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Maternal and Neonatal Vulnerabilities Associated with Child Survival in Indonesia

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ABSTRACT

Background: Child mortality remains a major public health challenge in Indonesia despite improvements in maternal and child healthcare services. Various maternal, socioeconomic, reproductive, and neonatal factors may contribute to child survival disparities across regions in Indonesia. **Objective:** This study aimed to identify factors associated with child survival among women in Indonesia. **Methods:** This study employed a cross-sectional design using secondary data from the 2017 Indonesian Demographic and Health Survey (IDHS) women's recode dataset (IDIR71FL). The study included 14,925 women aged 15–49 years who met the inclusion criteria. Weighting procedures were applied before analysis to ensure nationally representative estimates. Analyzed descriptive statistics were using to describe respondents' characteristics, while chi-square tests and binary logistic regression analyses were conducted to identify factors associated with child survival. Crude Odds Ratios (COR) and Adjusted Odds Ratios (AOR) with 95% Confidence Intervals (CI) were reported. **Results:** Maternal age, education level, occupation, province, parity, maternal age at first birth, twin status, birth weight, and labor complications were significantly associated with child survival. Mothers with no formal education (AOR=2.96; 95% CI=1.32–6.64), parity ≥ 4 (AOR=3.45; 95% CI=2.08–5.70), twin births (AOR=2.45; 95% CI=1.26–4.76), low birth weight infants (AOR=3.16; 95% CI=2.28–4.37), and labor complications (AOR=1.47; 95% CI=1.10–1.96) had higher odds of child mortality. **Conclusion:** Child survival in Indonesia is influenced by maternal socio-demographic, reproductive, and neonatal factors. Strengthening maternal and neonatal healthcare services, particularly among high-risk mothers and disadvantaged regions, is essential to improve child survival outcomes in Indonesia.

Keywords: child survival; maternal factors; low birth weight; labor complications; Indonesia

Background

Child mortality continues to represent a major global public health concern, particularly in low- and middle-income countries. Although substantial progress has been achieved over recent decades, neonatal and under-five mortality still contribute considerably to the global burden of preventable deaths worldwide. Approximately five million children died before reaching the age of five in 2021, and nearly half of these deaths occurred during the neonatal period (World Health Organization, 2022). Moreover, Indonesia continues to face significant challenges in achieving the Sustainable Development Goals (SDGs), especially the target of reducing neonatal mortality to fewer than 12 deaths per 1,000 live births by 2030 (World Health Organization, 2022). Early neonatal mortality remains a critical issue in Indonesia because most neonatal deaths occur within the first week of life, reflecting inadequate maternal and neonatal healthcare services (1). Furthermore, despite gradual improvements over time, Indonesia still experiences a relatively high neonatal mortality burden compared with several other Southeast Asian countries (2).

Previous studies have demonstrated that child survival is influenced by multiple maternal, socioeconomic, environmental, and neonatal determinants. Several factors, including maternal education, maternal age, parity, birth weight, delivery complications, and regional disparities, have consistently been associated with neonatal and infant mortality (3). In addition, maternal age, birth weight, residential status, and birth interval have been identified as significant predictors of under-five mortality in Indonesia (4). Similarly, infant mortality has been strongly associated with maternal age, infant birth size, and regional inequalities across Indonesia (5). Moreover, simultaneous exposure to multiple risk factors, such as low

maternal education and poor neonatal conditions, substantially increases the likelihood of under-five mortality in low- and middle-income countries (3). Therefore, these findings suggest that child mortality is not caused by a single determinant but rather results from complex interactions between maternal, socioeconomic, and neonatal factors (6).

Despite the growing body of evidence regarding child mortality in Indonesia, several limitations remain in previous studies. Many earlier studies focused specifically on neonatal mortality, perinatal mortality, or under-five mortality without comprehensively examining maternal socio-demographic, reproductive, and neonatal characteristics simultaneously among women of reproductive age using nationally representative data. Regional disparities in perinatal mortality have previously been investigated; however, the analysis mainly emphasized geographical variation rather than broader maternal and reproductive determinants (7). Likewise, childbirth complications and neonatal mortality have been explored in earlier studies, although the analyses were limited to obstetric factors (8). In addition, determinants of neonatal death have been examined previously without comprehensively incorporating wider maternal and reproductive characteristics into the analytical model (9). Furthermore, several previous analyses did not explicitly apply weighting procedures from the Indonesian Demographic and Health Survey (IDHS), potentially affecting the national representativeness and generalizability of the findings. Consequently, evidence regarding determinants of child survival among Indonesian women using weighted nationally representative data remains limited (10).

This study was conducted to address these gaps by analyzing determinants of child survival among women in Indonesia using weighted data from the 2017 Indonesian Demographic and Health Survey (IDHS). Unlike previous studies that focused only on specific mortality outcomes or limited determinants, the present study simultaneously evaluated maternal age, educational attainment, occupation, wealth index, parity, maternal age at first birth, regional disparities, birth weight, twin status, and labor complications within a nationally representative framework. Furthermore, the novelty of this study lies in the integration of maternal socio-demographic, reproductive, and neonatal factors into a single multivariable model using weighted IDHS data to obtain more accurate national estimates. Therefore, the findings are expected to provide comprehensive evidence for policymakers and healthcare providers in strengthening maternal and child health interventions aimed at improving child survival outcomes in Indonesia (11).

Methods

This study employed a quantitative analytic design using a cross-sectional approach based on secondary data obtained from the Indonesian Demographic and Health Survey (IDHS) data. The analysis utilized the women's individual recode data file (IDIR71FL), which contains nationally representative information related to maternal and child health in Indonesia. The study was conducted using data derived from the 2017 Indonesian Demographic and Health Survey (IDHS), which was implemented across all provinces in Indonesia. Data analysis and manuscript preparation were carried out from 2025 to 2026. The study population consisted of women of reproductive age included in the 2017 IDHS dataset. The analytical sample comprised women who met the inclusion criteria based on the availability and completeness of variables related to child survival status, socio-demographic characteristics, maternal factors, and neonatal factors. After data cleaning and exclusion of incomplete observations, a total weighted sample of 14,925 women was included in the final analysis. The IDHS applied a stratified two-stage cluster sampling design to obtain nationally representative data. In the first stage, census blocks were selected proportionally from urban and rural areas. In the second stage, households were systematically selected from each census block. To ensure representativeness and account for the complex survey design, sample weighting was applied prior to statistical analysis (12).

The dependent variable in this study was child survival status. The independent variables included maternal age, educational attainment, marital status, occupation, residential status, wealth index, province, parity, maternal age at first birth, twin status, birth weight, and labor complications. All variables were obtained from the standardized Indonesian Demographic and Health Survey (IDHS) 2017 women's questionnaire and birth recode dataset.

Before the statistical analysis, sample weighting was applied using the women's sampling weight (v005) provided in the IDHS 2017 dataset. Following the DHS guidelines, the sampling weight was

calculated by dividing the v005 variable by 1,000,000 before analysis. The weighting procedure was applied to account for unequal probabilities of selection and non-response, thereby ensuring nationally representative estimates. Descriptive statistics were used to summarize respondents' characteristics. Chi-square tests were performed to examine the associations between maternal socio-demographic, reproductive, and neonatal variables and child survival status. Variables with $p < 0.05$ were subsequently included in the binary logistic regression analysis to estimate crude odds ratios (COR), adjusted odds ratios (AOR), and 95% confidence intervals (CI). Statistical significance was established at $p < 0.05$.

Descriptive statistics were used to summarize respondents' characteristics and are presented as frequencies and percentages. Bivariate analysis was conducted using the chi-square test to assess the association between independent variables and child survival status. Variables with statistical significance at $p < 0.05$ were further included in binary logistic regression analysis to estimate crude odds ratios (COR) and adjusted odds ratios (AOR) with 95% confidence intervals (CI). Statistical significance was determined at $p < 0.05$.

The Institutional Review Board (IRB) approved the initial IDHS survey through the ICF IRB Review Board (FWA00000845). Permission to access and use the IDHS dataset was obtained through the Demographic and Health Surveys (DHS) Program. All data were fully anonymized prior to analysis to ensure participant confidentiality and privacy.

Results

Table 1. Socio-Demographic, Maternal, and Child Characteristics among Women in Indonesian (n=14,925)

Variable	Frequency (n)	Percent (%)
Age		
15–24	2,740	18.4
25–34	7,636	51.2
35–49	4,549	30.5
Education Level		
Highest	2,628	17.6
Secondary	8,450	56.6
Primary	3,689	24.7
No Education	158	1.1
Marital Status		
Unmarried	473	3.2
Married	14,452	96.8
Occupation		
Not Working	6,921	46.4
Working	8,004	53.6
Residential Status		
Urban	7,436	49.8
Rural	7,489	50.2
Wealth Index		
Poor	6,767	45.3
Middle	2,846	19.1
Rich	5,312	35.6
Province		
Java-Bali	4,815	32.3
Sumatra	3,900	26.1

Variable	Frequency (n)	Percent (%)
Other	6,210	41.6
Parity		
1	4,658	31.2
2–3	7,818	52.4
≥4	2,449	16.4
Maternal Age 1 st Birth		
<22	7,395	49.5
22–28	6,273	42.0
≥28	1,257	8.4
Twins Child		
Singletons	14,807	99.2
Twins	118	0.8
Birth Weight		
≥2.500	13,919	93.3
<2.500	1,006	6.7
Labor Complication		
No	12,330	82.6
Yes	2,595	17.4
Child Survival Status		
Alive	14,659	98.2
Death	266	1.8

Table 1 describes the socio-demographic, maternal, and neonatal characteristics of 14,925 respondents included in the study. More than half of the respondents were aged 25–34 years (51.2%), followed by those aged 35–49 years (30.5%), while respondents aged 15–24 years represented the smallest proportion (18.4%). This distribution indicates that the study population was largely composed of women within the peak reproductive age group. In terms of educational background, secondary education was the most common level attained (56.6%), whereas 24.7% had primary education and 17.6% had completed higher education. Only a small proportion of respondents had no formal education (1.1%). Most respondents were married (96.8%), and slightly more than half were employed (53.6%). The distribution of residence was relatively balanced, with 50.2% living in rural areas and 49.8% residing in urban settings. Regarding socioeconomic status, 45.3% of respondents were categorized in the poor wealth index group, followed by the rich (35.6%) and middle-income groups (19.1%). Regionally, the largest proportion originated from provinces outside Java-Bali and Sumatra (41.6%), while 32.3% were from Java-Bali and 26.1% from Sumatra.

The reproductive profile showed that most women had parity of 2–3 children (52.4%), whereas 31.2% had one child and 16.4% had four or more children. Nearly half of the respondents experienced their first childbirth before the age of 22 years (49.5%), while 42.0% had their first birth at 22–28 years and 8.4% at ≥28 years. Almost all pregnancies resulted in singleton births (99.2%). The majority of infants had normal birth weight (≥2,500 g) (93.3%), while low birth weight infants accounted for 6.7% of cases. Most respondents did not experience labor complications (82.6%), although complications during delivery were reported by 17.4% of women. In addition, child survival was high, with 98.2% of children reported alive at the time of the survey and 1.8% reported deceased.

Table 2. Bivariate Analysis of Factors Associated with Child Survival Status among Women in Indonesian

Variable	Child Survival		p-value
	Alive	Death	
	N (%)		
Age			0.001***
15–24	2,698(98.5)	42(1.5)	
25–34	7,520(98.5)	116(1.5)	
35–49	4,441(97.6)	108(2.4)	
Education Mothers			<0.001***
Highest	2,591(98.6)	37(1.4)	
Secondary	8,324(98.5)	126(1.5)	
Primary	3,595(97.5)	94(2.5)	
No Education	149(94.3)	9(5.7)	
Marital Status			0.469
Unmarried	464(98.1)	9(1.9)	
Married	14,195(98.2)	257(1.8)	
Occupation			<0.001***
Not Working	6,838(98.8)	83(1.2)	
Working	7,821(97.7)	183(2.3)	
Residential Status			0.132
Urban	7,313(98.3)	123(1.7)	
Rural	7,346(98.1)	143(1.9)	
Wealth Index			0.006**
Poor	6,622(97.9)	145(2.1)	
Middle	2,810(98.7)	36(1.3)	
Rich	5,227(98.4)	85(1.6)	
Province			<0.001***
Java-Bali	4,750(98,7)	65(1.4)	
Sumatra	3,846(98,6)	54(1.4)	
Other	6,063(97.6)	147(2.4)	
Parity			<0.001***
1	4,603(98.9)	55(1.2)	
2–3	7,695(98.4)	123(1.6)	
≥4	2,361(96.4)	88(3.6)	
Maternal Age 1 st Birth			0.520
<22	7,257(98.1)	138(1.9)	
22–28	6,170(98.4)	103(1.6)	
≥28	1,232(98.0)	25(2.0)	
Twins Status			<0.001***
Singletons	14,553(98.3)	254(1.7)	
Twins	106(89.8)	12(10.2)	
Birth Weight			<0.001***
≥2,500	13,708(98.5)	211(1.5)	

Variable	Child Survival		p-value
	Alive	Death	
	N (%)		
<2.500	951(94.5)	55(5.5)	
Labor Complication			0.001***
No	12,129(98.4)	201(1.6)	
Yes	2,530(97.5)	59(2.5)	

Note: Data are presented as frequency (n) and percentage (%). P-values were obtained using the chi-square test. Statistical significance was defined as $p < 0.05$.

Table 2 presents the bivariate analysis between respondents' characteristics and child survival status. Several variables demonstrated statistically significant associations with child survival, including maternal age, maternal education, occupation, wealth index, province, parity, twin status, birth weight, and labor complications ($p < 0.05$). Maternal age was significantly associated with child survival status ($p = 0.001$). The proportion of child deaths was higher among mothers aged 35–49 years (2.4%) compared with those aged 15–24 years (1.5%) and 25–34 years (1.5%). This finding suggests that advanced maternal age may increase the risk of adverse child outcomes. Maternal educational attainment also showed a significant relationship with child survival ($p < 0.001$). Mothers with no formal education had the highest proportion of child mortality (5.7%), followed by those with primary education (2.5%). In contrast, mothers with secondary and higher education demonstrated lower proportions of child deaths, at 1.5% and 1.4%, respectively. These results indicate that higher educational attainment may contribute to improved child survival. Occupation status was significantly associated with child survival ($p < 0.001$). Child mortality was more common among working mothers (2.3%) compared with mothers who were not working (1.2%). Similarly, wealth index demonstrated a significant association ($p = 0.006$), with the highest proportion of child deaths observed among respondents in the poor category (2.1%), compared with middle-income (1.3%) and rich households (1.6%). Regional differences were also statistically significant ($p < 0.001$). Respondents from provinces outside Java-Bali and Sumatra had the highest proportion of child mortality (2.4%), whereas respondents from Java-Bali and Sumatra each reported lower mortality proportions (1.4%).

Parity was strongly associated with child survival status ($p < 0.001$). Mothers with parity ≥ 4 experienced the highest proportion of child deaths (3.6%), followed by parity 2–3 (1.6%) and parity 1 (1.2%). These findings suggest that higher parity may increase maternal and child health risks. Twin status demonstrated one of the strongest associations with child survival ($p < 0.001$). Twin births had substantially higher child mortality (10.2%) compared with singleton births (1.7%). In addition, low birth weight infants ($< 2,500$ g) had a markedly higher proportion of mortality (5.5%) than infants with normal birth weight (1.5%) ($p < 0.001$). Labor complications were likewise significantly related to child survival ($p = 0.001$). Mothers who experienced delivery complications had a higher proportion of child mortality (2.5%) compared with those without complications (1.6%). In contrast, marital status ($p = 0.469$), residential status ($p = 0.132$), and maternal age at first birth ($p = 0.520$) were not significantly associated with child survival status.

Table 3. Binary Logistic Regression Analysis of Factors Associated with Child Survival Status among Women in Indonesian

Variables	Model 1	Model 2
	COR (95% CI)	AOR(95% CI)
Age		
15–24	Reference	Reference
25–34	0.99(0.69–1.41)	0.58(0.37–0.90)*
35–49	1.56(1.09–2.23)*	0.54(0.31–0.92)*
Education Level		

Highest	Reference	Reference
Secondary	1.06(0.73–1.53)	1.29(0.86–1.94)
Primary	1.83(1.24–2.68)**	1.88(1.19–2.98)**
No Education	4.23(2.00–8.92)***	2.96(1.32–6.64)**
Marital Status		
Unmarried	Reference	Reference
Married	0.93(0.47–1.82)	1.07(0.54–2.12)
Occupation		
Not Working	Reference	Reference
Working	1.92(1.48–2.50)***	1.93(1.47–2.54)***
Residential Status		
Urban	Reference	Reference
Rural	1.15(0.90–1.47)	0.95(0.72–1.27)
Wealth Index		
Poor	Reference	Reference
Middle	0.58(0.40–0.84)**	0.78(0.52–1.15)
Rich	0.74(0.56–0.97)*	1.02(0.72–1.45)
Province		
Java-Bali	Reference	Reference
Sumatra	1.02(0.71–1.47)	0.93(0.64–1.36)
Other	1.77(1.32–2.37)***	1.42(1.02–1.97)*
Parity		
1	Reference	Reference
2–3	1.33(0.97–1.84)*	1.62(1.10–2.39)*
≥4	3.11(2.21–4.38)***	3.45(2.08–5.70)***
Maternal Age 1 st Birth		
<22	Reference	Reference
22–28	0.87(0.67–1.13)	1.28(0.95–1.73)*
≥28	1.06(0.69–1.64)	1.88(1.12–3.17)*
Twins Status		
Singletons	Reference	Reference
Twins	6.48(3.52–11.93)***	2.45(1.26–4.76)**
Birth Weight		
≥2.500	Reference	Reference
<2.500	3.75(2.77–5.09)***	3.16(2.28–4.37)***
Labor Complication		
No	Reference	Reference
Yes	1.55(1.16–2.05)**	1.47(1.10–1.96)**

Note: COR = Crude Odds Ratio; AOR = Adjusted Odds Ratio; CI = Confidence Interval; Reference = reference category. Model 1 presents unadjusted associations, while Model 2 presents adjusted associations after controlling for covariates included in the regression model. Statistical significance was defined as $p < 0.05$.

Table 3 presents the results of binary logistic regression analysis examining factors associated with child survival status. The analysis consisted of crude odds ratio (COR) in Model 1 and adjusted odds ratio (AOR) in Model 2 after controlling for potential confounding variables. The findings indicate that maternal age, education level, occupation, province, parity, maternal age at first birth, twin status, birth

weight, and labor complications remained significantly associated with child survival in the adjusted model. After adjustment, mothers aged 25–34 years were less likely to experience child mortality compared with mothers aged 15–24 years (AOR=0.58; 95% CI=0.37–0.90). A similar protective effect was observed among mothers aged 35–49 years (AOR=0.54; 95% CI=0.31–0.92). These findings suggest that maternal maturity and reproductive experience may contribute to better child survival outcomes. Maternal education demonstrated a strong association with child survival. Mothers with primary education had 1.88 times higher odds of child mortality compared with mothers with higher education (AOR=1.88; 95% CI=1.19–2.98). Likewise, mothers without formal education were nearly three times more likely to experience child mortality (AOR=2.96; 95% CI=1.32–6.64). In contrast, secondary education was not significantly associated with child survival after adjustment. Occupation status remained statistically significant in the multivariable model. Working mothers had approximately two times greater odds of child mortality than non-working mothers (AOR=1.93; 95% CI=1.47–2.54). This finding may reflect differences in childcare practices, maternal workload, or limited time for accessing maternal and child health services. Regional disparities were also identified. Respondents residing in provinces outside Java-Bali had higher odds of child mortality compared with those living in Java-Bali (AOR=1.42; 95% CI=1.02–1.97). However, no significant difference was observed between Sumatra and Java-Bali after controlling for other variables.

Parity showed a dose-response relationship with child mortality. Mothers with parity of 2–3 children had 1.62 times higher odds of child mortality (AOR=1.62; 95% CI=1.10–2.39), while mothers with parity of four or more children demonstrated substantially higher odds (AOR=3.45; 95% CI=2.08–5.70) compared with mothers with one child. These findings indicate that increasing parity may elevate maternal and neonatal health risks. Maternal age at first birth was significantly associated with child survival in the adjusted model. Mothers whose first childbirth occurred at age ≥ 28 years had higher odds of child mortality (AOR=1.88; 95% CI=1.12–3.17) compared with mothers who gave birth before the age of 22 years. Meanwhile, the association among mothers aged 22–28 years was marginally significant. Twin pregnancy remained an important predictor of child mortality. Twin births were associated with 2.45 times higher odds of mortality compared with singleton births (AOR=2.45; 95% CI=1.26–4.76). Similarly, infants with low birth weight ($< 2,500$ g) had more than threefold higher odds of mortality than infants with normal birth weight (AOR=3.16; 95% CI=2.28–4.37), making low birth weight one of the strongest determinants identified in this study. Delivery complications were also independently associated with child mortality. Mothers who experienced labor complications had 1.47 times greater odds of child mortality compared with those without complications (AOR=1.47; 95% CI=1.10–1.96).

Discussion

This study identified several determinants associated with child survival among women in Indonesia, including maternal age, educational attainment, occupation, regional disparities, parity, maternal age at first birth, twin birth, birth weight, and labor complications. These findings indicate that child mortality remains closely related to maternal, socioeconomic, and neonatal conditions (4). Furthermore, child survival in low- and middle-income countries has consistently been shown to be multidimensional and strongly influenced by complex interactions between maternal and neonatal health conditions (3)(13).

Maternal age was significantly associated with child survival in the present study ($p=0.001$). The proportion of child mortality was higher among mothers aged 35–49 years (2.4%) than among those aged 15–24 years (1.5%) and 25–34 years (1.5%). In the adjusted analysis, women aged 25–34 years had 42% lower odds of child mortality (AOR=0.58; 95% CI=0.37–0.90), while women aged 35–49 years had 46% lower odds (AOR=0.54; 95% CI=0.31–0.92) compared with mothers aged 15–24 years. These findings suggest that maternal maturity and reproductive experience may contribute to improved child survival outcomes. Younger maternal age is commonly associated with biological immaturity, limited reproductive preparedness, and inadequate utilization of maternal healthcare services during pregnancy and childbirth (5). In addition, maternal age at delivery has been shown to significantly influence under-five mortality outcomes in Indonesia (4). Therefore, maternal maturity and reproductive readiness may contribute substantially to improving child survival outcomes (14).

Maternal education emerged as one of the strongest predictors of child survival in this study.

Mothers with primary education and those without formal education had significantly greater odds of child mortality compared with mothers who attained higher education. Educational attainment may affect maternal health literacy, nutritional practices, healthcare-seeking behavior, and the ability to recognize danger signs during pregnancy and infancy (1). Furthermore, low maternal education has been identified as an important contributor to under-five mortality in low- and middle-income countries (3). Consequently, improving women's educational status may play a crucial role in enhancing maternal and child health outcomes (15).

The present study also demonstrated that working mothers had a higher likelihood of experiencing child mortality compared with non-working mothers. Maternal employment may increase workload and simultaneously reduce the amount of time available for childcare, breastfeeding practices, and healthcare utilization (1). Additionally, maternal occupation has previously been associated with regional disparities in perinatal mortality across Indonesia (7). These findings suggest that occupational burden and limited childcare support may negatively influence child survival (16).

Regional disparities remained statistically significant after adjustment. Women residing in provinces outside Java-Bali experienced higher odds of child mortality compared with those living in Java-Bali. Unequal healthcare infrastructure, transportation barriers, socioeconomic inequality, and differences in healthcare accessibility between western and eastern Indonesia may explain these findings (7). Similarly, geographical disparities have been shown to contribute substantially to infant mortality differences across Indonesia (5). Therefore, strengthening equitable healthcare access across regions remains essential for improving child survival outcomes (17).

Parity was another determinant significantly associated with child survival. Parity was significantly associated with child survival in this study ($p < 0.001$). The proportion of child mortality increased with parity, from 1.2% among mothers with one child to 1.6% among those with 2–3 children and 3.6% among those with four or more children. In the adjusted analysis, mothers with parity of 2–3 children had 1.62 times higher odds of child mortality (AOR=1.62; 95% CI=1.10–2.39), while mothers with parity ≥ 4 had 3.45 times higher odds of child mortality (AOR=3.45; 95% CI=2.08–5.70) compared with mothers who had one child. These findings indicate that increasing parity is associated with a greater risk of child mortality. High parity may contribute to maternal nutritional depletion, pregnancy complications, and limited household resources for childcare and nutrition (7). Moreover, the coexistence of multiple maternal and reproductive risk factors has been reported to considerably increase under-five mortality risk in low- and middle-income countries (3). These findings reinforce the importance of family planning and reproductive health interventions in reducing child mortality (18).

Maternal age at first birth was significantly associated with child survival in this study. In the adjusted analysis, women whose first childbirth occurred at age ≥ 28 years had 1.88 times higher odds of child mortality than women whose first childbirth occurred before the age of 22 years (AOR=1.88; 95% CI=1.12–3.17). The proportion of child mortality was 2.0% among women whose first childbirth occurred at age ≥ 28 years, compared with 1.9% among those who gave birth before the age of 22 years and 1.6% among those whose first childbirth occurred at 22–28 years. These findings suggest that delayed first childbirth may be associated with an increased risk of adverse child survival outcomes. Advanced maternal age at first delivery is frequently associated with obstetric complications, pregnancy-related disorders, and adverse neonatal outcomes (5). Furthermore, maternal characteristics have been identified as important determinants of neonatal survival in Indonesia (2). Therefore, both younger and advanced maternal age may increase vulnerability to adverse child health outcomes (19).

Twin birth was significantly associated with child mortality in the current study. The proportion of child mortality was substantially higher among twin births (10.2%) than among singleton births (1.7%) ($p < 0.001$). After adjustment for potential confounding factors, children born from twin pregnancies had 2.45 times higher odds of mortality than singleton births (AOR=2.45; 95% CI=1.26–4.76). These findings indicate that twin pregnancies remain an important risk factor for adverse child survival outcome. Children born from twin pregnancies experienced significantly greater mortality risk compared with singleton births. Twin pregnancies are more likely to result in preterm birth, low birth weight, birth asphyxia, and neonatal complications (2). In addition, neonatal complications and low birth weight have been shown to substantially increase neonatal mortality risk in Indonesia (9). These findings highlight the vulnerability of multiple pregnancies and emphasize the importance of intensive antenatal monitoring for twin gestations (20).

Low birth weight was identified as one of the strongest predictors of child mortality in this study. The proportion of child mortality was substantially higher among infants with low birth weight (<2,500 g) (5.5%) than among those with normal birth weight ($\geq 2,500$ g) (1.5%) ($p < 0.001$). After adjustment for potential confounding factors, infants with low birth weight had 3.16 times higher odds of child mortality than infants with normal birth weight (AOR=3.16; 95% CI=2.28–4.37). These findings indicate that low birth weight remains a major determinant of adverse child survival outcomes in Indonesia. Low birth weight infants are more susceptible to respiratory distress, hypothermia, infection, and impaired immune function (2). Likewise, low birth weight has been reported to significantly increase the risk of under-five mortality in Indonesia (4). Therefore, birth weight remains an important predictor of child survival and should receive greater attention in maternal and neonatal healthcare interventions (21).

Labor complications were significantly associated with child mortality in this study. The proportion of child mortality was higher among mothers who experienced labor complications (2.5%) than among those without labor complications (1.6%) ($p = 0.001$). After adjustment for potential confounding factors, mothers who experienced labor complications had 1.47 times higher odds of child mortality than mothers who did not experience labor complications (AOR=1.47; 95% CI=1.10–1.96). These findings indicate that complications during labor remain an important contributor to adverse child survival outcomes. Mothers who experienced complications during delivery had significantly higher odds of losing their children compared with mothers without complications. Delivery complications may increase the risk of fetal distress, birth trauma, neonatal infection, and asphyxia, all of which contribute to mortality risk (8). Similarly, labor complications have been identified as important predictors of early neonatal mortality in Indonesia (1). These findings underscore the importance of strengthening emergency obstetric and neonatal care services to reduce preventable child deaths (11).

Conclusions and Recommendations

This study identified several determinants associated with child survival among women in Indonesia, including maternal age, maternal education, occupation, province, parity, maternal age at first birth, twin birth, birth weight, and labor complications. Low maternal education, high parity, twin pregnancy, low birth weight, and delivery complications were significant predictors that increased the likelihood of child mortality. In addition, regional disparities outside the Java-Bali region remained an important contributing factor. These findings indicate that child survival in Indonesia is influenced by a combination of maternal socio-demographic, reproductive, and neonatal factors.

Strengthening maternal and child health programs is essential, particularly among women with low educational attainment and high-risk pregnancies. Healthcare providers should improve early detection and management of pregnancy and delivery complications, especially among mothers with high parity, twin pregnancies, and low birth weight infants. In addition, the government should prioritize equitable access to quality maternal and neonatal healthcare services in regions outside Java-Bali to reduce regional disparities in child mortality. Further studies are recommended to explore additional behavioral, environmental, and healthcare utilization factors associated with child survival in Indonesia.

Ethical Consideration and Competing Interest

This study used secondary data from the 2017 Indonesian Demographic and Health Survey (IDHS), which is part of the Demographic and Health Surveys (DHS) Program. The original survey protocol was reviewed and approved by the ICF Institutional Review Board (IRB) (FWA00000845). Permission to access and analyze the IDHS 2017 dataset was obtained from the DHS Program. All data were fully anonymized prior to public release, and no personally identifiable information was available to the researchers. The authors declare that there are no conflicts of interest regarding the publication of this study.

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References

1. Titley CR, Mu'asyaroh A, Que BJ, Tjandrarini DH, Ariawan I. Determinants of early neonatal mortality: secondary analysis of the 2012 and 2017 Indonesia Demographic and Health Survey. *Front Pediatr*. 2024;Volume 12-2024. [doi:10.3389/fped.2024.1288260](https://doi.org/10.3389/fped.2024.1288260)
2. Sampurna MTA, Handayani KD, Utomo MT, Angelika D, Etika R, Harianto A, et al. Determinants of neonatal deaths in Indonesia: A national survey data analysis of 10,838 newborns. *Heliyon*. 2023 Jan 1;9(1). [doi:10.1016/j.heliyon.2023.e12980](https://doi.org/10.1016/j.heliyon.2023.e12980)
3. Kong Y, Chen S, Ma N, Chen Z, Karoli P, Niyi JL, et al. Association between concurrence of multiple risk factors and under-5 mortality: a pooled analysis of data from Demographic and Health Survey in 61 low-and-middle-income countries. *EClinicalMedicine*. 2024 May 1;71. [doi:10.1016/j.eclinm.2024.102583](https://doi.org/10.1016/j.eclinm.2024.102583)
4. Rachmawati PD, Kurnia ID, Asih MN, Kurniawati TW, Krisnana I, Arief YS, et al. Determinants of under-five mortality in Indonesia: A nationwide study. *Journal of Pediatric Nursing: Nursing Care of Children and Families*. 2022 Jul 1;65:e43–8. [doi:10.1016/j.pedn.2022.02.005](https://doi.org/10.1016/j.pedn.2022.02.005)
5. Wardani Y, Huang YL, Chuang YC. Factors Associated with Infant Deaths in Indonesia: An Analysis of the 2012 and 2017 Indonesia Demographic and Health Surveys. *J Trop Pediatr*. 2022 Oct 1;68(5):fmac065. [doi:10.1093/tropej/fmac065](https://doi.org/10.1093/tropej/fmac065)
6. Yuniar Wardani, Ichtirini Nurullita Santri, Suci Musvita Ayu, Liena Sofiana, Asa Ismia Bunga Aisyahrani, Mochamad Iqbal Nurmansyah, et al. Socioeconomic Disparities in Infant Mortality: Evidence from the 2017 Indonesia Demographic and Health Survey. *Media Publikasi Promosi Kesehatan Indonesia (MPPKI)*. 2025 Apr 9;8(4):243–51. [doi:10.56338/mppki.v8i4.6859](https://doi.org/10.56338/mppki.v8i4.6859)
7. Misnaniarti, Sariunita N, Idris H. Regional perinatal mortality differences in Indonesia: Evidence from Indonesian demographic health survey. *Public Health in Practice*. 2024;7:100501. [doi:https://doi.org/10.1016/j.puhip.2024.100501](https://doi.org/10.1016/j.puhip.2024.100501)
8. Anisa N, Astuti AW, Hakimi M. Correlation between complications during delivery and neonatal mortality: data analysis of Indonesia demographic and health survey (IDHS) 2017. *JKKI: Jurnal Kedokteran dan Kesehatan Indonesia*. 2022;125–38. <https://doi.org/10.20885/JKKI.Vol13.Iss2.art5>
9. Finisa Balkis, Fahmi Ichwansyah, Nurjannah, Asnawi Abdullah, Radhiah Zakaria, Aryandi Darwis. Analysis Determinants of Neonatal Death in Indonesia (2017 IDHS Data Analysis). *STRADA : Jurnal Ilmiah Kesehatan*. 2023 Nov 30;12(2):155–66. [doi:10.30994/sjik.v12i2.968](https://doi.org/10.30994/sjik.v12i2.968)
10. Kefale B, Jancey J, Gebremedhin AT, Pereira G, Tessema GA. Changes in the contributions of risk factors to under-five mortality in low-and lower-middle-income countries (1997–2022): an analysis of Demographic and Health Survey data. *World Journal of Pediatrics*. 2025;21(5):502–14. doi.org/10.1007/s12519-025-00912-8
11. Sohail H, Neupane S. Prevalence of and factors associated with under-5 mortality in South Asia. *Int Health*. 2019 Mar 1;11(2):119–27. [doi:10.1093/inthealth/ihy065](https://doi.org/10.1093/inthealth/ihy065)
12. Wihatno E, Asri Y, Kushayati N, Parahita DP. Urban-Rural Disparities in Smoking Prevalence, Consumption, and Indoor Smoking Habits Among Older Adults in Indonesia. *Care: Jurnal Ilmiah Ilmu Kesehatan*. 2025;13(1):30–41. <https://doi.org/10.33366/jc.v13i1.6704>
13. Irawaty DK, Elfiyan I, Purwoko E. Exploring the factors associated with infant mortality in rural Indonesia. *Glob J Health Sci*. 2021;13:17–27. [10.5539/gjhs.v13n1p17](https://doi.org/10.5539/gjhs.v13n1p17)
14. Bantas K, Aryastuti N, Gayatri D. The relationship between antenatal care with childbirth complication in Indonesian's mothers (data analysis of the Indonesia Demographic and Health Survey 2012). *Jurnal Epidemiologi Kesehatan Indonesia*. 2019;2(2):4. <https://doi.org/10.7454/epidkes.v2i2.3141>
15. Wulandari RD, Laksono AD, Negara IJ. Antenatal care as predictor of neonatal death in Rural Indonesia. *Int Med J [Internet]*. 2020;25(2):511–8.

16. Nasrun AM. Relationship Antenatalcare (ANC) with Neonatal Death in Indonesia (Data Analysis 2017 IDHS). *Indian J Public Health Res Dev.* 2020;11(3).
17. Sampurna MTA, Mapindra MP, Mahindra MP, Efendi F, Etika R, Utomo MT, et al. A population-based study of neonatal deaths in Indonesia based on the Indonesian demographic health survey: what determinants play an essential role? 2021. <https://doi.org/10.21203/rs.3.rs-290158/v1>
18. Ahmad I, Qothrunnada N, Dewi YR. Determinants of early neonatal mortality in Indonesia. *Popul Rev.* 2022;61(2):96–106. 10.1353/prv.2022.0009
19. Rumiaty F, C Adisasmita A. Determinants of neonatal mortality based on the 2017 Indonesian demographic and health survey (IDHS). 2021. <https://doi.org/10.20473/ijph.v16i3.2021.363-374>
20. Laksono AD, Wulandari RD. Understanding neonatal death in urban area in indonesia. *Medico-Legal Updat.* 2020;20(2):825–9. <https://doi.org/10.37506/mlu.v20i2.1218>
21. Sarder MA, Mehedi T, Ahammed B, Islam MK, Kundu S, Muna M, et al. Prevalence and determinants of under-five mortality (U5M) in low-and lower-middle-income countries: Evidence from recent demographic and health surveys. *PLoS One.* 2025;20(11):e0336616. doi.org/10.1371/journal.pone.0336616