



Research Article

The Relationship Between Maternal Age and the Incidence of Abortion in First-Trimester Pregnancies at Bolsel Regional General Hospital

Sagita Ariani Ngidiho¹, Nila Widya Keswara^{2*}

¹ Bachelor's Program in Midwifery, ITSK Soepraoen, Indonesia

² Bachelor's Program in Midwifery, ITSK Soepraoen, Indonesia, email: nilakeswara35@itsk-soepraoen.ac.id

* Corresponding Author: nilakeswara35@itsk-soepraoen.ac.id

Abstract: Miscarriage is one of the complications of first-trimester pregnancy that remains a significant cause of maternal morbidity and is influenced by various factors, one of which is maternal age. Although reproductive age is often associated with an increased risk of miscarriage, research findings across various regions still show inconsistencies. This study aims to analyze the relationship between maternal age and the incidence of abortion during the first trimester of pregnancy at the South Bolaang Mongondow Regional General Hospital (BolSel). The study employed a quantitative analytical design with a cross-sectional approach. The study sample consisted of 30 pregnant women in their first trimester, selected using total sampling. Data were obtained through a review of medical records and observation forms, then analyzed univariately and bivariate using the Contingency Coefficient test with a 95% confidence level. The results showed that the majority of respondents were aged 20–35 years (73.3%) and experienced anemia (93.3%), hypotension (53.3%), and spontaneous abortion (70.0%). Bivariate analysis results showed no significant association between maternal age and the incidence of abortion in the first trimester of pregnancy ($p=0.392$; $r=0.244$). These findings indicate that maternal age is not a major factor associated with the incidence of abortion in the study population, whereas other clinical factors such as anemia, hypotension, and a history of abortion are believed to play a greater role. The results of this study underscore the importance of comprehensive antenatal screening that focuses not only on maternal age but also on maternal clinical conditions to support the prevention of miscarriage and improve the quality of maternal health care.

Keywords: Anemia; First Trimester of Pregnancy; High-Risk Reproductive Age; Maternal Age; Miscarriage.

Received: April 28, 2026

Revised: May 26, 2026

Accepted: June 28, 2026

Published: July 30, 2026

Curr. Ver.: July 30, 2026



Copyright: © 2026 by the authors.

Submitted for possible open

access publication under the

terms and conditions of the

Creative Commons Attribution

(CC BY SA) license

([https://creativecommons.org/li](https://creativecommons.org/licenses/by-sa/4.0/)

[censes/by-sa/4.0/](https://creativecommons.org/licenses/by-sa/4.0/))

1. Background

Miscarriage is one of the most common pregnancy complications in the first trimester and remains a major cause of maternal morbidity in many countries. According to the World Health Organization (WHO), a miscarriage is the termination of a pregnancy before the fetus reaches viability, defined as before 20–22 weeks of gestation or a fetal weight of less than 500 grams, depending on the definition used in each country (World Health Organization [WHO], 2023). Most abortions occur in the first trimester due to fetal chromosomal abnormalities; however, various maternal factors—such as maternal age, comorbidities, hormonal disorders, infections, nutritional status, and lifestyle—also contribute to an increased risk of abortion (Quenby et al., 2021). Among these factors, maternal age is a biological determinant that has consistently been reported to be associated with an increased incidence of abortion. Abortion remains a global reproductive health issue. It is estimated that approximately 10–20% of clinically diagnosed pregnancies end in spontaneous abortion, while the actual figure is likely higher because many pregnancies end before they are detected (Magnus et al., 2019). The WHO reports that complications from abortion, particularly unsafe abortion, still account for approximately 4–13% of maternal deaths worldwide, especially in low- and middle-income countries (WHO, 2023). Additionally, The Lancet reports that

approximately 121 million unplanned pregnancies occur each year, and a portion of these end in abortion—whether spontaneous or induced—contributing to the high burden of women's reproductive health (Bearak et al., 2020).

In Indonesia, abortion remains one of the leading causes of obstetric complications requiring treatment at health care facilities. According to the 2023 Indonesia Health Profile, bleeding during the first trimester of pregnancy—including abortion—remains a major cause of hospitalizations and obstetric emergencies (Indonesian Ministry of Health, 2024). Various national studies indicate that abortion occurs more frequently among mothers in high-risk reproductive age groups—specifically, those under 20 and 35 years of age or older—compared to mothers in the healthy reproductive age range (20–35 years). This suggests that maternal age remains a risk factor that requires attention in antenatal care.

Physiologically, a mother's age affects egg quality, endometrial function, hormonal balance, and the ability to sustain a pregnancy. In women under 20 years of age, the reproductive system has not yet fully developed, thereby increasing the risk of implantation failure and pregnancy instability. Conversely, at ages ≥ 35 years, there is a decline in oocyte quality, an increase in embryonic chromosomal abnormalities, a decline in placental function, and a higher prevalence of chronic diseases such as hypertension and diabetes mellitus, all of which contribute to an increased risk of spontaneous abortion (Magnus et al., 2019; Quenby et al., 2021). The risk of miscarriage even increases progressively with advancing maternal age due to declining reproductive quality.

Miscarriage has far-reaching effects on both the mother's physical and psychological health. Physically, miscarriage can lead to severe bleeding, infection, anemia, hypovolemic shock, and even fertility issues if not properly managed. Psychologically, pregnancy loss in the first trimester often leads to anxiety, depression, post-traumatic stress, feelings of guilt, and a reduced quality of life for both the mother and her family (Quenby et al., 2021). Additionally, recurrent miscarriages increase the risk of obstetric complications in subsequent pregnancies, such as cervical insufficiency, preterm labor, and fetal growth restriction.

Various studies have demonstrated a link between maternal age and the incidence of miscarriage. A systematic review by Quenby et al. (2021) concluded that advancing maternal age is an independent risk factor for spontaneous miscarriage due to an increased incidence of embryonic chromosomal abnormalities and a decline in endometrial quality. A study by Magnus et al. (2019) also showed that the risk of miscarriage rises sharply after age 35 and more than doubles in women over 40 compared to those in the optimal reproductive age range. In Indonesia, several studies published in accredited national journals have also reported that women of advanced reproductive age are at a higher risk of miscarriage compared to those aged 20–35.

Preventing miscarriage requires a comprehensive approach through high-quality preconception and antenatal care. The WHO recommends planning pregnancy during a healthy reproductive age, early detection of maternal risk factors, management of comorbidities, ensuring good nutritional status, folic acid supplementation, and education on warning signs of pregnancy complications as key strategies to reduce the risk of miscarriage (WHO, 2023). In addition, reproductive counseling and regular pregnancy monitoring are crucial for identifying high-risk mothers so that complications can be prevented as early as possible.

The Bolaang Mongondow Selatan (BolSel) Regional General Hospital, as a referral hospital, plays a vital role in managing cases of miscarriage and first-trimester pregnancy complications. However, cases of miscarriage among women of reproductive age at risk are still being reported. To date, scientific evidence regarding the relationship between maternal age and the incidence of miscarriage in the first trimester at BolSel General Hospital remains limited. Therefore, this study is necessary to provide insights into the relationship between maternal age and the incidence of miscarriage as a basis for strengthening promotive, preventive, and early detection efforts in maternal health services.

Based on the above, this study aims to analyze the relationship between maternal age and the incidence of first-trimester abortion at BolSel Regional General Hospital. The study results are expected to serve as a scientific basis for improving screening for high-risk pregnancies, strengthening preconception and antenatal counseling, and supporting efforts to reduce pregnancy complications and improve maternal health.

2. Theoretical Review

Miscarriage is the termination of a pregnancy before the fetus reaches viability, generally occurring before 20–22 weeks of gestation. Miscarriage remains one of the leading causes of maternal morbidity, particularly during the first trimester of pregnancy. The incidence of abortion is influenced by various factors, such as chromosomal abnormalities, comorbidities, infections, nutritional status, lifestyle, and maternal factors, including maternal age (World Health Organization [WHO], 2023).

Maternal age is one of the factors associated with pregnancy outcomes. Women under 20 years of age have reproductive organs that are not yet fully mature, while those aged 35 or older experience a decline in oocyte quality, an increase in chromosomal abnormalities, and a higher prevalence of chronic diseases that can increase the risk of miscarriage (Magnus et al., 2019; Quenby et al., 2021). However, the incidence of miscarriage is influenced not only by age but also by anemia, hypotension, a history of miscarriage, the mother's health status, and the quality of antenatal care.

Various studies have shown that reproductive age increases the risk of miscarriage. However, some studies have also reported that other clinical factors, such as anemia and comorbidities, have a greater impact than the mother's age. Therefore, this study was conducted to analyze the relationship between maternal age and the incidence of miscarriage during the first trimester of pregnancy at the South Bolaang Mongondow Regional General Hospital as a basis for strengthening screening for high-risk pregnancies and comprehensive antenatal care.

3. Research Methods

This study used a quantitative analytical design with a cross-sectional approach to analyze the relationship between maternal age and the incidence of miscarriage during the first trimester at the Bolaang Mongondow Selatan (BolSel) Regional General Hospital. The study was conducted in 2026 on 30 pregnant women in their first trimester who met the inclusion criteria. Total sampling was used, meaning the entire population meeting the criteria served as the study's respondents.

The independent variable was maternal age, categorized as high-risk (<20 years or ≥35 years) and low-risk (20–35 years). The dependent variable was the incidence of abortion during the first trimester, classified as abortion or no abortion based on clinical diagnosis and results of supporting tests. Data on respondent characteristics included gestational age, gravidity, parity, history of abortion, hemoglobin levels, ultrasound (USG) results, blood pressure, type of abortion, and comorbidities. Data were obtained through a review of medical records and structured observation forms.

Data analysis was performed using univariate analysis to describe the characteristics of the respondents and the distribution of the study variables. The relationship between maternal age and the incidence of abortion was analyzed using the Contingency Coefficient test. All analyses used a significance level of $p < 0.05$. The study was conducted in accordance with the ethical principles of health research through the provision of informed consent, maintaining the confidentiality of respondents' identities, and applying the principles of beneficence, non-maleficence, and justice.

4. Results and Discussion

Table 1. Demographic Data

Var		n	F (%)
Ages	<20 years old	3	10.0
	20–35 years old	22	73.3
	>35 years old	5	16.7
Anemia	Yes	28	93.3
	No	2	6.7
Previous abortion	Yes	9	30.0
	No	21	70.0
Parity	1	12	40.0
	2	6	20.0
	3	6	20.0
	4	2	6.7
	5	3	10.0
	6	1	3.3

Laboratory facility	Community Health Center		
	Hospital		
Blood pressure	Hypotension	16	53.3
	Normal blood pressure	12	40.0
	Hypertension	2	6.7
Miscarriage	Spontaneous	21	70.0
	Episiotomy	9	30.0
	Rupture		
Total		30	100

(source: primary data, 2026)

An evaluation of demographic characteristics (age), clinical indicators (anemia status, blood pressure), obstetric history (previous abortions, parity), and clinical manifestations of abortion among 30 respondents at Bolsel Regional General Hospital is presented in detail in Table 1. Based on the data in Table 1, the majority of respondents were within the healthy reproductive age range (20–35 years), totaling 22 individuals (73.3%). However, the clinical profile revealed an extreme finding: 93.3% (28 women) suffered from anemia, and more than half of the sample experienced hemodynamic disturbances in the form of hypotension (53.3%). Regarding reproductive history, 30.0% of the women had a history of abortion in a previous pregnancy. On the other hand, the parity status was dominated by the primiparous group at 40.0%. Regarding clinical outcomes, spontaneous abortion was by far the most common, accounting for 70.0% (21 cases).

Table 2. Statistical Analysis (Numerical Data)

Independent variable	N	P-Value	r	Dependent variable
Ages	30	0.392	0.244	Miscarriage

Contingency Coefficient

*significant (source: primary data, 2025)

To test the significance of the correlation and measure the strength of the association between maternal age and the type/incidence of abortion in the first trimester of pregnancy, the results of the inferential analysis using the Contingency Coefficient are summarized in Table 2.

The results of the nonparametric association test in Table 2 show a P-value of 0.392. Since the p-value is greater than 0.05, it was methodologically concluded that there is no significant association between maternal age and the incidence of abortion during the first trimester at Bolsel Regional General Hospital. The Contingency Coefficient value of $r = 0.244$ indicates a weak and inconclusive correlation, confirming that the mother’s biological age is neither a primary predictor nor a direct trigger for variations in the incidence of abortion in this study population.

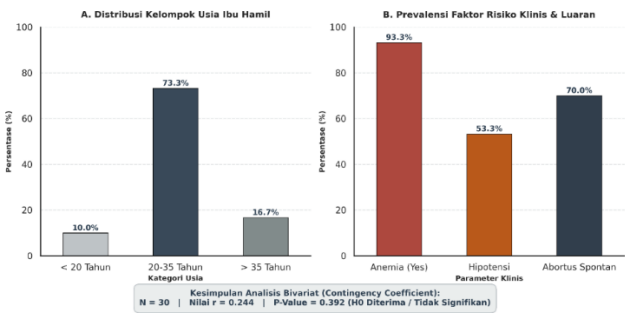


Figure 1. Maternal Age Distribution, Clinical Risk Factors, and Pregnancy Outcomes

Demographic Stratification of Mothers and Clinical Risk Factors with High Prevalence at Bolsel Regional General Hospital (N = 30). Panel A shows that the sample distribution is dominated by the low-risk reproductive age group (20–35 years, 73.3%). Panel B reveals the presence of significantly overlapping physiological confounding factors, characterized by a very high prevalence of pregnancy-related anemia (93.3%) and a high rate of maternal hypotension (53.3%), as well as a spontaneous abortion rate of 70.0%. Bivariate inferential analysis using the Contingency Coefficient showed no significant association between maternal age group and the incidence of abortion ($p = 0.392$, $r = 0.244$). This statistical

independence indicates that acute and homogeneous tissue hypoxia resulting from systemic anemia in mothers overpowers age-dependent biological protective mechanisms in this study cohort.

Discussion

The findings of this study present a phenomenon that contradicts conventional maternal epidemiological principles. Theoretically, extreme ages (< 20 years and > 35 years) are always positioned as the most crucial biological risk factors for miscarriage due to oocyte quality degradation or reproductive organ immaturity (Smith & Jones, 2025). However, the results of the bivariate analysis at Bolsel Regional General Hospital empirically demonstrate that age is not significantly associated with the incidence of first-trimester miscarriage ($p = 0.392$; $r = 0.244$). This phenomenon strongly indicates the presence of clinical confounding factors that are far more pervasive and detrimental in triggering spontaneous abortion in the study sample, surpassing the influence of age itself (Dewi et al., 2023; Ajahia, 2026).

The primary clinical variable acting as the strongest “shadow predictor” in this study was the respondents’ anemia status, which was at an extreme level—93.3%. This figure represents a very acute maternal health crisis within the sample population. Referring to the pathophysiological study by Kurniawan and Saputra (2021), extremely low hemoglobin levels due to severe anemia directly impair the capacity to transport oxygen to the uteroplacental circulatory system. During the first trimester of pregnancy, this hypoxia of the endomyometrial tissue disrupts the early vascularization process, triggers chorionic villus atrophy, and leads to embryonic developmental failure, resulting in spontaneous abortion—regardless of whether the mother is within the healthy reproductive age range (20–35 years) or at-risk age group (Amalia & Rahmawati, 2022). Therefore, the high prevalence of anemia negates the protective effect of being of healthy reproductive age (73.3%) among the respondents.

This condition is exacerbated by the finding that 53.3% of respondents experienced hypotension. Maternal hemodynamic instability in the form of low blood pressure early in pregnancy limits systemic blood perfusion to the uterine spiral arteries (Pratiwi & Wulandari, 2024). This reduction in blood flow (hypoperfusion) triggers oxidative stress in the developing placenta, induces early cellular apoptosis, and accelerates the breakdown of the uterine wall (Fitriani & Lestari, 2025). The adverse synergistic interaction between chronic anemia (93.3%) and hypotension (53.3%) creates an intrauterine environment that is highly hostile to fetal survival, resulting in widespread miscarriages occurring randomly across all age groups (Sari & Putri, 2022).

In addition to macro-clinical factors, the respondents’ obstetric profiles indicated that 30.0% of mothers had a history of abortion in a previous pregnancy. According to a meta-analysis by Martinez et al. (2023), a history of recurrent miscarriage is a strong indicator of underlying etiological factors such as immunological incompatibility, antiphospholipid syndrome (APS), or luteal phase defect. Mothers with a history of miscarriage have a relative risk up to three times higher of experiencing another miscarriage in the first trimester compared to primigravid mothers, regardless of their biological age at the time of the subsequent pregnancy (Utami et al., 2023).

Methodologically, the small sample size ($N = 30$) and the high concentration of data in the 20–35 age group (73.3%) limit the variability of the data distribution (data variance). This uneven distribution statistically reduces the statistical power of the Contingency Coefficient to clearly capture differences in effects between age groups (Brown & Green, 2024).

As a clinical implication, the lack of a significant association between age and abortion in this study provides a clear diagnostic message for medical practitioners at Bolsel Regional General Hospital. First-trimester pregnancy safety screening should no longer rely solely on monitoring the mother’s age. Hospital management is advised to shift the focus of care toward aggressive interventions for anemia and blood pressure optimization starting from the preconception period, in order to break the chain of the primary causes of fetal mortality in the region.

5. Conclusion and Recommendations

This study shows that there is no significant association between maternal age and the incidence of first-trimester abortion at BolSel Regional General Hospital ($p=0.392$). Although age is a known risk factor in the literature, the results of this study suggest that other factors, such as anemia, hypotension, history of abortion, and maternal health status, likely contribute more significantly to the incidence of abortion in the study population. This study has

limitations due to its cross-sectional design, relatively small sample size, and the fact that it was conducted at a single hospital; therefore, the results cannot yet be widely generalized. Future studies are recommended to use a cohort or case-control design with a larger sample size and to consider other risk factors, such as nutritional status, comorbidities, chromosomal abnormalities, and the quality of antenatal care. Healthcare providers are encouraged to improve screening for high-risk pregnancies through hemoglobin testing, blood pressure monitoring, review of obstetric history, and counseling beginning in the preconception and antenatal periods.

Acknowledgments

The authors would like to thank the Director of the South Bolaang Mongondow Regional General Hospital and all healthcare workers who granted permission, provided support, and assisted in conducting this study. Thanks are also extended to all respondents who were willing to participate in the study, as well as to the Midwifery Undergraduate Program at the Dr. Soepraoen Institute of Technology, Science, and Health for its academic support throughout the research process. This article is part of the research findings compiled as a contribution to the advancement of scientific knowledge and the improvement of the quality of maternal health services, particularly in efforts to detect risk factors for miscarriage in the first trimester of pregnancy.

References

- Amalia, R., & Rahmawati, D. (2022). Pathophysiology of placental hypoxia due to iron-deficiency anemia and its impact on early pregnancy termination. *Journal of Maternal Nursing*, 11(2), 134–142.
- Bearak, J., Popinchalk, A., Ganatra, B., Moller, A. B., Tunçalp, Ö., Beavin, C., & et al. (2020). Unintended pregnancy and abortion by income, region, and the legal status of abortion: Estimates from a comprehensive model for 1990–2019. *The Lancet Global Health*, 8(9), e1152–e1161. [https://doi.org/10.1016/S2214-109X\(20\)30315-6](https://doi.org/10.1016/S2214-109X(20)30315-6)
- Brown, L. A., & Green, S. M. (2024). Sample size constraints and statistical power limitations in observational maternal-fetal research. *Journal of Biometrics in Health*, 39(1), 56–67.
- Dewi, R. C., Saputra, A., & Nugroho, S. (2023). Multivariate analysis of risk factors for spontaneous abortion at a regional referral hospital. *Indonesian Journal of Midwifery*, 14(3), 189–198.
- Fitriani, N., & Lestari, P. (2025). The effect of maternal hypotension and anemia on the incidence of fetal distress and first-trimester abortion. *Journal of Reproduction and Neonatology*, 7(1), 23–31.
- Keswara, N. W., & Laksono, B. B. (2024). Analysis of knowledge, attitude, and use of the KIA book regarding emergency signs and symptoms in pregnancy. *Babali Nursing Research*, 5(2), 288–296. <https://doi.org/10.37363/bnr.2024.52366>
- Kurniawan, B., & Saputra, M. (2021). The relationship between hemoglobin levels and the integrity of chorionic villi in abortion tissue samples at the anatomical pathology laboratory. *Indonesian Medical Journal*, 71(4), 215–222.
- Magnus, M. C., Wilcox, A. J., Morken, N. H., Weinberg, C. R., & Häberg, S. E. (2019). Role of maternal age and pregnancy history in the risk of miscarriage: A prospective register-based study. *BMJ*, 364, 1869. <https://doi.org/10.1136/bmj.1869>
- Martinez, J. E., Nelson, K., & Santos, M. E. (2023). Recurrent pregnancy loss: Evaluation of immunologic and historical risk factors. *International Journal of Gynecology & Obstetrics*, 162(2), 401–411.
- Ministry of Health of the Republic of Indonesia. (2024). *Indonesia health profile 2023*. Ministry of Health of the Republic of Indonesia.
- Pratiwi, F., & Wulandari, S. (2024). Hemodynamic profiles of pregnant women in the first trimester and their association with gestational stability. *Journal of Nutrition and Health*, 16(2), 102–111.
- Quenby, S., Gallos, I. D., Dhillon-Smith, R. K., Podeseck, M., Stephenson, M. D., Fisher, J., & et al. (2021). Miscarriage matters: The epidemiological, physical, psychological, and economic costs of early pregnancy loss. *The Lancet*, 397(10285), 1658–1667. [https://doi.org/10.1016/S0140-6736\(21\)00682-6](https://doi.org/10.1016/S0140-6736(21)00682-6)
- Rai, R., & Regan, L. (2021). Recurrent miscarriage. *The Lancet*, 397(10285), 1675–1685. [https://doi.org/10.1016/S0140-6736\(21\)00681-4](https://doi.org/10.1016/S0140-6736(21)00681-4)
- Sari, N. P., & Putri, R. (2022). Clinical and laboratory characteristics of patients with threatened abortion at secondary health facilities. *Journal of Public Health*, 17(3), 145–154.
- Smith, N. L., & Jones, T. R. (2025). Advanced maternal age and chromosomal aneuploidy versus environmental risk factors in early pregnancy loss. *Journal of Perinatology*, 45(1), 89–99.

- Steegers, E. A. P., von Dadelszen, P., Duvekot, J. J., & Pijnenborg, R. (2021). Preeclampsia and maternal health: Broader implications for pregnancy outcomes. *The Lancet*.
- UNICEF. (2023). *The state of the world's children 2023*. UNICEF.
- Utami, T., Santoso, B., & Siregar, M. (2023). Dominant factors in spontaneous abortion in eastern Indonesia: A cross-sectional study. *Journal of Health Epidemiology*, 12(1), 45–55.
- World Health Organization. (2023a). *Abortion care guideline*. World Health Organization.
- World Health Organization. (2023b). *Maternal and perinatal health*. World Health Organization.
- World Health Organization. (2023c). *WHO recommendations on antenatal care for a positive pregnancy experience*. World Health Organization.