



Analisis Korelasi Kematian Neonatal BBLR: Cakupan Tablet Tambah Darah Ibu Hamil dan Kunjungan K4 di Jawa Timur (Periode 2019-2021)

Correlation Analysis of LWB Neonatal Mortality: Iron-Folic Acid Tablet During Pregnancy and Four Antenatal Care Coverage in East Java (Period 2019-2021)

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ABSTRAK

Latar Belakang: Kematian neonatal adalah jumlah penduduk yang meninggal pada usia satu bulan pertama setelah kelahiran (0-28 hari). Kondisi berat badan lahir rendah (BBLR) menjadi penyebab kematian neonatal terbanyak. Kebutuhan gizi saat kehamilan mampu mengurangi risiko terjadinya kematian neonatal akibat BBLR salah satu upayanya dengan pemberian Tablet Tambah Darah (TTD) pada ibu hamil. Pemantauan kondisi kesehatan pada ibu hamil dan janin perlu dilakukan untuk mengurangi risiko kematian neonatal dengan melakukan kunjungan K4 selama kehamilan. Jawa Timur menjadi salah satu penyumbang kematian neonatal akibat BBLR terbesar di Indonesia pada tahun 2019-2021.

Tujuan: Penelitian ini bertujuan untuk menganalisis hubungan kematian neonatal akibat BBLR dengan cakupan Tablet Tambah Darah pada ibu hamil dan cakupan kunjungan K4 di Jawa Timur.

Metode: Penelitian ini menggunakan desain studi observasional analitik dengan populasi 38 kota/kabupaten di Jawa Timur. Menggunakan uji korelasi Pearson untuk menganalisis data sekunder dari Laporan Kesehatan Jawa Timur pada 2019-2021. Pengolahan data menggunakan SPSS 18.

Hasil: Hasil penelitian ini menunjukkan bahwa angka kematian neonatal di Jawa Timur terus mengalami penurunan dari tahun 2019-2021. Cakupan TTD ibu hamil terbesar pada tahun 2019 (92%) dan terendah tahun 2020 (88,5%). Cakupan kunjungan K4 ibu hamil terbesar pada tahun 2019 (91,2%) dan terendah tahun 2020 (90%). Tidak ada korelasi signifikan antara cakupan TTD ibu hamil dengan kasus kematian neonatal akibat BBLR pada 2019 ($p = 0,504$; $OR = -0,112$) sedangkan ada korelasi signifikan antara kunjungan K4 ibu hamil dengan kasus kematian neonatal akibat BBLR pada 2019 ($p = 0,001$; $OR = -0,497$).

Kesimpulan: Cakupan TTD tidak berhubungan dengan kejadian kematian neonatal akibat BBLR dibandingkan dengan cakupan K4 ibu hamil. Perlunya peningkatan edukasi mengenai pentingnya kunjungan K4 selama kehamilan untuk mencegah terjadinya kematian neonatal.

Kata kunci: BBLR, Jawa Timur, Kematian neonatal, K4, TTD

ABSTRACT

Background: Neonatal death is a condition responsible for babies' deaths during the first month after birth (0-28 days). Low birth weight (LBW) conditions are the leading cause of neonatal death. Nutritional needs during pregnancy can reduce the risk of LWB neonatal death. One way to avoid it is to take iron-folic acid tablets during pregnancy. Health conditions must be monitored during pregnancy to reduce the risk of neonatal death by conducting four ANC. East Java is one of the largest contributors to LWB neonatal death in Indonesia 2019-2021.

Objectives: This study aimed to analyze the relationship of LWB neonatal death with the coverage of iron-folic acid tablet pregnancy and four ANC in East Java.

Methods: This study used an observational analytic study design with 38 cities/regencies in East Java. The Pearson correlation test was used to analyze secondary data from the East Java Health Report for 2019-2021. Data processing was done using SPSS 18.

Results: The results of this study show that the neonatal death rate in East Java continues to decrease from 2019-2021. The coverage of iron-folic acid tablet pregnancy was largest in 2019 (92%) and lowest in 2020 (88.5%). Four ANC coverage was the largest in 2019 (91.2%) and the lowest in 2020 (90%). There was no significant correlation between iron-folic acid tablets of pregnant women coverage and cases of neonatal death from LBW in 2019 ($p = 0.504$; $r = -0.112$), whereas there was a significant correlation between four ANC coverage and neonatal death cases due to LBW in 2019 ($p = 0.001$; $r = -0.497$).

Conclusions: The coverage of iron-folic acid tablets was not associated with the incidence of LWB neonatal death but with four ANC coverage. Educating people about the importance of four ANC during pregnancy is essential to prevent neonatal death.

Keywords: East Java, Four ANC, Iron-folic acid tablet, LBW, Neonatal Death

INTRODUCTION

One of the indicators of health degrees in the Sustainable Development Goals (SDGs) is the Neonatal Mortality Rate (NMR). The third SDGs goal is "Ensure healthy lives and promote well-being for all ages". This point explains that one of the expected impacts is the resolution of the problem of infant and toddler mortality, with prevention targeted by 2030 and reducing under-five mortality that occurs in low and middle-income countries (Raikes & Yoshikawa, 2017).

In 2019, 29,322 under-five deaths in Indonesia, 69% or around 20,244 of them occurred during neonates. The leading cause of neonatal death was a low birth weight (LBW) of about 35.3% or 7,150 deaths (Kemenkes RI, 2020). It is the same as in 2020 and 2021: the leading cause of neonatal death was an LBW of about 35.2% and 34.5% (Kemenkes RI, 2021, 2022). Other causes of death are asphyxia, congenital abnormalities, sepsis, tetanus neonatorum, covid-19, and others (Kemenkes RI, 2022).

Neonatal deaths refer to deaths during the first month after birth (0-28 days). These neonatal deaths are expressed in 1,000 births in the same year. The neonatal period is one of the most vulnerable times for the survival of the child (di Mascio et al., 2020).

There are several factors related to neonatal death, such as external factors related to maternal characteristics and the environment, such as maternal age, parity, complications in pregnancy, and distance to health facilities. In addition, there are also internal factors of babies such as asphyxia and Low Birth Weight Babies (LBW) (Kusumawardani et al., 2018). In a study conducted by Kusumawati (2020), it was found that there was a gap between

LBW and early neonatal death. Infants with LBW had a 0.26 times greater risk of premature neonatal death than NBW (Kusumawati & Yunadi, 2020).

LBW is one of the health problems that attract worldwide attention, so the World Health Assembly in 2012 passed the Comprehensive Implementation Plan on Maternal, Infant, and Young Child Nutrition by targeting a 30% decrease in LBW by 2025 (Trisnawati et al., 2021). LBW is divided into 1) Normal birth weight babies, i.e. (NBW) with a birth weight of ≤ 2500 grams, 2) Low birth weight babies (LBW), i.e., babies with birth weight between 1500 – 2500 grams, 3) Very low birth weight babies (VLBW), i.e., babies with a birth weight of 1000 – 1500 grams, 4) Extremely low birth weight babies (ELBW), i.e., live-born babies with a birth weight of fewer than 1000 grams (Hughes et al., 2017).

Another factor that causes LBW is anemia in pregnant women. The increased need for iron in pregnant women that is not followed by adequate iron-containing nutritional intake will interfere with uteroplacental oxygenation, so fetal growth and development can be hampered and result in babies with low birth weight. Pregnant women with anemia can increase the risk of LBW 6 times greater than pregnant women who are not anemic (Trisnawati et al., 2021). East Java is one of Indonesia's largest contributors to neonatal deaths due to LBW. This study aimed to determine the relationship between iron-folic acid tablets in pregnancy coverage and four ANC coverage with neonatal death due to LBW.

METHOD

This study used an observational analytic study design. The unit of analysis was 38 cities/regencies in East Java. The variables analyzed

included low birth weight neonatal death as a dependent variable, iron-folic acid tablets in pregnant women, and the number of four ANC coverage as an independent variable.

The data used in this study were secondary data derived from the East Java Health Profile in 2019, 2020, and 2021 to determine the correlation between iron-folic acid tablets in pregnant women coverage and four ANC coverage to LBW neonatal death cases.

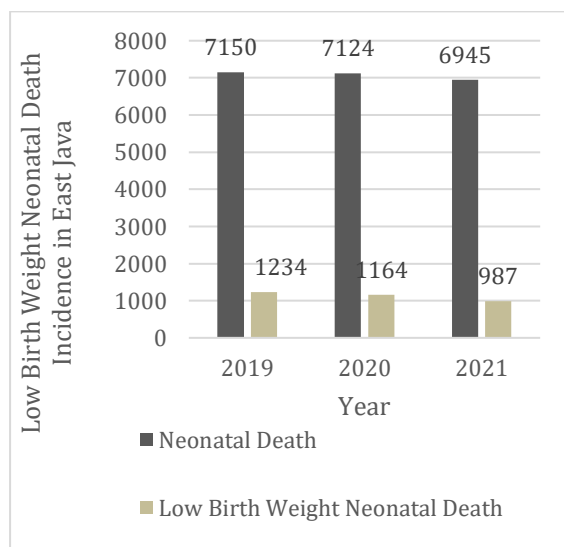
This study was carried out with analytical analysis using SPSS 18. Before conducting data analysis, a data normality test, the Kolmogorov-Smirnov test, was done to find out whether the data were distributed normally or not. The data is normally distributed when the value of Sig. (2-tailed) is more than 0.05. If the data is distributed normally, it is continued with the Pearson population correlation test to determine the relationship between variables.

Table 1. Normality Test Results of Low Birth Weight (LBW) Neonatal Death Case, Iron-Folic Acid Tablets for Pregnant Women Coverage, and Four ANC Coverage in 2019-2021

Results	Category					
	2019		2020		2021	
	N	Asymp. Sig (2-tailed)	N	Asymp. Sig (2-tailed)	N	Asymp. Sig (2-tailed)
LBW Neonatal Death Case	38	0.892	38	0.345	38	0.799
Iron-Folic Acid Tablet Coverage	38	0.175	38	0.98	38	0.179
Four ANC Coverage	38	0.491	38	0.821	38	0,539

RESULT AND DISCUSSION

Image 1. shows that LBW neonatal death in East Java from 2019 to 2021 has decreased. In 2020 there was a decrease in LBW neonatal death cases of around 5,6% or 70 cases compared to 2019. This decline in cases continued in 2021, which was 15.2% or around 177 cases compared to the previous year. Despite the decline, several districts/cities still have experienced an increase in cases of LBW neonatal death. Pacitan Regency, Kediri City, and Pasuruan City experienced successive declines from 2019 to 2021.



Images 1. LBW Neonatal Death Incidence in East Java in 2019-2021

Image 2 shows that iron-folic acid tablets pregnancy and four ANC coverage in East Java decreased in 2020 and increased in 2021. In 2020 there was a decrease either in iron-folic acid tablets pregnancy or four ANC coverage by 3.5% and 1.2%. Coverage of both increased again in 2021 by 0.4% and 0.5%.

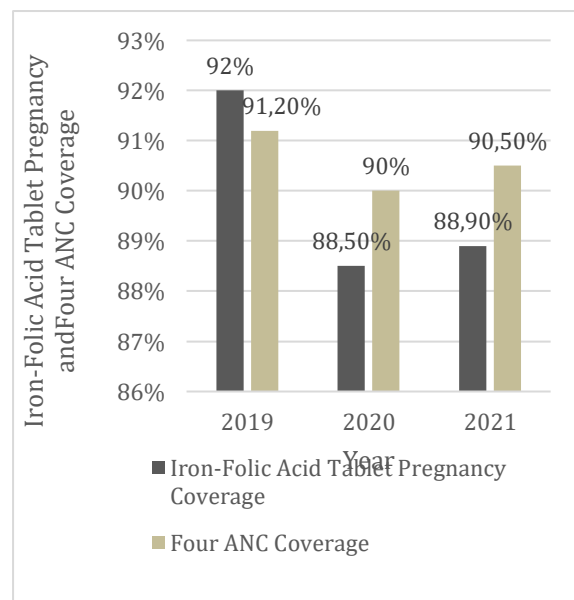


Image 2. Iron-Folic Acid Tablet Pregnancy Coverage and Four ANC Coverage in East Java in 2019-2021

Image 1 shows that in 2019 East Java Province had 3,032 cases of neonatal death, with

40.69% or around 1,234 of them caused by LBW. In 2020 there were 2,997 cases of neonatal deaths, with 38.8% or about 1,164 of them caused by LBW. The number of neonatal deaths decreased in 2021, as there were 2,727 neonatal death cases, with 36.19% of them caused by LBW.

Table 2, show that the highest number of neonatal deaths due to LBW occurred in Jember Regency, with 99 cases. This figure increased by 5 cases in 2020, becoming 104 cases. However, in 2021 there was a decrease to 88 cases. Despite the decline, it is still the highest case in East Java. The coverage of iron-folic acid tablets pregnancy in Jember City increased from 2019 to 2020 by 0.3%. Meanwhile, from 2020 to 2021, there was a decrease in coverage, which was around 3%.

Table 2, show that Mojokerto City has the lowest cases of neonatal deaths due to LBW, with zero cases in 2019, 2020, and 2021. When viewed from the iron-folic acid tablets during pregnancy coverage, Mojokerto City is categorized as good enough. However, there was a decrease in the coverage of iron-folic acid tablets pregnancy successively in 2019, 2020, and 2021 by 2.9% and 2.1%.

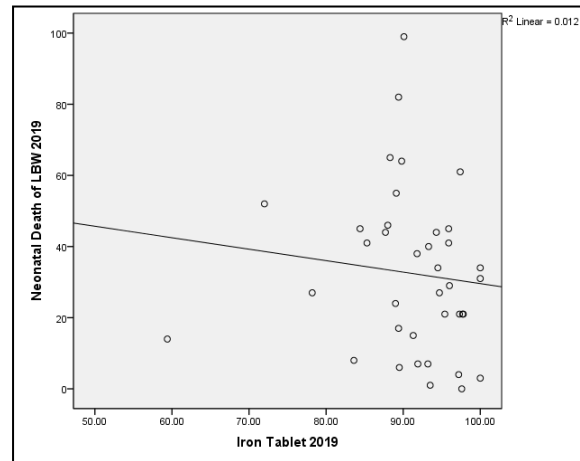
Table 2. The Highest and the Lowest Cases of Low Birth Weight (LBW) Neonatal Death Case and Iron-Folic Acid Tablets for Pregnant Women Coverage in 2019-2021

City/regency	Neonatal death due to LBW (cases)	Iron folic-acid tablet pregnancy (%)
Jember		
2019	99	90.1
2020	104	90.4
2021	88	87.4
Mojokerto		
2019	0	97.6
2020	0	94.7
2021	0	92.6

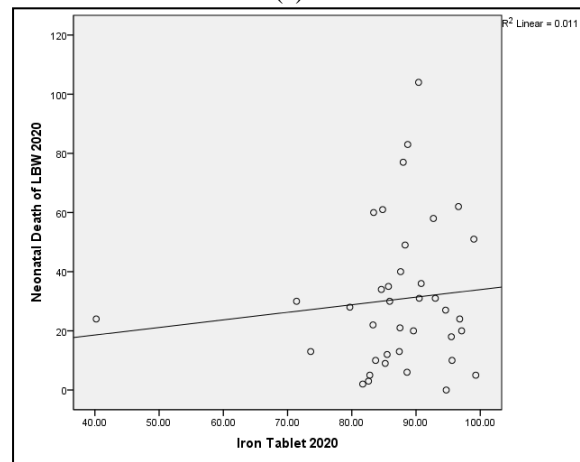
The Pearson population correlation test results in table 4, between the iron-folic acid tablets coverage in 2019-2021 and the incidence of neonatal death due to LBW in 2019-2021 obtained value Sig. (2-tailed) > 0.05, greater than 0.05. It indicated no significant relationship between iron-folic acid tablets pregnancy coverage in 2019-2021 and the incidence of neonatal death due to LBW in 2019-2021.

Table 4, show that in 2019 the correlation coefficient was -0.112, which means that the correlation was very weak. The negative correlation means that the higher the iron-folic acid tablets coverage, the lower LWB neonatal death cases. Otherwise, in 2020 the resulting correlation coefficient was 0.106, indicating a very weak correlation. It has a positive correlation which means

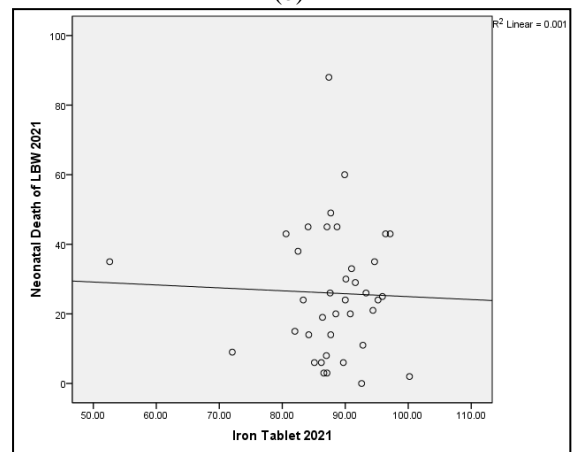
that the higher the iron-folic acid tablets coverage, the higher the case of LWB neonatal death. The result of the correlation coefficient in 2021 was -0.036, which means that the correlation is very weak. It was the same as that in 2019; a negative correlation means that the higher the iron-folic acid tablets coverage, the lower the case of LWB neonatal death.



(a)

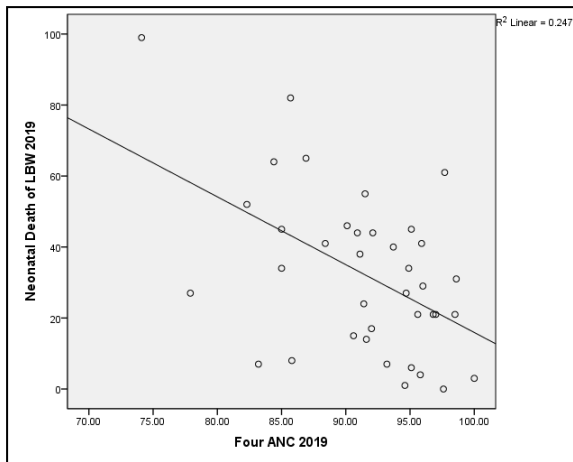


(b)

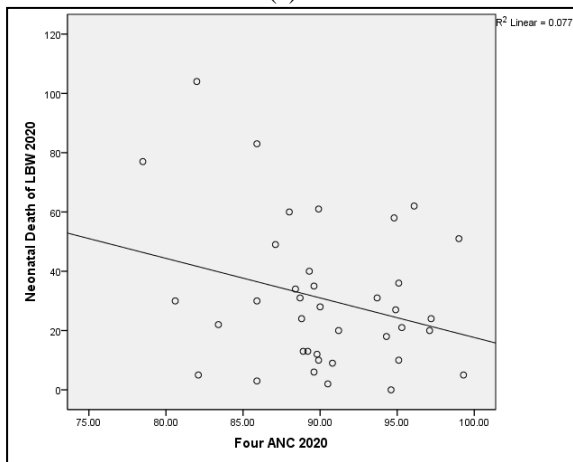


(c)

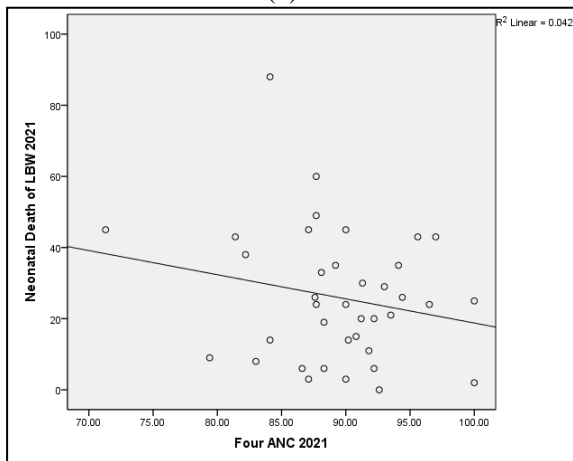
Image 3. Graph of Correlation of Iron-Folic Acid Tablet Pregnancy Coverage with LBW Neonatal Deaths Cases 2019 (a), 2020 (b), 2021 (c)



(a)



(b)



(c)

Image 4. Graph of Correlation of Four ANC Coverage with LBW Neonatal Deaths Cases 2019 (a), 2020 (b), 2021 (c)

Table 3, show that in 2019, there were 1,234 cases of neonatal death due to LBW, with 91.2% of four ANC coverage. The area with the lowest four ANC coverage, about 74.1%, was Jember Regency, with the highest number of

neonatal deaths due to LBW, 99 cases. Meanwhile, Madiun City had 100% of four ANC coverage, having 3 cases of neonatal death due to LBW. In 2020, there were 1,164 cases of neonatal death due to LBW, with 90% of four ANC coverage. The area with the lowest four ANC coverage, about 78.5%, was Situbondo Regency, with 77 cases of neonatal death due to LBW. Meanwhile, Madiun City had a 99.3% of four ANC coverage, with 5 cases of neonatal death due to LBW. In 2021, 987 cases of neonatal death were due to LBW, with 90.5% of four ANC coverage. The lowest four ANC coverage, about 71.3%, was Situbondo Regency, with 60 cases of neonatal death due to LBW. Meanwhile, Madiun City, with 100% of four ANC coverage, had 2 cases of neonatal death due to LBW.

Table 3. The Highest and the Lowest Cases of Four ANC Coverage and Low Birth Weight (LBW) Neonatal Death Case in 2019-2021

City/regency	Four ANC Coverage (%)	Neonatal death due to LBW (cases)
2019		
East Java	91.2	1,234
Jember	74.1	99
Madiun	100	3
2020		
East Java	90	1,164
Situbondo	78.5	77
Madiun	99.3	5
2021		
East Java	90.5	987
Situbondo	71.3	60
Madiun	100	2

The results of the Pearson population correlation test that show in table 4, between four ANC coverage in 2019 and the incidence of neonatal deaths due to LBW in 2019 obtained Sig. (2-tailed) < 0.05 or smaller than 0.05. The result showed a significant relationship between the four ANC coverage in 2019 and the incidence of neonatal deaths due to LBW in 2019. In 2020 and 2021, the Sig. (2-tailed) > 0.05, which was greater than 0.05. It showed no significant relationship between the four ANC coverage in 2020 and 2021 and the incidence of neonatal deaths due to LBW in 2020 and 2021.

According to table 4, the correlation coefficient in 2019 was -0.497, which means that the correlation was moderate. It had a negative correlation which means that the higher the coverage of four ANC, the lower the number of neonatal deaths due to LBW. In 2020 the correlation coefficient was -0.227, which means that the correlation was very weak. The negative correlation means that the higher the four ANC coverage, the

Table 4. Pearson Population Correlation Test between Iron-Folic Acid Tablet Coverage and Four ANC Coverage with The LWB Neonatal Death Incidence 2019-2021

Factors	Sig (2-tailed)*	Correlation Coefficient**	
2019			
Iron-Folic Acid Tablet Coverage	0.504	-0.112	Insignificant
Four ANC Coverage	0.001	-0.497	Significant-Moderate
2020			
Iron-Folic Acid Tablet Coverage	0.528	0.106	Insignificant
Four ANC Coverage	0.093	-0.227	Insignificant
2021			
Iron-Folic Acid Tablet Coverage	0.831	-0.036	Insignificant
Four ANC Coverage	0.217	-0.205	Insignificant

*p value > 0,05 insignificant, p value < 0,05 significant

** correlation coefficient

0,00 – 0,20 = very weak; 0,21 – 0,40 = weak; 0,41 – 0,60 = moderate; 0,61 – 0,80 = strong; 0,8 – 0,99 = very strong; 1,00 = perfect.

lower the neonatal deaths due to LBW. In 2021 the correlation coefficient was -0.205, which means that the correlation was very weak. It had a negative correlation which means that the higher four ANC coverage for pregnant women, the lower the neonatal death cases due to LBW

According to image 1, in 2019 East Java Province had 3,032 cases of neonatal death, with 40.69% or around 1,234 of them caused by LBW. In 2020 the number of neonatal deaths was 2,997 cases, with 38.8% or about 1,164 of them caused by LBW. This neonatal death case continued to decline in 2021, as there were 2,727 neonatal death cases, with 36.19% of them caused by LBW. Cases of neonatal deaths due to LBW in East Java during 2019-2021 decreased yearly.

The data processing results showed no significant relationship between iron-folic acid tablet coverage and cases of neonatal death due to LBW in East Java. This result same as study in India which showed that consumption of iron folic-acid tablet pregnancy was not associated with neonatal death during day 2–6(Rai et al., 2022). Neonatal death is maternal age, occupation, type of birth, father's education background, birth weight, antenatal care, and complications. There are several other factors that need to be controlled in reducing neonatal mortality, namely age at birth, childbirth type, occupation, father's education, antenatal care, birth weight, and complications (Aula Rumana & Ariawan, 2016).

The current results differ from a study in Tanzania which showed that the consumption of Fe and Ca in women had a significant relationship with a reduced risk of neonatal death. A decrease in Fe consumption is directly related to an increased risk of neonatal death but not associated with a decreased risk of low birth weight (Mosha et al., 2017).

Iron-folic acid tablets have a fairly significant role in fetal growth. It also helps

accelerate the healing process of wounds, especially wounds that arise in the process of childbirth. Mothers need to get additional iron tablets from the start of pregnancy to the breastfeeding period (Amalia et al., 2020). Pregnant women are recommended to consume iron-folic acid tablets of at least 90 tablets during pregnancy because they tend to experience deficiencies in both iron and folate. Their need for iron-folic acid tablets increases for the formation of the placenta and red blood cells by 200-300% (Ketut & Sunarsih, 2020; Sunarti & Andi. K., 2019).

Iron-folic acid tablets intake during pregnancy to prevent anemia will increase the risk twice as much as pregnant women who do not have anemia (Young, 2018). Fe tablets are given to women of productive age and pregnant. Iron can reduce the risk of LBW babies, perinatal death, maternal mortality and obstetric complications In pregnant women and her fetuses (WHO, 2014b). We know that anemia caused by various factor, but it can occur due to iron deficiency. Anemia caused various effect for baby and mother such as sepsis, perinatal death, maternal mortality, low birth weight, premature, and other complications (WHO, 2013a, 2014b). The result form Titaley et al. (2010) show that iron-folic acid tablets was responsible for the main protective effect against neonatal death.

A literature study conducted in low and moderate-income countries showed that as many as 2987 neonatal deaths could be prevented by consuming iron and folic acid (Tong & Walker, 2021). Another literature study showed that iron-folic acid intake in 30-59 days during pregnancy has a relationship with neonatal death incidence. Other results showed that women who consumed iron for 30-59 days during pregnancy had a risk of neonatal death 2.56 times greater than women who took supplements for ≥ 120 days (Aula Rumana & Ariawan, 2016).

A pregnancy check-up is a form of health service aiming to monitor the fetus's growth and development in utero to prevent pain and death. The implementation of Antenatal Care (ANC) is carried out at *puskesmas*, auxiliary health centres, village maternity huts (*polindes*), and integrated service posts (*posyandu*). The standard time of service is recommended to ensure protection for pregnant women and fetuses in the form of prevention, early detection of risk factors, and early treatment in the event of pregnancy complications (Kemenkes RI, 2020).

The government has sought the health of pregnant women manifested in the provision of antenatal care (ANC) at least four times during pregnancy (four ANC/K4) (Tunçalp et al., 2017). This service is sought to include getting iron-folic acid tablets of at least 90 tablets during pregnancy as well as a simple laboratory test service, namely the hemoglobin (Hb) test (Salulinggi et al., 2021).

The data processing results show that in 2019 there was a significant relationship between four ANC coverage in pregnant women and neonatal death cases due to LBW in East Java. Meanwhile, in 2020 and 2021, there was no significant relationship between four ANC coverage cases in pregnant women and neonatal death due to LBW in East Java. This can be influenced by several factors. As the results of the study were based on the Indonesian Demographic and Health Survey (IDHS) in 2017, factors related to neonatal death might include the baby's weight at birth, ANC examination, mother's employment status, and health costs (Tirsa Lengkong et al., 2020). Study in Nepal show that there is no association between antenatal care visit with neonatal death (Thapa B et al., 2013).

Regarding the frequency of antenatal care (ANC) of mothers during pregnancy, there are still many pregnant women who do ANC not according to the minimum standards under government recommendations, which should be four times during pregnancy. Babies whose mothers have an ANC pregnancy checked four or more times have 73% less risk of dying compared to babies whose mothers received less ANC examination than that (Tirsa Lengkong et al., 2020).

A study conducted in the Mentawai Islands showed a significant relationship between ANC and neonatal mortality, with an OR value of 6.80. This shows that pregnant women who do not do four ANC 6.8 times are at risk of neonatal death compared to pregnant women who do four ANC (Bangun et al., 2019).

CONCLUSION

Based on the results of this study, it can be implied that there was no significant relationship between LBW neonatal death cases and the consumption of iron-folic acid tablets during

pregnancy in East Java from 2019 to 2021, and four ANC coverage in pregnant women in East Java from 2020 to 2021. However, there was a significant relationship between neonatal death cases due to LBW and four ANC coverage in pregnant women in East Java in 2019. It is crucial to pay more attention to neonatal death cases due to LBW, especially by monitoring the administration of iron-folic acid tablets during pregnancy periodically and requiring complete pregnant women visits up to four ANC so that death cases due to LBW will not continue to increase every year.

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REFERENCE

- Amalia, W., Lestari, P., Wijaya, S., Ibu, B. K., Anak, D., S1, P., & Masyarakat, K. (2020). Literature Review: Status Gizi dan Kepatuhan Dalam Mengonsumsi Tablet Tambah Darah dengan Kejadian Anemia pada Ibu Hamil. *National Conference for Ummah*.
- Aula Rumana, N., & Ariawan, I. (2016). Effect of Iron Supplementation During Pregnancy on Neonatal Death in Indonesia (IDHS Secondary Data Analysis 2012). *International Conference on Health and Well-Being*.
<http://www.dhsprogram.com/Data/>.
- Bangun, I. F., Abdiana, A., & Edison, E. (2019). Faktor Risiko Kematian Neonatal di Kabupaten Kepulauan Mentawai. *Jurnal Endurance*, 4(1), 26.
<https://doi.org/10.22216/jen.v4i1.3641>
- di Mascio, D., Sen, C., Saccone, G., Galindo, A., Grünebaum, A., Yoshimatsu, J., Stanojevic, M., Kurjak, A., Chervenak, F., Suárez, M. J. R., Gambacorti-Passerini, Z. M., de Los Angeles Anaya Baz, M., Galán, E. V. A., López, Y. C., de León Luis, J. A., Hernández, I. C., Herraiz, I., Villalain, C., Venturella, R., ... D'Antonio, F. (2020). Risk factors associated with adverse fetal outcomes in pregnancies affected by Coronavirus disease 2019 (COVID-19): A secondary analysis of the WAPM study on COVID-19. *Journal of Perinatal Medicine*, 48(9), 950–958.
<https://doi.org/10.1515/jpm-2020-0355>
- Hughes, M. M., Black, R. E., & Katz, J. (2017). 2500-g Low Birth Weight Cutoff: History and Implications for Future Research and Policy. *Maternal and Child Health Journal*,

- 21(2), 283–289.
<https://doi.org/10.1007/s10995-016-2131-9>
- Kemkes RI. (2020). *Profil Kesehatan Indonesia 2019*. Kementerian Kesehatan Republik Indonesia.
<https://www.scribd.com/document/478660054/Profil-Kesehatan-Indonesia-2019-pdf>
- Kemkes RI. (2021). *Profil Kesehatan Indonesia 2020*.
<https://www.kemkes.go.id/downloads/resources/download/pusdatin/profil-kesehatan-indonesia/Profil-Kesehatan-Indonesia-Tahun-2020.pdf>
- Kemkes RI. (2022). *Profil Kesehatan Indonesia 2021*.
<https://www.kemkes.go.id/downloads/resources/download/pusdatin/profil-kesehatan-indonesia/Profil-Kesehatan-2021.pdf>
- Ketut, N. M., & Sunarsih, N. (2020). Analisis Faktor yang Berhubungan dengan Kejadian Anemia Pada Ibu Hamil di Puskesmas Dana dan Puskesmas Pasir Putih Kabupaten Muna. *Midwifery Journal*, 5(1), 13–18.
- Kusumawardani, A., Handayani, S., & Kesehatan Universitas Dian Nuswantoro Korespondensi, F. (2018). Karakteristik Ibu dan Faktor Risiko Kejadian Kematian Bayi di Kabupaten Banjarnegara. In *Jurnal Promosi Kesehatan Indonesia* (Vol. 13, Issue 2).
- Kusumawati, D. D., & Yunadi, F. D. (2020). The Correlation Between Low Birth Weight And Early Neonatal Mortality. *Jurnal Kesehatan Madani Medika*, 11(01), 97–101.
- Mosha, D., Liu, E., Hertzmark, E., Chan, G., Sudfeld, C., Masanja, H., & Fawzi, W. (2017). Dietary Iron and Calcium Intakes During Pregnancy Are Associated with Lower Risk of Prematurity, Stillbirth and Neonatal Mortality Among Women in Tanzania. *Public Health Nutrition*, 20(4), 678–686.
<https://doi.org/10.1017/S1368980016002809>
- Rai, R. K., De Neve, J. W., Geldsetzer, P., & Vollmer, S. (2022). Maternal Iron and Folic Acid Supplementation and Its Association with Low-Birth Weight and Neonatal Mortality in India. *Public Health Nutrition*, 25(3), 623–633.
<https://doi.org/10.1017/S1368980021004572>
- Raikes, A., & Yoshikawa, H. (2017). Children, Youth and Developmental Science in the 2015-2030 Global Sustainable Development Goals. *Children*, 30(3).
www.srcd.org/publications/social-policy-report
- Salulinggi, A., Asmin, E., Titaley, C. R., & Bension, J. B. (2021). Hubungan Pengetahuan dan Kepatuhan Ibu Hamil Konsumsi Tablet Tambah Darah Dengan Kejadian Anemia di Kecamatan Leitimur Selatan dan Teluk Ambon. *Jurnal Epidemiologi Kesehatan Komunitas*, 6(1), 229–236.
- Sunarti, A. S., & Andi. K. (2019). Analisis Faktor yang Berhubungan dengan Kejadian Anemia pada Ibu Hamil di Puskesmas Sanrobone Kabupaten Takalar. *Media Publikasi Promosi Kesehatan Indonesia*, 2(2), 134–147.
- Thapa B, Thapa A, & Aryal DR. (2013). Neonatal sepsis as a major cause of morbidity in a tertiary center in Kathmandu. *J Nepal Med Assoc*, 52(192).
- Tirsa Lengkong, G., LFG Langi, F., Posangi, J., Studi Ilmu Kesehatan Masyarakat, P., Pascasarjana Universitas Sam Ratulangi, P., & Kesehatan Masyarakat Universitas Sam Ratulangi Manado ABSTRAK, F. (2020). Faktor-Faktor yang Berhubungan Dengan Kematian Bayi di Indonesia. In *Jurnal KESMAS* (Vol. 9, Issue 4).
- Titaley, C. R., Dibley, M. J., Roberts, C. L., Hall, J., & Agho, K. (2010). Iron and folic acid supplements and reduced early neonatal deaths in Indonesia. *Bulletin of the World Health Organization*, 88(7), 500–508.
<https://doi.org/10.2471/BLT.09.065813>
- Tong, H., & Walker, N. (2021). Current Levels of Coverage of Iron and Folic Acid Fortification Are Insufficient to Meet The Recommended Intake for Women of Reproductive Age in Low- and Middle-Income Countries. *Journal of Global Health*, 11, 18002.
<https://doi.org/10.7189/jogh.11.18002>
- Trisnawati, R., Banul, M., Emiliana, T., Armu V, Rato, B., & Tembaru, M. (2021). Analisis Faktor Yang Berhubungan Dengan Berat Badan Lahir Rendah. *J Kebidanan*, 10(1), 37–42.
- Tunçalp, Pena-Rosas, J. P., Lawrie, T., Bucagu, M., Oladapo, O. T., Portela, A., & Metin Gülmezoglu, A. (2017). WHO recommendations on antenatal care for a positive pregnancy experience—going beyond survival. In *BJOG: An International Journal of Obstetrics and Gynaecology* (Vol. 124, Issue 6, pp. 860–862). Blackwell Publishing Ltd.
<https://doi.org/10.1111/1471-0528.14599>
- WHO. (2013a). *Iron Deficiency Anaemia Assessment, Prevention, and Control A guide for programme managers*.
- WHO. (2014b). *Guidelines for the use of iron supplements to prevent and treat iron deficiency anemia*. ISLI Press.
- Young, M. F. (2018). Maternal Anemia and Risk of Mortality: A Call for Action. In *The Lancet Global Health* (Vol. 6, Issue 5, pp. e479–e480). Elsevier Ltd.
[https://doi.org/10.1016/S2214-109X\(18\)30185](https://doi.org/10.1016/S2214-109X(18)30185)