# ANALYSIS OF NEONATAL DEATH RISK FACTORS BASED ON NEONATAL DEATH REPORT DATA

**Gusni Ekawati[1*], Amran Julianto Tanesib[2], Agustin Kusumayati[3]**

[1,2]Department of Reproductive Health, Faculty of Public Health, Universitas Indonesia
[3]Faculty of Public Health, Universitas Indonesia
Correspondence e-mail: Gusniekawati99@gmail.com

**ABSTRAK: ANALISIS FAKTOR RISIKO KEMATIAN NEONATAL BERDASARKAN DATA LAPORAN KEMATIAN NEONATAL**

Latar Belakang: Kematian neonatal masih termasuk dalam masalah kematian bayi, di mana angka kematian bayi (AKB) digunakan untuk melihat seberapa besar kematian bayi di suatu daerah. AKB sangat diperhatikan karena menjadi salah satu indikator tingkat kesehatan masyarakat sehingga memberikan gambaran mengenai kesehatan penduduk secara umum.

Tujuan: Penelitian ini bertujuan untuk mengidentifikasi faktor-faktor yang mempengaruhi kematian neonatal di Kota Bogor pada Tahun 2023.

Metode: Penelitian menggunakan metode kuantitatif dengan desain studi *case control*. Populasi penelitian terdiri dari seluruh kasus kematian neonatal yang terjadi pada tahun 2023. Instrumen penelitian menggunakan data laporan kematian neonatal Kota Bogor tahun 2023.

Hasil: Hasil penelitian menunjukkan adanya hubungan signifikan antara umur ibu *(p-value 0,024),* paritas ibu *(p-value 0,002)* dengan kematian neonatal. Namun, tidak ditemukan hubungan signifikan antara tingkat pendidikan ibu *(p-value 0,226)*, usia kehamilan *(p-value 0,108)* dengan kematian neonatal.

Kesimpulan: Dari hasil penelitian ini, dapat disimpulkan bahwa terdapat hubungan antara umur ibu, paritas ibu dengan kematian neonatal.

Saran: Berdasarkan hasil penelitian, direkomendasikan beberapa langkah untuk mencegah kematian neonatal di Kota Bogor, yaitu meningkatkan edukasi dan promosi kesehatan kepada ibu hamil tentang pentingnya pemeriksaan kehamilan yang rutin dan lengkap, meningkatkan akses pelayanan kesehatan ibu dan anak, terutama bagi ibu hamil dan bayi baru lahir dengan risiko tinggi, meningkatkan kualitas pelayanan kesehatan ibu dan anak, termasuk pelayanan persalinan dan perawatan bayi baru lahir dan melakukan penelitian lebih lanjut untuk mengidentifikasi faktor-faktor lain yang berhubungan dengan kematian neonatal di Kota Bogor.

Kata Kunci : Kematian Neonatal, Kota Bogor

## ABSTRACT

Background: Neonatal deaths are still included in the problem of infant mortality, where how much infant mortality in a region can be measured by the infant mortality rate (IMR). IMR is of great concern because it is one of the indicators of the level of public health to provide an overview of the health of the population in general.

Purpose: This study aims to identify the factors influencing neonatal mortality in Bogor City in 2023.

Methods: The research employs a quantitative method with a case-control study design. The study population consists of all neonatal mortality cases that occurred in 2023. The research instrument uses data from the 2023 neonatal mortality report for Bogor City.

Results: The results indicate a significant relationship between maternal age (p-value 0.024), maternal parity (p-value 0.002), and neonatal mortality. However, no significant relationship was found between maternal education level (p-value 0.226), gestational age (p-value 0.108), and neonatal mortality.

Conclusion: From these findings, it can be concluded that there is a relationship between maternal age, maternal parity, and neonatal mortality.

Suggestions: Based on the results of the study, several steps are recommended to prevent neonatal death in Bogor City, namely Increase health education and promotion for pregnant women regarding the importance of regular and comprehensive antenatal checkups, Improve access to maternal and child health services, especially for pregnant women and newborns at high risk, Improving the quality of maternal and child health services, childbirth services, and newborn care, and Conduct further research to identify other factors that correlate with neonatal mortality in Bogor City.

Keywords: Neonatal Mortality, Bogor City

**Gusni Ekawati, Amran Julianto Tanesib, Agustin Kusumayati**

## INTRODUCTION

Maternal and child health is the main focus of global commitments to the Sustainable Development Goals (SDGs). The third SGDs goal is specifically related to welfare and health, the first goal is minimizing maternal mortality to less than 70 deaths per 100,000 KH and the second goal is minimizing neonatal mortality to 12 per 100 KH by 2030. Indonesia ranks 77th in the world for infant mortality with 14 newborn deaths per 1000 KH (UNICEF, 2015), reducing neonatal mortality is a top priority. This is because neonatal deaths contribute 60% to the overall infant mortality rate.

Child mortality is an important issue and topic in global health. Therefore, child mortality is one of the goals of the SDGs. The Sustainable Development Goals (SDGs) on reducing child mortality are listed in the third goal, By 2030, the global goal is to end avoidable deaths in newborns and young children. Each country has a target to minimize neonatal mortality to less than 12 per 1,000 live births and under-five mortality to no more than 25 per 1,000 live births.

Neonatal deaths are still included in the problem of infant mortality, where how much infant mortality in a region can be measured by the infant mortality rate (IMR). IMR is of great concern because it is one of the indicators of the level of public health to provide an overview of the health of the population in general (BPS, 2016).

UNICEF data in 2020 shows that every year around 2.5 million babies around the world die before reaching the age of one month. Development in Indonesia is still uneven for each region, this is reflected in the infant mortality rate which can describe the health status in the territory. The improvement of health services and the development of health facilities that support the improvement of human quality in the territory, as well as health infrastructure and medical personnel also greatly affect the development of public health (Pohan & Halim, 2016).

The 2017 Indonesian Demographic and Health Survey showed that the infant mortality rate in the 2022 National Seminar on Official Statistics 208 Indonesia from 1991 to 2017 tended to decline but has not reached the target of the SDGs, which is at least 23 deaths per 1000 births. Source: SDKI 2017. The cause of the unattainable SDGs target in Indonesia is the lack of equitable development of health facilities followed by an imbalance in the number of people between islands. Java Island has the largest population in Indonesia, which is 151,591,262 people (BPS, 2020). With a large population, the infrastructure on the island of Java will be better than many of the other islands, especially the infrastructure of health facilities, this makes the health indicators owned by the island of Java better than with other islands as evidenced by the figures of the Public Health Development Index (IPKM) owned by the provinces.

In Indonesia, the neonatal mortality rate in 2021 reached 13 per 1,000 KH. Research by Morwarti (2015) and Umah (2014) states that the causes of neonatal death are respiratory disorders, jaundice, sepsis, hypothermia, and BBLR. According to the Profile of the Bogor City Health Office, neonatal deaths aged 0-28 days are dominated by BBLR and prematurity. The reduction in Neonatal Mortality is very important because it contributes to 60% of the total Infant Mortality Rate. Prawirohardjo (2011) also noted that other causes include asphyxia, birth trauma, infection, prematurity, and congenital abnormalities. Based on these findings, further research was carried out to identify factors that affect the neonatal mortality rate in Bogor City in 2023.

Neonatal deaths in Bogor City are a serious concern, reflecting challenges in maternal and infant health services. An in-depth analysis of the factors contributing to neonatal mortality is essential to formulate appropriate prevention strategies. The Infant Mortality Rate (IMR) is an important parameter in measuring the effectiveness of health services, especially for newborns, perinatal periods, and neonatal. The IMR shows the magnitude of the risk of death of infants under the age of 1 year per 1,000 live births. In Bogor City, data shows an increase in IMR in 2022 compared to the previous four years. There were 66 infant deaths, with 46 of them occurring in the neonatal phase (0-28 days), equivalent to an infant mortality rate of 3.7 per 1,000 KH (Bogor City Health Office, 2022).

Efforts to reduce the neonatal mortality rate in Bogor City require in-depth analysis and a comprehensive strategy. Understanding the factors that contribute to neonatal mortality, especially maternal factors, is key to formulating appropriate interventions. This is because the role of mothers in the health of babies is very crucial, especially during pregnancy and postpartum. Maternal health conditions such as anemia, chronic diseases, as well as obstetric complications such as preeclampsia and gestational diabetes, have a significant impact on the main factors of neonatal death, namely the incidence of premature birth and low birth weight (BBLR). The quality of nutrition during pregnancy, the level of maternal knowledge about the health of the baby, and the mother's access to antenatal care (ANC) services also contribute directly to the reduction of the risk of neonatal death.

In the context of Bogor City, the challenges faced include not only medical aspects, but also socio-economic aspects such as maternal education, nutritional status, and access to health facilities. The study intended to identify how factors related to the mother, such as health conditions before and during pregnancy, access to health services, and the mother's level of knowledge about neonatal care, affect the risk of infant mortality in the neonatal period. With a focus on maternal factors, the research is expected to share new insights to develop more effective interventions in reducing neonatal mortality rates in Bogor City.

## RESEARCH METHODS

This study adopts a case-control design with a population of all babies who die within 28 days of birth in Bogor City in 2023. The sample was calculated using the purposive sampling method based on inclusion criteria, namely infants who had complete data and died at a health facility. Using univariate and bivariate analysis. Univariate analysis serves to describe the frequency distribution of research variables. Meanwhile, bivariate analysis serves to test the relationship between the dependent variable (neonatal death) and the independent variable (maternal factor). The variables studied included maternal characteristics such as education level, age at childbirth, gestational age, and parity.

This research was conducted in Bogor City from April 1 to May 30, 2024. The population includes all cases of infants dying in the neonatal period recorded in the work area of the Bogor City Health Office in 2023, while the control population consists of babies who are still alive past the neonatal period recorded in the same area. This study used a 1:1 ratio for cases and controls with each group totaling 67 subjects for a total of 134. The inclusion criteria for the case group were obtained from neonatal death sample data recorded in the Bogor City Health Office report. Control sample data was obtained from childbirth records in the same region.

Primary data was collected from the neonatal death report of Bogor City, while secondary data was obtained from neonatal death reports, birth records, and perinatal maternal audit (AMP) documents. The collected data will be validated, encoded, and compiled before statistical analysis is carried out according to the predetermined method. This study applies statistical methods that include univariate and bivariate analysis using the alpha formula and using the SPSS version 26 program.

## RESEARCH RESULTS

Data is processed through the stages of editing, coding, data entry, and tabulation. The bivariate analysis used includes:
a. Chi-square analysis functions to identify the relationship between independent variables and dependent variables using the Chi-Square Test (Budiarto, 2002). This test assesses the significance of the relationship based on the p-value, which is compared to the predetermined level of significance. If $p < 0.05$ then the null hypothesis (Ho) is rejected, while if $p > 0.05$ then Ho is accepted.
b. Odds Ratio (OR) functions to determine significant risk factors with a significance level of a = 0.05 and a Confidence Interval (CI) of 95% using the formula Odds Ratio (Budiarto, 2002): a x d. b x c Effect (+) Effect (-) Number of Risk Factors (+) a B a+b Risk Factors (- ) C D c+d Number of a+c b+d a+b+c+d

**Table 1**
**Univariate Analysis of Factors Associated with Neonatal Death**

| Variable | Category | Frequency | Percentage |
|---|---|---|---|
| Education Level | Low | 70 | 52.2 |
| | High | 64 | 47.8 |
| Age | <20 and >35 | 62 | 46.3 |
| | 20-35 | 72 | 53.7 |
| Gestational Age | <37 week and >42 week | 50 | 37.3 |
| | 37-42 week | 84 | 62.7 |
| Parity | 1 and >4 | 59 | 44.0 |
| | 2 and 3 | 75 | 56.0 |

The univariate analysis showed that the percentage of low education level was 52.2% and the percentage of higher education level was 47.8%. The percentage of <20 years old and >35 years old was 46.3% and the percentage of 20-35 years old was 53.7%. The percentage of gestational age <37 weeks and >42 weeks was 37.3% and the percentage of gestational age 37-42 weeks was

**Gusni Ekawati, Amran Julianto Tanesib, Agustin Kusumayati**

62.7%. The percentage of parity 1 and >4 was 44.0% and the percentage of parity 2 and 3 was 56.0%.

**Table 2**
**Bivariate Analysis of Factors Associated with Neonatal Death**

| Variable | Neonatal Death | | | | OR 95% CI | p-value |
|---|---|---|---|---|---|---|
| | Case (N=67) | | control (N=67) | | | |
| | N | % | n | % | | |
| Education Level | | | | | | |
| Low | 39 | 58.2 | 31 | 46.3 | 1.618 | 0.226 |
| High | 28 | 41.8 | 36 | 53.7 | (0.817-3.202) | |
| Age | | | | | | |
| <20 and >35 | 38 | 56.7 | 24 | 35.8 | 2.348 | 0.024 |
| 20-35 | 29 | 43.3 | 43 | 64.2 | (1.172-4.704) | |
| Gestational Age | | | | | | |
| <37 week and >42 week | 20 | 29.9 | 30 | 44.8 | 1.905 | 0.108 |
| 37-42 week | 37 | 55.2 | 47 | 70.1 | (0.936-3.880) | |
| Parity | | | | | | |
| 1 and >4 | 39 | 58.2 | 20 | 29.9 | 3.273 | 0.002 |
| 2 and 3 | 28 | 41.8 | 47 | 70.1 | (1.603-6.683) | |

Table 2 shows that respondents with low levels of knowledge are more present in the case group (58.2%) compared to the control group (46.3%). The results of the chi-square test showed that there was no significant relationship between education level and neonatal mortality (p-value 0.226). The results of the OR showed that respondents with low education levels had a 1,618 times greater risk of neonatal death than respondents with higher education levels (95% CI 0.817-3,202).

Mothers aged <20 and >35 were more likely in the case group (56.7%) than in the control group (35.8%). The results of the chi-square test showed that there was a significant relationship between age and neonatal mortality (p-value 0.024). The results of the OR showed that mothers aged <20 and >35 were 2,348 times at risk of neonatal death compared to mothers aged 20-35 years (95% CI 1,172-4,704).

Mothers who had a gestational age of <37 weeks and >42 weeks were more in the control group (44.8%) than in the case group (29.9%). The results of the chi-square test showed no significant relationship between gestational age and neonatal mortality (p-value 0.108). The results of the OR showed that mothers with a gestational age of <37 weeks and >42 weeks were at 1,905 times at risk of neonatal death compared to mothers with a gestational age of 37-42 weeks (95% CI 0.936-3,880).

Mothers with parity of 1 and > 4 were more in the case group (58.2%) than in the control group (29.9%). The results of the chi-square test showed that there was a meaningful relationship between parity and neonatal mortality (p-value 0.002). The results of the OR showed that mothers with parties 1 and >4 were at 3,273 times at risk of neonatal death compared to mothers with parties 2 and 3 (95% CI 1,603-6,683).

**DISCUSSION**

The study found that there was a greater proportion of mothers with low educational backgrounds in the group facing neonatal death. However, statistical analysis showed different results. It was found that there was no significant relationship between maternal education level and the incidence of neonatal mortality, with a p-value of 0.226 (p-value > 0.05). This finding is in line with the research of Apriningrum (2015) which uses Riskesdas 2015 data and also shows that there is no relationship between maternal education level and infant mortality (p-value = 0.299).

Education is a process that plays a role in improving the knowledge and behavior of individuals or groups. Mothers with a high level of education are generally easy to receive and understand information, while mothers with a low level of education may have difficulties in this regard. Although this study shows no statistically significant relationship, it does not mean that the role of

education and improving health literacy for mothers is not important. Health education and counseling efforts need to continue to be carried out to increase maternal knowledge and awareness about pregnancy, childbirth, and optimal baby care.

Research shows that maternal age has a significant influence on the risk of neonatal death. This is evidenced by the research of Astuti, Sholikhah, and Angkasawati (2008) that found a relationship between the age of mothers at risk during childbirth and temperature regulation disorders in babies, with a p-value of 0.029. This finding is reinforced by the study of Noviani (2011) that showed a significant relationship between maternal age at childbirth and premature neonatal death (p-value = 0.028). The ideal age to undergo pregnancy is in the age range of 20 to 35 years, when mothers give birth under the age of 20 years generally the reproductive organs are not fully developed, while mothers who give birth over 35 years old are more at risk of complications such as diabetes, birth disorders, hypertension, obesity, and the possibility of the baby experiencing chromosomal abnormalities (Utama, 2014).

These findings have important implications for efforts to prevent neonatal deaths. Pre-pregnancy education and counseling efforts need to be intensified to encourage pregnancy at an optimal age. In addition, it is also necessary to improve the quality of maternal and infant health services, especially for mothers who are classified as high-risk. Significant association between maternal age and neonatal death: Research reveals that the risk of neonatal death is increased in infants born outside the optimal age range (20-35 years). Risk factors in young and old mothers: Mothers under 20 generally have a poorly developed reproductive apparatus, while mothers over 35 are more at risk of pregnancy complications. Important implications: These findings need to be followed up with pre-pregnancy education, counseling, and improving the quality of maternal and infant health services.

Parity, or the number of pregnancies that reach the age of viability, influences the risk of neonatal death. This risk is likely to be experienced in the first pregnancy and after the fourth pregnancy (Latifah, 2012). This is supported by the results of statistical analysis with a p-value of 0.002, showing a significant relationship between parity and neonatal mortality. Another factor was found in the study, that the distance from home to a health facility that is more than 6 hours has a higher risk of neonatal death (Imelda Ferawati Bangun, et al.). This significant relationship was shown through a statistical test with a p-value of 0.002 for the distance from home to a

health facility and a p-value of 0.001 for referral status. The long-distance traveled is an obstacle for mothers to reach health facilities quickly. Another study by Jehan and Harris (2009) also corroborates these findings, showing a link between distance to health facilities and newborn mortality. Delays in referrals and limited access to transportation are important factors contributing to the incidence of neonatal mortality. Another study by Sukamti and Riono (2015) used multiple logistic regression analysis. The results show that in Indonesia, good-quality neonatal health services can prevent newborn deaths.

Several factors found in the study are associated with neonatal deaths in Bogor City in 2023, including:
- Maternal factors: maternal age, parity
- Health facility factors: referral status and referral delays

Then, based on data obtained from the Bogor City audit report, it is known that the birth rate in 2023 is 19,355, while the infant mortality rate in Bogor City in 2023 is 101 cases so that the infant mortality ratio is obtained as much as 5.22 deaths per 1,000 live births. This ratio shows a relatively low infant mortality rate compared to other regions with an infant mortality rate of more than 10 per 1,000 live births, such as Papua, East Nusa Tenggara (NTT), and Maluku (Central Statistics Agency, 2020). In general, the eastern region of Indonesia experiences a higher infant mortality rate than the western region of Indonesia, which is likely due to limited access to health facilities and underdeveloped economic factors.

## CONCLUSION

This study found that maternal age factors and parity have a relationship with neonatal mortality cases in Bogor City in 2023. The relatively low infant mortality rate ratio in Bogor City in 2023 can be an indication of the success of maternal and child health interventions in Bogor City, such as immunization programs and access to adequate childbirth facilities. However, even though the infant mortality rate ratio is relatively good, the existence of 101 cases of infant mortality still requires attention.

## SUGGESTION

Based on the results of the study, several steps are recommended to prevent neonatal death in Bogor City, namely:

- Increase health education and promotion for pregnant women regarding the importance of regular and comprehensive antenatal checkups.
- Improve access to maternal and child health services, especially for pregnant women and newborns at high risk.
- Improving the quality of maternal and child health services, childbirth services, and newborn care.
- Conduct further research to identify other factors that correlate with neonatal mortality in Bogor City.

## REFERENCES

Asnawi Abdullah, Krishna Hort, Yuli Butu & Louise Simpson. 2016. Risk factors associated with neonatal deaths: a matched case–control study in Indonesia. Global Health Action. 9:1

Besral. 2012. Regresi Logistik Multivariat Analisis Data Riset Kesehatan. Jakarta: Departemen Biostatistik Fakultas Kesehatan Masyarakat Universitas Indonesia

Latifah, Noor, 2012, Hubungan Frekuensi Kunjungan ANC Selama Kehamilan dengan Kejadian Kematian Neonatal (Analisis Data SDKI 2007), FKM Universitas Indonesia

Mafticha, Elyana. 2016. Faktor Yang Mempengaruhi Kejadian Kematian Neonatal Di Indonesia. Hospital Majapahit. 8(2)

Muharram, Johan Umfri. 2017. Analisis Faktor Risiko Kematian Neonatal Di Kabupaten Boyolali 2016. Naskah Publikasi. Universitas Muhammadiyah Surakarta.

Najmah. 2017. Statistika Kesehatan Aplikasi Stata & SPSS. Jakarta: Salemba Medika

Noorhalimah. 2015. Faktor-Faktor Yang Berhubungan Dengan Kematian Neonatal Di Kabupaten Tapin. Jurnal Publikasi Kesehatan Masyarakat Indonesia. 2(2).

Oktarina, Silvia.,Nur Alam Fajar, Yeni. 2017. Model Prediksi Kejadian Kematian Neonatal Di Kecamatan Purbolinggo Kabupaten Lampung Timur Provinsi Lampung. Jurnal Ilmu Kesehatan Masyarakat. 8(1):49-55.

Saifudin, AB. 2000. Buku Panduan praktis pelayanan kesehatan maternal dan neonatal. Jakarta : YBPSP.

Profil kesehatan dinas kesehatan kota Bogor tahun 2022

Data laporan kematian maternal neonatal Kota Bogor tahun 2023

Sasaran program kesga berdasarkan SPM Kota Bogor tahun 2023

Jehan, I., Harris, H., S. (2009). Neonatal mortality, risk factors and causes: A prospective population-based cohort study in urban Pakistan. Bulletin of the World Health Organization, 87(2), 130–138. https://doi.org/https://doi.org/10.2471/BLT.08.050963 Kemenkes. (2015).

Kesehatan dalam Kerangka Sustainable Development Goals (SDGs). Rakorpop Kementerian Kesehatan RI, 97(24)

Departemen Kesehatan RI. 2002. Program Safe Motherhood di Indonesia.

Direktorat Jenderal Bina Kesehatan Masyarakat. Jakarta. Depkes RI. 2000. Pedoman Pelayanan Kesehatan Neonatal Esensial. Dirjen Binkesmas. Jakarta

Wahid. 2000. Analisis Faktor Risiko Kematian Neonatal : Studi Nested Case Control di Kabupaten Purworejo. Tesis S2 UGM Yogyakarta.

Keputusan Menteri Kesehatan Republik Indonesia nomor 369/Menkes/SK/III/2007 tentang Standar Profesi Bidan. 29 Maret 2016

Kemenkes. Laporan Hasil Riset Kesehatan Dasar (Riskesdas) Indonesia tahun 2018. Ris Kesehat Dasar 2018 2018:182–3

WHO UNICEF. Reaching the Every Newborn National 2020 Milestones Country Progress, Plans and Moving Forward. 2017.

Kemenkes. Profil Kesehatan Indonesia Tahun 2019. 2019

Badan Pusat Statistik. Angka Kematian Neonatal dan Angka Kematian Bayi per 1000 Kelahiran Menurut Provinsi 2020. 2020