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Socioeconomic and Geographical Analysis on Antenatal Care Visits in Indonesia: A Cross-sectional Study

Tety Rachmawati^{1,2}, PhD candidate; Stefanus Supriyanto³, PhD; Dede Anwar Musadad², PhD; Hari Basuki Notobroto³, PhD; Yunita Fitrianti², MSc; Indah Pawitaningtyas², MSc; Arief Priyo Nugroho², MSc; Sri Handayani², MSc; Nantabah Zainul Khaqiqi⁴, MSc; Diyan Ermawan Effendi², MSc

¹Doctoral Program of Faculty of Public Health, University of Airlangga, Indonesia;

²Research Center for Public Health and Nutrition, National Research and Innovation Agency Republic of Indonesia, Cibinong Science Center, Indonesia;

³Faculty of Public Health, University of Airlangga, Kampus C Unair, Indonesia;

⁴Directorate of Laboratory Management, Research Facilities, and Science and Technology Park, National Research and Innovation Agency, Indonesia

Corresponding Author:

Tety Rachmawati, PhD; Doctoral Program of Faculty of Public Health, University of Airlangga, Indonesia

Tel: +62 31 5920948; Fax: +62 31 5924618; Email: tety.rachmawati-2023@fkm.unair.ac.id

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ABSTRACT

Background: Antenatal care (ANC) is crucial for reducing maternal and neonatal mortality by detecting and managing pregnancy complications. In Indonesia, a policy mandating at least six ANC visits (K6) per pregnancy has been introduced, yet factors influencing adequate ANC under this new policy remain unevaluated. This study examines the national and sub-national prevalence of adequate ANC visits as well as its associated geographic and socioeconomic factors.

Methods: This cross-sectional study analyzed data from the 2023 Indonesian Health Survey, which included 70,916 women of reproductive age. Logistic regression was used to assess predictors of ANC adequacy, such as age, education, marital status, health insurance, employment, urbanicity, economic status, and travel time to healthcare facilities. The data were analyzed through SPSS version 23 using descriptive statistics, chi square test, and multiple logistic regression. Final regression model was based on significant predictors only with calculated adjusted odd ratios and 95% confidence interval (CI) with a significance level of 0.05.

Results: The national prevalence of adequate ANC visits was 38.65%. However, a significant disparity was observed between provinces, with eastern areas showing much lower prevalence than provinces in western Indonesia. ANC adequacy was highest among women aged 25–29 and lowest among those under 20. Higher education (aOR=1.45, P<0.001), combined health insurance (aOR=2.84, P<0.001), employment (aOR=1.07, P<0.001), urban residence (aOR=1.24, P<0.001), and higher economic status (aOR=1.60, P<0.001) were positively associated with ANC adequacy. Conversely, being divorced (aOR=0.76, P<0.001) and widowed (aOR=0.74, P=0.004), and longer travel times to primary healthcare center negatively affected compliance (aOR=0.68, P<0.001).

Conclusion: Addressing geographic and socioeconomic barriers through improved healthcare infrastructure, transportation support, and expanded insurance coverage is essential for increasing ANC utilization and improving maternal health in Indonesia.

Keywords: Antenatal care; Healthcare disparities; Maternal health; Pregnancy

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INTRODUCTION

The World Health Organization (WHO) envisions a world where all pregnant women and newborns receive high-quality care throughout pregnancy, childbirth, and the postnatal period.¹ Antenatal care (ANC) plays a pivotal role in achieving this vision by promoting health, providing screening and diagnostic services, and delivering life-saving interventions.² ANC is not only considered a medical necessity but also designed as a proactive approach to ensure healthy pregnancy, safe delivery, and a good start in life for the baby.² This preventive approach is important as a mitigation strategy for pregnancy complications at the earliest possible stage. Mitigation of complication possibilities plays a pivotal role in minimizing maternal and infant mortality.^{3,4}

To enhance maternal healthcare quality, WHO introduced updated guidelines in 2016, recommending a minimum of eight ANC contacts during pregnancy—one in the first trimester, two in the second, and five in the third.⁵ Unlike traditional “visits,” the concept of “contacts” underscores meaningful interactions between pregnant women and healthcare providers, ensuring comprehensive care rather than mere attendance.^{6,7} Studies suggest that reducing the number of prenatal visits does not necessarily compromise the quality of care if the interactions are meaningful and goal-oriented.^{7,8}

In Indonesia, the Ministry of Health (MOH) has made substantial changes to the ANC protocols. Under MOH 21-2021, the recommended number of visits has been increased from four (per MOH 97/2014) to six. For enhancing mother and fetal health monitoring, ANC is now done twice in the first trimester, once to two times in the second trimester, and two to three times in the third trimester, to improve maternal and fetal health monitoring.⁹ This policy shift from the earlier three-visit model (K3) aims to improve early detection of complications and expand coverage in a geographically and socioeconomically diverse nation.¹⁰

ANC is widely recognized for reducing

maternal and neonatal mortality; for instance, attending even one ANC visit correlates with higher rates of live births and lower risks of severe maternal morbidity and perinatal complications.¹¹ Another study on low- and middle-income (LMICs) countries showed there was a suboptimal number of women attending ANC.¹² Further, the study of ANC utilization in Philippines confirms that more ANC visits correlate with positive impact, especially institutional delivery.¹³

Despite the ANC critical role, Indonesia’s ANC utilization remains uneven, with stark disparities across regions, income levels, and educational backgrounds.¹⁴ Factors such as education, economic status, and proximity to healthcare facilities have been identified as significant determinants of ANC utilization.¹⁵ Studies indicate that women with higher education levels and greater financial resources are more likely to complete ANC visits, whereas those in rural areas and lower-income households face persistent barriers, including infrastructural limitations, cultural constraints, and inadequate healthcare resources.^{14,16} Rural populations and low-income families face persistent challenges due to infrastructural and cultural barriers.^{17,18} These disparities also happened globally (across 63 LMICs countries), indicating inequalities in coverage and quality of ANC persist and necessity of an attempt to bridge the gap.¹⁹

The disparities condition in Indonesia on ANC utilization in a three-visits (K3) models scheme spark some questions, such as if there is a gap in service with 3 (three) visit scheme, will implementing 6 (six) visit schemes be able to improve ANC? The transition from a three-visit ANC model (K3) to K6 represents a significant policy shift. Moreover, it is known that the national and sub-national prevalence as well as geographic and socioeconomic factors influence such program implementation.²⁰ Understanding these factors is critical for assessing the effectiveness of the policy and identifying areas that should be the target of intervention and reveal barriers that hinder ANC adherence among Indonesian women.

However, there is limited research on the implementation of Indonesia's K6 program, specifically on how geographic and socioeconomic factors affect adherence. The majority of the accessible research focuses on general ANC coverage, developing a gap in our understanding of the new guideline's effectiveness. In light of the above, this study aims to map the prevalence of adequate ANC under K6 policy and investigate its associated geographic and socioeconomic factors using the 2023 Indonesian National Health Survey called Survei Kesehatan Indonesia (SKI) data. This study will provide insights into the key factors influencing ANC adherence, identify vulnerable populations at risk of inadequate ANC coverage, and inform policy interventions to enhance maternal healthcare services. As the first study to evaluate the socioeconomic dimensions of ANC K6 implementation, its findings will contribute to maternal health policy development and support progress toward achieving the Sustainable Development Goals.

MATERIALS AND METHODS

This is a cross-sectional study that utilized the SKI 2023 data.²¹ SKI 2023 is a comprehensive health survey conducted by the MOH of Indonesia in collaboration with Statistics Indonesia, and the WHO. SKI 2023 employed a stratified random sampling method. The maternal health questionnaire in SKI 2023 was developed through a collaborative process involving health experts, policymakers, and stakeholders, ensuring alignment with national health priorities and global maternal health guidelines. It was rigorously reviewed and pretested to ensure cultural relevance, clarity, and reliability in capturing key indicators, including ANC visits under the K6 policy. The instrument demonstrated a strong internal consistency with Cronbach's Alpha of 0.85.²¹ The data were collected in August to October 2023 from 34,065 census blocks in 514 Cities and Districts in all 38 Indonesian provinces by trained enumerators with a health education

background through face-to-face interviews. The data were input by enumerators using a computer-assisted personal interviewing system to ensure accuracy and minimize data entry errors. SKI 2023 showed a high response rate of 98.74%.²¹ A total of 1,191,692 individuals from 599,823 households participated in the survey. The validity of SKI 2023 was ensured by an external auditor from the Association of Indonesian Higher Education institutions for public health.

In this study, only responses from women who had ever been pregnant in the past five years were included. The K6 policy was formally introduced only two years before SKI 2023. However, it is important to note that many pregnant women had already proactively attended at least six ANC visits before its official implementation. This is because the recommendation of a minimum of six ANC visits has long been considered an essential component of optimal maternal healthcare, supported by global evidence, well before the formalization of the policy. Moreover, the implementation of the K6 policy was taken into account during the development of the SKI 2023 instrument, ensuring that relevant indicators were incorporated to assess adherence to the recommended ANC visit standard. Consequently, studies examining the prevalence of K6 and its determining factors using SKI 2023 data remain highly relevant, even though the dataset encompasses a five-year period. This data enables the assessment of the adoption of optimal ANC visit standards within the community, as well as the identification of persistent determinants that are unlikely to undergo significant changes solely due to policy formalization. These findings provide valuable insights for the strategic planning and enhancement of maternal health programs, highlighting specific areas that require further intervention to ensure equitable adherence to the K6 standard.

The data were extracted by the National Health Policy Agency, MOH of Indonesia, which is responsible for managing and

providing access to the SKI 2023 dataset. The authors conducted the data analysis independently. Systematically, there was no missing data because the program entry system must have been filled in completely. If the questionnaire was incomplete, the entry system could not continue. If it was incomplete, it would be deleted or returned to the enumerator to be completed. The response selection flow is illustrated in Figure 1.

The outcome measure of this study was the adequate ANC (K6) service utilized by Indonesian women. The definition of standard ANC followed the recommendation of the Indonesia MOH. The recommended ANC visits for pregnant women are at least six times. A minimum of one visit in the first trimester, two visits in the second trimester, and three visits in the third trimester.²² Therefore, in this study, six ANC visits or more that followed the recommended minimum visit in each trimester were categorized as adequate ANC and coded “1”. On the other hand, six or more ANC visits that did not comply with the minimum visit in each trimester and ANC visits less than six were categorized as inadequate and coded “0”. The data utilized in this study comprised ANC visit data from 2018 onwards.²¹ Adequate ANC visits were computed from that year.

The predictors were chosen based on the literature including socioeconomic factors such as age, education attained, marital status, employment, residence urbanicity, health insurance ownership, and wealth status.²³⁻²⁵ Health insurance ownership was divided into five categories: not insured, national health

insurance (NHI), private health insurance (PHI), combination between NHI and PHI, and other health insurances. This study also included the time needed to travel from home to healthcare facilities such as primary healthcare centers (PHC), clinics, and hospitals. The travel time was divided into four categories, not knowing/not sure, less than 30 minutes, 30-60 minutes, and more than 60 minutes.

The data were analyzed in three stages, univariate, bivariate test of association, and multiple logistic regression. In the univariate stage, descriptive statistics were utilized to outline the frequencies and percentages of the outcome and independent variables. During the bivariate stage, chi-square tests were conducted to examine the relationship between standard ANC visits and each predictor variable. Finally multiple binary logistic regression was employed to assess the association between the predictors and the outcome measure. Only predictors that showed significant P-values in the bivariate stage were taken in this stage. The adjusted odds ratio (aOR) and its 95% confidence interval (CI) were calculated. A significance level of 0.05 (P=0.05) was used throughout all analysis stages. Additionally, the Variance Inflation Factor (VIF) was calculated to evaluate potential multicollinearity issues within the dataset. All the statistical tests were conducted using SPSS version 23 (www.ibm.com). The map of adequate ANC prevalence was created using Quantum Geographic Information System open-source software version 3.34.1 (<https://qgis.org/>).

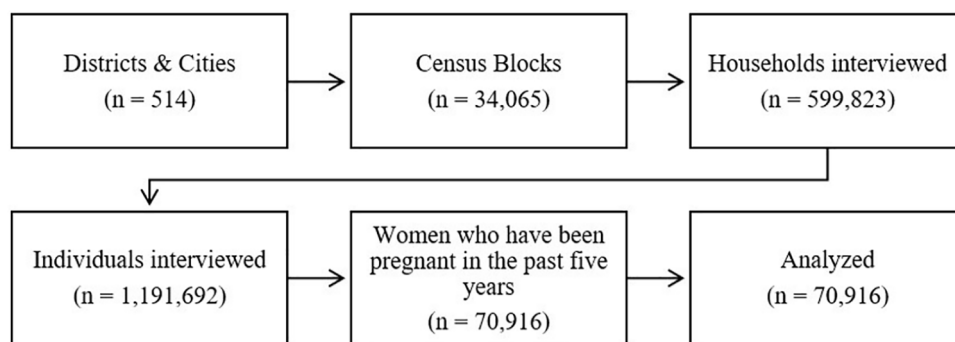


Figure 1: Response Selection Flow

Table 1: Prevalence of adequate antenatal care visit according to the participants' characteristics (n=70,916)

Variable	Adequate Antenatal Care		P value*
	No N (%)	Yes N (%)	
Age (year)			
<20	473 (77.67)	136 (22.33)	
20-24	4152 (64.03)	2332 (35.97)	
25-29	10050 (59.29)	6901 (40.71)	
30-34	12262 (59.80)	8242 (40.20)	<0.001
35-39	9792 (61.28)	6187 (38.72)	
40-44	5320 (63.74)	3027 (36.26)	
45+	1455 (71.25)	587 (28.75)	
Education			
No formal education	3355 (74.41)	1154 (25.59)	
Elementary	7529 (66.77)	3747 (33.23)	
Junior high school	8753 (61.25)	5537 (38.75)	<0.001
Senior high school	15978 (59.35)	10943 (40.65)	
University	7889 (56.67)	6031 (43.33)	
Marital Status			
Married	42593 (61.21)	26990 (38.79)	
Divorced	590 (67.58)	283 (32.42)	<0.001
Widowed	321 (69.78)	139 (30.22)	
Health Insurance			
Not insured	8692 (63.79)	4933 (36.21)	
NHI ^a	33656 (60.88)	21631 (39.12)	
PHI ^b	522 (51.99)	482 (48.01)	<0.001
NHI & PHI combined	30 (27.03)	81 (72.97)	
Other	604 (67.94)	285 (32.06)	
Employment			
Unemployed	25207 (61.87)	15536 (38.13)	0.001
Employed	18297 (60.64)	11876 (39.36)	
Residence urbanicity			
Rural	23151 (67.61)	11092 (32.39)	<0.001
Urban	20353 (55.50)	16320 (44.50)	
Economic status			
Poorest	8858 (72.80)	3310 (27.20)	
Poor	8465 (65.59)	4440 (34.41)	
Middle	9039 (61.66)	5620 (38.34)	<0.001
Rich	8766 (57.74)	6415 (42.26)	
Richest	8376 (52.34)	7627 (47.66)	
Travel time from home to PHC^c			
<30 minutes	34194 (59.30)	23470 (40.70)	
30-60 minutes	7441 (68.92)	3355 (31.08)	<0.001
>60 minutes	1410 (79.21)	370 (20.79)	
Not knowing/not sure	459 (67.90)	217 (32.10)	
Travel time from home to clinic			
<30 minutes	29394 (57.40)	21812 (42.60)	
30-60 minutes	3606 (66.61)	1808 (33.39)	<0.001
>60 minutes	1205 (70.47)	505 (29.53)	
Not knowing/not sure	9299 (73.88)	3287 (26.12)	
Travel time from home to hospital			
<30 minutes	15245 (55.85)	12053 (44.15)	
30-60 minutes	15545 (60.41)	10188 (39.59)	<0.001
>60 minutes	8803 (69.54)	3856 (30.46)	
Not knowing/not sure	3911 (74.84)	1315 (25.16)	

^aNHI: National health insurance; ^bPHI: Private health insurance; ^cPHC: Primary healthcare center; *Chi square test

The National Ethics Committee for approved this research under the code of LB.02.01/I/KE/L/287/2023, and all participants provided informed consent before participating in the study. Verbal and written informed consent was obtained from each participant prior to their involvement. The participants were also assured that their participation was entirely voluntary and that they could withdraw from the study at any point without affecting the care they received. Additionally, the researchers guaranteed the confidentiality and anonymity of the participants' responses and any data collected.

RESULTS

A total of 70,916 women of reproductive age participated in the study, with the largest age group being 30–34 years (20504; 28.91%) and the smallest below 20 years (609; 0.85%) (Table 1). The national prevalence of adequate ANC visit with a minimum of six visits was 38.65% (27412) including the six ANC visits before the K6 policy which was formally stipulated. At sub-national level, the prevalence of adequate ANC in Indonesia showed a significant variation between provinces. Provinces in the western region of Indonesia, particularly in Java, had a higher prevalence of adequate ANC compared to provinces in the eastern region, such as Papua and Maluku. For example, West Java (2768; 58.79%), Central Java (3297; 58.65%), and East Java (2998; 57.60%) showed much

higher prevalence compared to West Papua (94; 13.00%) and Maluku (244; 17.78%). The prevalence of adequate ANC visits is illustrated in Figure 2.

According to the demographic factors, women under 20 years exhibited the lowest percentage of adequate ANC (136; 22.33%). The descriptive statistics are presented in Table 1. Educational attainment had a clear impact on ANC utilization. Women with no formal education had the lowest prevalence of adequate ANC (1154; 25.59%). Married women had the highest proportion of adequate ANC (26990; 38.79%) than divorced (283; 32.42%) or widowed (139; 30.22%) women ($P < 0.001$).

In terms of health insurance ownership, only 4933 out of 13625 (36.21%) uninsured women had adequate ANC visits. This finding highlights financial barriers as a major obstacle to adequate maternal healthcare. Furthermore, employed women had a slightly higher prevalence of adequate ANC visits (11876; 39.36%) compared to unemployed women (15536; 38.13%) ($P = 0.001$). Urban residents were shown to have a better prevalence of adequate ANC visits (16320; 44.50%) compared to their rural counterparts (11092; 32.39%) ($P < 0.001$).

Regarding economic status, the wealthiest women had the highest proportion of adequate ANC visits (7627; 47.66%) compared to only 27.20% (3310) of women in the poorest economic category ($P < 0.001$).

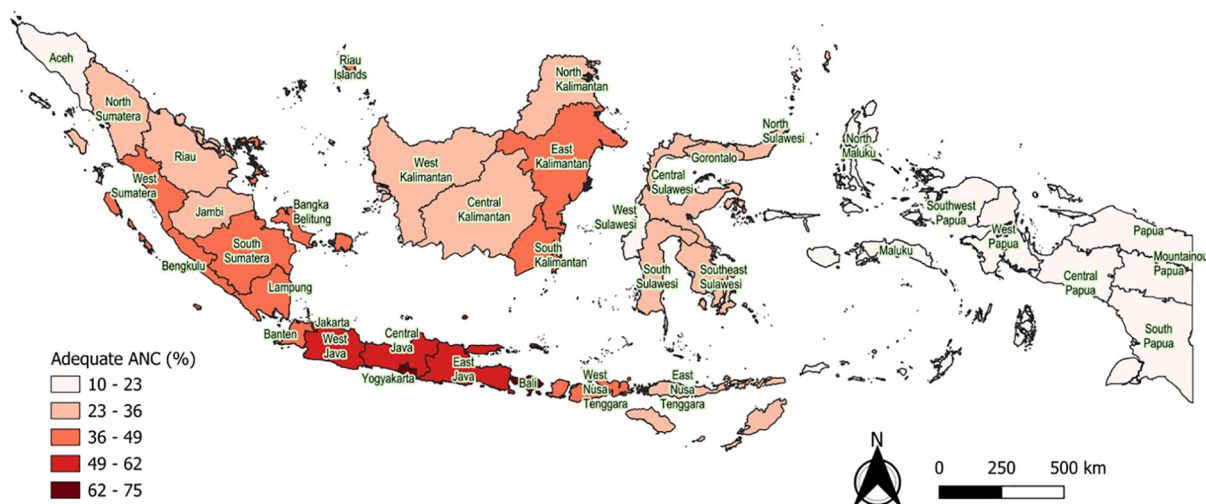


Figure 2: The prevalence of adequate ANC visits in Indonesia

Table 2: Geographic and socioeconomic predictors of adequate antenatal care in Indonesia using multiple logistic regression (n=70916)

Variable	aOR ^a	95% CI ^b	P value
Age (year)			
<20 (Ref.) ^c	1	1	1
20-24	1.78	1.45-2.17	<0.001
25-29	1.94	1.59-2.36	<0.001
30-34	1.82	1.50-2.22	<0.001
35-39	1.72	1.41-2.10	<0.001
40-44	1.58	1.29-1.92	<0.001
45+	1.19	0.96-1.48	0.105
Education			
No formal education (Ref.)	1	1	1
Elementary	1.32	1.22-1.43	<0.001
Junior high school	1.45	1.34-1.56	<0.001
Senior high school	1.37	1.27-1.47	<0.001
University	1.30	1.19-1.41	<0.001
Marital status			
Married (Ref.)	1	1	1
Divorced	0.76	0.66-0.88	<0.001
Widowed	0.74	0.60-0.91	0.004
Health insurance			
Not insured (Ref.)	1	1	1
NHI ^d	1.00	0.96-1.04	0.941
PHI ^e	1.21	1.06-1.38	0.004
NHI & PHI combined	2.84	1.86-4.34	<0.001
Other	0.78	0.67-0.91	0.001
Employment			
Unemployed (Ref.)	1	1	1
Employed	1.07	1.04-1.11	<0.001
Residence urbanicity			
Rural (Ref.)	1	1	1
Urban	1.24	1.19-1.28	<0.001
Economic status			
Poorest (Ref.)	1	1	1
Poor	1.13	1.07-1.20	<0.001
Middle	1.25	1.18-1.32	<0.001
Rich	1.38	1.30-1.46	<0.001
Richest	1.60	1.51-1.70	<0.001
Travel time from home to PHC^f			
<30 minutes (Ref.)	1	1	1
30-60 minutes	0.91	0.86-0.95	<0.001
>60 minutes	0.68	0.60-0.77	<0.001
Not knowing/not sure	0.86	0.72-1.02	0.085
Travel time from home to clinic			
<30 minutes (Ref.)	1	1	1
30-60 minutes	0.85	0.80-0.90	<0.001
>60 minutes	0.90	0.81-1.01	0.094
Not knowing/not sure	0.66	0.63-0.69	<0.001
Travel time from home to hospital			
<30 minutes (Ref.)	1	1	1
30-60 minutes	1.02	0.98-1.06	0.250
>60 minutes	0.88	0.83-0.93	<0.001
Not knowing/not sure	0.70	0.65-0.76	<0.001

^aaOR: adjusted odds ratio; ^bCI: confidence interval; ^cRef: reference; ^dNHI: national health insurance; ^ePHI: private health insurance; ^fPHC: primary healthcare center

Travel time to healthcare facilities influenced the likelihood of completing standard ANC. Women living more than 60 minutes from a PHC were the least likely to have adequate ANC visits (370; 20.79%). For clinics, women who needed less than 30 minutes to travel to clinics had the highest prevalence of adequate ANC visits (21812; 42.60%). A similar pattern was observed for hospitals, where shorter travel times corresponded to higher ANC utilization (12053; 44.15%).

The results of binary logistic regression revealed several key predictors of adequate ANC visits, including age, education level, marital status, health insurance ownership, employment status, urbanicity, economic status, and travel time to healthcare facilities. Younger women, particularly those below 20 years, and women with lower socioeconomic status were less likely to complete standard ANC visits. By contrast, higher education levels, urban residence, and combined health insurance coverage were strongly associated with better ANC utilization. The predictors of complete ANC visits are illustrated in Table 2.

Maternal age demonstrated a significant association with the adequacy of ANC visits. Compared to mothers under 20 years of age, those aged 20-24 years were more likely to receive adequate ANC (aOR: 1.78, CI: 1.45-2.17, $P<0.001$). Maternal education level also significantly impacted the adequacy of ANC visits. Compared to mothers without formal education, those with elementary education were more likely to receive adequate ANC (aOR: 1.32, CI: 1.22-1.43, $P<0.001$). Marital status was also associated with adequate ANC, with divorced mothers being less likely to receive adequate ANC (aOR: 0.76, CI: 0.66-0.88, $P<0.001$) compared to married mothers. Similarly, widowed mothers showed a lower likelihood of adequate ANC compliance compared to married mothers (aOR: 0.74, CI: 0.60-0.91, $P=0.004$).

Health insurance ownership influenced the adequacy of ANC visits as well. Compared to uninsured mothers, those with a combination of national and private insurance showed the

strongest effect on ANC compliance (aOR: 2.84, CI: 1.86-4.34, $P<0.001$). Maternal employment status also exhibited a significant association with adequate ANC, as working mothers were more likely to receive adequate ANC than non-working ones (aOR: 1.07, CI: 1.04-1.11, $P<0.001$). Moreover, mothers residing in urban areas were more likely to receive adequate ANC visits compared to those in rural areas (aOR: 1.24, CI: 1.19-1.28, $P<0.001$). Regarding economic status, mothers in the “poor” economic group were more likely to receive adequate ANC (aOR: 1.13, CI: 1.07-1.20, $P<0.001$) compared to the poorest economic group.

The results of the multiple logistic regression showed that travel time from home to health facilities exhibited a significant association with the adequacy of ANC visits. Mothers who required 30-60 minutes to reach a health center were less likely to attend sufficient ANC visits compared to those who required less than 30 minutes (aOR: 0.91, CI: 0.86-0.95, $P<0.001$).

Similar findings were observed regarding access to clinics. Mothers who required 30-60 minutes of travel were less likely to receive adequate ANC compared to those who traveled less than 30 minutes (aOR: 0.85, CI: 0.80-0.90, $P<0.001$). Regarding access to hospitals, the logistic regression analysis revealed that a 30-to 60-minute journey did not significantly correlate with ANC adequacy (aOR: 1.02, CI: 0.98-1.06, $P=0.250$). However, mothers who required more than 60 minutes of travel were less likely to receive adequate ANC than those who traveled less than 30 minutes (aOR: 0.88, CI: 0.83-0.93, $P<0.001$).

DISCUSSION

This study identified significant disparities in the adequacy of ANC visits. The gap in the prevalence of adequate ANC between provinces in the western and eastern regions of Indonesia could be due to several factors. First, access to adequate health facilities in the eastern region is still limited compared to the western region.

Limited health infrastructure, including long distances between people's homes and health facilities, is a major barrier to utilization of ANC services in remote areas.¹⁴ Second, socioeconomic factors also play an important role. Provinces in the eastern region, such as Papua and Maluku, have higher poverty rates compared to provinces in Java, which may affect pregnant women's ability to access health services.²⁶

In addition, cultural and educational factors also contribute to these differences. Lower education levels in some eastern regions of Indonesia may affect awareness of the importance of complete ANC. Previous studies have found that the education level of pregnant women has a positive correlation with ANC service utilization. Pregnant women with lower education levels tend to have a poorer understanding of the importance of regular ANC visits.²⁷

Logistic regression results demonstrated a significant association between age and adequate ANC visits. Women aged 25–29 showed the highest ANC utilization, likely due to their reproductive maturity and risk awareness, whereas women over 35, despite greater experience and confidence in judgment, tended to engage less with ANC. Meanwhile, individuals aged under twenty were less likely to have adequate ANC visits compared to other older age groups. In the Indonesian context, adolescent mothers experience substantial social stigma due to the perception that young girls who become pregnant at a very young age are generally the result of premarital sex.¹⁶ Such pregnancies continue to be widely regarded as taboo by the majority of Indonesian societal groups. This situation hampers their access to ANC. Additionally, mature women are often associated with better health services uptake because of better health knowledge and economic stability.²⁸ This finding is consistent with the results of similar studies in other LMICs.^{29,30} However, research in high-income countries identified the importance of culturally competent staff to enhance comfort levels among pregnant

women.³¹ The study recommends designing programs which include interaction time, ensure cultural sensitivity, and offer flexibility in attendance options.³¹

The current study also found that formal education significantly increased the likelihood of completing ANC services. Women with formal education were more likely to recognize the importance of ANC and access these services compared to those without formal education. This finding aligns with studies conducted in East Africa, which identified a positive relationship between women's education and ANC utilization.³² Educated women possess greater knowledge of pregnancy danger signs and are more aware of health risks, which increases their utilization of preventive services.³³

Marital status emerged as another important factor influencing adequate ANC visits. Married women demonstrated higher engagement with ANC services compared to their divorced or widowed counterparts. This finding corroborates the result of previous research in Ethiopia.³⁴ The current precedent is often attributed to the support provided by spouses and families, which facilitates access to healthcare services. Thus, policymakers must further emphasize initiatives that foster social support to address the negative impacts of diminished support among divorced or widowed women.

Health insurance ownership played a critical role in determining ANC utilization. Women with health insurance, particularly those covered by both NHI and PHI, were more likely to have adequate ANC visits compared to the uninsured women. This result aligns with the findings of prior systematic reviews showing that health insurance significantly reduces financial barriers to maternal healthcare in LMICs and increases the uptake.³⁵ Increasing health insurance coverage is, therefore, essential to mitigating financial constraints and encouraging greater utilization of ANC services.³⁶

Employment status also exhibited a significant association with ANC utilization.

Employed women were slightly more likely to have adequate ANC visits compared to their unemployed counterparts. This trend is consistent with findings from sub-Saharan Africa, where employed women were more likely to attend ANC visits due to financial stability and exposure to health-related information.³⁷ Employment, therefore, not only contributes to household income but also empowers women to prioritize maternal healthcare.

The study highlights urban-rural disparities in ANC utilization, with urban residents being more likely to get adequate ANC services compared to women in rural areas. This finding aligns with prior research in the United States.³⁸ Women in rural areas face significant challenges, including limited healthcare facilities, longer travel times, and lower health literacy.³⁹ Addressing these inequities requires investments in rural healthcare systems, including infrastructure development and community outreach programs to enhance access to maternal healthcare.

Economic status was found to be a key determinant of ANC utilization. Women from wealthier households were more likely to complete ANC visits. This result supports the findings of earlier studies in Namibian hospitals.⁴⁰ Wealthy women benefitted from financial resources that facilitated healthcare access. In contrast, women from lower-income groups often faced financial constraints, such as transportation costs, which limited their ability to seek care.⁴¹ Bridging this gap requires targeted policies to reduce financial barriers, such as transportation subsidies and affordable healthcare services, to ensure equitable access to ANC. Moreover, a study on perinatal care for migrant women in high-income countries found that group prenatal care, mental health support, and continuous midwife care improved the outcomes.⁴² Effective policies include providing social welfare, free healthcare, and maternal education. A multi-approach strategy such as using diverse healthcare teams, in-person

interpreters, education, and social support can enhance health outcomes. Removing financial barriers may also improve care access and reduce healthcare costs.⁴³

The proximity of healthcare facilities further influenced ANC utilization. Women who lived closer to healthcare facilities were more likely to have adequate ANC visits, highlighting the importance of geographic accessibility. This result aligns with the findings of a prior cohort study in British Columbia, Canada, which found that women who lived far from healthcare facilities were shown to have less preferred ANC utilization and pregnancy outcomes.⁴⁴ Furthermore, in the Indonesian context, mothers who were unaware of the travel time to health facilities tended to have lower ANC attendance rates compared to those who knew they had longer travel times.⁴⁵ This may reflect a lack of awareness or information about the importance of ANC.¹⁴ Uncertainty around the travel time to health facilities, often due to traffic congestion or unreliable transportation, reduces ANC uptake in Indonesia by making it harder for women to plan visits, increasing commuting discomfort, and lowering their motivation to seek care. Thus, the results of this study confirm that distance to health facilities is a significant barrier to meeting ANC visit standards in Indonesia. Therefore, efforts are needed to improve the accessibility of maternal health services, including strengthening referral systems, transportation subsidies, and educational campaigns to increase maternal awareness of the importance of adequate ANC.

This study has several notable strengths. First, it utilized nationally representative data from the 2023 SKI, which ensures comprehensive coverage of diverse populations across Indonesia. The large sample size enhances the generalizability of the findings, providing robust insights into the factors influencing ANC utilization.

However, this study is not without limitations. There was a focus in this study on quantitative data, excluding qualitative insights that could provide a deeper understanding of cultural and contextual

factors influencing ANC utilization. Despite these limitations, the findings contribute significantly to the existing body of knowledge and offer actionable recommendations for addressing disparities in maternal healthcare.

CONCLUSION

This study highlights that access to health services, particularly distance to health facilities, plays a significant role in maternal compliance with ANC visits in Indonesia. Moreover, the study findings underscore the need for more comprehensive interventions to ensure that every mother receives adequate ANC, regardless of geographic or economic factors. Indonesian experience can be seen as a developing country context that implies a necessity to implement comprehensive approach policies that address the identified geographic and socioeconomic disparities, culturally and behaviorally. Based on Indonesian lessons, the government in developing countries should prioritize expanding access to maternal health services by enhancing health infrastructure in regions with low prevalence of maternal health challenges. As demonstrated in the Indonesian case, the developing countries' common context addresses disparities in diverse aspects. As an implication, there is a need to explore cultural and behavioral aspects and the structural aspects of ANC. The call for future research with comprehensive methods is inevitable because it enables a better understanding of the complex factors of maternal health-seeking behavior in developing countries.

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Authors' Contribution

Conceptualization and study design were done by TR, SS, and DAM. Data management was

performed by HB, ZN, APN, and DEE. Formal analysis and interpretation were carried out by DAM, HB, DEE, YF, SH, and IP. Writing-original draft was done by TR, IP, APN, SH, DEE, and YF. Writing review & editing were carried out by all authors. All authors read and approved the final manuscript. All authors take responsibility for the integrity of the data and the accuracy of the data analysis. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

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Conflict of Interest

None declared.

Declaration on the use of AI

This study was conducted without the use of AI-assisted technology in data collection, analysis or writing the manuscript.

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