Maternal Age and Perinatal Mortality in Indonesia: An Analysis of Indonesia Demographic Health Survey 2017

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Abstract - Perinatal mortality remains an important public health problem, particularly in low- and middle-income countries (LMICs); preventable deaths continue to occur at unacceptable levels. The present study examines the relationship between maternal age and perinatal mortality in Indonesia. Perinatal mortality or perinatal death is the number of foetal deaths in the third trimester of pregnancy and deaths among live births within 7 days after birth (stillbirths and live births). The effect of maternal age at delivery has always been an important etiological factor for pregnancy outcomes, and both extremes of the reproductive age have been associated with higher chances of poor perinatal outcomes. This analysis drew data from a secondary source, the 2017 Indonesia Demographic and Health Survey (DHS), which is a broadly representative national survey designed to gather demographic and maternal and child health information. This analysis found that mother's age was a predictor for perinatal mortality in Indonesia, statistically significant as a determinant of perinatal mortality, with the risk estimates for mother's age at birth age 20 – 29 and 30 – 39 making perinatal mortality lower compared to < 20-year-old mothers (OR: 0.52, 0.38 – 0.71; OR: 0.59, 0.43 – 0.81), while age at first cohabitation (OR: 0.97, 0.95 – 1.00) and age at first birth made perinatal mortality higher when the age increased (OR: 0.99, 0.96 - 1.01). Finally, a more comprehensive strategy, encompassing social, economic, and clinical initiatives, is crucial to tackle the risks associated with advanced maternal age and further strengthen Indonesia's commitment to reducing perinatal deaths and achieving national and global health benchmarks, such as the Sustainable Development Goals (SDGs). Additional studies are necessary to understand the underlying mechanisms and contextual factors associated with these age-specific risks, to inform maternal and child health policies in Indonesia.

Keywords: Maternal age, Perinatal Mortality, DHS

I. INTRODUCTION

Perinatal mortality, including stillbirth and early neonatal death, is a significant public health problem, mainly in low- and middle-income countries (LMICs) where preventable mortality exists at alarming proportions. Indonesia is the world's fourth most populous country and the largest country in Southeast Asia, consisting of more than 17,000 islands, and is home to a great number of maternal and perinatal health issues. Indonesia's maternal and child health statistics reflect the need for further improvement, with a Maternal Mortality Ratio (MMR) of 189 per 100,000 live births, the third highest in Southeast Asia after Cambodia and Myanmar. Perinatal mortality prevalence in Indonesia was reported as 21 per 1,000 pregnancies in the Indonesian Demographic and Health Survey (IDHS) (Hadjo et al., 2023). This high perinatal mortality rate places Indonesia amongst the top 10 countries worldwide with the highest neonatal mortality rates, with a predictable 56,000 neonatal deaths in 2020 (Misnaniarti et al., 2024).

The 2017 IDHS is one of the latest nationally representative surveys that provides detailed information on maternal and child health outcomes across Indonesia. This dataset offers an unparalleled opportunity to study the relation between maternal age and perinatal death, adjusting for multiple confounders such as socioeconomic status, levels of education, access to health care, and geographical differentials (IDHS, 2017). Previous studies about Indonesian demographic data have found that maternal age is an important variable in neonatal prognosis, but not much is known about perinatal mortality across the entire range of maternal ages (Rumiati & Adisasmita, 2021; Siahaan & Ariawan, 2021). The knowledge of such associations is vital in designing targeted interventions and policies for reducing the country's high perinatal mortality and meeting the SDGs target of a neonatal mortality rate of 12/1,000 live births by 2030 (Balkis et al., 2023; Raina et al., 2023).

This research examines the relationship between maternal age and perinatal mortality in Indonesia, using secondary data from the 2017 Indonesia Demographic and Health Survey. In particular, this study seeks to estimate the risk of perinatal mortality in terms of different categories of maternal age and to determine the optimal childbearing age range for Indonesia.

Additionally, this study seeks to build on evidence about the gap in risk between younger and older mothers to inform evidence-based policy and program-making on maternal health for age groups at high risk for adverse perinatal outcomes. By using the full IDHS 2017 data, this study will further add to the emerging evidence on how maternal age relates to perinatal health outcomes in low- and middle-income countries, delivering important information for health care providers, policymakers, and public health professionals working to enhance maternal and child health in Indonesia and in similar settings (Raina et al., 2023).

II. LITERATURE REVIEW

Perinatal mortality or perinatal death is defined as the number of foetal deaths of 22 (or 28) completed weeks of pregnancy and the number of deaths among live births up to seven days of life (stillbirths and live births) (Tanaka et al., 2010). The Demographic Health Survey (DHS) program defines perinatal mortality or perinatal death as the sum of stillbirths (28 weeks of pregnancy) and loss of life in the first seven days (early neonatal mortality). The perinatal mortality rate is estimated as the number of perinatal deaths per 1,000 pregnancies (Rutstein et al., 2019).

Maternal age at delivery has been a major contributor to pregnancies, either excess or a deficiency of the reproductive range, which links to more risks of a worse perinatal outcome. Advanced maternal age, conventionally defined as pregnancy at the age of 35 or greater, has become a growing trend in the world because of evolving socioeconomic trends, educational, and employment opportunities in life (Glick et al., 2021; Mutz-Dehbalaie et al., 2014). Concurrently, young maternal age, particularly teenage pregnancies, remains a concern in developing countries like Indonesia, where early marriage and childbearing are still common in certain regions (Demirci et al., 2016). The association between maternal age and perinatal mortality is complex and includes biological, social, and access-to-care determinants that differ widely between populations and healthcare facilities (Kim et al., 2021; Mersha et al., 2020).

Data from several studies have suggested that with both young and advanced maternal ages, an elevated risk of perinatal complications is found. Young maternal age, specifically age ≤ 20 years, is associated with a higher incidence of preterm delivery, low birth weight, intrauterine growth restriction, and an rise in perinatal mortality (Demirci et al., 2016; Mcanarney, 1987). This is related mainly to biological immaturity, lack of prenatal care, insufficient nutritional status, and social disadvantages that teenage mothers generally face (Demirci et al., 2016; Fall et al., 2015). On the other hand, advanced maternal age is linked with higher likelihoods of chromosomal disorders, gestational diabetes, pre-eclampsia, placental dysfunction, and stillbirth (Frick, 2021; Glick et al., 2021; Mutz-Dehbalaie et al., 2014). These associations are likely due to several mechanisms, including, but not limited to: age-related reduction of oocyte quality, higher rates of the presence of chronic medical conditions, and changing maternal physiology as it relates to advancing age (Frick, 2021; Glick et al., 2021).

Despite the growing international literature on maternal age and perinatal outcomes, a large gap in country-specific analyses for Indonesia based on nationally representative data needs to be addressed. Although a few studies have considered some maternal age-related factors with pregnancy outcomes in Indonesia, a more comprehensive analysis of the effect of maternal age on perinatal mortality using reliable datasets generated by IDHS 2017 was rarely conducted in the country (Balkis et al., 2023; Rumiati & Adisasmita, 2021). Most research on this issue has been conducted in high-income countries or with small hospital-based samples that are not representative of the broader Indonesian population (Bekele et al., 2023; Mersha et al., 2020). In addition, the specificities of Indonesia's population, such as its large array of different ethnicities, the great disparity in healthcare access between islands, and the specific cultural practices around

birthing and childbearing, call for studies which are targeted at this specific country in order to inform effective policies and interventions (UNFPA, 2012).

III. MATERIALS AND METHODS

Demographic Health Survey

This study utilized a secondary dataset from the 2017 Indonesia Demographic and Health Survey (DHS), a large-scale nationally representative survey designed to collect demographic and maternal and child health data. The DHS employs a stratified multistage cluster sampling design, with households and eligible individuals as the sampling units (Rutstein et al., 2019).

The **primary variables** in this study are perinatal mortality and maternal age at childbirth. Perinatal mortality is defined as the death of the embryo or newborn during delivery. Maternal age is assigned to reproductive age groups, such as <19 years old, 20-34 years old, or ≥35 years old.

Data Analysis Procedures:

1. **Data Preparation:** Extract the raw data from the standard DHS birth recode file. Data on perinatal mortality were defined according to the day of birth and day of death of infants as recorded in the DHS original guidelines. Maternal age, meanwhile, was calculated from the mother's date of birth and the children's date of birth.

2. **Data Conditioning:** Records that were incomplete and saw no chance of being improved, that did not fit experimental criteria in any way, and at the lowest point in this report, would be pregnancy below 28 weeks of gestation for perinatal mortality definition were excluded.

3. **Weighting and Survey Design Adjustment:** Since the DHS uses a complex stratified and clustered sample plan, analyses were carried out with sampling weights in place to yield national estimates that are representative of all households. Adjustments had to be made for the complex design of the survey; therefore, methods were employed that take account of the design effect for variance estimation.

4. **Tools and Instruments:** To deal with complex survey design data analysis, this paper applies statistical packages that can function properly under such conditions, such as Microsoft Excel and STATA.

5. **Ethical Considerations:** The 2017 Indonesia DHS Survey was granted ethical clearance. By means of anonymizing secondary data, respondent privacy is guaranteed.

6. **Statistical Analysis:**

- Descriptive analyses were performed to observe indicators of perinatal mortality frequency based on maternal age characteristics.

- Bivariate analysis using logistic regression tests assessed the association between maternal age groups and perinatal mortality incidence.

- Fractional polynomials are an alternative to linear models, providing flexible parameterization for continuous variables—regression models based on fractional polynomial functions of a continuous covariate.

IV.   RESULTS AND DISCUSSION

Table 1 presents the distribution of maternal age—analyzed both as age at the time of survey and age at birth—alongside perinatal mortality in Indonesia. The table presents the number of stillbirths, early neonatal mortality (ENM), perinatal survival, perinatal deaths, perinatal mortality rate per 1,000 births, along with the total births, stratified by the maternal age categories. Results show that younger maternal age (15–19 years) and advanced maternal age (40–49 years) are associated with higher perinatal mortality rates compared to women in their mid-20s to late 30s. The table allows for comparison across age groups and indicates trends in perinatal survival and death relative to both age at survey and age at birth.

Table 1. Distribution of maternal age and perinatal mortality in Indonesia as categorical variable

| | Variables | Stillbirths | ENM (Early Neonatal M) | Indonesia Perinatal | | | |
				Survive	Death	Per 1000	Births
1	Mother's Age at Survey						
	15-19	6.12	9.90	382.56	16.02	40.19	398.58
	20-24	33.01	23.09	2,774.21	56.10	19.82	2,830.31
	25-29	25.37	57.22	4,310.09	82.58	18.80	4,392.67
	30-34	35.11	42.30	4,417.49	77.41	17.22	4,494.90

Variables	Stillbirths	ENM (Early Neonatal M)	Indonesia Perinatal			
			Survive	Death	Per 1000	Births
35-39	32.79	47.37	3,312.45	80.15	23.63	3,392.61
40-44	10.18	26.16	1,324.96	36.33	26.69	1,361.29
45-49	**9.33**	**6.70**	**284.94**	**16.03**	**53.25**	**300.97**
Total			16,806.70	364.63	21.23	17,171.33
2 Mother's Age at Birth						
< 20	24.13	21.44	1,382.31	45.57	31.91	1,427.87
20-29	59.30	92.03	8,346.48	151.34	17.81	8,497.82
30-39	54.22	86.12	6,378.63	140.34	21.53	6,518.96
40-49	**14.26**	**13.13**	**699.29**	**27.38**	**37.68**	**726.67**
Total			16,806.70	364.63	21.23	17,171.33

Table 2 reports the univariable logistic regression analysis assessing the association between categorized maternal age and perinatal mortality. The results are presented as odds ratios (OR), 95% confidence intervals (CI), and p-values. Both maternal ages at survey and birth are statistically significant ($p = {<}0.001$). The analysis discovered a statistically significant reduction in the odds of perinatal mortality among mothers aged 20–39 compared to adolescents, with risk increasing again in the highest age groups (40–49 years). This study found mother's age to be statistically significant as perinatal mortality determinant in Indonesia with the risk estimates of mother's age at birth at 20 – 29 and 30 – 39 reduced the risk of perinatal mortality compared to <20 years of age respectively (OR: 0.52, 0.38 – 0.71; and OR: 0.59, 0.43 – 0.81), while mother's age at first cohabitation (OR: 0.97, 0.95 – 1.00) and age at first birth increased the risk of perinatal mortality as the age increases (OR: 0.99, 0.96 - 1.01).

Table 2. Logistic Regression: maternal age and perinatal mortality in Indonesia as categorical variables

	Variables	OR	95% CI	*p-*value
1	Mother's Age at Survey			<0.001
	< 19	1.00	Ref	
	20-24	0.55	0.33 – 0.91	
	25-29	0.41	0.25 – 0.67	
	30-34	0.44	0.27 – 0.72	
	35-39	0.50	0.30 – 0.83	
	40-44	0.70	0.41 – 1.20	
	45-49	**1.11**	**0.56 – 2.18**	
5	Mother's Age at Birth			<0.001
	<20	1.00	Ref	
	20-29	0.52	0.38 – 0.71	
	30-39	0.59	0.43 – 0.81	
	40-49	**1.09**	**0.70 – 1.69**	

Table 3 presents the univariable logistic regression results examining the association between maternal age, measured as a continuous variable, and perinatal mortality in Indonesia. Two variables are analysed: age at first cohabitation and age at first birth. The odds ratio (OR), 95% confidence intervals (CI), and p-values are reported for each. Results indicate that a higher age at first cohabitation is significantly associated with a slight reduction in the odds of perinatal mortality (OR = 0.97, 95% CI: 0.95–1.00, p = 0.042). However, age at first birth does not show a statistically significant association with perinatal mortality (OR = 0.99, 95% CI: 0.96–1.01, p = 0.321). These findings suggest that maternal age as a continuous measure, specifically age at first cohabitation, may have a modest protective effect on perinatal outcomes.

Table 3. Logistic Regression maternal age and perinatal mortality in Indonesia as continuous variables

No	Variable	Odds Ratio	95% CI	*p-*value
1	Age of Respondent at First Cohabitation (Years)	0.97	0.95 – 1.00	*0.042*
2	Age of Respondent at First Birth (Years)	0.99	0.96 – 1.01	*0.321*

The result shows from figure 1, respondents' first cohabitation at the age less than 15 has the highest risk of perinatal mortality, which sharply declined at the age of 20 and remained steady at older ages.
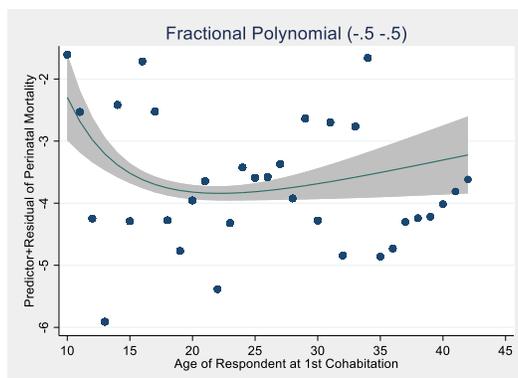
Figure 1: Fractional Polynomial Mother's age at First Cohabitation

Figure 2 shows that respondents' age at first birth at the age less than 15 has the highest risk of perinatal mortality, and sharply declined towards the age of 20, remained steady at older ages.
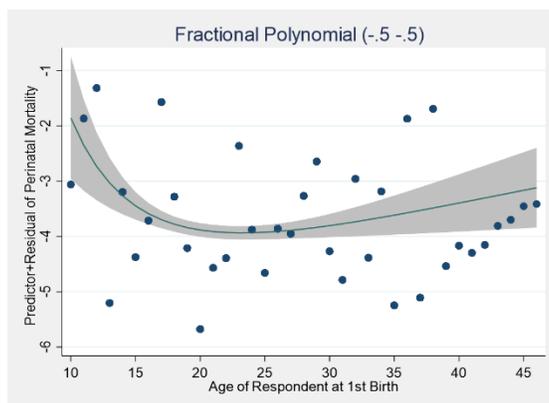

Figure 2. Fractional Polynomial Mother's Age at First Birth in Indonesia

Statistical analysis of the 2017 Indonesian Demographic and Health Survey (IDHS) shows that the mother's age is an important determinative factor in fetal death in Indonesia. This is consistent with both international studies on reproductive health and regional literature.

This study found mother's age to be statistically significant as perinatal mortality determinant in Indonesia with the risk estimates of mother's age at birth at 20 – 29 and 30 – 39 reduced the risk of perinatal mortality compared to <20 years of age respectively (OR: 0.52, 0.38 – 0.71; and OR: 0.59, 0.43 – 0.81), while mother's age at first cohabitation (OR: 0.97, 0.95 – 1.00) and age at first birth increased the risk of perinatal mortality as the age increases (OR: 0.99, 0.96 - 1.01).

In univariable logistic regression, we tested the association of maternal age as a continuous variable with perinatal mortality in Indonesia. Two variables are analyzed: age at first cohabitation and age at first birth. The odds ratio (OR), 95% confidence intervals (CI), and p-values are reported for each. Results show that a higher age at first cohabitation is related to a slightly reduced risk of perinatal death (OR = 0.97, 95% CI: 0.95–1.00, p = 0.042). However, age at first birth does not show a statistically significant association with perinatal mortality (OR = 0.99, 95% CI: 0.96–1.01, p = 0.321). These findings suggest that maternal age as a continuous measure, specifically age at first cohabitation, may have a modest protective effect on perinatal outcomes.

Women who gave birth before age 20 were at a significantly higher risk of perinatal mortality. This result is consistent with prior research that finds adolescent mothers face elevated risks due to biological immaturity, poor prenatal care, and economic marginalization (Balkis et al., 2023; Rumiati & Adisasmita, 2021). The study's results showed that maternal age groups of 20–29 and 30–39 years were significantly protective against perinatal mortality compared to teenage mothers (<20 years), with adjusted odds ratios (OR: 0.52, 0.38 – 0.71; and OR: 0.59, 0.43 – 0.81), while mother's age at first cohabitation (OR: 0.97, 0.95 – 1.00), respectively. hese figures illustrate the most effective age for bearing children if one wants to avoid perinatal hazards. It is consistent with earlier research conducted in low- and middle-income countries that childbearing in the twenties and thirties will bring about less risk of adverse birth outcomes of any kind and mortality for the mother or child.

Conversely, advanced maternal age (≥35 years) was associated with a markedly higher risk of perinatal loss (AOR 7.59, 95% CI: 1.91–30.10, (Roro et al., 2018)). The elevated risk in older mothers is often attributed to a higher incidence of pregnancy complications such as hypertension, diabetes, and chromosomal abnormalities, as well as increased likelihood of congenital anomalies and obstetric complications. This risk pattern is consistent with findings from other resource-limited settings, emphasizing that Indonesia's demographic transition with increasing maternal age at first birth may introduce new public health challenges.

Complicating the risk landscape is the still-prevalent occurrence of early marriage and adolescent childbearing in Indonesia, particularly in rural areas. According to the IDHS and corroborated reports, 18% of girls are married before 15 and 47% before 18, perpetuating early motherhood and increasing perinatal mortality risk (Bekele et al., 2023). Early marriage is not only a harbinger of early motherhood but combines all too frequently with lower educational attainment, less control over one's own destiny, and fewer opportunities for facility-based deliveries and quality antenatal care that are key compounding factors in perinatal risk.

Moreover, analysis showed that the age of one's first copulation (unofficial synonym for early marriage, which is imprecise but used in the literature) and the age of first birth had distinct, subtle links with perinatal mortality. Though a higher age at first copulation slightly lowered risk (OR: 0.92, 95% CI: 0.87–0.98), older age at first birth increased it (OR: 1.07, 95%

CI: 1.01–1.13), suggesting a complex balance between the risks of being too young and the risks associated with delaying pregnancy in contexts where women may have preexisting reproductive health conditions (Frick, 2021).

These findings highlight the need for targeted interventions tailored to the age-specific needs of Indonesian women. Strategies include delaying age at marriage and first pregnancy through policy enforcement and community education, improving adolescent reproductive health, and enhancing prenatal and perinatal care for women at both age extremes. Such interventions are vital for achieving further reductions in perinatal mortality and meeting the Sustainable Development Goals for maternal and newborn health.

V.   CONCLUSION

This research presents explicit evidence that maternal age is a powerful predictor of perinatal mortality in Indonesia, using nationally representative IDHS 2017 data. This apparent U-shaped association is of public health interest, as younger women under 20 years and older women over the age of 35 years share a higher risk for perinatal mortality than women of the optimal reproductive ages 20-29 and 30-39 years of age, the authors note. Early childbearing is a major public health concern in rural Indonesian areas, which is often associated with early marriage and related social drawbacks, and is associated with an increased risk of adverse perinatal outcomes. On the other hand, advanced maternal age is an independent risk factor associated with the physiopathological and obstetric complications.

The higher perinatal mortality associated with older age at first birth in Indonesia reflects the combined effect of age-related biological influences on pregnancy, higher prevalence of maternal comorbidities, and, possibly, disparities in access to care and management of pregnancies among older women. Biological aging results in compromised oocyte quality and quantity, impaired uterine and placental function, with greater susceptibility to complications such as pre-eclampsia and intrauterine fetal demise. Furthermore, older mothers are also more likely to have pre-existing chronic conditions (such as hypertension, diabetes), which can worsen pregnancy risks.

A study involving clinical data from Indonesia found that hypertensive disorders were the leading complications in pregnancies in women with ages of 35 up to 39. These maternal morbidities culminate in increased odds of perinatal deaths such as stillbirths and early neonatal deaths. These results suggest that specific antenatal care and risk management for older mothers is crucial to reduce perinatal mortality in this group. These highlight the need for focused public health efforts for delaying age at first pregnancy through increasing education level, empowering adolescent girls, and law enforcement against early marriage. Increasing availability and quality of antenatal and perinatal care for both adolescent and older mothers is also important in minimizing the risks to mortality.

Policymakers and hospitals need to be aware of the dual burden attached to the two extremes of maternal age posture and plan age-tailored interventions to reduce maternal and neonatal outcomes.

In summary, a multicomponent approach that accounts for social, economic, and healthcare factors is key to improving Indonesia's efforts to reduce perinatal mortality and meet national and global targets, such as the Sustainable Development Goals. Future studies should clarify the mechanisms and contexts behind these age-specific risks to contribute to the design of optimal policies for maternal and child health in Indonesia.

AUTHORS' CONTRIBUTIONS

Samuel Hadjo generates the ideas, data extraction, writes the discussion, and data analysis; Nicely Hadjo and Telvie Kasenda find the literature review, write the articles for the introduction, methodology, and manage the bibliography and references.

REFERENCES

Balkis, F., Ichwansyah, F., Abdullah, A., Zakaria, R., Darwis, A., & Ilmiah Kesehatan, J. (2023). Analysis Determinants of Neonatal Death in Indonesia (2017 IDHS Data Analysis). *STRADA : Jurnal Ilmiah Kesehatan*, *12*(2), 155–166. https://doi.org/10.30994/SJIK.V12I2.968

Bekele, G. G., Yohannes Roga, E., Gonfa, D. N., Yami, A. T., Fekene, D. B., & Kabale, W. D. (2023). The effects of advanced maternal age on perinatal mortality in Ethiopia: A systematic review and meta-analysis. *SAGE Open Medicine*, *11*, 20503121231201280. https://doi.org/10.1177/20503121231201282

Demirci, O., Yılmaz, E., Tosun, Ö., Kumru, P., Arınkan, A., Mahmutoğlu, D., Selçuk, S., Dolgun, Z. N., Arısoy, R., Erdoğdu, E., & Tarhan, N. (2016). Effect of young maternal age on obstetric and perinatal outcomes: Results from the tertiary center in Turkey. *Balkan Medical Journal*, *33*(3), 344–349. https://doi.org/10.5152/BALKANMEDJ.2015.150364,

Fall, C. H. D., Sachdev, H. S., Osmond, C., Restrepo-Mendez, M. C., Victora, C., Martorell, R., Stein, A. D., Sinha, S., Tandon, N., Adair, L., Bas, I., Norris, S., Richter, L. M., Barros, F. C., Gigante, D., Hallal, P. C., Horta, B. L., Ramirez-Zea, M., Bhargava, S. K., … Stein, A. (2015). Association between maternal age at childbirth and child and adult outcomes in the offspring: a prospective study in five low-income and middle-income countries (COHORTS collaboration). *The Lancet. Global Health*, *3*(7), e341. https://doi.org/10.1016/S2214-109X(15)00038-8

Frick, A. P. (2021). Advanced maternal age and adverse pregnancy outcomes. *Best Practice and Research: Clinical Obstetrics and Gynaecology*, *70*, 92–100. https://doi.org/10.1016/j.bpobgyn.2020.07.005

Glick, I., Kadish, E., & Rottenstreich, M. (2021). Management of Pregnancy in Women of Advanced Maternal Age: Improving Outcomes for Mother and Baby. *International Journal of Women's Health*, *13*, 751. https://doi.org/10.2147/IJWH.S283216

Hadjo, S., Pearce, M. S., Booth, M., & Rankin, J. (2023). P125 Perinatal mortality and it's determinants in Indonesia: An epidemiological investigation using data from the Indonesia demographic health survey 2017. *J Epidemiol Community Health*, *77*(Suppl 1), A109–A109. https://doi.org/10.1136/JECH-2023-SSMABSTRACTS.226

IDHS. (2017). Adolescent Reproductive Health. *Indonesia Demographic and Health Survey 2017*.

Kim, Y. N., Choi, D. W., Kim, D. S., Park, E. C., & Kwon, J. Y. (2021). Maternal age and risk of early neonatal mortality: a national cohort study. *Scientific Reports*, *11*(1), 814. https://doi.org/10.1038/S41598-021-80968-4

Mcanarney, E. R. (1987). Young Maternal Age and Adverse Neonatal Outcome. *American Journal of Diseases of Children*, *141*(10), 1053–1059. https://doi.org/10.1001/ARCHPEDI.1987.04460100031017

Mersha, A., Ayele, G., Worku, T., Zerdo, Z., Shibiru, S., Bante, A., & Chonka, T. (2020). Association between maternal age and adverse perinatal outcomes in Arba Minch zuria, and Gacho Baba district, southern Ethiopia: a prospective cohort study. *BMC Pregnancy and Childbirth*, *20*(1), 590. https://doi.org/10.1186/S12884-020-03285-0

Misnaniarti, Sariunita, N., & Idris, H. (2024). Regional perinatal mortality differences in Indonesia: Evidence from Indonesian demographic health survey. *Public Health in Practice*, *7*, 100501. https://doi.org/10.1016/J.PUHIP.2024.100501

Mutz-Dehbalaie, I., Scheier, M., Jerabek-Klestil, S., Brantner, C., Windbichler, G. H., Leitner, H., Egle, D., Ramoni, A., & Oberaigner, W. (2014). Perinatal mortality and advanced maternal age. *Gynecologic and Obstetric Investigation*, *77*(1), 50–57. https://doi.org/10.1159/000357168,

Raina, N., Khanna, R., Gupta, S., Jayathilaka, C. A., Mehta, R., & Behera, S. (2023). Progress in achieving SDG targets for mortality reduction among mothers, newborns, and children in the WHO Southeast Asia Region. *The Lancet Regional Health - Southeast Asia*, *18*, 100307. https://doi.org/10.1016/J.LANSEA.2023.100307

Roro, E. M., Sisay, M. M., & Sibley, L. M. (2018). Determinants of perinatal mortality among cohorts of pregnant women in three districts of North Showa zone, Oromia Region, Ethiopia: Community based nested case control study. *BMC Public Health*, *18*(1), 1–11. https://doi.org/10.1186/S12889-018-5757-2/TABLES/7

Rumiati, F., & Adisasmita, A. C. (2021). *DETERMINANTS OF NEONATAL MORTALITY BASED ON THE 2017 INDONESIAN DEMOGRAPHIC AND HEALTH SURVEY (IDHS)*. https://doi.org/10.20473/ijph.vl16il.2021.363-374

Rutstein, S., Calverton, G. R.-, Macro, M. O., & 2006, undefined. (2019). Guide to DHS statistics. *Dhsprogram.Com*, *14*(5). https://doi.org/10.1371/journal.pone.0216403

Siahaan, A., & Ariawan, I. (2021). Effect of Parity on Neonatal Mortality in Indonesia. *Jurnal Ilmu Kesehatan Masyarakat*, *12*(3), 250–262. https://doi.org/10.26553/jikm.2021.12.3.250-262

Tanaka, S., Stock, S. J., Yamamoto, Y., Kondejewski, J., & Olson, D. M. (2010). Understanding perinatal mortality. *Obstetrics, Gynaecology & Reproductive Medicine*, *20*(11), 317–322. https://doi.org/10.1016/J.OGRM.2010.08.004

UNFPA. (2012). Disparity of Access & Quality Review of Maternal Mortality in Five Region in Indonesia. *UNITED NATIONS POPULATION FUND (UNFPA)*.