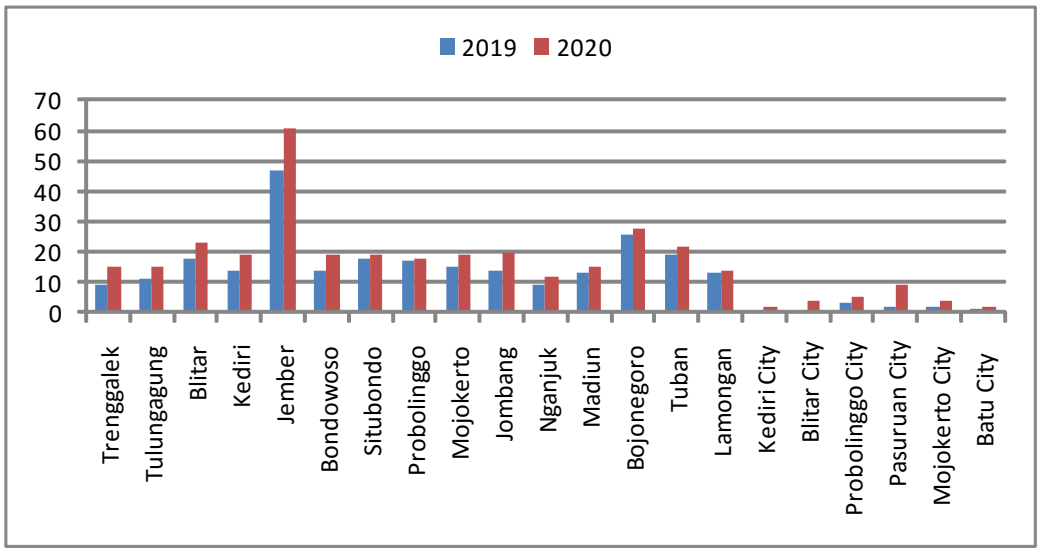

Figure 1 Distribution of maternal mortality rates across districts and cities in East Java

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Table 1. Maternal mortality based on socio-health demographics

Characteristics	2019	%	2020	%	Total
Age					
<16	1	0.19	0	0	1
17-18	17	3.27	19	3.36	36
20-35	334	64.23	385	68.14	719
>35	168	32.31	161	28.50	329
Gravida					
1	113	21.73	153	27.08	266
2-3	301	57.88	320	56.64	621
≥4	106	20.38	92	16.28	198
Place of deaths					
Public hospital	349	67.12	384	67.96	733
Private hospital	97	18.65	104	18.41	201
PHCs	9	1.73	12	2.12	21
Maternity clinics	0	0	1	0.18	1
Private practice	5	0.96	1	0.18	6
Home	25	4.81	35	6.19	60
Refferal trip	35	6.73	28	4.96	28
Rescue relay					
0x	103	19.81	116	20.53	219
1x	152	29.23	170	30.09	322
2x	180	34.62	193	34.16	373
3x	73	14.04	70	12.39	143
4x	11	2.12	13	2.30	24
>4x	1	0.19	3	0.53	4
Period of death					
Antepartum	150	28.85	194	34.34	344
Intrapartum	98	18.85	103	18.23	201
Postpartum	272	52.31	268	47.43	540
Complications					
Hemorrhage	120	23.08	121	21.42	241
Eclampsia	162	31.15	151	26.73	313
Infection	36	6.92	37	6.55	73
Heart disease	66	12.69	63	11.15	129
AFE	15	2.88	13	2.30	28
Miscariage	0	0.00	1	0.18	1
COVID-19	0	0.00	56	9.91	56
Tuberculosis	26	5.00	22	3.89	48
Hepatitis	6	1.15	6	1.06	12
HIV	15	2.88	4	0.71	19
Pneumonia	3	0.58	15	2.65	18
Others	71	13.65	76	13.45	147

Pregnant women in Surabaya showed increased anxiety about the infection as well (Hatmanti, Rusdianingseh and Septianingrum, 2021). Table 1 shows maternal mortality rates according to the socio-health demographics.

Table 1 shows that the deaths occurred among mothers aged 20-35 years. In 2019, some mothers died at the age of less than 16 years, but in 2020 there were no reports of deaths below 16 years old. In 2020, maternal deaths at the age of over 35 years decreased by 3.81% and 17-18 years by 0.09%. Maternal mortality at the age of below 35 years significantly increased in 2020. The risk of COVID-19

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infection increased in mothers of reproductive age. According to the CDC report, 9% of pregnant women infected were of reproductive age, and about 5% of them were aged 15-44 years (Ellington, 2021). In Brazil, the average maternal mortality occurred to women aged 31 years old (S Takemoto *et al.*, 2020). This present study showed mothers of reproductive age had a higher percentage of death than groups at risk (less than 20 years old or more than 35 years old). Indirect factors that potentially increase maternal mortality include poverty, distance, lack of information, inadequate services, cultural practices, and others (McCall, Nair and Knight, 2017; World Health Organization, 2019; Chinwah, Nyame-Asiamah and Ekanem, 2020).

Maternal mortality by gravida occurred mostly to gravida status 2-3. In 2020, the number of maternal mortality increased up to 5.35% in women with primigravida status. The maternal mortality during 2019 and 2020 dominantly occurred to multigravida mothers who were not supposed to be at risk. While women with primigravida at risk of preeclampsia and those with grand multigravida at risk of Hemorrhage PostPartum (HPP), contributed a quarter to the overall deaths. Attention must be given to all risk and non-risk women. Self-efficacy is important for pregnant and postpartum women in dealing with pregnancy, childbirth, and postpartum (Delavari, Mohammad-Alizadeh-Charandabi and Mirghafurvand, 2018). Midwives are responsible to prevent complications and maternal mortality by promoting maternal health (Rosyidah, Koning and Ormel, 2019).

The majority of maternal mortality occurred in public hospitals. In 2020, a lot more women giving birth at maternity clinics died. Most maternal mortality occurred in 2-time rescue. Most of the deaths occurred to women with rescue relay more than once. Maternal handling procedures and referrals for COVID-19 and non-COVID-19 mothers are urgently needed for the need of emergency, fast and precise treatment. Almost all maternal mortality at tertiary referral hospitals were resulted from referrals to lower hospitals (Mahmood *et al.*, 2021). Limited research on maternal impacts and the quality of health services hinders the progress of health workers to adapt to new situations immediately (Rosyidah, Koning and Ormel, 2019; Patrick and Johnson, 2021). Access to health services has a very strong impact on maternal mortality. Research showed the risk of maternal death will increase by about 3.9% for every 10 kilometers distance to access health services (Cameron, Suarez and Cornwell, 2019).

Most maternal mortality during the periods were caused by bleeding and eclampsia. In 2020, 9.91% of mothers died due to COVID-19. Eclampsia cases decreased in 2020. Maternal mortality likely has a relationship with the incidence of eclampsia, especially for nulliparous women, followed by perinatal morbidity and mortality (Mendoza *et al.*, 2020; Coronado-Arroyo *et al.*, 2021; Papageorghiou *et al.*, 2021). Pregnant women infected with COVID-19 in the second and third trimesters have the potential to experience cardiopulmonary complications and death (Hantoushzadeh *et al.*, 2020). Comprehensive management on infectious diseases such as HIV, tuberculosis, hepatitis, and others must also be taken into action.

Of the 38 cities/regencies in East Java, maternal mortality occurred in 22 districts/cities in 2020. At least seven mothers died from COVID-19 infection in Pasuruan. Table 2 shows the relationship between the demographic characteristics of maternal mortality before and during the pandemic .This study showed no difference between age of death ($p > 0.05$), place of death ($p > 0.05$), and rescue relay ($p > 0.05$), in 2019 and 2020. There was a difference in maternal deaths by gravida within these periods ($p < 0.05$).

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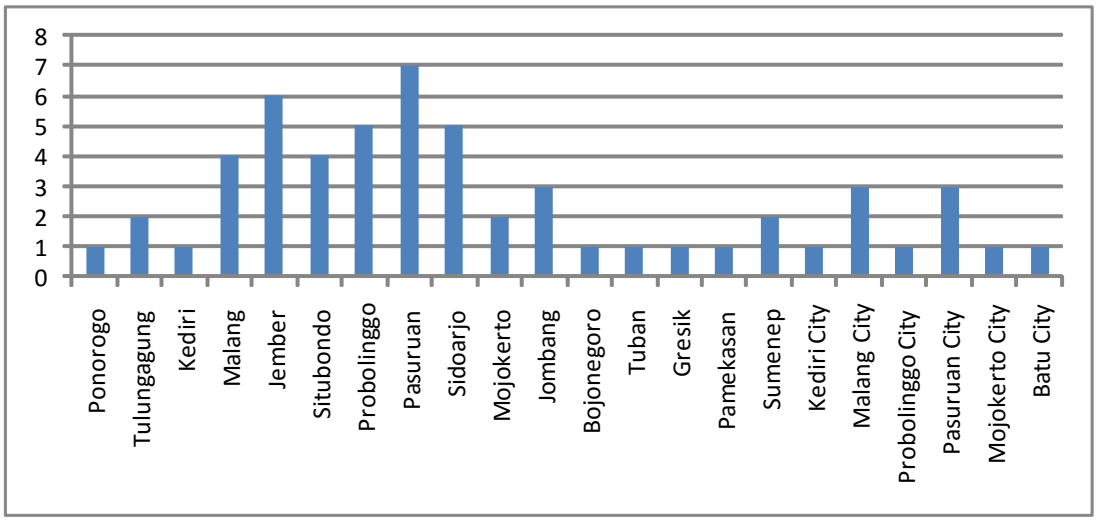

Figure 2. Distribution of maternal mortality due to COVID-19 in 2020 across regions.

Table 2. Difference of Demographic and Maternal Mortality

Variable	2020 (n)	%	2019 (n)	%	P	Std Dev
Age (years)						
< 20 or > 35	180	31,86	186	35.77	0.173	0.473
20-35	385	68.14	334	64.23		
Place of death						
Health care facilty	502	88.85	460	88.46	0.84	0.317
Non Health care facility	63	11.15	60	11.54		
Rescue Relay						
≤1x	286	50.62	255	49.04	0.60	0.5
>1x	279	49.38	265	50.96		
Gravida						
≤1	153	27.08	113	21.73	0.041	0.430
>1	412	72.92	407	78.27		

Maternal mortality ratio (MMR) is one of the main issues in several countries, especially developing countries. Maternal health is influenced by the service system and access to health services, the availability of service providers, and skills in providing adequate services, education and health information (Bhan *et al.*, 2020). By improving professional and adequate midwifery services during childbirth developed countries have previously succeeded in reducing maternal mortality rates by up to 50% in the early 20th century (Prawirohardjo, 2016). Poor management, lack of policy, inadequate number of staff and senior clinical staff, delay in emergency response, unresponsive procedures, the poor process of information sharing, pyramidal referrals, poor knowledge and skills of antenatal care staff, poor communication and lack of recognition of the seriousness (Mahmood *et al.*, 2021).

Conclusion

Gravida is the main variable that influences the maternal mortality rates before and during the COVID-19 pandemic. However, age, place of death, and rescue relay do not make any difference in the cases before and during the pandemic.

Maternal mortality cases were mostly found in women aged 20-35 years, admitted to hospitals, during the postpartum period, and having complications due to eclampsia.

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This study could not give holistic results since it did not touch down primary resources e.g., pregnancy, childbirth, postpartum and women with COVID-19. Further qualitative research is needed for more comprehensive results.

Abbreviations

WHO: World Health Organization; SD: Standard Deviation; OR: Odds Ratio; MMR: Maternal Mortality Ratio; SDGs: Sustainable Development Goals; COVID-19: Corona Virus Disease 2-19; SARS-CoV-2: Severe Acute Respiratory Syndrome- Corona Virus-2; USG: Ultrasono Graphy; PSBB: *Pembatasan Sosial Berskala Besar.*

Declarations

Ethics Approval and Consent Participant

This study has received ethical clearance approval from the Ethics Committee of the Faculty of Medicine, Universitas Airlangga No. 162/EC/KEPK/FKUA/2021.

Conflict of Interest

There is no conflict of interest in this study.

Availability of Data and Materials

Not applicable

Authors' Contribution

DAF and WA conceptualized the study; WA and MACL reviewed and edited the manuscript; DAF wrote the original draft.

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