

Spatial Analysis of Maternal Mortality Ratio (MMR) with Midwife Ratio, K1, and K4 Coverage in Bogor Regency, Tangerang City, and South Tangerang City in 2020

Putri Rizky Maritza¹ and Agushybana Farid^{1*}

¹Department of Biostatistics and Demography, Faculty of Public Health, Diponegoro University, Semarang, Indonesia

Abstract: Maternal mortality is impacted by several factors, including how women manage their health, especially regarding healthcare providers nearby, such as midwives, and prenatal care visits to medical institutions.

This study analyzed the Maternal Mortality Ratio (MMR), midwives ratio, and K1 and K4 coverage in Bogor Regency, Tangerang City, and South Tangerang City in 2020. This research employed a descriptive quantitative study method using secondary data from the Health Profiles of Bogor Regency, Tangerang City, and South Tangerang City in 2020, as well as the Central Bureau of Statistics. The findings revealed areas with a high midwife ratio but still high MMR, as well as areas with a low midwife ratio and low MMR. Additionally, the study found that higher K4 coverage is associated with lower MMR incidence. It can be concluded that midwife competence plays a crucial role in reducing MMR; the higher the competence, the greater the reduction in MMR. Furthermore, antenatal services contribute to reducing maternal mortality through early detection. The government is encouraged to increase the number of midwives in each region and ensure equitable distribution. Educating pregnant women about the importance of K1 and K4 visits, as well as active participation from various stakeholders, is also essential.

1 Introduction

Health development is an effort carried out by all components of the Indonesian nation with the aim of raising awareness, willingness, and ability to live healthily for every individual so that the highest possible degree of public health can be achieved. This, in turn, can become an investment for the development of productive human resources, both socially and economically [1]. Health development encompasses several indicators, including child health, maternal health, infectious diseases, non-communicable diseases, reproductive health,

* Corresponding author: farid_agushybana@lecturer.undip.ac.id

and nutritional status. Among these, maternal health remains a critical issue that continues to be addressed globally.

The Maternal Mortality Rate (MMR) is one of the unresolved problems within the context of health issues under SDG Goal number three, which aims to ensure healthy lives and promote well-being for all at all ages. Globally, the target for MMR according to the SDGs is 70 deaths per 100,000 live births. However, in 2020, the WHO recorded that global MMR reached 295 per 100,000 live births, with various causes [2]. Based on this data, Indonesia has the highest MMR in Southeast Asia and is still far from reaching the global SDG target to reduce MMR to 183 per 100,000 live births by 2024 and less than 70 per 100,000 live births by 2030. To meet these targets, maternal deaths need to decrease by at least 55% per year [3].

The persistence of high maternal mortality rates, without significant decline, is certainly due to several causes, such as direct obstetric causes, including hemorrhage, sepsis, unsafe abortion, preeclampsia-eclampsia, and obstructed labor. Additionally, some diseases can worsen due to pregnancy. These causes are undoubtedly related to how mothers maintain their health, especially in relation to the healthcare providers around where pregnant women live and their visits to healthcare facilities during pregnancy [4].

To reduce the Maternal Mortality Rate (MMR), it is necessary to ensure that every mother has access to maternal health services, including deliveries assisted by health workers [5]. Health workers who assist in childbirth include midwives. Midwives are healthcare professionals often assigned to remote areas. However, the policy of placing midwives in these areas is not sufficient to support efforts to reduce maternal mortality [6]. Moreover, the distribution of midwives in urban areas is still uneven. In addition to their uneven numbers, midwives, as the first health professionals to directly interact with pregnant women, must be competent. If midwives are competent in carrying out their duties, MMR due to childbirth can be reduced [7].is

Antenatal Care (ANC) is a program that involves examinations, education, and treatment for pregnant women aimed at protecting maternal health during pregnancy, childbirth, as well as ensuring safe and satisfactory childbirth. Moreover, ANC monitors risks during pregnancy, plans, and manages high-risk pregnancies, and reduces morbidity and mortality for both the mother and perinatal child [8].

Antenatal visits refer to the number of pregnant women receiving antenatal services (K4) according to standards in a particular area within a certain period. Standard antenatal care (K4) refers to pregnant women who receive antenatal services four times during the pregnancy period: once in the first trimester, once in the second trimester, and twice in the third trimester [9]. According to the 2020-2024 National Medium-Term Development Plan (RPJMN) on Family Health, the target for antenatal visit coverage is set at 80% in 2020 [1]. In 2020, antenatal visit coverage reached 88.13%, an increase from previous years.

As the capital of Indonesia, Jakarta is surrounded by several supporting cities commonly known as Jabodetabek, which include Bogor Regency, Tangerang City, and South Tangerang City.

Bogor Regency, Tangerang City, and South Tangerang City are regions with their own challenges concerning MMR, midwife ratio, and delivery coverage by health workers. According to data from the South Tangerang City Health Office, the MMR in this city reached 32 deaths per 100,000 live births in 2020 [10]. The Tangerang City Health Office reported an MMR of 13 per 100,000 live births in the same year [11]. Meanwhile, the Bogor Regency Health Office stated that in 2019, the MMR in the regency reached 72 deaths per 100,000 live births [12].

The unmet targets for the MMR and midwife ratio remain issues that need to be addressed to improve maternal health. Furthermore, antenatal coverage is still suboptimal. Therefore,

the researchers are motivated to analyze the Maternal Mortality Rate (MMR), midwife ratio, K1 and K4 coverage in Bogor Regency, Tangerang City, and South Tangerang City in 2020.

2 Methods

This study is a quantitative research project with a descriptive approach, utilizing secondary data from the 2020 Health Profiles of Bogor Regency, Tangerang City, and South Tangerang City, as well as data from the respective regional Central Bureau of Statistics. The study covers 40 sub-districts in Bogor Regency, 13 sub-districts in Tangerang City, and 7 sub-districts in South Tangerang City. The maternal mortality ratio is calculated as follows:

The maternal mortality ratio in Tangerang is classified as low (<70), medium (≤ 183), and high (>183) per 100,000 live births. The independent variables in this study are the midwife ratio and K1 and K4 coverage, while the dependent variable is the Maternal Mortality Rate (MMR). The midwife ratio is calculated from the number of midwives in a sub-district divided by 100,000 inhabitants [13]. The relationship between the dependent and independent variables will be analyzed using a scatter plot. Further analysis will be conducted using Tableau and QGIS software.

3 Results

In 2020, Bogor Regency had a population of approximately 5.43 million people. Access to healthcare services was still a challenge, particularly in rural and remote areas, although efforts were made to improve healthcare infrastructure to cater to the large population. Tangerang City recorded a population of 2.2 million people, characterized by high urbanization and relatively good healthcare facilities, though challenges related to pollution and environmental health persisted. Meanwhile, South Tangerang had a population of about 1.37 million people, experiencing rapid growth and increasing demand for healthcare services, especially concerning non-communicable diseases [10, 11,12].

3.1 Midwife Ratio and MMR per Sub-district

The Maternal Mortality Ratio (**MMR**) is the number of maternal deaths during pregnancy, childbirth, and the postpartum period caused by complications related to pregnancy, childbirth, and postpartum issues, but not due to other reasons such as accidents or falls, per 100,000 live births [1]. Out of 60 sub-districts in Bogor Regency, Tangerang City, and South Tangerang City, 17 sub-districts recorded no **maternal mortality**. Meanwhile, the highest MMR occurred in Sukajaya Sub-district, with 365 deaths per 100,000 live births [1].

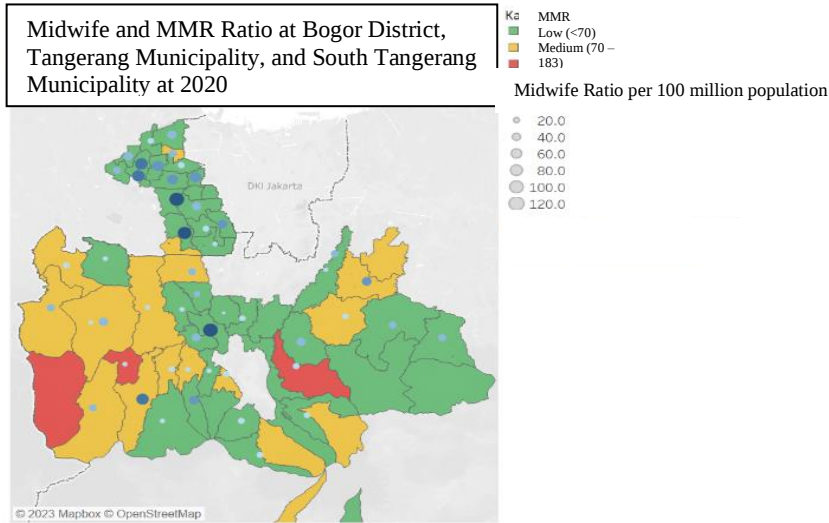


Fig. 1. Midwife Ratio and Maternal Mortality Ratio (MMR) per Sub-district in 2020

Out of 60 sub-districts in Bogor Regency, Tangerang City, and South Tangerang City, 17 sub-districts recorded no MMR at all. Meanwhile, the highest MMR occurred in Sukajaya Sub-district, with 365 deaths per 100,000 live births [1]. The midwife ratio is the number of midwives in a sub-district per 100,000 inhabitants. The lowest ratio is in Tajurhalang Sub-district, with 6 midwives per 100,000 inhabitants, and the highest is in Serpong Sub-district, with 116 midwives per 100,000 inhabitants. According to Ministry of Health Regulation No. 81 of 2004 on Guidelines for Human Resources Planning in Health at Provincial, Regency/City, and Hospital Levels, the expected availability of midwives in 2019 was 75 midwives per 100,000 inhabitants. However, out of 60 sub-districts, only 8 sub-districts met this strategic target: North Serpong, Serpong, Karawaci, Cibodas, Leuwiliang, Ciawi, Kemang, and Sukajaya. Based on mapping, the higher the midwife ratio in an area, the lower the MMR in that area. The study indicates that a meaningful reduction in maternal mortality can occur when health workers, particularly midwives, possess competent skills [13].

3.2 MMR with K1 Coverage

Based on scatter plot analysis, the relationship between the Maternal Mortality Rate (MMR) and K1 coverage in Bogor Regency, Tangerang City, and South Tangerang City in 2020 shows an upward trend. This suggests that the higher the K1 coverage in the area, the higher the MMR. However, the strength of this relationship is weak as the correlation is still unclear.

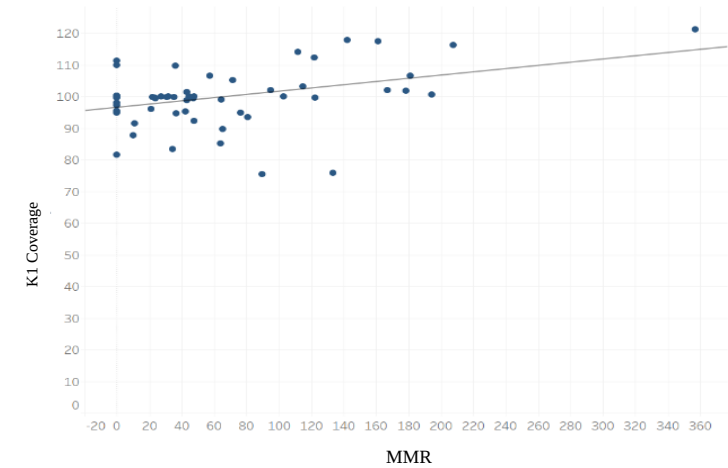


Fig. 2. Scatter Plot of MMR with K1 Coverage in 2020

3.3 MMR with K4 Coverage

Based on scatter plot analysis, the relationship between the Maternal Mortality Rate (MMR) and K4 coverage in Bogor Regency, Tangerang City, and South Tangerang City in 2020 shows a downward trend. This indicates that the higher the K4 coverage in the area, the lower the MMR. However, the relationship between these two variables is weak, as the correlation remains unclear.

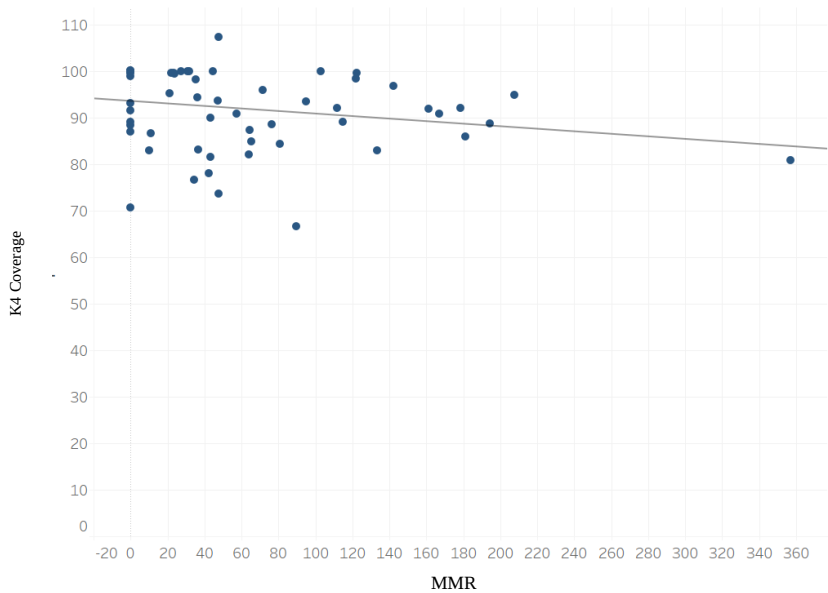


Fig. 3. Scatter Plot of MMR with K4 Coverage in 2020

4 Discussion

4.1 Midwife Ratio and MMR per Sub-district

The study found that a high midwife ratio could reduce the Maternal Mortality Rate (MMR) in an area. This reduction becomes significant when health workers with expertise in midwifery possess adequate skills. Midwives are expected to educate pregnant women about maintaining health during and after pregnancy and recommend safe deliveries assisted by health workers. If birth attendants have good competence, maternal mortality can be reduced by 13-33% [14].

4.2 MMR with K1 and K4 Coverage

The results of this study show that the higher the K4 coverage in an area, the lower the Maternal Mortality Rate (MMR). This is consistent with previous research stating that antenatal services have an additional impact on reducing maternal mortality. Antenatal services that meet targets can increase early detection of pregnancy and childbirth complications, thereby reducing maternal mortality risk [15].

However, another study mentioned that antenatal services have only limited impact on reducing Maternal Mortality Rate (MMR) because most of the main causes of maternal death remain undetected in the preclinical stage. This statement supports the findings of this study, where the relationship between the two variables is still weak [16].

Overall, K1 and K4 coverage has met the national target of 80%. However, some sub-districts have not yet reached the target and even experienced a significant drop from K1 to K4 coverage. The decline in this rate, especially in K4 coverage, is due to a larger target compared to the actual number of pregnant women in the field, the mobilization of pregnant women out of the area, and the still low awareness among pregnant women to regularly check their pregnancies [17].

5 Conclusion

Based on the above findings, it can be concluded that the midwife ratio affects the Maternal Mortality Rate (MMR). When healthcare workers possess expertise in midwifery and demonstrate strong competence, maternal deaths can be reduced.

Additionally, higher coverage of antenatal services, especially K4, can further decrease maternal mortality rates. This is because antenatal services have an additional impact on reducing maternal mortality through early detection of pregnancy and childbirth complications.

Therefore, the governments of Bogor Regency, Tangerang City, and South Tangerang City are encouraged to increase the number of midwives in each region, ensure equitable distribution, and enhance midwives' competencies. Furthermore, midwives should educate pregnant women on the importance of K1 and K4 visits, and active participation from various stakeholders in each regency and city is essential to motivate pregnant women to seek health services.

References

1. Kemenkes RI, Rencana Strategis Kementerian Kesehatan Tahun 2020-2024 (Kementerian Kesehatan RI, 2020), p. 1–55.
2. S. Khoirunnisa & E. S. Futriani, Pengaruh Pendidikan Kesehatan Masa Nifas Terhadap Pengetahuan Ibu Tentang Kemampuan Perawatan Mandiri Ibu Nifas Tahun 2022. *Jurnal Pendidikan dan Konseling* **4**, 1701–1706 (2022).
3. Dinas Kesehatan Kabupaten Bojonegoro, Pertemuan Upaya Penurunan Angka Kematian Ibu (AKI) dan Pertemuan Angka Kematian Bayi (AKB), (Pemerintah Kabupaten Bojonegoro, 2020) [cited 2023 Nov 20], available from: <https://dinkes.bojonegorokab.go.id/berita/baca/49>.
4. M. T. Chalid, Upaya Menurunkan Angka Kematian Ibu: Peran Petugas Kesehatan, (PT. Gakken Heal. Educ. Indonesia, 2016), p. 1–8.
5. Kemenkes RI, Situasi Bidan di Indonesia (Kementerian Kesehatan RI, 2014) [cited 2023 Nov 21], available from: <https://www.depkes.go.id/resources/download/pusdatin/infodatin/infodatin-bidan.pdf>.
6. R. Yuningsih, Pengembangan Kebijakan Profesi Bidan dalam Upaya Meningkatkan Pelayanan Kesehatan Ibu dan Anak. *Aspirasi: Jurnal Masalah-Masalah Sosial* **7**, 63–76 (2016).
7. A. Amelia, Pengaruh Kompetensi Terhadap Kinerja Bidan Di Puskesmas Mampu Poned Kota Bandung. *Scientica* **3**, 56–65 (2016).
8. F. Fitrayeni, S. Suryati, & R. M. Faranti, Penyebab rendahnya kelengkapan kunjungan antenatal care ibu hamil di wilayah kerja puskesmas pegambiran. *Jurnal Kesehatan Masyarakat Andalas* **10**, 101–107 (2017).
9. Direktorat Kesehatan Keluarga, Laporan Kinerja Direktorat Kesehatan Keluarga Tahun Anggaran 2021 (2021).
10. Dinkes Kota Tangerang Selatan, Profil Kesehatan 2020 (Kota Tangerang Selatan, 2021).
11. Dinkes Kota Tangerang, Profil Kesehatan Daerah Kota Tangerang (Kota Tangerang, 2021).
12. Dinkes Kabupaten Bogor, Buku Profil Informasi Kesehatan 2019 (Kabupaten Bogor, 2020).
13. N. Nurjannah, I. Maria, R. Rildayani, & E. Sari, Analisis Spasial Angka Kematian Ibu (AKI) dengan Rasio Bidan serta Cakupan Persalinan oleh Tenaga Kesehatan Di Provinsi Aceh Tahun 2017. *Jurnal Kedokteran Nanggroe Medika* **1**, 7–14 (2018).
14. W. J. Graham, J. S. Bell, & C. H. Bullough, Can Skilled Attendance at Delivery Reduce Maternal Mortality in Developing Countries? Safe motherhood strategies: a review of the evidence (2001), p. 97–129.
15. Y. Berhan & A. Berhan, Antenatal Care as a Means of Increasing Birth in the Health Facility and Reducing Maternal Mortality: A Systematic Review. *Ethiop. J. Health Sci.* **24**, 93 (2014).
16. K. Oyerinde, Can Antenatal Care Result in Significant Maternal Mortality Reduction in Developing Countries? *J. Community Med. Health Educ.* **3**, 1 (2013).
17. D. Z. Idami, A. Agustina, & G. Amin, Faktor-faktor yang berhubungan dengan Kunjungan Pemeriksaan Kehamilan K4 di Wilayah Kerja Puskesmas Kecamatan

Singkil Kabupaten Aceh Singkil Tahun 2021. *Journal of Health and Medical Science* **1**, 1–13 (2022).