Original Article

JHSMR Journal of Health Science and Medical Research

Determinants of Delayed Antenatal Care Initiation among Low-Income Families in Indonesia

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Received 6 June 2025 ● Revised 14 January 2026 ● Accepted 27 January 2026 ● Published online 6 November 2026

Abstract:

Objective: Ensuring proper and timely antenatal care (ANC) can reduce poor birth outcomes among low-income families. This study examined the determinants of delayed ANC initiation among low-income families in Indonesia.

Material and Methods: The study examined 25,073 women. We used delayed ANC initiation as a dependent variable and eight independent variables: residence, age, marital status, education, employment, parity, insurance, and wealth. In the last step, the research employed binary logistic regression.

Results: 26.4% of women among low-income families delayed ANC initiation. Women in rural areas were 1.091 times more likely than those in urban areas to delay ANC initiation (95% CI 1.087–1.096). All age groups were less likely to delay ANC initiation than those aged ≤ 19. Divorced/widowed women were 1.390 times more likely than those married to delay ANC initiation (95% CI 1.373–1.407). Women at all education levels were more likely to delay ANC initiation than women with a college education. Employed women were 1.030 times more likely than unemployed women to delay ANC initiation (95% CI 1.026–1.034). The poorest were 1.538 times more likely to delay ANC initiation than the poorer (95% CI 1.532–1.544). Women with any insurance type were less likely than those without insurance to delay ANC initiation. Women with all parity types were more likely than primiparous women to delay ANC initiation.

Conclusion: Delayed ANC initiation among low-income families in Indonesia is driven by multiple socioeconomic and structural factors. Targeted and context-specific policies are needed to improve early ANC uptake.

Keywords: antenatal care, big data, low-income families, maternal health, population health, poverty

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J Health Sci Med Res
doi: 10.31584/jhsmr.20261497
www.jhsmr.org

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Introduction

Maternal mortality remains a major global challenge, particularly in low- and middle-income countries such as Indonesia[1,2]. It serves as a vital indicator of a nation's health system performance, reflecting the accessibility and quality of maternal care[3]. The Sustainable Development Goals (SDGs) aim to reduce the global maternal mortality ratio (MMR) to below 70 deaths per 100,000 live births by 2030, with no country exceeding 140 per 100,000[4].

In Indonesia, the MMR declined from 346 per 100,000 live births in 2010 to 189 in 2020—a 45% reduction over a decade[5]. Despite this progress, the rate remains above the regional average and ranks fourth highest in Southeast Asia. From 2000 to 2020, Indonesia's MMR decreased by 42.8%, a slower pace than the regional decline of 58%. This indicates persistent gaps in maternal health outcomes compared to neighboring countries[6].

Most maternal deaths in Indonesia are preventable and linked to conditions such as hypertension in pregnancy, hemorrhage, infection, and other complications—primarily reflecting issues in service coverage and quality[3,7]. Timely and adequate antenatal care (ANC) is one of the most effective strategies to prevent such deaths. Yet, many women still initiate ANC late or attend fewer than the recommended visits.

Socioeconomic inequality, limited access to skilled health workers, and disruptions to essential maternal services—particularly during the COVID-19 pandemic—have further hindered progress. Strengthening health systems, ensuring equitable access to care, and improving the quality and continuity of maternal services are therefore urgent priorities if Indonesia is to achieve the SDG target by 2030[8,9].

Establishing a causal relationship between maternal mortality and its predictors is challenging due to the low frequency of maternal death events. Identifying determinants of maternal death is a challenging task due to the aforementioned factor[10,11]. Timely ANC is a critical intervention for preventing pregnancy-related complications and improving maternal and neonatal outcomes. The World Health Organization recommends that the first ANC contact occur during the first trimester of pregnancy. However, delayed initiation of ANC continues to be common, particularly among socially and economically disadvantaged populations[12]. Existing evidence indicates that socioeconomic status, geographic barriers, education, and insurance coverage shape ANC utilization. Despite this, nationally representative evidence on delayed ANC initiation among low-income families in Indonesia remains limited. This study addresses this gap by examining the determinants of delayed ANC initiation among low-income families at the national level.

To improve survival rates, women and infants must have access to quality, affordable healthcare before, during, and after childbirth, as well as family planning services. Achieving this requires an adequate number of skilled and motivated health workers—particularly midwives—supported by essential medicines, supplies, clean water, and reliable electricity. However, the most disadvantaged women, especially those living in poverty, rural areas, or belonging to ethnic and indigenous groups, remain at the highest risk of lacking access to lifesaving care[8]. Although most maternal and newborn deaths are preventable through well-established interventions, inequalities persist. Strengthening perinatal care, health systems, community engagement, and data-driven planning is therefore crucial[13]. Despite these global efforts, limited evidence exists on the factors influencing delayed ANC initiation in Indonesia, particularly among low-income families. Understanding these determinants is essential to guide targeted interventions and ensure that no woman is left behind in accessing timely and adequate maternal health services[14]. Based on the

context, the study examined the determinants of delayed ANC initiation among low-income families in Indonesia.

Material and Methods

Data source and study design

The secondary analysis primarily utilized data from the 2023 Indonesian Health Survey conducted by the Ministry of Health of the Republic of Indonesia. Multistage and stratified random sampling techniques were employed for interviews, utilizing household and individual instruments. The survey was conducted from May to July 2023, with a response rate of 91.49% among participants[15].

The study's subjects were women from Indonesia who were living in poverty and had given birth five years before the survey. The research examined responses from 25,073 individuals in the weighted sample.

Setting

The study investigated low-income Indonesian women who had given birth five years prior at the national level. The study used a household's asset wealth quintile to assess its wealth status. The quantity and diversity of controls, including televisions, bicycles, autos, and residential attributes, were employed to assess families, encompassing access to potable water, restroom facilities, and materials used to construct the ground floor. The score was derived from the principal component analysis of the research. The household ratings for each member were averaged, yielding five groupings comprising 20% of the population, each corresponding to a national wealth quintile. The survey categorized respondents into five quintiles based on their wealth levels[16,17]. The research categorized low-income families as quintiles 1 and 2.

Dependent variable

The research employed delayed ANC initiation as a dependent variable. If a woman's initial ANC visit occurred after 12 weeks of gestation, it was considered her most recent occurrence[12]. In the 2023 Indonesian Health Survey, the initial ANC visit in months was designated as "1" if the gestation was greater than 3 months. If not, it constituted an early beginning if scheduled within four months and defined as "0".

Independent variables

The research analyzed eight independent variables: residence, age, marital status, education, employment status, wealth, health insurance, and parity. The kind of residence encompasses both urban and rural areas.

The research categorized age into the following groups: 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, and 45-49. Marital status includes married and divorced/widowed categories. The education level encompasses no education, elementary school, junior high school, senior high school, and college. Furthermore, the study categorized employment into unemployed and employed individuals.

Wealth level was categorized into quintile 1 (the most impoverished) and quintile 2 (the less affluent). Health insurance ownership includes the uninsured, government-run, private-run, and a combination of government and private insurance. Moreover, parity referred to the count of live births. Parity encompasses primiparous (≤1), multiparous (2-4), and grand multiparous (>4) classifications.

Data analysis

The authors commenced with the Chi-Square test for bivariate analysis. The collinearity test was used in the second phase of the inquiry to confirm that the independent variables were not significantly associated. In the final phase, we used the entry approach for a binary logistic regression analysis. The study reported adjusted odds ratios (AORs) with 95% confidence intervals (CIs). Furthermore, IBM SPSS 26 was employed to do the statistical analysis.

The research employed ArcGIS 10.3 (ESRI Inc., Redlands, CA, USA) to delineate the percentage of women who postponed the commencement of antenatal care among low-income households by province in Indonesia. The Indonesian Statistics Service provided a shapefile including polygons that delineate administrative borders for the survey.

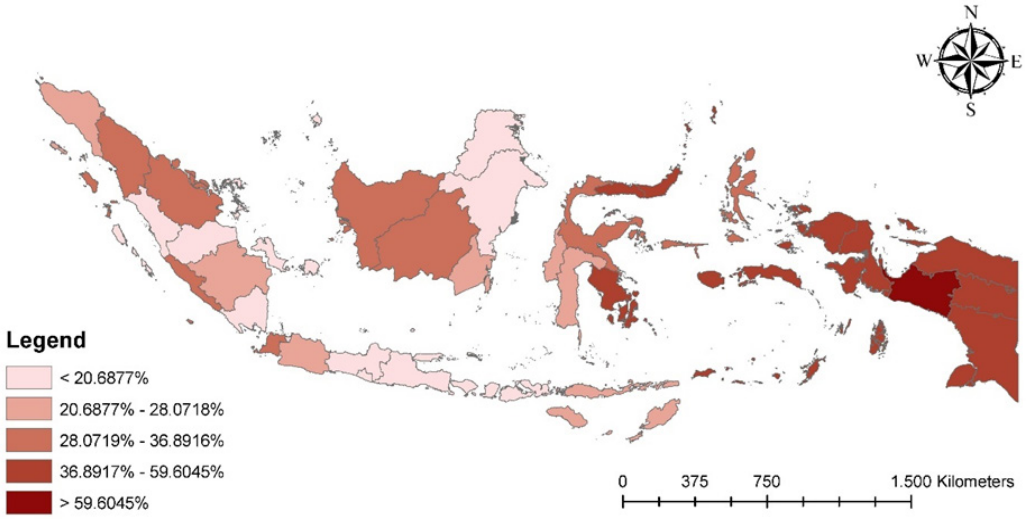
Results

The result shows that 26.4% of women in low-income families in Indonesia delayed ANC initiation. Meanwhile, Figure 1 provides the distribution map of the proportion of women who delayed ANC initiation among low-income families by province in Indonesia. The figure indicates a tendency for a higher proportion of delayed ANC initiation in eastern Indonesia. The lowest proportion of delayed ANC initiation is in the lower-central region.

Moreover, the bivariate analysis showed that delayed ANC initiation was significantly associated with all demographic factors (p-value=<0.001). Women living in rural areas, those who were younger (≤19 years) or older (≥45 years), divorced or widowed, less educated, and from poorer households were more likely to delay ANC. Delays were also more common among uninsured and grand multiparous women. Overall, the findings highlight that socioeconomic disadvantage and limited access to health resources contribute substantially to late ANC initiation in Indonesia (Table 1).

The subsequent phase of the investigation encompassed a collinearity assessment. The test results indicate that the independent variables exhibit a weak or negligible connection. Every factor possesses a tolerance value of at least 0.10. Moreover, the variance inflation factor for each variable is below 10.00. The findings demonstrate that the regression model is devoid of multicollinearity.

Table 2 presents the results of the binary logistic regression. All the examined variables were significantly associated with delayed ANC initiation (p-value=< 0.001). Rural residence, lower education, lower wealth, unemployment, and higher parity were consistently linked



Source: Visualization by the authors.

Figure 1 Distribution map of the proportion of women who delayed ANC initiation among low-income families by province in Indonesia

Table 1 The results of bivariate analysis (n=25,073)

Demographic characteristics	Delayed ANC initiation		p-value
	No (%) (n=12,168)	Yes (%) (n=12,905)	
Residence			<0.001
Urban	76.2	23.8	
Rural	72.2	27.8	
Age group			<0.001
≤19	55.0	45.0	
20–24	73.6	26.4	
25–29	76.9	23.1	
30–34	74.8	25.2	
35–39	73.2	26.8	
40–44	69.0	31.0	
≥45	57.6	42.4	
Marital status			<0.001
Married	73.8	26.2	
Divorced/Widowed	67.1	32.9	
Education level			<0.001
No education	56.9	43.1	
Primary school	69.5	30.5	
Junior high school	76.3	23.7	
Senior high school	76.9	23.1	
College	80.5	19.5	
Employment status			<0.001
Unemployed	74.1	25.9	
Employed	72.7	27.3	
Wealth status			<0.001
Poorest	67.7	32.3	
Poorer	77.9	22.1	
Health insurance			<0.001
Uninsured	68.7	31.3	
Government-run	75.5	24.5	
Private-run	77.0	23.0	
Mix	81.0	19.0	
Parity			<0.001
Primiparous	77.0	23.0	
Multiparous	73.3	26.7	
Grand multiparous	52.3	47.7	

ANC=antenatal care

Table 2 The results of binary logistic regression (n=25,073)

Variables	Delayed ANC initiation			
	p-value	Adjusted odds ratio	95% Confidence interval	
			Lower bound	Upper bound
Residence: Urban (Reference)	-	-	-	-
Residence: Rural	<0.001	1.091	1.087	1.096
Age: ≤19 (Ref.)	-	-	-	-
Age: 20–24	<0.001	0.430	0.425	0.435
Age: 25–29	<0.001	0.327	0.323	0.331
Age: 30–34	<0.001	0.332	0.328	0.336
Age: 35–39	<0.001	0.320	0.316	0.323
Age: 40–44	<0.001	0.355	0.350	0.359
Age: ≥45	<0.001	0.511	0.503	0.520
Marital: Married (Reference)	-	-	-	-
Marital: Divorced/Widowed	<0.001	1.390	1.373	1.407
Education: No education	<0.001	2.138	2.109	2.167
Education: Primary school	<0.001	1.420	1.404	1.435
Education: Junior high school	<0.001	1.111	1.099	1.124
Education: Senior high school	<0.001	1.169	1.156	1.182
Education: College (Reference)	-	-	-	-
Employment: Unemployed (Reference)	-	-	-	-
Employment: Employed	<0.001	1.030	1.026	1.034
Wealth: Poorest	<0.001	1.538	1.532	1.544
Wealth: Poorer (Reference)	-	-	-	-
Insured: Uninsured (Reference)	-	-	-	-
Insured: Government-run	<0.001	0.755	0.752	0.758
Insured: Private-run	<0.001	0.732	0.715	0.750
Insured: Mix	<0.001	0.552	0.531	0.574
Parity: Primiparous (Reference)	-	-	-	-
Parity: Multiparous	<0.001	1.450	1.442	1.457
Parity: Grand multiparous	<0.001	3.099	3.068	3.130

ANC=antenatal care

to increased odds of delayed ANC. The most substantial effects were observed among women with no formal education, those in the poorest wealth quintile, and grand multiparous mothers—each showing markedly higher likelihoods of delay. In contrast, health insurance ownership, particularly mixed public–private coverage, was strongly protective. Age showed an inverse relationship, with older women less likely to delay ANC than adolescents. Overall, social disadvantage and reproductive experience emerged as dominant predictors of delayed ANC initiation.

Regarding employment status, Table 2 shows that employed women are 1.030 times more likely than unemployed women to delay ANC initiation (95% CI 1.026–1.034). Based on wealth status, the poorest are 1.538 times more likely to delay ANC initiation than the poorer (95% CI 1.532–1.544). Conversely, women with all insurance

types are less likely than those uninsured to delay ANC initiation. Furthermore, according to parity, women with all parity kinds are more likely than primiparous women to delay ANC initiation.

Discussion

The study found that women in rural areas were more likely to delay ANC initiation than their urban counterparts. This pattern reflects persistent geographic and structural disparities in Indonesia's healthcare system. Many rural and remote communities, particularly in eastern Indonesia, face long distances to health facilities, poor road access, and limited transportation options, which discourage timely visits[18–20]. In addition, the uneven distribution of midwives and health professionals—still concentrated in urban or district-capital areas—limits service availability in remote villages. Strengthening the primary healthcare network through outreach programs, mobile health services, and incentive schemes for rural health workers could significantly improve early ANC uptake.

Adolescent mothers (≤19 years) were at the highest risk of delayed ANC initiation, aligning with previous findings that younger women often lack knowledge about pregnancy care, face social stigma, or have limited autonomy in healthcare decisions[21,22]. In Indonesia, early pregnancy outside of marriage remains highly stigmatized, especially in conservative or rural areas, leading some adolescents to conceal their pregnancies and delay care. School-based reproductive health education, adolescent-friendly health services, and community counseling could address these cultural and informational barriers.

Divorced or widowed women were also more likely to delay ANC compared to those who were married. In Indonesia's social context, single mothers often experience economic hardship and limited social support networks[23–25]. Without a partner's financial or logistical support, they may have difficulty affording transportation or childcare for ANC appointments. Integrating maternal health services with social protection programs—such as Program Keluarga Harapan (Family Hope Program) or community-based Posyandu (Integrated Service Post) activities—could help address these barriers by offering targeted assistance to vulnerable women[26].

Educational attainment showed a strong inverse relationship with delayed ANC initiation. Women with higher education were significantly less likely to delay care, likely due to better health literacy, decision-making autonomy, and awareness of ANC benefits[27,28]. In Indonesia, women with limited schooling are also more likely to live in rural or low-income settings, compounding the disadvantage. Strengthening maternal health promotion through Bidan Desa (village midwives) and integrating maternal health modules into formal and non-formal education programs could help mitigate these educational disparities.

Interestingly, employed women were more likely to delay ANC than unemployed women. This counterintuitive finding suggests that employment, while providing financial means, may also introduce time constraints or workplace barriers that hinder timely care[29,30]. Many women in Indonesia work in the informal sector—such as markets, agriculture, or domestic labor—where flexible hours and maternity leave are rare[31]. Without employer support or nearby facilities, scheduling ANC visits becomes challenging. Strengthening labor protections, promoting workplace-based maternal health initiatives, and ensuring flexible ANC hours at primary healthcare could help address this emerging issue among working women.

Economic status remains a key determinant of ANC timing. Women in the poorest households were substantially more likely to delay ANC initiation. Financial barriers, such as transportation costs, opportunity costs of time off work, and informal payments, can deter early

visits[32]. Although Indonesia's National Health Insurance (NHI) program provides free ANC, indirect costs remain a burden, particularly in rural and remote areas. Expanding transportation subsidies, integrating ANC visits into community outreach, and strengthening NHI awareness at the grassroots level could improve service uptake among the poorest women.

Health insurance coverage was strongly protective against delayed ANC initiation. Women covered by government or private insurance were more likely to initiate ANC early, highlighting the success of Indonesia's JKN in reducing financial barriers[33]. However, administrative complexity, lack of understanding of benefits, and limited provider networks in rural regions still constrain access. Targeted campaigns to improve health insurance literacy and streamline enrollment could further enhance early ANC utilization. Similar patterns were observed in Gambia, where uninsured women were more likely to postpone ANC[34].

Finally, parity was significantly associated with delayed ANC initiation. Grand multiparous women were more likely to delay care, possibly due to overconfidence from previous pregnancies or competing domestic and economic responsibilities[29,35]. In Indonesia, multiparous women often rely on prior experiences and may undervalue the need for early ANC, especially if previous pregnancies were uncomplicated. Continuous community education emphasizing that each pregnancy carries unique risks—regardless of parity—could help sustain timely care across all pregnancies.

Taken together, these findings underscore that a complex interplay of structural, socioeconomic, and behavioral factors shapes delayed ANC initiation in Indonesia. Policies should prioritize context-specific interventions, including improving rural health infrastructure, enhancing education and insurance coverage, and promoting workplace and community-based maternal health programs. By addressing these multidimensional barriers, Indonesia can accelerate progress toward reducing maternal mortality and achieving its SDG targets by 2030.

Strengths and limitations

This study benefits from a large, nationally representative dataset. However, gestational age at first ANC was self-reported and subject to recall bias, particularly given the retrospective reporting period of up to five years. Additionally, the survey structure limited the use of alternative gestational age cut-offs. Moreover, since it uses secondary data, the survey restricts the variables studied to those that are pertinent. This study does not consider additional factors affecting institutional delivery identified in prior research, including family decision-making, the significance of children and families, or belief systems[36–38].

Conclusion

Delayed ANC initiation among low-income families in Indonesia is associated with residence, age, marital status, education, employment, parity, insurance coverage, and wealth. Addressing these factors through targeted, multi-sectoral policies is essential to improving early ANC uptake.

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