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Factors Associated with Iron Supplementation During Pregnancy Among Married Women in Indonesia

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ABSTRACT

Background: Iron supplementation during pregnancy is essential for preventing maternal anemia and adverse pregnancy outcomes. However, disparities in supplementation coverage remain a public health concern in Indonesia. Sociodemographic characteristics, media exposure, women's autonomy, and antenatal care (ANC) utilization may influence iron supplementation uptake. **Objective:** This study aimed to analyze factors associated with iron supplementation during pregnancy among married women in Indonesia. **Methods:** A cross-sectional study was conducted using secondary data from the 2017 Indonesian Demographic and Health Survey (IDHS) women's dataset (IDIR71FL). The study included married women aged 15–49 years with complete information on iron supplementation during pregnancy. Sampling weights were applied to account for the complex survey design. Data were analyzed using IBM SPSS Statistics version 25. Descriptive statistics were presented as frequencies and percentages, while associations between variables were examined using the chi-square test with a significance level of $p<0.05$. **Results:** Sociodemographic characteristics, media exposure, women's involvement in healthcare decision-making, and ANC visits were significantly associated with iron supplementation during pregnancy ($p<0.001$). Higher proportions of iron supplementation were observed among women with secondary education, greater media exposure, higher decision-making autonomy, and more than four ANC visits. ANC utilization showed the strongest association with iron supplementation coverage. **Conclusion:** Iron supplementation during pregnancy among married women in Indonesia was significantly associated with demographic, socioeconomic, media exposure, and maternal healthcare factors. Strengthening ANC services, expanding maternal health education through mass media, and promoting women's empowerment may improve iron supplementation coverage and contribute to reducing maternal anemia in Indonesia.

Keywords: iron supplementation; antenatal care; maternal health; media exposure; women's autonomy

Background

Anemia during pregnancy continues to be a major global public health concern, particularly in low- and middle-income countries, with iron deficiency identified as the primary underlying cause. Nearly 40% of pregnant women worldwide experience anemia (1)(2). Various adverse maternal and neonatal outcomes, including preterm birth, low birth weight, maternal mortality, impaired fetal growth, and reduced maternal productivity(3)(4). Therefore, routine iron and folic acid supplementation during pregnancy is recommended as an essential component of antenatal care (ANC) services to prevent anemia and its associated complications. However, despite the implementation of supplementation programs in many countries, adherence to iron supplementation among pregnant women remains suboptimal, especially in developing countries (5)(6).

Various factors have been identified as influencing iron supplementation during pregnancy, including maternal age, educational attainment, socioeconomic status, healthcare accessibility, media exposure, women's autonomy, and antenatal care (ANC) utilization. Greater decision-making autonomy and adequate ANC visits have been associated with higher adherence to iron supplementation among pregnant women (4)(7). Furthermore, exposure to mass media has been shown to enhance maternal healthcare utilization, including ANC attendance and the use of maternal health services (8)(9). In addition, maternal education and community media exposure were reported to significantly reduce poor adherence to iron–folic acid supplementation among pregnant women in Ethiopia (5)(10). Moreover,

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women living in disadvantaged socioeconomic conditions were more likely to experience barriers in accessing maternal nutrition services and supplementation programs (3)(11). Although several studies have investigated the determinants of iron supplementation during pregnancy, evidence from Indonesia is still limited and remains fragmented. Most previous studies in Indonesia have mainly emphasized socioeconomic inequality or antenatal care (ANC) utilization, without thoroughly examining the combined effects of demographic characteristics, media exposure, women's participation in healthcare decision-making, and maternal healthcare utilization on iron supplementation among married women. Furthermore, many earlier studies relied on regional data or focused on specific population groups, which may reduce the generalizability of the findings at the national level (12)(13).

In addition, only a limited number of studies have specifically examined married women using nationally representative Indonesian Demographic and Health Survey (IDHS) data with weighted analytical approaches. This gap is important because married women often experience distinct social and household dynamics, particularly in relation to healthcare decision-making and the utilization of maternal health services (9)(11).

Therefore, this study aimed to analyze factors associated with iron supplementation during pregnancy among married women in Indonesia using nationally representative data from the 2017 Indonesian Demographic and Health Survey (IDHS). This study provides several novelties. First, the analysis simultaneously examines demographic, socioeconomic, media exposure, decision-making autonomy, and maternal healthcare factors related to iron supplementation. Second, this study specifically focuses on married women, a population group that remains underexplored in previous Indonesian studies. Third, this study applies weighted DHS analysis to improve the representativeness and accuracy of national estimates. The findings are expected to contribute to evidence-based maternal nutrition policies and strengthen strategies to improve iron supplementation coverage among pregnant women in Indonesia.

Methods

This study used a cross-sectional design based on secondary data from the 2017 Indonesian Demographic and Health Survey (IDHS), specifically the Women's Individual Recode dataset (IDIR71FL). The IDHS is part of the Demographic and Health Survey (DHS) Program, an international survey program that provides nationally representative data on population, maternal and child health, reproductive health, and nutrition indicators in Indonesia. The IDHS 2017 was conducted across all provinces in Indonesia and covered both urban and rural areas. The present study analyzed the IDIR71FL dataset after receiving official permission from the DHS Program. Data processing and statistical analysis were carried out during the study period using the authorized dataset. The target population consisted of married women of reproductive age (15–49 years) included in the 2017 IDHS dataset. Respondents were eligible for inclusion if they had complete information regarding iron supplementation during pregnancy and all selected study variables. The IDHS applied a stratified two-stage cluster sampling technique to ensure national representativeness. In the first stage, census blocks were selected using probability proportional to size sampling based on the national census framework. In the second stage, households were systematically selected from each census block. To adjust for unequal sampling probabilities and the complex survey design, sampling weights provided by DHS were applied prior to analysis (14).

The dependent variable was receipt of iron supplementation during pregnancy. Independent variables included demographic characteristics (age, education level, occupation, residence, province, and wealth status), (media exposure frequency of reading newspapers and listening to the radio), (women's involvement in healthcare decision-making), and(maternal health characteristics measured by antenatal care (ANC) visits).

Data were obtained from the standardized DHS questionnaires administered during the 2017 IDHS survey. Sociodemographic characteristics, media exposure, and decision-making variables were obtained from the women's questionnaire section. Information related to maternal healthcare utilization, including ANC visits, was collected from respondents' pregnancy and reproductive health histories. Before analysis, the dataset was screened to evaluate completeness, consistency, and eligibility of the selected variables.

Data analysis was to statistical testing, sampling weights from the DHS dataset were applied to produce nationally representative estimates and to account for the complex sampling design. Descriptive statistics were used to summarize respondents' characteristics and were presented as frequencies and percentages. Bivariate analysis was conducted using the chi-square test to assess the association between

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independent variables and receipt of iron supplementation during pregnancy. Statistical significance was determined at $p<0.05$.

Results

Table 1. Sociodemographic, Media Exposure, Decision-Making, and Maternal Health Characteristics of Married Women During Pregnancy

Variable	Frequency(n)	Percent(%)
Age		
15–19		
20–24	360	2.5
25–29	2,267	15.5
30–34	3,652	25.0
35–39	3,828	26.2
40–44	2,922	20.0
45–49	1,285	8.8
Education Level		
Primary		
Secondary	192	1.3
Higher	11,846	81.2
	2,553	17.5
Occupation		
Not working		
Professional working	8,028	55.0
Non professional	3,166	21.7
	3,397	23.3
Resident		
Urban		
Rural	7,202	49.4
	7,389	50.6
Province		
Java Bali		
Sumatera	4,673	32.0
Kalimantan	3,788	26.0
Sulawesi	1,362	9.3
Eastern Indonesia	2,192	15.0
	2,576	17.7
Wealth Status quintile		
Poorest	3,807	26.1
Poorer	2,882	19.8
Middle	2,762	18.9
Richer	2,643	18.1
Richest	2,497	17.1

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Variable	Frequency(n)	Percent(%)
Media Exposure		
Frequency of reading newspaper	8,354	57.3
Not at all	4,843	33.2
Less than once a week	1,394	9.6
At least once a week		
Frequency of listening to radio	8,781	60.2
Not at all	4,268	29.3
Less than once a week	1,542	10.6
At least once a week		
Involvement in decision-making		
Maternal final say on her own health care	6,379	43.7
Woman alone	6,664	45.7
Women with partner/other	1,548	10.6
Partner alone/someone else		
Maternal health		
ANC Visit	1,147	7.9
<4 times	13,034	81.3
>4 times	410	2.8
Never		
Received iron supplements during pregnancy	1,918	13.1
No	12,673	86.9
Yes		

Table 1 presents the characteristics of respondents included in this study. The largest proportion of respondents was aged 30–34 years (26.2%), followed by those aged 25–29 years (25.0%) and 35–39 years (20.0%), whereas the smallest proportion was found among women aged 45–49 years (1.9%). Most respondents had secondary education (81.2%), while 17.5% had higher education and 1.3% had primary education. More than half of the respondents were unemployed (55.0%), whereas 23.3% worked in non-professional occupations and 21.7% in professional occupations. The distribution of residence was relatively balanced between rural (50.6%) and urban areas (49.4%). Based on geographical distribution, most respondents resided in the Java-Bali region (32.0%), followed by Sumatera (26.0%), Eastern Indonesia (17.7%), Sulawesi (15.0%), and Kalimantan (9.3%). Regarding wealth status, the highest proportion of respondents was identified in the poorest quintile (26.1%), whereas the lowest proportion was found in the richest quintile (17.1%).

Regarding media exposure, most respondents reported never reading newspapers (57.3%) or listening to the radio (60.2%), while only a small proportion accessed these media sources at least once a week. In terms of healthcare decision-making, 45.7% of respondents reported making healthcare decisions jointly with their partners or other family members, whereas 43.7% independently made decisions regarding their own healthcare. Only 10.6% reported that healthcare decisions were determined solely by

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their partners or others. Concerning maternal health characteristics, the majority of respondents attended more than four antenatal care (ANC) visits during pregnancy (81.3%). In addition, 86.9% of respondents reported receiving iron supplementation during pregnancy.

Table 2. Bivariate Analysis of Factors Associated with Iron Supplementation During Pregnancy Among Married Women

Variable	Received iron supplements during pregnancy		p-value
	No n (%)	Yes n (%)	
Age			
15–19	69(0.5)	291(2.0)	0.000
20–24	307(2.1)	1,960(13.4)	
25–29	449(3.1)	3,203(22.0)	
30–34	449(3.1)	3,379(23.2)	
35–39	385(2.6)	2,537(17.4)	
40–44	211(1.4)	1,074(7.4)	
45–49	48(0.3)	229(1.6)	
Education level			
Primary	68(0.5)	124(1.0)	0.000
Secondary	1,612(11.0)	10,234(70.1)	
Higher	238(1.6)	2,315(15.9)	
Occupation			
Not working	1,022(7.0)	7,006(48.0)	0.000
Professional working	370(2.5)	2,796(19.2)	
Non professional	526(3.6)	2,871(19.7)	
Resident			
Urban	787(5.4)	6,415(44.0)	0.000
Rural	1,131(7.8)	6,258(42.9)	
Province			
Java Bali	437(3.0)	4,236(29.0)	0.000
Sumatera	749(5.1)	3,039(20.8)	
Kalimantan	189(1.3)	1,173(8.0)	
Sulawesi	141(1.7)	1,951(13.4)	
Eastern Indonesia	302(2.1)	2,274(15.6)	
Wealth Status			
Poorest	699(4.8)	3,108(21.3)	0.000
Poorer	376(2.6)	2,506(17.2)	
Middle	345(2.4)	2,417(16.6)	
Richer	249(1.7)	2,394(18.9)	
Richest	249(1.7)	2,248(15.4)	

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Variable	Received iron supplements during pregnancy		p-value
	No n (%)	Yes n (%)	
Media Exposure			
Frequency of reading newspaper			
Not at all	1,281(8.8)	7,073(48.5)	0.000
Less than once a week	496(3.4)	4,347(29.8)	
At least once a week	141(1.0)	1,253(8.6)	
Frequency of listening to radio			
Not at all	1,245(8.5)	7,536(51.6)	0.000
Less than once a week	496(3.4)	3,772(25.9)	
At least once a week	177(1.2)	1,365(9.4)	
Involvement in decision-making			
Maternal final say on her own health care			
Woman alone	780(5.3)	5,599(38.4)	0.000
Women with partner/other	862(5.9)	5,802(39.8)	
Partner alone/someone else	276 (1.9)	1,272(8.7)	
Maternal health			
ANC Visit			
<4 times	316(2.2)	831(5.7)	0.000
>4 times	1,255(8.6)	11,779(80.7)	
Never	347(2.4)	63(0.4)	

Note: Data were analyzed using the chi-square test. Statistical significance was set at $p<0.05$. ANC = antenatal care.

Table 2 presents the results of the bivariate analysis examining the association between respondents' characteristics and iron supplementation during pregnancy. All independent variables were significantly associated with the receipt of iron supplementation during pregnancy ($p<0.001$). The highest proportion of women who received iron supplementation was observed among those aged 30–34 years (23.2%), followed by women aged 25–29 years (22.0%) and 35–39 years (17.4%), whereas the lowest proportion was identified among women aged 45–49 years (1.6%). Based on educational attainment, women with secondary education accounted for the largest proportion of iron supplementation recipients (70.1%), while women with primary education represented the smallest proportion (1.0%). Regarding occupation, the majority of women who received iron supplementation were unemployed (48.0%), followed by those working in non-professional (19.7%) and professional occupations (19.2%).

According to place of residence, women living in urban areas showed a slightly higher proportion of iron supplementation receipt compared with those residing in rural areas (44.0% and 42.9%, respectively). Based on geographical distribution, the highest proportion of iron supplementation receipt was found among women living in the Java-Bali region (29.0%), whereas the lowest proportion was observed in Kalimantan (8.0%). Across wealth status categories, iron supplementation receipt was distributed across all wealth quintiles, with the highest proportion identified among women in the poorest

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quintile (21.3%) and the lowest among those in the richest quintile (15.4%).

Media exposure was also significantly associated with iron supplementation during pregnancy. Women who never read newspapers accounted for the largest proportion of respondents receiving iron supplementation (48.5%), whereas women who read newspapers at least once a week represented 8.6% of supplementation recipients. A similar distribution was observed for radio exposure, where most women who received iron supplementation reported never listening to the radio (51.6%). Regarding healthcare decision-making, women who made healthcare decisions jointly with their partners or other family members accounted for the highest proportion of iron supplementation receipt (39.8%), followed by women who independently made healthcare decisions (38.4%). In contrast, the lowest proportion was found among women whose healthcare decisions were determined solely by their partners or others (8.7%).

Regarding maternal health characteristics, women who attended more than four antenatal care (ANC) visits accounted for the highest proportion of iron supplementation receipt (80.7%), whereas women who never attended ANC visits represented only 0.4% of supplementation recipients.

Discussion

This study demonstrated that sociodemographic characteristics, media exposure, women's involvement in healthcare decision-making, and antenatal care (ANC) utilization were significantly associated with iron supplementation during pregnancy among married women in Indonesia. These findings indicate that adherence to iron supplementation is influenced not only by individual factors but also by broader socioeconomic and healthcare-related determinants. Similarly, previous studies have shown that women's autonomy, educational level, and ANC utilization significantly contribute to adherence to iron supplementation among pregnant women in sub-Saharan Africa (4). Moreover, social inequality and women's empowerment have also been identified as important factors influencing adherence to iron–folic acid supplementation in Indonesia (2)(13).

This study demonstrated that sociodemographic characteristics, media exposure, women's involvement in healthcare decision-making, and antenatal care (ANC) utilization were significantly associated with iron supplementation during pregnancy among married women in Indonesia. These findings suggest that adherence to iron supplementation is influenced not only by individual factors but also by broader socioeconomic and healthcare-related determinants. Similarly, women's autonomy, educational attainment, and adequate ANC utilization have been reported to significantly improve adherence to iron supplementation among pregnant women in sub-Saharan Africa (4). Moreover, socioeconomic inequality and women's empowerment were also identified as important factors influencing adherence to iron–folic acid supplementation among women in Indonesia (2)(13).

Educational attainment was identified as an important factor associated with iron supplementation during pregnancy. Women with secondary education represented the largest proportion of respondents who received iron supplementation in this study. Higher levels of education may improve women's understanding of nutritional information, increase awareness of pregnancy-related complications, and enhance compliance with maternal healthcare recommendations. Similarly, maternal education has been reported to significantly reduce poor adherence to iron–folic acid supplementation among pregnant women in Ethiopia, while women with secondary educational status demonstrated better adherence to iron supplementation compared with those with lower educational attainment (4)(5). Moreover, improved educational attainment contributes to better health literacy and strengthens women's ability to access and utilize maternal healthcare services effectively (15)(16).

The present study also revealed disparities in iron supplementation coverage based on residence and geographical region. Women living in urban areas demonstrated slightly higher supplementation coverage compared with those residing in rural settings, while respondents from the Java-Bali region showed better uptake than women from Kalimantan and Eastern Indonesia. Better supplementation coverage among urban populations may be related to improved access to healthcare facilities, transportation systems, and maternal health promotion programs (2)(8). Similarly, urban–rural disparities in adherence to iron–folic acid supplementation among Indonesian women have also been reported (2)(17). Furthermore, geographical and socioeconomic inequalities were found to significantly influence access to maternal healthcare services and health-related information (8)(18). Therefore, these findings suggest that unequal healthcare infrastructure and disparities in health service distribution remain

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important barriers to maternal nutrition programs in Indonesia..

Socioeconomic status was significantly associated with the receipt of iron supplementation during pregnancy. Women from economically disadvantaged households were more likely to experience barriers related to healthcare expenses, transportation access, and continuity of antenatal care (ANC) utilization (19)(20). Furthermore, wealth status has been identified as one of the strongest predictors of anemia among women of reproductive age (3)(19). Similarly, socioeconomic inequalities were also reported to influence adherence to iron–folic acid supplementation among women in Indonesia (2). Therefore, these findings suggest that financial and social disparities continue to affect maternal nutritional outcomes despite the implementation of national supplementation programs..

Media exposure was identified as another factor significantly associated with the utilization of iron supplementation in this study. Women exposed to newspapers or radio demonstrated better supplementation coverage than those without media exposure. Despite the expansion of digital media, traditional media continue to provide accessible health information, particularly in populations with limited internet access. Mass media may serve as an effective platform for disseminating information related to maternal nutrition, antenatal care (ANC) services, and anemia prevention during pregnancy. Furthermore, exposure to newspapers, radio, and television has been associated with higher utilization of maternal healthcare services, including ANC attendance and postnatal care utilization (8)(9). Similarly, exposure to radio and television was reported to significantly increase early ANC initiation among women in Uganda (9)(12). In addition, community media exposure was found to significantly reduce poor adherence to iron–folic acid supplementation among pregnant women in Ethiopia (5)(10). Therefore, these findings suggest that strengthening health promotion strategies through mass media may improve women's awareness and increase adherence to supplementation programs.

Women's involvement in healthcare decision-making was also significantly associated with iron supplementation during pregnancy. Women who independently made healthcare decisions or shared decision-making with their partners demonstrated better supplementation coverage compared with women whose healthcare decisions were determined solely by others. Women with greater autonomy are generally more capable of accessing healthcare services, attending antenatal care (ANC) visits, and complying with maternal nutritional recommendations (7)(21). Furthermore, women's decision-making power has been reported to significantly increase adherence to iron supplementation among pregnant women in sub-Saharan Africa. Similarly, women's autonomy was also identified as an important contributor to adherence to iron–folic acid supplementation among women in Indonesia (2)(22). Therefore, these findings highlight the important role of women's empowerment in improving maternal healthcare utilization and maternal nutritional outcomes.

Among all variables examined, antenatal care (ANC) visits showed the strongest association with iron supplementation during pregnancy. Regular ANC visits increase opportunities for healthcare providers to deliver iron supplements and provide counseling on their benefits and proper use. Women who attended more than four ANC visits demonstrated substantially higher supplementation coverage compared with those who had inadequate or no ANC visits. ANC services serve as the primary platform for iron tablet distribution, nutritional counseling, and maternal health monitoring during pregnancy (4)(6). Furthermore, women who attended at least four ANC visits were reported to be significantly more likely to consume 90 or more iron-containing supplements during pregnancy across low- and middle-income countries. Similarly, ANC utilization has been identified as one of the strongest predictors of adherence to iron supplementation among pregnant women. In addition, early initiation of ANC increases opportunities for women to receive maternal nutritional interventions during pregnancy (4)(23). Therefore, improving both the accessibility and quality of ANC services remains essential for strengthening maternal nutrition programs in Indonesia.

This study has several strengths. The use of nationally representative Demographic and Health Survey (DHS) data enhances the generalizability of the findings among married women in Indonesia. In addition, the application of sampling weights improved the representativeness and accuracy of the estimates. However, several limitations should also be considered. The cross-sectional design limits the ability to establish causal relationships between the independent variables and iron supplementation utilization. Furthermore, the study relied on self-reported information, which may increase the possibility of recall bias, a common limitation in population-based surveys. Several potentially important variables, including dietary intake, cultural beliefs, family support, and healthcare quality, were also unavailable in

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the dataset, which may affect the comprehensiveness of the analysis. Similarly, comparable methodological limitations have also been reported in previous DHS-based studies examining maternal healthcare utilization and iron supplementation practices (6)(8).

Despite these limitations, the findings of this study provide important implications for maternal health policy and practice in Indonesia. Although iron supplementation and ANC services have been incorporated into national maternal health programs, disparities in supplementation coverage persist across educational, socioeconomic, and geographic groups. This suggests that existing policies may not adequately reach vulnerable women with limited access to health information and maternal healthcare services. Based on these findings, efforts should focus on strengthening ANC quality, expanding targeted health education through both traditional and digital media, and improving outreach programs for disadvantaged populations. In addition, healthcare providers should be supported to deliver consistent counseling on iron supplementation, while community-based interventions should be strengthened to promote women's participation in healthcare decision-making and improve adherence to supplementation during pregnancy (5)(24).

Conclusions and Recommendations

This study found that sociodemographic characteristics, media exposure, women's involvement in healthcare decision-making, and antenatal care (ANC) visits were significantly associated with iron supplementation during pregnancy among married women in Indonesia. Women with higher educational attainment, better media exposure, greater autonomy in healthcare decision-making, and adequate ANC visits were more likely to receive iron supplementation during pregnancy. Among all factors, ANC utilization showed the strongest association with iron supplementation coverage.

Efforts to improve iron supplementation coverage among pregnant women in Indonesia should focus on strengthening ANC services, particularly by increasing the frequency and accessibility of ANC visits. Health promotion strategies through mass media and digital platforms should also be expanded to improve maternal knowledge regarding the importance of iron supplementation during pregnancy. Digital approaches, including social media campaigns, mobile health applications, and online maternal education programs, may enhance access to health information and support adherence to iron supplementation among pregnant women. In addition, policies aimed at reducing socioeconomic disparities and promoting women's empowerment in healthcare decision-making are essential to improve maternal nutrition outcomes and reduce the burden of maternal anemia in Indonesia.

Ethical Consideration and Competing Interest

The Institutional Review Board (IRB) approved the initial IDHS survey through the ICF IRB Review Board (FWA00000845). Permission to access and use the dataset was obtained from the DHS Program. All data were fully anonymized before being made publicly available; therefore, no additional ethical approval was required for this secondary data analysis.

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