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Anemia in Pregnant Women and Adherence to Iron Supplement Intake in the Community

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Abstract

Background: Anemia during pregnancy remains a public health problem in Indonesia, and the distribution of iron–folic acid (IFA) tablets does not necessarily guarantee their consumption. **Objective:** To describe anemia trends and the gap between IFA distribution and consumption data, analyze provincial variation in IFA coverage among adolescent girls and pregnant women in 2022, and assess its association with midwife density. **Methods:** An ecological study using open secondary data: Riskesdas 2018, SKI 2023, the Indonesia Health Profile 2022 (34 provinces), and midwife density in 2020. Analysis used medians with IQR, Mann–Whitney tests, and Spearman correlation with Fisher-z 95% CI. **Results:** The prevalence of anemia among pregnant women was 37.1% (2013), 48.9% (2018), and 27.7% (2023). In 2018, only 38.1% of pregnant women consumed ≥90 IFA tablets, whereas routine reports for 2022 indicated that 86.2% received ≥90 tablets. The median provincial IFA coverage was 82.8% (IQR 77.6–87.7) for pregnant women and 46.7% (IQR 30.5–63.2) for adolescent girls; coverage was significantly lower in eastern Indonesia (60.0% vs. 84.5% for pregnant women; $p < 0.001$). Coverage among adolescent girls and pregnant women was strongly correlated ($\rho = 0.78$), whereas midwife density correlated negatively with coverage among pregnant women ($\rho = -0.48$; $p = 0.004$). **Conclusion:** IFA coverage is unevenly distributed across provinces, and the number of midwives alone does not ensure adherence; village midwives should emphasize adherence counseling, consumption monitoring, and prevention starting in adolescence.
Keywords: anemia; pregnant women; iron–folic acid; adherence; village midwife; community midwifery

Introduction

Anemia during pregnancy, generally defined as a hemoglobin level below 11 g/dL, is a widespread public health problem in low- and middle-income countries. Global trend analyses indicate that anemia among pregnant women remains highly prevalent, particularly in low-income regions (Stevens et al., 2013). Severe anemia during pregnancy and the postpartum period is associated with an increased risk of maternal mortality (Daru et al., 2018), making anemia prevention a critical component of antenatal care. A Cochrane review concluded that daily iron supplementation during pregnancy reduces the risk of maternal anemia in the third trimester and iron-deficiency anemia (Peña-Rosas et al., 2015). In Indonesia, the primary program for this purpose is the provision of iron tablets (TTD)—at least 90 tablets—during pregnancy.

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The prevalence of anemia among pregnant women in Indonesia rose from 37.1% in the 2013 Riskesdas to 48.9% in the 2018 Riskesdas (Ministry of Health of the Republic of Indonesia, Agency for Health Research and Development, 2018). The 2023 Indonesian Health Survey (SKI) reported a decrease to 27.7%, a drop of 21.2 percentage points (Health Development Policy Agency [BKPK], 2024). In the 2018 survey, only 38.1% of pregnant women consumed 90 or more TTD tablets (Ministry of Health of the Republic of Indonesia, Agency for Health Research and Development, 2018). Meanwhile, the program's 2022 routine report noted that 86.2% of pregnant women received at least 90 TTD tablets (Ministry of Health of the Republic of Indonesia, 2023). This significant discrepancy between distribution and consumption figures indicates that the tablets distributed are not necessarily taken.

Adherence to iron tablets is influenced by many factors. An analysis of the 2002–2012 SDKI data showed that mothers' knowledge of pregnancy risks (aOR 1.8), family support—particularly from their husbands (aOR 1.9), and adequate antenatal care visits (aOR 2.2) were associated with the consumption of ≥90 tablets; among women with adequate antenatal care, 15% reported never having received or purchased TTD, meaning that opportunities for health workers to provide the tablets and information were missed (Wiradnyani et al., 2016). Therefore, in addition to tablet distribution, consumption adherence needs to be assessed.

Midwives occupy a strategic position in this chain, ranging from providing iron tablets to adolescent girls and brides-to-be, dispensing tablets during antenatal visits, to providing adherence counseling and monitoring in the community. However, provincial data on iron tablet provision to adolescent girls and pregnant women are rarely analyzed together. This study aims to (1) describe trends in the prevalence of anemia among pregnant women and the gap between iron-folic acid tablet distribution and consumption data, (2) analyze variations in iron-folic acid tablet coverage among adolescent girls and pregnant women across provinces in 2022, and (3) assess its relationship with the midwife-to-population ratio, as a basis for strengthening the role of midwives in community midwifery care.

Methods

Study Design. This is a descriptive-analytical ecological study with provinces as the unit of analysis, using aggregated open-access secondary data. Survey data (Riskesdas 2013 and 2018, SKI 2023) were used for national trends in anemia and iron-folic acid supplement (IFAS) consumption, while routine program report data (2022) were used to examine interprovincial variations.

Data Sources. The prevalence of anemia among pregnant women in 2013 and 2018, as well as the percentage of pregnant women who consumed ≥90 TTD tablets in 2018, were obtained from the Key Findings of Riskesdas 2018 (Ministry of Health of the Republic of Indonesia, Agency for Health Research and Development, 2018). The prevalence of anemia among pregnant women in 2023 was taken from the Key Findings of the 2023 SKI (BKPK, 2024). The percentage of adolescent girls receiving iron supplements and the percentage of pregnant women receiving at least 90 tablets of iron supplements by province in 2022 were taken from Appendix 28.a of the 2022 Indonesia

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Health Profile (Ministry of Health of the Republic of Indonesia, 2023). The ratio of midwives per 100,000 population by province is taken from the 2020 Indonesia Health Profile (Ministry of Health of the Republic of Indonesia, 2021). A summary of data sources is presented in Table 1.

Table 1. Research data sources

Variable	Year	Coverage	Source
Prevalence of Anemia in Pregnant Women (%)	2013, 2018, 2023	National	Riskesdas 2018; SKI 2023
Pregnant women consuming ≥90 TTD tablets (%)	2018	National	2018 Riskesdas
Adolescent girls receiving TTD (%)	2022	34 provinces	Ministry of Health (2023)
Pregnant women receiving TTD ≥90 tablets (%)	2022	34 provinces	Ministry of Health (2023)
Midwives per 100,000 people	2020	34 provinces	Ministry of Health (2021)

Operational definition. Anemia in pregnant women is defined as a hemoglobin level below 11 g/dL. Iron supplement coverage for pregnant women in routine reports is the percentage of pregnant women who received at least 90 iron tablets, as reported in the source appendix, while iron supplement consumption in the survey is the percentage of pregnant women who consumed ≥90 tablets according to respondent self-reports. These two measures are not identical and are not compared as a simple difference. Iron-folic acid supplement coverage among adolescent girls is the percentage of target adolescent girls who received iron-folic acid supplements in 2022. The eastern region is defined as Papua, West Papua, Maluku, North Maluku, and East Nusa Tenggara, and the Java–Bali region as DKI Jakarta, West Java, Central Java, DI Yogyakarta, East Java, Banten, and Bali.

Data analysis. Provincial coverage was summarized using the median and interquartile range (IQR), as well as the number of provinces below a specific threshold. Interregional differences were tested using the Mann–Whitney U test. The relationship between TTD coverage among adolescent girls and pregnant women, as well as between the midwife-to-population ratio and TTD coverage, was assessed using Spearman's rank correlation; 95% confidence intervals were calculated using Fisher's z-transformation and the Bonett–Wright standard error. A sensitivity analysis was conducted excluding Papua and West Papua. Tests were two-tailed with $\alpha = 0.05$, and analyses were performed using Python 3 (SciPy library).

Design limitations. Survey-based iron supplement consumption figures and routine iron supplement coverage data come from different sources, years, and denominators. The national denominator in the routine table for pregnant women (3.17 million) is smaller than the annual number of births; therefore, the percentages were likely

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calculated against targets reported by local governments and should be interpreted with caution. Provincial-level data on anemia are not publicly available, so the relationship between TTD coverage and anemia cannot be tested at the provincial level. Ecological studies do not draw conclusions at the individual level. This study uses publicly available aggregated data without individual identifiers and therefore does not require ethical approval.

Results

National trends in anemia and iron-folic acid supplement (IFAS) consumption. The prevalence of anemia among pregnant women rose from 37.1% (2013) to 48.9% (2018), then fell to 27.7% in the 2023 SKI, a decrease of 21.2 percentage points (Table 2). In the 2018 survey, only 38.1% of pregnant women consumed ≥90 iron tablets. In contrast, the 2022 routine report noted that 86.2% of pregnant women received at least 90 iron tablets and 50.0% of adolescent girls received iron tablets.

Table 2. Prevalence of anemia among pregnant women and iron supplement indicators, Indonesia 2013–2023

Indicator	Source	Year	Value (%)
Prevalence of Anemia in Pregnant Women	Riskesdas	2013	37.1
Prevalence of Anemia in Pregnant Women	Riskesdas	2018	48.9
Prevalence of Anemia in Pregnant Women	SKI	2023	27.7
Pregnant women consuming ≥90 TTD tablets	Riskesdas (survey)	2018	38.1
Pregnant women received ≥90 TTD tablets	Routine report	2022	86.2
Adolescent girls receive TTD	Routine report	2022	50.0

Note: Source: Indonesian Ministry of Health, National Institute of Health Research and Development (2018); BKPK (2024); Indonesian Ministry of Health (2023).

Variation in TTD coverage across provinces in 2022. The median TTD coverage of ≥90 tablets among pregnant women was 82.8% (IQR 77.6–87.7; range 18.4–91.7). Only seven provinces achieved ≥90% (Bali, Bangka Belitung Islands, DKI Jakarta, West Java, Lampung, East Java, and Banten), while 12 provinces were below 80% and four provinces were below 70%: North Sulawesi (64.1%), North Maluku (60.0%), Papua (38.9%), and West Papua (18.4%). TTD coverage among adolescent girls was significantly lower and more variable (median 46.7%; IQR 30.5–63.2; range 2.5–95.1), with nine provinces below 30%, including West Papua (2.5%), Aceh (8.2%), Gorontalo (14.1%), North Sulawesi (17.6%), and Papua (18.0%). Coverage among adolescent girls was lower than among pregnant women in 33 of 34 provinces; the only exception was Bali (95.1% vs. 91.7%) (Figure 1).

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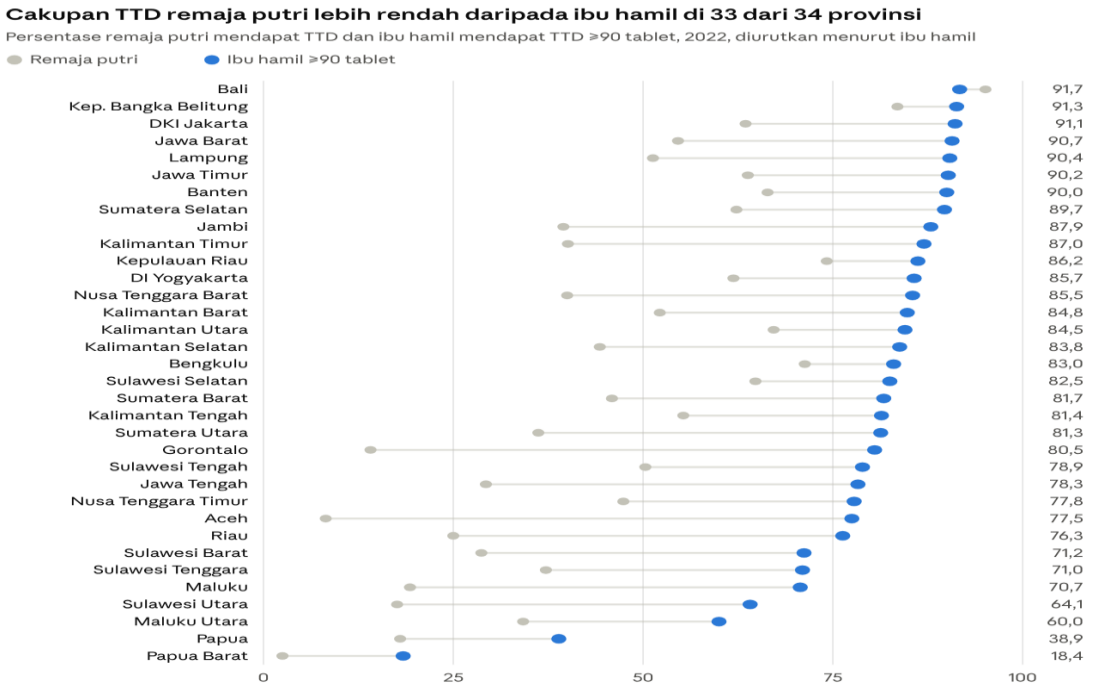


Figure 1. Adolescent girls' TTD coverage is lower than that of pregnant women in 33 of 34 provinces. Source: Ministry of Health of the Republic of Indonesia (2023), processed by the author

Regional differences and relationships among indicators. Contraceptive coverage among pregnant women was higher in the Java–Bali provinces (median 90.2%) than in other provinces (81.4%; $p = 0.004$), and significantly lower in the eastern region (60.0% vs. 84.5%; $p < 0.001$). A similar pattern was observed among adolescent girls: 63.5% in Java–Bali vs. 40.1% in other provinces ($p = 0.039$), and 19.3% in the eastern region vs. 51.3% in other provinces ($p = 0.019$). The coverage of antenatal care for adolescent girls and pregnant women showed a strong positive correlation ($\rho = 0.78$; 95% CI 0.56–0.89; $p < 0.001$; excluding Papua and West Papua, $\rho = 0.74$; 95% CI 0.49–0.88) (Table 3).

Association with the midwife-to-population ratio. The ratio of midwives per 100,000 population was negatively correlated with TTD coverage among pregnant women ($\rho = -0.48$; 95% CI −0.71 to −0.15; $p = 0.004$; $n = 34$), and was stronger after excluding Papua and West Papua ($\rho = -0.61$; 95% CI −0.80 to −0.31; $p < 0.001$; $n = 32$). The correlation with coverage among adolescent girls was also negative but not statistically significant ($\rho = -0.26$; 95% CI −0.56 to 0.09; $p = 0.13$).

Table 3. Regional differences and correlations in TTD coverage across provinces, 2022 (n = 34)

Measure	Pregnant women ≥90 tablets	Adolescent girls

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Measure	Pregnant women ≥90 tablets	Adolescent girls
Median Java–Bali (n = 7), %	90.2	63.5
Median for other provinces (n = 27), %	81.4	40.1
*p-value (*Mann–Whitney)	0.004	0.039
Median for the eastern region (n = 5), %	60.0	19.3
Median for other provinces (n = 29), %	84.5	51.3
*p-value (*Mann–Whitney)	< 0.001	0.019
Spearman's ρ with midwife ratio (95% CI)	−0.48 (−0.71 to −0.15)	−0.26 (−0.56 to 0.09)

Note. Source: Ministry of Health of the Republic of Indonesia (2021, 2023), processed by the author.

Discussion

Anemia rates have declined, but data on iron-rich food consumption do not yet explain this trend. The prevalence of anemia among pregnant women reported by the 2023 SKI (27.7%) is significantly lower than that reported by the 2018 Riskesdas (48.9%). Such a substantial change must be interpreted with caution because the data used do not allow for testing of the underlying causes, and differences in survey design and hemoglobin measurement methods may influence the figures. The only publicly available data on iron-folic acid supplement (IFAS) consumption at the national level comes from the 2018 Riskesdas, which showed that only 38.1% of pregnant women consumed ≥90 tablets; this figure indicates that, at the time when anemia rates were highest, adherence was indeed low. This association is consistent with clinical evidence that daily iron supplementation during pregnancy reduces the risk of maternal anemia (Peña-Rosas et al., 2015) and with the importance of preventing severe anemia, which is associated with maternal mortality (Daru et al., 2018). However, data on TTD consumption trends after 2018 are not available, so the decline in anemia in 2023 cannot be attributed to improved adherence.

The gap between distribution and consumption. The 2022 routine report noted that 86.2% of pregnant women received ≥90 TTD tablets, while the 2018 survey noted that 38.1% consumed that many. These two figures are not comparable because the years, denominators, and definitions differ; in fact, the national denominator in the routine table is smaller than the annual number of births. However, this gap serves as a reminder that receiving tablets is not the same as taking them. Wiradnyani et al. (2016) demonstrated that knowledge of pregnancy risks, family support—particularly from the husband—and adequate antenatal visits are associated with the consumption of ≥90 tablets, and that antenatal care providers often miss opportunities to provide both the

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tablets and relevant information. This underscores that program indicators should be supplemented with consumption indicators, such as adherence as reported by the mother or a count of remaining tablets during follow-up visits.

Regional disparities and prevention starting in adolescence. TTD coverage among pregnant women is lower in the eastern regions (median 60.0%) and very low in West Papua (18.4%) and Papua (38.9%), so areas with limited access require special attention. Coverage of emergency contraception for adolescent girls is significantly lower than for pregnant women in nearly all provinces (median 46.7% vs. 82.8%), and the two are strongly correlated ($\rho = 0.78$); provinces that perform poorly in providing emergency contraception to adolescent girls tend to perform poorly for pregnant women as well. Because the provision of TTD during pregnancy depends on early antenatal visits, programs that rely solely on antenatal services are prone to delays. Prevention starting in adolescence is a critical entry point for community midwifery care, for example, through collaboration between village midwives and schools and community health centers.

Midwives: Numbers alone do not guarantee compliance. The ratio of midwives to population is negatively correlated with TTD coverage among pregnant women ($\rho = -0.48$; -0.61 excluding Papua and West Papua). A plausible explanation—though not tested in the available data—is that high midwife-to-population ratios tend to be found in sparsely populated provinces or areas with difficult terrain, where distance and logistical challenges hinder service delivery, so the ratio per capita does not reflect actual access. The implication is that increasing the number of midwives must be accompanied by quality oversight of counseling, ensuring a steady supply of TTD, and strategies to reach hard-to-reach areas.

Implications for community midwifery care. First, village midwives need to ensure that pregnant women receive iron supplements starting from their first antenatal visit and receive counseling on adherence, including how to manage side effects, as well as involve their husbands and families (Wiradnyani et al., 2016). Second, midwives need to monitor consumption—not just distribution—at every visit. Third, collaboration with schools and community health centers is necessary to increase iron supplement coverage among adolescent girls. Fourth, provincial data on anemia and iron supplement consumption should be published to enable evaluation.

Limitations. This study is ecological in nature. Provincial-level data on anemia and iron-folic acid supplement consumption are not publicly available, so the relationship between iron-folic acid supplement coverage and anemia cannot be tested. Routine iron supplement coverage data comes from program reports with a denominator that is not entirely clear; the midwife-to-population ratio is from 2020; and the number of provinces included is limited. Anemia rates for 2013, 2018, and 2023 come from surveys with different designs.

Conclusion

The prevalence of anemia among pregnant women increased from 37.1% (2013) to 48.9% (2018), then reportedly decreased to 27.7% in the 2023 SKI. In 2018, only 38.1%

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of pregnant women consumed ≥90 iron tablets, whereas the 2022 routine report noted that 86.2% of pregnant women received ≥90 iron tablets; therefore, consumption measurements need to be refined. Prenatal vitamin coverage varies greatly across provinces: only seven provinces achieved ≥90% coverage among pregnant women, and coverage among adolescent girls is much lower (median 46.7%) and strongly correlates with coverage among pregnant women (ρ = 0.78). The ratio of midwives per capita is not positively associated with TTD coverage (ρ = −0.48). Village midwives need to emphasize adherence counseling, consumption monitoring, and prevention starting in adolescence, with a priority on eastern regions.

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