

ORIGINAL ARTICLE

MATERNAL DEATH DETERMINANT AND HEALTH SERVICE DELIVERY DURING COVID-19: WHAT'S THE DIFFERENCE?

Determinan Kematian Ibu dan Pelayanan Kesehatan Selama Pandemi COVID-19: Adakah Perbedaan?

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ABSTRACT

Background: The COVID-19 pandemic has provided a new challenge for the delivery of health system in Indonesia. Maternal health services were no exception, as the reduction in antenatal unscheduled home visits were the main issues found in maternal health service disruption during the COVID-19 pandemic. In the last few decades, Indonesia has adopted a range of health strategies to reduce maternal mortality rates. Nganjuk is one of the regencies that enforce the reduction of maternal mortality, which successfully reducing maternal mortality rates from 212 per 100.000 live births in 2010 to 57 per 100.000 live births in 2018. With the emergence of COVID-19, the health system's capacity and access are once again being shaken. **Purpose:** This research aimed to analyze the determinants of maternal death before the COVID-19 pandemic situation and during the COVID-19 pandemic. **Method:** This type of research is non-reactive research using secondary data from maternal mortality reports, Nganjuk Regional Health Office. Analysis was carried out with a chi-Square test using Statistical Package for the Social Sciences (SPSS) version 26.0. **Results:** A significant increase in maternal deaths (85.29%) was observed during the COVID-19 pandemic. Determinants of maternal death, such as the age of the mother ($p<0.00$), number of pregnancies ($p<0.00$), period of death ($p=0.02$), healthcare referral ($p=0.01$), and cause of death ($p<0.00$) showed a significant increase during COVID-19. **Conclusion:** COVID-19 pandemic contributed to the increase in maternal deaths in Nganjuk Regency. This study has implications for the priority setting in policy development and implementation at reducing maternal mortality.

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ABSTRAK

Latar Belakang: Pandemi COVID-19 telah memberikan tantangan baru bagi penyelenggaraan sistem kesehatan di Indonesia. Tidak terkecuali

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pelayanan kesehatan ibu, karena penurunan pelayanan antenatal dan kunjungan rumah yang tidak terjadwal menjadi masalah utama yang ditemukan dalam gangguan pelayanan kesehatan ibu selama pandemi COVID-19. Dalam beberapa dekade terakhir, Indonesia telah mengadopsi berbagai strategi kesehatan untuk menurunkan angka kematian ibu. Nganjuk merupakan salah satu kabupaten yang melaksanakan penurunan Angka Kematian Ibu (AKI) yang berhasil menurunkan AKI dari 212 per 100.000 kelahiran hidup pada tahun 2010 menjadi 57 per 100.000 kelahiran hidup pada tahun 2018. Dengan munculnya COVID-19, kapasitas dan akses sistem kesehatan kembali terguncang. **Tujuan:** Penelitian ini bertujuan untuk menganalisis determinan kematian ibu sebelum situasi pandemi COVID-19 dan selama situasi pandemi COVID-19. **Metode:** Jenis penelitian ini adalah penelitian non reaktif dengan menggunakan data sekunder dari laporan kematian ibu Dinas Kesehatan Kabupaten Nganjuk. Analisis dilakukan dengan uji Chi-Square menggunakan *Statistical Package for the Social Science* (SPSS) versi 26.0. **Hasil:** Peningkatan yang signifikan pada kematian ibu (85.29%) terjadi selama pandemi COVID-19. Determinan kematian ibu, seperti umur ibu ($p < 0,00$), gravid ($p < 0,00$), periode kematian ($p = 0,02$), rujukan kesehatan ($p = 0,01$) dan penyebab kematian ($p < 0,00$) menunjukkan peningkatan yang signifikan selama situasi pandemic COVID-19. **Kesimpulan:** Pandemi COVID-19 menjadi salah satu factor signifikan dalam peningkatan angka kematian ibu di Kabupaten Nganjuk. Studi ini berimplikasi pada penetapan prioritas dalam pengembangan dan implementasi kebijakan untuk menurunkan angka kematian ibu.

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INTRODUCTION

The COVID-19 pandemic has posed a new challenge for the delivery of health systems in Indonesia. The government of Indonesia was reported to be slow and late in responding to the pandemic situation (1,2). The strategy implemented was maintained to limit the transmission of COVID-19 which lead to the partial closure of health services (3). Maternal health services were no exception, as the reduction in antenatal care and an unscheduled home visit were the main issues found in maternal health services disruption during the COVID-19 pandemic (4,5). Studies have addressed the impact of COVID-19 on pregnancy and childbirth. Studies worldwide reported an increase in maternal mortality during the COVID-19 pandemic situation (6-8). In Indonesia, maternal deaths are still a challenge during the COVID-19 situation. Mobility restriction that was forced by the central government sparked fear among pregnant women to access health services due to the threat of infection (9).

One of the Sustainable Development Goals is to reduce maternal mortality rates (MMR) to 70 per 100,000 live birth (10). Indonesia is one of the countries that has been rapidly progressing to

reach this target. Despite implementing a comprehensive health strategy on safe-maternal policy measures, maternal mortality in Indonesia remains unacceptably high. MMR in Indonesia is still at 189 per 100,000 live birth (11) far from its target of 70 per 100,000 live birth in 2030 making Indonesia one of the countries with the highest maternal mortality rate in South East Asia. Identifying key determinants of maternal mortality and their relative importance is crucial to priority setting in policy development and implementation. However, only a small number of studies have covered the role of such determinants.

Indonesia has recently implemented various health strategies to reduce maternal mortality rates in recent decades. Poor quality and accessibility of healthcare facilities affect maternal mortality rate in Indonesia. Nganjuk is one of the regencies that enforce the reduction of maternal mortality with the program innovation called *Gerdaristi* which successfully reduced the maternal mortality rate from 212 per 100.000 live birth in 2010 to 57 per 100.000 live birth in 2018 (12). With the emergence of COVID-19, the capacity and access of health systems are once again being shaken. Based on this background, this research aimed to analyze maternal mortality determinants before the

COVID-19 pandemic and during the COVID-19 pandemic situation in Nganjuk Regency.

METHODS

This is non-reactive research using secondary data. Non-reactive research is also called unobtrusive research. In unobtrusive research, the subjects studied were not aware that they were part of the research so there was no reaction from the research subject (13).

The population that became the object of research were mothers who died as a result of pregnancy and childbirth from 2017 to 2022. The sampling was chosen using simple random sampling. This study used secondary data from maternal mortality reports from Nganjuk Regional Health Office that was formally requested by the researchers. The dependent variable was the maternal death status and the independent variables that were used in this study included the age of the mother, number of pregnancies, healthcare referrals, period of death, and cause of death. The age of the mother was then categorized as under 20, 20 – 35, and over 35 years old. The number of pregnancies categorize as first gestation (1), second to fourth gestation (2 – 3), and more than fourth gestation (>4). Analysis was carried out using chi – square test using Statistical Package for the Social Sciences (SPSS) version 26. The study had been approved by the Health Research Ethics Committee, Faculty of Public Health University of Jember, Number 328/KEPK/FKM-UNEJ/II/2023 on February 22nd, 2023.

RESULTS

The result from the study showed that maternal mortality during the pre-COVID-19 period showed a declining trend from 2017 to 2019 with the lowest number in 2019 under 10 maternal deaths. However, maternal death started to rise again during COVID-19 from 2020 to 2022 and reach its peak in 2021 with a total of 30 maternal deaths.

Table 1 provided the details determinants of maternal deaths. It is known that the highest maternal mortality frequency occurred during the COVID-19 period with 63 maternal deaths from 2020 to 2022, accounting for an 85.29% increase in maternal deaths. According to the age of the mother, both pre-COVID-19 and during COVID-19 the majority of maternal death happened at 20 –

35 years old for pregnancy with 22 deaths during pre-COVID-19 and 43 deaths during COVID-19, rising about 95.45% respectively. The same result occurred in the number of pregnancies, both of the majority death happened in the 2-4 pregnancies. However, it was noticed that there was an extreme escalation of maternal deaths on the first pregnancy (primigravid) during the COVID-19 compared to the pre-COVID-19 period with a 375% escalation.

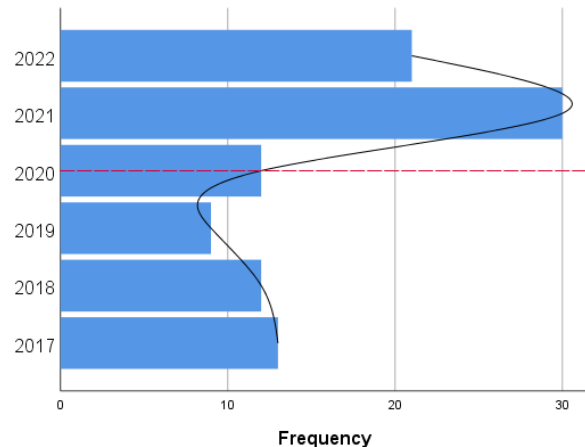


Figure 1. Maternal Mortality Trend in Nganjuk Regency from 2017 to 2022

As for the period of death, it was known that both of the majority maternal death happened in the post-partum period with 52.94% and 46.03% respectively. The majority of maternal deaths occurred in the first referral hospital both in the pre-COVID-19 and during the COVID-19 period. As for the cause of death, in the pre-COVID-19 period, the majority of deaths were due to preeclampsia or eclampsia (35.29%) while during the COVID-19 period, the others cause 34.92% of deaths. During COVID-19, infection causes of death rose by about 200% compared to the pre-COVID-19 situation. To better understand the difference between the pre-COVID-19 and during COVID-19 periods, the Chi-Square test was performed, from the test result, it was known that all of the determinants were significant (p -value < 0.05), indicating that there were significant differences in maternal mortality determinants before the COVID-19 pandemic situation and during the COVID-19 pandemic situation in Nganjuk Regency.

Table 1
Maternal Mortality Determinant Pre and During COVID-19 Occurrence

Variable	Before COVID-19		During COVID-19		Increase	P - value
	n	%	n	%	%	
Number of Maternal Death	34	100.00	63	100.00	85.29	
Mother Age						
< 20	1	2.94	1	1.59	0.00	<0.00
20 - 35	22	64.71	43	68.25	95.45	
> 35	11	32.35	19	30.16	72.73	
Number of Pregnancy						
1	4	11.76	19	30.16	375.00	<0.00
2 - 4	26	76.47	41	65.08	57.69	
> 4	4	11.76	3	4.76	-25.00	
Period of Death						
Antepartum	6	17.65	22	34.92	266.67	0.02
Intrapartum	10	29.41	12	19.05	20.00	
Postpartum	18	52.94	29	46.03	61.11	
Healthcare Referrals						
0-1	22	64.71	42	66.67	90.91	0.01
2-4	12	35.29	19	30.16	58.33	
>4	0	0.00	2	3.17	100.00	
Cause of Deaths						
Hemorrhage	9	26.47	18	28.57	100.00	<0.00
Preeclampsia / Eclampsia	12	35.29	15	23.81	25.00	
Infection	1	2.94	3	4.76	200.00	
Heart Disease	3	8.82	3	4.76	0.00	
Amniotic Embolism	3	8.82	2	3.17	-33.33	
Others	6	17.65	22	34.92	266.67	

DISCUSSION

The COVID-19 pandemic situation has had a profound on the healthcare system including maternal and infant health services. A systematic review showed that the COVID-19 pandemic had strong evidence of increased maternal mortality and stillbirth (8,14). The result of this study is in line with the finding in Nganjuk Regency, the number of maternal deaths during the COVID-19 pandemic was almost twice compared to the pre-COVID-19 pandemic period. This finding suggests that the outcome of maternal deaths might be driven mainly by the inequality and shortage of healthcare during the COVID-19 pandemic situation (6,8,14).

UNICEF reported that there was a disruption in health services related to maternal healthcare delivery including antenatal care (ANC), vitamin A distribution, and home visits. A significant

reduction in ANC and an increase in maternal mortality were reported in Indonesia from 2019 to 2021 (15). Several studies in India, China, and Italy of the intrapartum and postpartum periods considered clinically relevant anxiety and depression that the pandemic COVID-19 impacted maternal mental health (16). COVID-19 is one of the causes of the poor health condition of mothers (17) due to a lack of access to health services and also mental health disorders due to excessive stress.

Maternal age is one of the maternal mortality predictors. According to WHO, the risk of maternal death is highest in women under 15 years old and the pregnancy complication mostly occurred in a woman aged 10 years old to 19 years old compared to women aged 20 years old to 24 years old (18). While the previous study showed that pregnancy in an older woman has a higher risk of severe, life-threatening complications that could

cause deaths (19,20) However, this study found that in both periods the majority of maternal deaths occurred at the 20 to 35 years old. This is because the number of pregnancies at a specific age was unknown, therefore the prevalence of death according to age cannot be compared. The highest number of maternal deaths might account for the highest number of pregnancies in an ideal-aged woman from 20 to 35 years old. Technology and educational improvement have made the majority of women have better knowledge about safe gestational ages that the number of pregnancies at a younger and older age is decreased compared to ten years ago.

Globally most maternal deaths occur during the postpartum period. In the first week postpartum, severe bleeding, high blood pressure, and infection are the most common contributors to maternal deaths (21). The study reported that the majority of postpartum maternal mortality occurred in low – middle-income countries (22). Potential cause of maternal deaths during the postpartum period was postpartum hemorrhage, embolism, and postpartum eclampsia. Another study has reported that hemorrhage was the main cause of maternal deaths (23). The finding of this study was slightly different from the previous study. However, hemorrhage remains one of the biggest contributors to maternal deaths. This study reported that in pre COVID-19 period, the main cause of maternal deaths was preeclampsia and eclampsia while during COVID-19 the main cause was due to other reasons such as hypertension, obesity, complication, and comorbidity.

Several studies done in Indonesia reported that there was an association between the number of pregnancy status with antepartum hemorrhage and preeclampsia in mothers (24). Preeclampsia and eclampsia remain the accountable maternal death worldwide (25,26). The study done in Surabaya, Indonesia reported that severe preeclampsia patients have a high prevalence of mortality and morbidities that affect maternal outcomes. It also suggests that all patients with severe preeclampsia need to receive intensive maternal and fetal care (25). During COVID-19, the Indonesian health system was facing huge disruption in delivering essential healthcare resulting in prolonged emergency, shortage of medical workers availability, bed capacity, supply, and referral system failure was the main cause of the collapse of health system delivery (3).

The modeling study has reported that disruption in essential health services threatens

progress in the achievement of health targets. Significant increases in maternal and newborn deaths and stillbirths were predicted to occur in India, Indonesia, Nigeria, and Pakistan (27). The referral system in Indonesia has been inadequate even before the COVID-19 pandemic situation due to the shortage of specialist and facility equipment as well as low-level coordination (3,28,29). The referral system failure was also related to the three-delay model that contributes to maternal deaths (30). The first is a delay in seeking assistance, including the ability to recognize the emergency, the second delay occurs after the decision to be referred was made, is identifying and accessing the medical center, including geographic and transportation difficulties followed by the third delay, having prompt treatment. During the pandemic situation, primary health services also experienced closure due to the spreading of COVID-19 among healthcare workers adding complications to maternal care. Due to the shortage of specialists and medical equipment, secondary or tertiary hospital takes longer time to decide on emergency referrals. The condition will contribute to the delay of mothers having necessary treatment creating a greater risk of maternal deaths.

CONCLUSION

The COVID-19 pandemic contributed to the increase in maternal deaths in Nganjuk Regency. The results of the study show that all death determinants were significantly different between Pre- and During- COVID-19. While first pregnancy (primigravida) status, antepartum period of death, infection, and other cause of death indicate the highest percentage increase among their determinants categories. This study has implications for the priority setting in policy development and implementation at reducing maternal mortality.

CONFLICT OF INTEREST

There is no competing interest declared by the authors.

AUTHOR CONTRIBUTIONS

MJAY: Conceptualization, Methodology. DIP: Data curation, Analysis, Writing- Original draft preparation, Visualization, NAF: Writing- Reviewing and Editing.

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