

Factors associated with receiving iron supplements during pregnancy among women in Indonesia

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ABSTRACT

Introduction: Anemia during pregnancy is a significant threat to health and safety of mothers and children.

Objective: This study aimed to investigate factors associated with receiving iron supplements during pregnancy among women in Indonesia.

Methods: This study used data from the Indonesian demographic and health survey 2017. The dataset used was individual data with a target population of women aged 15-49. A total of 14,564 women aged from 15 to 49 years were included in the analysis. A binary logistic regression model explored associations between the independent variables and the received iron supplements.

Results: In this study, most interviewed women (n=12,939; 88.84%) received iron supplements during pregnancy. Factors found to be associated with receiving iron supplements during pregnancy included pregnant women aged >35 years (AOR=2.20; 95% CI=1.34-3.61), lived in the eastern and middle part of Indonesia (AOR=1.71; 95% CI=1.20-2.42; AOR=1.75; 95% CI=1.49-2.06), attended antenatal care consultations (AOR=1.40; 95% CI=1.18-1.65), had blood tests (AOR=1.52; 95% CI=1.32-1.76), knew the signs and symptoms of danger of pregnancy complications (AOR=1.56; 95% CI=1.29-1.89), had vaginal bleeding during pregnancy (AOR=1.25; 95% CI=1.03-1.50), had 1-2 total children ever born (AOR=1.18; 95% CI=1.00-1.40), and were exposed to information via the Internet (AOR=1.18; 95% CI=1.00-1.39) and newspapers or magazines (AOR=1.17; 95% CI=1.01-1.35).

Conclusions: The study highlighted that despite free access to iron supplementation during pregnancy, some women failed to receive iron supplements during pregnancy. Also, women of reproductive age living in the eastern part of Indonesia, who did not have blood tests, were absent from attending antenatal care and did not know the signs and symptoms of dangerous pregnancy complications were among those who failed to receive iron supplements during pregnancy. Thus, identifying and promoting awareness of those at high risk of not receiving iron supplements should be a priority for the government and health workers in providing health services.

Keywords: anemia, iron tablets, pregnancy, Indonesia

INTRODUCTION

Iron tablets are needed exponentially during pregnancy to meet the needs of the fetoplacental unit, increase maternal erythrocyte mass, and compensate for iron losses that will occur at birth [1, 2]. Iron deficiency anemia (IDA) in pregnant women is detrimental to positive reproductive outcomes such as premature birth, low birth weight babies, and decreased iron stores for babies, which can cause developmental disorders [3]. Anemia during pregnancy is considered a severe public health problem in Indonesia [4].

The reported prevalence of anemia during pregnancy is >20%, and a significant public health problem in more than

80% of countries in the world [1]. WHO reports that globally, the prevalence of anemia in 2019 was 29.9% in women of reproductive age, equivalent to over half a billion women aged 15-49 years, while prevalence was 29.6% in non-pregnant women of reproductive age, and 36.5% in pregnant women [3]. Indonesia is one country to experience the problem of anemia during pregnancy over a long period, and it has become a concern for many parties [5]. The results of national research, namely basic health research (Riskesmas), in Indonesia in 2018 found that the percentage of pregnant women who experienced anemia reached 48.9%, and this situation increased from the results of national research in the previous five years, which in 2013 had reached 37.1% [6]. This finding shows that about five out of 10 pregnant women in Indonesia are likely to be anemic [7]. The study also found that pregnant

women who consumed and received iron tablets was 73.2%, and there were still 26.8% of pregnant women who did not consume or receive iron tablets [6].

IDA that is not treated correctly will significantly impact the health of the mother and fetus. Chronic iron deficiency can degrade maternal health, cause fatigue, and threaten the health and safety of the mother and fetus [1]. Anemia in pregnant women will impact the non-optimal growth and development of the fetus in the womb and has the potential to cause complications in pregnancy and childbirth, and even cause maternal and infant deaths during childbirth [7]. In Indonesia, anemia in pregnant women reportedly increases the risk of premature birth, maternal and child mortality, and infectious diseases [8]. Anemia during pregnancy in Indonesia occurs due to various factors, including the level of education, knowledge about health, parity, and compliance with iron supplementation, usually in the form of folic acid tablets [5]. Low received of the iron folic acid (IFA) tablet supplementation program and antenatal care were found to be factors associated with anemia in pregnant women [4]. The role of health workers, antenatal care, education, nutrition, health knowledge, awareness, and consumption of iron tablets [9], and non-compliance with iron supplement consumption is associated with anemia in pregnant women [10].

Iron tablets help increase hemoglobin concentration in pregnant women with Anemia [11]. The program for giving iron or blood-added tablets to prevent anemia during pregnancy is a national program in Indonesia that continues today. So far, the government's program comprises giving 90 iron tablets for free to pregnant women. However, the incidence of anemia is still significant and may occur in pregnant women who do not receive iron tablets or not taking them as recommended [12]. This study aimed to determine various factors related to receiving iron supplements during pregnancy among women of reproductive age in Indonesia.

METHODS

Study Design

This research is a type of secondary data research through Indonesia's demographic and health survey (DHS), which was conducted to determine the factors associated with received of iron supplements during pregnancy among women of reproductive age in Indonesia.

Data Source and Sampling Procedure

This study used a dataset from Indonesia's DHS conducted in 2017. Sampling was done by analyzing selected individual data with a target population of reproductive women aged 15-49 years who had children aged zero-five years in Indonesia. The total sample in this study was 14,564 women of reproductive age.

Variables of the Study

Dependent variable

The dependent variable in this study was receiving iron supplements during pregnancy to prevent anemia in women of reproductive age in Indonesia. This variable comes from the DHS questions during pregnancy, given or bought iron tablets/syrup "(m45)" with the answer choices "no" and "yes".

Table 1. Characteristics of risk factors associated with received of iron supplements during pregnancy among women of reproductive age in Indonesia on demographic data (n=14,564)

Demographic data	Frequency (n)	Percentage (%)
Current age		
<18 years old	203	1.39
19-34 years old	9,943	68.27
>35 years old	4,418	30.34
Highest education level		
No education	148	1.02
Elementary school	3,550	24.38
Middle school	8,248	56.88
Higher education	2,582	17.73
Currently working		
Yes	6,937	47.63
No	7,627	52.37
Type of place of residence		
Urban	7,274	49.95
Rural	7,290	50.05
Province		
East of Indonesia	1,279	8.78
Middle of Indonesia	4,514	30.99
West of Indonesia	8,771	60.22
Wealth index combined		
Poorest	3,662	25.14
Poorer	2,907	19.96
Middle	2,793	19.18
Richer	2,677	18.38
Richest	2,525	17.34
Covered by health insurance		
Yes	9,083	62.37
No	5,481	37.63

Independent variables

Independent variables in this study were respondents' current age, highest educational level, current employment status, type of place of residence, province, wealth index, covered by health insurance, antenatal care consultation during pregnancy, blood samples taken, knew danger signs during pregnancy, during pregnancy had any complications, problems during pregnancy (vaginal bleeding), (Percentage of respondents who reported serious problems in accessing health care for themselves), knew what to do if experiencing the problem during pregnancy, accompanied by the husband to antenatal care visit, total children ever born, and exposure to information via the Internet and newspapers or magazines (Table 1 and Table 2).

All identified variables were derived from a literature review and theoretical framework related to iron supplementation during pregnancy, which was then adjusted for the availability of relevant data in DHS dataset.

Data Analysis

To explore associated factors of received of iron supplements, we performed bivariable and multivariable logistic regression. Frequencies and percentages were used to describe the characteristics of the study participants. Results of the multivariable analysis were presented by adjusted odds ratio (AOR) with their corresponding 95% confidence intervals (CI) and p-value. Variables with p-values ≤ 0.05 were considered statistically significant factors associated with received of iron supplements. Data analysis was performed using a univariable analysis test, bivariable Chi-square test (χ^2) and multivariable binary logistic regression test, with the final report being the

Table 2. Characteristics of risk factors associated with received of iron supplements during pregnancy among women of reproductive age in Indonesia on access to health services (n=14,564)

Access to health services	Frequency (n)	Percentage (%)
Attended antenatal care consultation		
Yes	12,344	84.76
No	2,220	15.24
Blood samples were taken during pregnancy		
Yes	6,923	47.54
No	7,641	52.46
Knew danger signs during pregnancy		
Yes	9,558	65.63
No	5,006	34.37
Had any complications during pregnancy		
Yes	2,534	17.40
No	12,030	82.60
Had vaginal bleeding during pregnancy		
Yes	6,622	45.47
No	7,942	54.53
Distance to the health facility		
Big problem	1,644	11.29
Not a big problem	12,920	88.71
Knew what to do if experiencing this problem during pregnancy		
Yes	4,324	29.69
No	10,240	70.31
Accompanied by husband at antenatal care visit		
Yes	10,936	75.09
No	3,628	24.91
Total children ever born		
1-2	9,363	64.29
≥3	5,201	35.71
Frequency of using the Internet last month		
Yes	6,321	43.40
No	8,243	56.60
Frequency of reading newspapers or magazine		
Yes	6,315	43.36
No	8,249	56.64
Received iron supplements during pregnancy		
Yes	12,939	88.84
No	1,625	11.16

odds ratio (OR) and 95% CI. All analytical tests were performed using the Stata software version 16.

RESULTS

Background Characteristics of the Study Participants

A total of 14,564 women of reproductive age in Indonesia were involved in this study. Most (n=9,943; 68.27%) were aged 19-34. The majority had middle school education (n=8,284; 56.88%), were not working (n=7,627; 52.37%), living in rural areas (n=7,290; 50.05%), in provinces in western Indonesia (n=8,771; 60.22%) from the poorest wealth index (n=3,662; 25.14%), were covered by health insurance (n=9,083; 62.37%), attended antenatal care consultations (n=12,344; 84.76%), did not undergo blood testing during pregnancy (n=7,641; 52.46%), knew the danger signs of pregnancy (n=9,558; 65.63%), had no complications (n=12,030; 82.60%), or vaginal bleeding problems during pregnancy (n=7,942; 54.53%), did not experience problems with distance to health care facilities to get health services (n=12,920; 88.71%), did not know what to do if experiencing the problem during pregnancy (n=10,240; 70.31%), had husband's support during antenatal care visits (n=10,936; 75.09%), had one-two total children ever

Table 3. Bivariable Chi-square test (χ^2) of factors associated with received of iron supplements during pregnancy among women of reproductive age in Indonesia on demographic data characteristics (n=14,564)

Demographic data	Received iron supplements during pregnancy				χ^2
	Yes		No		
	F	%	F	%	
Current age					
<18 years old	167	82.27	36	17.73	16.62*
19-34 years old	8,867	89.18	1,076	10.82	
>35 years old	3,905	88.39	513	11.61	
Highest education level					
No education	124	83.78	24	16.22	83.01*
Elementary school	3,020	85.07	530	14.93	
Middle school	7,438	89.79	846	10.21	
Higher education	2,357	91.29	225	8.71	
Currently working					
Yes	6,193	89.27	744	10.73	0.66
No	9,746	88.45	881	11.55	
Type of place of residence					
Urban	6,554	90.10	720	9.90	32.66*
Rural	6,385	87.59	905	12.41	
Province					
East of Indonesia	1,156	90.38	123	9.62	38.73*
Middle of Indonesia	4,154	92.02	360	7.98	
West of Indonesia	7,629	86.98	1,142	13.02	
Wealth index combined					
Poorest	3,185	86.97	477	13.03	50.78*
Poorer	2,567	88.30	340	11.70	
Middle	2,476	88.65	317	11.35	
Richer	2,431	90.81	246	9.19	
Richest	2,280	90.30	245	9.70	
Covered by health insurance					
Yes	950	10.46	8133	89.54	19.69*
No	675	12.32	4806	87.68	

Note. F: Frequency; %: Percentage; *There is a significant relationship ($p < 0.01$); & **There is a significant relationship ($p < 0.05$)

born (n=9,363; 64.29%), not using Internet last month (n=8,243; 56.60%), and not reading newspaper or magazine (n=8,249; 56.64%). Of the 14,564 women, 12,939 (88.84%) took iron supplements during pregnancy (**Table 1** and **Table 2**).

Factors Associated with Received of Iron Supplements

Most independent variables are significantly associated with receiving iron supplements except working status (**Table 3** and **Table 4**). The results of the multivariable binary logistic regression (**Table 5**) showed that there was a statistically significant relationship between maternal age, province, antenatal care consultation, blood tests during pregnancy, frequency of using the Internet, frequency of reading newspaper/magazines, knowing sign of pregnancy complications, total children ever born, and problems during pregnancy: vaginal bleeding with received of iron supplements during pregnancy.

Pregnant women aged >35 years were 2.20 times more likely to receive iron supplements during pregnancy than those aged below (AOR=2.20; 95% CI=1.34-3.61). Pregnant women in the east of Indonesia and middle of Indonesia 1.71 (AOR=1.71; 95% CI=1.20-2.42) and 1.75 (AOR=1.75; 95% CI=1.49-2.06) times did not received of iron supplements during pregnancy than pregnant women in the western provinces of Indonesia respectively. Pregnant women who did antenatal care consultations were 1.40 times more likely to receive iron

Table 4. Bivariable Chi-square test (χ^2) of factors associated with received of iron supplements during pregnancy among women of reproductive age in Indonesia on health service access data (n=14,564)

Access to health services	Received iron supplements during pregnancy				χ^2
	Yes		No		
	F	%	F	%	
Attended antenatal care consultation					
Yes	11,100	89.92	1,244	10.08	80.55*
No	1,839	82.84	381	17.16	
Blood samples were taken during pregnancy					
Yes	6,355	91.80	568	8.20	120.92*
No	6,584	86.17	1,057	13.83	
Knew danger signs during pregnancy					
Yes	8,737	91.41	821	8.59	198.12*
No	4,202	83.94	804	16.06	
Had any complications during pregnancy					
Yes	2,293	90.49	241	9.51	7.56**
No	10,646	88.50	1,384	11.50	
Had vaginal bleeding during pregnancy					
Yes	6,096	92.06	526	7.94	126.35*
No	9,843	86.16	1,099	13.84	
Distance to the health facility					
Big problem	1,410	85.77	234	14.23	7.87**
Not a big problem	11,529	89.23	1,391	10.77	
Knew what to do if experiencing this problem during pregnancy					
Yes	4,006	92.65	318	7.35	80.18*
No	8,933	87.24	1,307	12.76	
Accompanied by husband at antenatal care visit					
Yes	9,791	89.53	1,145	10.47	22.08*
No	3,148	86.77	480	13.23	
Total children ever born					
1-2	8,368	89.37	995	10.63	14.20*
≥ 3	4,571	87.89	630	12.11	
Frequency of using the Internet last month					
Yes	5,760	91.12	561	8.88	69.29*
No	7,179	87.09	1,064	12.91	
Frequency of reading newspapers or magazine					
Yes	5,729	90.72	586	9.28	45.32*
No	7,210	87.40	1,039	12.60	

Note. F: Frequency; %: Percentage; *There is a significant relationship ($p < 0.01$); & **There is a significant relationship ($p < 0.05$)

supplements during pregnancy than pregnant women who did not do antenatal care consultations (AOR=1.40; 95% CI=1.18-1.65). Pregnant women who did blood tests were 1.52 times more likely to receive iron supplements during pregnancy than pregnant women who did not have blood tests (AOR=1.32; 95% CI=1.42-1.76).

Pregnant women who knew the danger signs during pregnancy were 1.56 times more likely to receive iron supplements during pregnancy than pregnant women who did not know the danger signs (AOR=1.56; 95% CI=1.29-1.89), and pregnant women who had problems during pregnancy: vaginal bleeding 1.25 times more likely to received of iron supplements during pregnancy than pregnant women who did not problems vaginal bleeding during pregnancy (AOR=1.25 95% CI=1.03-1.50), had 1-2 total children ever born, 1.18 times more likely to receive iron supplements during pregnancy than pregnant women with over 3 children ever born (AOR=1.18; 95% CI=1.00-1.40). Pregnant women who were exposed to information via the Internet and newspapers or magazines 1.18 (AOR=1.18; 95% CI=1.00-1.39) and 1.17 (AOR=1.17; 95% CI=1.01-1.35) times more likely to received of iron supplements during pregnancy

Table 5. Multivariable binary logistic regression of factors associated with received of iron supplements during pregnancy among women of reproductive age in Indonesia (n=14,564)

Variables	AOR	95% CI	
		Lower	Upper
Current age			
<18 years old	Ref.		
19-34 years old	1.95*	1.21	3.15
>35 years old	2.20*	1.34	3.61
Highest education level			
No education	Ref.		
Elementary school	1.33	0.75	2.34
Middle school	1.53	0.87	2.68
Higher education	1.34	0.74	2.44
Type of place of residence			
Rural	Ref.		
Urban	1.16	0.99	1.36
Province			
West of Indonesia	Ref.		
East of Indonesia	1.71*	1.20	2.42
Middle of Indonesia	1.75*	1.49	2.06
Attended antenatal care consultation			
No	Ref.		
Yes	1.40*	1.18	1.65
A blood sample is taken during pregnancy			
No	Ref.		
Yes	1.52*	1.32	1.76
Knew the danger signs during pregnancy			
No	Ref.		
Yes	1.56*	1.29	1.89
Had vaginal bleeding during pregnancy			
No	Ref.		
Yes	1.25*	1.03	1.50
Total children ever born			
≥ 3	Ref.		
1-2	1.18**	1.00	1.40
Frequency of using Internet last month			
No	Ref.		
Yes	1.18**	1.00	1.39
Frequency of reading newspapers or magazine			
No	Ref.		
Yes	1.17**	1.01	1.35

Note. *There is a significant relationship ($p < 0.01$) & **There is a significant relationship ($p < 0.05$)

than pregnant women who were not exposed to this information, respectively (**Table 5**).

DISCUSSION

The provision of iron tablets is a national program of the Indonesian government to prevent anemia in pregnant women. Age over 35 years was a risk factor associated with the incidence of anemia during pregnancy [13]. Pregnant women aged >35 years are informed by health workers during the first antenatal care check that they are a group at high risk for anemia. Early information conveyed by health workers to pregnant women in this high-risk group can increase patient knowledge about risk of anemia and efforts to prevent it. Good knowledge can produce good attitudes and behaviors in using iron tablets for prevention of anemia during pregnancy [14, 15].

Pregnant women in the western part of Indonesia were better than those in the eastern part at receiving iron tablets to prevent anemia during pregnancy [8]. Indonesia is a vast

archipelago with different geographical and socio-economic conditions and the availability and affordability of healthcare facilities. The improvement of antenatal care facilities is an efficient delivery channel for iron tablets to pregnant women. However, access to various health services, including insufficient iron tablets, is a severe obstacle for pregnant women in obtaining these to prevent anemia during pregnancy [17]. Barriers found by health workers in the prevention of IDA in pregnant women include limited facilities, infrastructure, supporting supports, socio-cultural factors, and health provider competency deficits and no guidelines have been developed [18]. The facilities used are incomplete, storage of iron tablets is incomplete, and administration is not timely, so the program's scope does not reach the target of minimum service standards [19].

Another obstacle is the lack of knowledge related to clinical indicators of anemia, such as husband and family support related to anemia prevention. There is a tradition of taboos around the risk of anemia, which is still found in some regions of Indonesia, such as pregnant women limiting all types of food that their parents recommend not to be consumed because of local beliefs [20]. In general, inadequate supply of iron tablets, inadequate facilities and infrastructure, as well as counselling guidance, relevant materials, and insufficient information media have been factors related to the success of receiving iron tablets in patients with anemia in several regions in Indonesia [4].

Pregnant women in Indonesia are required to meet the minimum frequency of receiving antenatal care services by health workers in health care facilities in each trimester, namely at least once in the first trimester (0-12 weeks gestation), at least once in the second trimester (12-24 weeks gestation), and at least twice in the third trimester (24 weeks of gestation until delivery). This standard time of service is carried out to ensure protection for pregnant women and fetuses in the form of early detection of risk factors, prevention, and early treatment of pregnancy complications [8]. Pregnant women who attended antenatal care consultations had blood tests and knew the danger signs of complications were found to be better at taking or buying iron tablets to prevent anemia during pregnancy.

Health services during antenatal care will fulfil ten health services, including providing at least 90 iron tablets during pregnancy, implementation of interviews (providing interpersonal communication and counselling, including delivery plans and postpartum contraception), and simple laboratory test services, minimal tests. Blood hemoglobin (Hb), urine protein examination and blood type examination if it has not been done before [8]. From this, it can be understood that if pregnant women conduct antenatal care consultations with health workers in health service facilities, information about the importance of iron tablets in preventing anemia during pregnancy will be adequately obtained during the counselling. This certainly affects the behaviour of pregnant women for receiving or buying iron tablets/syrups to prevent anemia during pregnancy. Good knowledge of pregnant women during the consultation will promote a positive attitude toward consuming iron (Fe) tablets. Knowledge about the importance of iron tablets during pregnancy has a significant relationship with the incidence of anemia in pregnant women [21]. Knowledge of pregnant women about anemia is significantly related to adherence to received iron tablets [14, 15], adherence to receiving iron tablets is significantly related to

the incidence of anemia in pregnant women [22], and also knowledge and attitudes towards iron supplements are strongly related to maternal behaviour pregnant in receiving iron tablets [23].

Knowledge about the signs and symptoms of anemia in pregnancy is generally good among pregnant women and healthcare providers in almost all countries. However, many pregnant women do not realize they are at risk [17]. This condition makes it essential for pregnant women to have blood tests to accurately determine hemoglobin level, an indicator of anemia during pregnancy. Pregnant women were only found to be anemic after receiving antenatal care and undergoing blood tests to measure hemoglobin levels using finger prick samples by midwives in health care facilities [24]. Increasing access of pregnant women to antenatal care facilities ultimately supports the early detection of anemia and facilitates the provision of iron supplementation. Provision of counselling during antenatal care services also eventually overcomes various problems pregnant women face related to the continuous administration of iron supplements [17]. Pregnant women exposed to information have much higher knowledge about iron supplementation and improved attitudes or intentions towards receiving iron tablets compared to unexposed pregnant women [25].

Information exposure dramatically affects a person's knowledge and actions. The study's results have demonstrated a significant relationship between the knowledge of pregnant women and the received of iron supplementation during pregnancy [26]. Mothers' knowledge about the benefits of using iron tablets is significantly related to the behaviour of pregnant women during pregnancy [27]. Information to improve the use of iron tablets can now be obtained with the help of internet access. Various online-based newspapers and various types of internet-based social media have helped increase public knowledge about health, including the use of iron during reproductive age. The results showed that health promotion using internet-based Facebook social media influenced and increased women's knowledge of productive age about anemia, protein consumption, iron consumption, and vitamin C consumption [28]. In addition, the application of a website-based information system that utilizes the Internet has also been found to have increased the accuracy of reporting cases of anemia in productive pregnant women in the community [29].

Clinical Implications

The results of this study are beneficial in providing recommendations for policymakers regarding the received of iron supplements during pregnancy for women of reproductive age in Indonesia, namely health promotion efforts regarding the use of iron supplement tablets in pregnant women and women of childbearing age in the eastern region must be further improved, increased health promotion can be carried out with advances in technology by utilizing various internet-based social media, which are currently overgrowing in society.

Study Limitations

This study used datasets from DHS from Indonesia, which was conducted in 2017, so the availability of existing data determined the selection of variables. However, this study has the strength that the sample was selected using two-stage cluster sampling and has nationally representative data.

CONCLUSIONS

Most women of reproductive age in Indonesia are receiving iron supplements during pregnancy, although it is still found that a small proportion does not. The factors found to be associated with received of iron supplements during pregnancy included the age of the pregnant woman, province of residence, attending antenatal care consultations, having blood tests, knowing the signs and symptoms of the danger of pregnancy complications, having vaginal bleeding during pregnancy, and exposure to information from the Internet and newspapers. Hence, identifying those at high risk of not receiving the supplementation should be a policy priority for government and health workers in providing health services.

Future research needs to be carried out again to discover the development of the scope of use of blood booster tablet supplements in pregnant women in eastern Indonesia and the factors that influence it.

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