Determinants Of Maternal Death Rate In Lamongan District, East Java Province, Indonesia

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Abstract: Maternal mortality is still a hot issue worldwide and in Indonesia. Maternal Mortality Rate (MMR) is an indicator of public health status where according to WHO the causes of MMR are largely preventable. Pregnancy complications are the highest cause of MMR. The purpose of the study was to determine what determinants were associated with maternal mortality in Lamongan Regency from 2020 to 2022. This study used an analytical descriptive method with a cross-sectional approach. The data used was secondary data from the Lamongan Regency Health Profile in 2020, 2021 and 2022. The instrument used an observation sheet. Data were analyzed using bivariate and univariate analysis. There was an upward trend in MMR in Lamongan Regency from 2020 to 2021 and then experienced a sharp decline in 2022. Maternal age did not have a significant relationship as an indirect cause of MMR, but maternal age correlated with the incidence of bleeding as a direct cause of maternal death. The age determinants of maternal mortality were more than half in the healthy reproductive age range of 20-34 years at 57.7%. The direct causes of maternal mortality were not significantly associated with MMR. The cause of MMR was almost partly due to other causes at 42.2%. Almost half of obstetric complications in Lamongan Regency in 2022 were anemia at 39.6%. The direct causes of maternal mortality were not significantly associated with MMR in Lamongan Regency. MMR can be reduced through efforts to detect early pregnancy complications and improve maternal health services. Efforts to prevent pregnancy complications can be made with good self-care during pregnancy and supported by the environment. Therefore, health promotion efforts should begin before pregnancy so that the results are more optimal.

Keywords: MMR, Determinants, Complications of pregnancy.

INTRODUCTION

Maternal mortality is still a hot issue worldwide and in Indonesia. Maternal Mortality Rate (MMR) is an indicator of public health status, which according to the World Health Organization (WHO) is largely preventable. Approximately 830 women die from complications of pregnancy or childbirth worldwide every day. In Nigeria, maternal mortality accounts for 32% of all deaths among women aged 15-49 years. For one, pregnancy complications in 2012 caused the deaths of more than 52,000 women (Arisukwu *et al*., 2021). It is estimated that in 2015, about 303,000 maternal deaths, and in 2020, 287,000 mothers died during and after pregnancy and childbirth. Georgia, one of the US states, has a maternal mortality rate almost twice that of the US, which is attributed to inequalities in the health care received by non-Hispanic black women, resulting in increased complications (Hernandez *et al*., 2023). Between 2000 and 2020, eight countries recorded significant increases in MMR: Venezuela (182.8%), Cyprus (107%), Greece (101.1%), the United States (77.9%), Mauritius (62.1%), Puerto Rico (55.9%), Belize (51.3%), and the Dominican Republic (36.0%) (Khalil *et al*., 2023). The high rate of maternal mortality is a worldwide

concern, with low-income countries accounting for the highest incidence. Meanwhile, the global Sustainable Development Goals (SDGs) target number 3 explains that by 2030, reducing the maternal mortality ratio to less than 70 per 100,000 live births (Bappenas, 2020).

In Indonesia, the Indonesian Ministry of Health noted that the maternal mortality rate in 2022 was around 183 per 100,000 births. This implies that the Government of Indonesia needs to work hard to reduce this number according to the SDGs target. Meanwhile, in Lamongan in 2021 the number of maternal deaths handled by health workers based on reports from Puskesmas received by the Family Health Section of the Lamongan District Health Office was 23 people consisting of 12 pregnant women, 1 delivery mother and 10 postpartum mothers with a MMR of 148 per 100,000 births. The high MMR was due to the fact that pregnant women did not routinely see a health worker during pregnancy, which prevented them from early screening for pregnancy complications. One study in Lampung stated that maternal health conditions and pregnancy complications contribute to maternal mortality (Sari et al., 2024). This is a challenge for health workers to reduce MMR in Lamongan (Dinas Kesehatan Lamongan, 2022).

Direct causes of maternal deaths are a result of complications of pregnancy, labor, or the puerperium, and any interventions or inappropriate treatment of these complications. Meanwhile, indirect maternal deaths are the result of pre-existing diseases or diseases that arise during pregnancy that affect pregnancy. The direct causes of maternal mortality in Indonesia are dominated by postpartum hemorrhage, hypertension/eclampsia, and infection. The indirect cause of maternal death is the number of cases of 3 too late and 4 too (Direktorat Gizi dan Kesehatan Ibu dan Anak, Kementrian Kesehatan Republik Indonesia, 2023). In line with the results of another study that analyzed the status of mothers too young, too old, too many, and too close (4T) with maternal mortality, the results of mothers with too old were likely to cause maternal death with RR = 0.443. Mothers with too many children have a risk of dying with RR = 3.153. Mothers with children born too close together have a risk of dying with RR = 1.05 so it is necessary to prevent pregnancy in at-risk mothers with family planning programs (Tri Wahyuni & Puspitasari, 2021).

Other preventive measures taken by the government to improve maternal health status include increasing the coverage of pregnancy visits (K1, K4, and K6), the Childbirth Planning and Complication Prevention Program (P4K), and the provision of blood supplement tablets in pregnancy services, delivery at health care facilities for mothers in labor and coverage of postpartum services, namely postpartum visits (KF1 and complete KF). These programs have been well implemented in the Lamongan district but there are still maternal deaths. In addition, internet-based health services (Telehealth) are currently also a health promotion medium used by the community when Covid-19 is rampant, it is proven that Telehealth

increases antenatal care visits, compliance, knowledge, and readiness to give birth (Haryanti et al., 2023) but in Lamongan it still does not exist. This study aims to determine what determinants are associated with MMR in Lamongan Regency in the last 3 years.

METHOD

This study used a descriptive-analytic method with a cross-sectional approach to assess what determinants were associated with maternal mortality in Lamongan Regency in the last 3 years. The data used was secondary data from the Family Health Section of the Lamongan District Health Office in the Lamongan District Health Profile in 2020, 2021, and 2022. The instrument used an observation sheet. Data were analyzed using bivariate and univariate analysis.

RESULT

In the 3 years period from 2020 to 2022, 45 mothers died due to pregnancy, childbirth, and postpartum in Lamongan Regency. In 2020 there were 14 maternal deaths (31.1%), in 2021 it increased to 23 maternal deaths (51.1%) while in 2022 it decreased to 8 maternal deaths (17.8%) (Figure 1).

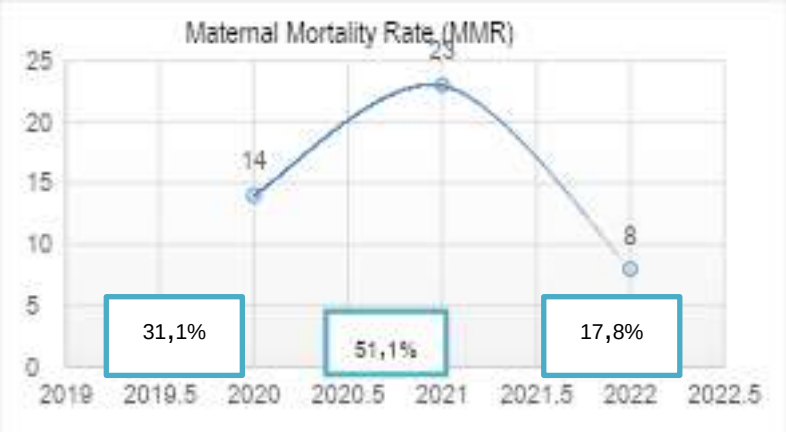

Figure 1. Trend Chart Of Maternal Mortality Rate From 2020 to 2022 In Lamongan District, East Java, Indonesia
Source: Secondary Data of Lamongan Health Profile Year 2020-2022

Table 1. Univariate Analysis Results

Variable	Category	N	%
MMR (Maternal Mortality Rate)	Before labor	21	46,7
	After labor	24	53,3
Indirect causes of MMR:			
Mother's age	Non-risk	26	57,7
	Risk	19	42,2
Direct causes of MMR:			
Hemorrhage	Yes	8	17,8
	No	37	82,2
Hypertension/preeclampsia	Yes	13	28,9
	No	32	71,1
Infection	Yes	2	4,4
	No	43	95,6
Circulatory/cardiovascular disease	Yes	3	6,7
	No	42	93,3
Others	Yes	19	42,2
	No	26	57,8

Source: Secondary Data of Lamongan Health Profile Year 2020-2022

Table 1 shows that more than half of maternal deaths occurred after childbirth, namely the postpartum period at 53.3%. From 2020 to 2022, the age group of mothers who died was more than partly in the healthy reproductive age, namely between 20-34 years by 57.7%. The direct cause of maternal death was almost partly due to other causes at 42.2%, hypertension/preeclampsia at 28.9%, hemorrhage at 17.8%, circulatory disease at 6.7%, and infection at 4.4%.

Table 2. Bivariate Analysis Results

Variables	p-value	OR (95% CI)	Description
Indirect causes of MMR:			
Mother's age	0,493	0,660	No Correlation
Direct causes of MMR:			
Hemorrhage	0,567	1,579	No Correlation
Hypertension/preeclampsia	0,053	0,267	No Correlation
Infection	0,176	0,512	No Correlation
Circulatory/cardiovascular disease	0,632	1,818	No Correlation
Others	0,600	1,375	No Correlation
Other variables :			
Mother's age and hemorrhage	0,004	14,583	Correlation

Table 2, the results of the recapitulation of bivariate analysis between MMR and direct and indirect causes all have no significant relationship as evidenced by p-value > 0.05 so Ho is accepted. However, maternal age was correlated with the occurrence of hemorrhage which is a direct cause of maternal mortality in Lamongan Regency with a p-value of 0.004 < 0.05 so Ho is rejected. The OR (Odd

Ratio) of 14.583 indicates that high-risk age mothers increased the occurrence of bleeding by 14.583 times compared to mothers who were not high-risk age. In line with the results of other studies, there is a significant relationship between high-risk age and postpartum hemorrhage with a p-value of 0.000 (Ratnaningtyas & Indrawati, 2023). Complications with the highest chance occur in women aged 11-18 years, compared to women aged 25-29 years, increasing the incidence of preterm birth, chorioamnionitis, endometritis, and mild preeclampsia (Cavazos-Rehg *et al*., 2015). Besides bleeding, high-risk age also affects other pregnancy complications.

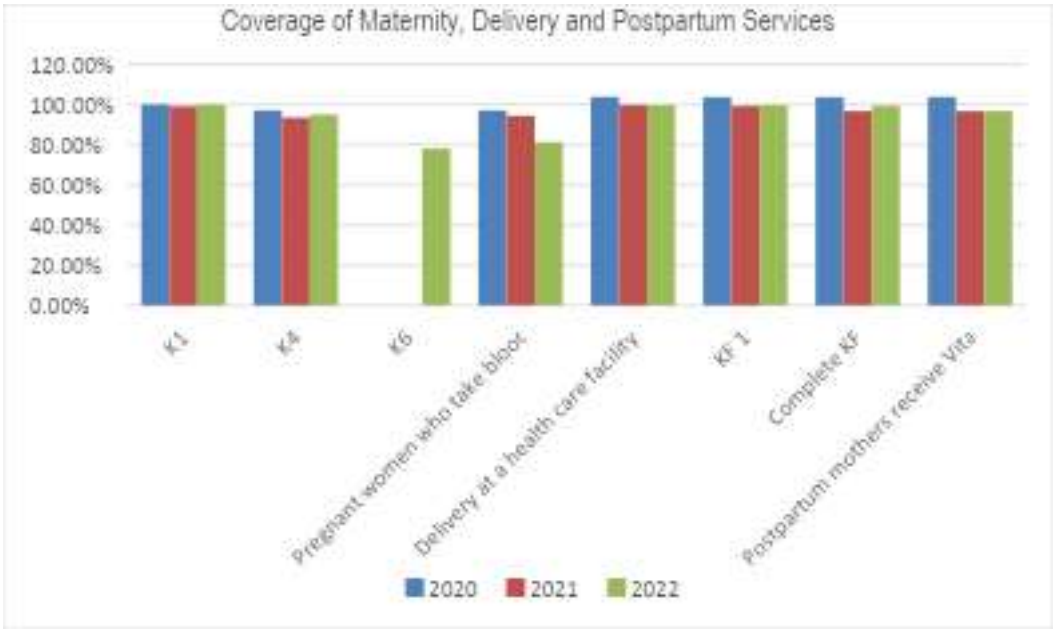

Figure 2. Coverage of Maternity, Delivery, and Postpartum Services from 2020 to 2022 in Lamongan District, East Java Indonesia
Source: Secondary Data of Lamongan Health Profile Year 2020-2022

Figure 2, in 2020 the coverage of services for pregnant women, maternity, and postpartum mostly exceeded the target. In 2021, there was a decrease in the percentage of coverage from last year but it was still above 90% with the number of MMR increasing sharply this year. In 2022, it increased again, but there were several indicators that decreased below 90%, namely first, the coverage of pregnant women who consumed Blood Supplement Tablets was 81.30%. Second, the coverage of childbirth in healthcare facilities decreased to 99.60%. Similarly, the coverage of complete postpartum visits (KF complete) decreased to 99.30%. This year there is additional data on the coverage of Antenatal Care (ANC) visits 6 times (K6) in accordance with the Word Health Organization (WHO) standards which reached 78.10%.

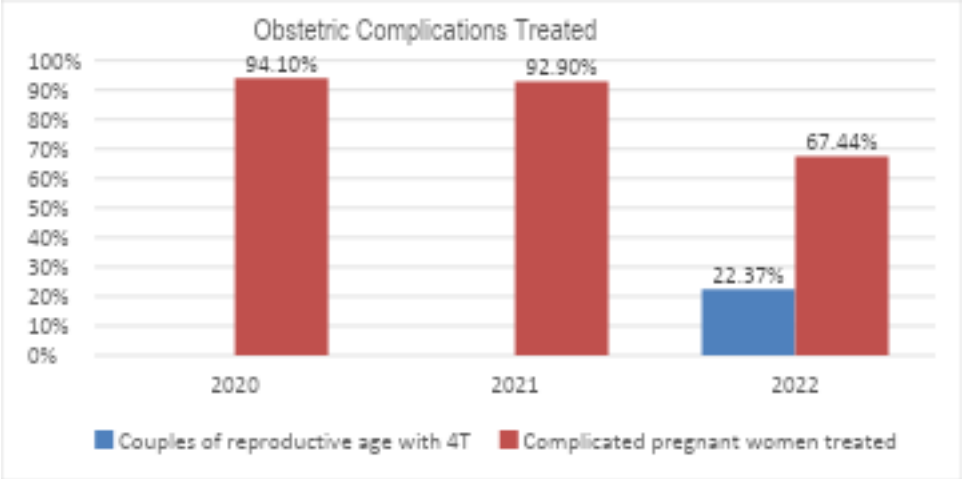

Figure 3: Obstetric Complications Treated by Health Workers from 2020 to 2022 in Lamongan District, East Java Indonesia
Source: Secondary Data of Lamongan Health Profile Year 2020-2022

Figure 3, describes the complications experienced by pregnant, delivery, and postpartum women from 2020 to 2022 that were treated by health workers in Lamongan Regency with the highest percentage in 2020 at 94.10% and the lowest in 2022 at 67.44%. In the same year there is also an indicator of pregnancy risk in pregnant women, the addition of data on Fertile Age Couples who experience the condition of 4 Too (4T) namely too young, too old, too close, and too much by 22.37% of the number of Fertile Age Couples in Lamongan District.

Table 3. Frequency Distribution of Types of Obstetric Complications in 2022

Types of complications	N	%
Chronic Energy Deficiency	1.660	17
Anemia	3.870	39,6
Bleeding	89	1
Infection	267	2,7
Preeclampsia/ Eclampsia	434	4,4
DM	15	0,2
Other causes	3.436	35,1

Source: Secondary Data of Lamongan Health Profile Year 2022

Table 3 shows that the most obstetric complications in Lamongan Regency in 2022 were anemia at 39.6% and a small proportion had diabetes mellitus at 0.2%. There are also other types of complications, namely, Chronic Energy Deficiency 17%, preeclampsia/eclampsia 4.4%, infection 2.7%, and bleeding 1%.

DISCUSSION

Maternal mortality rate (MMR) is an important indicator of the quality of maternal and child health services. MMR is the number of women who die in a given year with causes of death related to pregnancy disorders or their management (excluding accidents or incidental cases) during pregnancy, childbirth, and

the postpartum period (42 days after delivery) without taking into account the length of pregnancy per 100,000 live births (Dinas Kesehatan Lamongan, 2022).

The trend of MMR in Lamongan Regency from 2020 to 2021 has increased (Figure 1), but in 2022 it has decreased significantly. In 2021, the MMR increased, the same year there was a spike in Covid-19 cases, which had an impact on antenatal care (ANC) visits in Lamongan Regency. The fear factor of visiting a doctor or public health service triggers stress during pregnancy (Ahmed *et al.*, 2022) so that visits decrease. The Covid-19 pandemic has greatly affected the mental health of vulnerable groups of pregnant women (Khamees *et al*., 2021). However, there are no reports of the use of Telehealth to replace ANC visits in Lamongan District. ANC is important to monitor the well-being of the fetus, clear evidence that a reduced number of antenatal visits results in an increase in perinatal mortality (RR 1.14 95% CI 1.00 to 1.31, 5 RCTs, 56.431 women) (Ota *et al*., 2020). The Lamongan District Government responded quickly so that in 2022 the MMR fell sharply, by increasing access to maternal and child health services by fulfilling the facilities and infrastructure of Puskesmas Doctors with basic BLUSG training (Blended Learning USG) (Dinas Kesehatan Lamongan, 2022) as a means of screening for pregnancy complications. In addition, services for pregnant women such as K1, K4, and K6 were also improved, as evidenced in Figure 2, the achievements exceeded the target.

Many factors that can influence maternal mortality can be divided into direct and indirect causes. Based on Table 1, the results of univariate analysis, maternal deaths in Lamongan Regency more than partially occurred in the postpartum period (53.3%), some of which were at a healthy reproductive age, namely between 20-34 years by 57.7%. The age of pregnant women who came to the emergency room in India had an average age of 26.85 years with obstetric causes accounting for 53.2% of emergency room visits, while non-obstetric causes accounted for 43.2%. More than a third (39.7%) required hospital admission (Ankita et al., 2020). This indicates that a healthy reproductive age also has a risk of maternal death. Table 2, the results of the bivariate analysis show that there is no relationship between maternal age as an indirect cause of MMR. However, there is a relationship between maternal age and the incidence of bleeding where according to research (Ratnaningtyas & Indrawati, 2023) age is one of the factors that has a significant relationship with the incidence of high-risk pregnancies. The outcome of pregnancy at a high-risk age ≥ 35 years may have a negative impact on women's health as they age due to changes from the pregnancy itself and an increased risk of pregnancy-related complications (Correa-De-Araujo & Yoon, 2021). Pregnancy complications include ectopic pregnancy, spontaneous

abortion, fetal chromosomal abnormalities, congenital abnormalities, placenta previa and placental abruption, gestational diabetes, preeclampsia, and cesarean delivery. Maternal age is also a dominant factor associated with labor complications (Astutik et al., 2018).

The direct causes of maternal deaths were almost entirely due to other causes at 42.2%, hypertension/preeclampsia at 28.9%, hemorrhage at 17.8%, circulatory diseases at 6.7%, and infections at 4.4%. In the United States, the causes of maternal deaths are caused by crime and violence against mothers during pregnancy and postpartum, which stem from socioeconomic levels (Wallace et al., 2020). The causes of maternal mortality according to sociodemographic factors in South Africa are age, province, place of death, occupation, education, and marital status. MMR increases with age (Bomela, 2020). In contrast to the results of this study, in a study on Factors Associated with Maternal Mortality during Pregnancy, Childbirth, and Puerperium, it was stated that the direct cause of bleeding (p-value = 0.0002) had a relationship with maternal mortality. Indirect causes include ANC history (p value=0.002) and disease history (p value=0.037) have an association with maternal mortality (Ratnaningtyas & Indrawati, 2023). According to WHO, hemorrhage, hypertensive disorders, and sepsis are responsible for more than half of all maternal deaths worldwide. More than a quarter of deaths are caused by indirect causes (Say et al., 2014). However, based on Table 2, the results of bivariate analysis between MMR and direct and indirect causal factors all have no significant relationship with a p-value> 0.05. When viewed from the results of the coverage of pregnant women, maternity and postpartum services (Figure 2), most of them exceeded the target of Family Health Indicators in the Ministry of Health's Strategic Plan 2020-2024, namely 85% coverage of antenatal visits (K1 and K4) and 60% for K6 (Direktorat Gizi dan Kesehatan Ibu dan Anak, 2023), 95% in the percentage of deliveries in health care facilities (KemenkesRI, 2022) and postpartum visits target of 90% in 2019.

Complications during pregnancy, labor, and postpartum are also one of the causes of maternal and infant mortality. Obstetric complications are illnesses in pregnant women, mothers in labor, postpartum women, and or fetuses in the womb, either directly or indirectly, including infectious and non-communicable diseases that can threaten the life of the mother and or fetus (Dinas Kesehatan Lamongan, 2022). In an effort to reduce maternal mortality and infant mortality, midwifery complication management services are carried out. In Figure 3, it is evident that from 2020 to 2022 the percentage decreased, which means that the number of pregnancy complications in Lamongan Regency has decreased. The target is calculated from the number of mothers with obstetric complications in one working area at the same time period based on an estimated figure of 20% of the total pregnant women in one area at the same time period (Dinas Kesehatan Lamongan, 2022). Since 2007, the Indonesian Ministry of Health has launched

the Childbirth Planning and Complication Prevention Programme (P4K) as a joint effort between husbands, communities, and health workers to monitor high-risk pregnant women through stickers in the mother's home. Research in South Carolina, USA, showed that intensive nurse home visiting programs conducted before birth and 2 years after birth did not significantly reduce the incidence of adverse birth outcomes including preterm birth, low birth weight, and small for gestational age or perinatal death (McConnell et al., 2022). In the US, there are maternal mortality review committees in each state that will identify factors contributing to pregnancy-related maternal deaths, and categorize prevention strategies at the community, facility, patient, provider, and system levels, and include improving access to and coordination and delivery of quality care (Petersen et al., 2019).

There is no data on P4K in the Lamongan Health Profile so an evaluation cannot be conducted, but there is data on monitoring pregnant women who consume Blood Supplement Tablets as a form of monitoring the prevention of anemia in pregnant women, which exceeds the Minimum Service Standard target of 80% (Ratnaningtyas & Indrawati, 2023). Figure 2 shows that the number of women delivering in health facilities has decreased to 99.60% in 2022, which should reach 100%. The result is not much different from Uganda's 90.2% who deliver in health facilities, this cannot be separated from sociodemographic characteristics, economic factors, and service costs (Mugambe et al., 2021). The number of postpartum women receiving vitamin A has also decreased in the last 3 years. Daily low-dose oral vitamin A supplementation (one soft capsule containing 1800 IU vitamin A and 600 IU vitamin D2) is beneficial in improving maternal vitamin A status, although it does not affect infant health status through breast milk (Ding et al., 2021).

Table 3 shows that most of the pregnancy complications were anemia at 39.6% and diabetes mellitus at 0.2%. There were also other types of complications, namely, Chronic Energy Deficiency 17%, preeclampsia/eclampsia 4.4%, infection 2.7%, and bleeding 1%. Anemia is a precursor to high-risk pregnancy. Anemia cannot be underestimated as it can impact the incidence of bleeding and be an indirect cause of maternal death. Supporting the results of this study, the article Characteristics of Pregnant Women with High-Risk Pregnancy states that hemoglobin levels are the strongest chance of high-risk pregnancy (Ratnaningtyas & Indrawati, 2023). Women with Hb levels > 130 g/L have an increased risk of LBW (OR, 2.20; 95% CI, 1.07-4.51) and SGA (Small for Gestational Age) (95% CI, 1.05-3.80) (Wu et al., 2022).

CONCLUSION

There was an upward trend in MMR in Lamongan district from 2020 to 2021 and then a sharp decline in 2022. Maternal age did not have a significant relationship as an indirect cause of MMR, but

maternal age was correlated with bleeding as a direct cause of maternal death. The age determinants of maternal mortality were more than half in the healthy reproductive age range of 20-34 years at 57.7%. The direct causes of maternal deaths all had no significant association with MMR. The causes of MMR were almost partly due to other causes at 42.2%, hypertension/preeclampsia at 28.9%, hemorrhage at 17.8%, circulatory diseases at 6.7%, and infection at 4.4%. The most obstetric complications in Lamongan Regency in 2022 were anemia at 39.6%.

MMR can be reduced through early detection of pregnancy complications and improved maternal health services. Efforts to prevent pregnancy complications can be made with good self-care during pregnancy and supported by the environment. Therefore, health promotion efforts should begin before pregnancy so that the results are more optimal.

Conflict of Interest

The authors declare that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript

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