Probability of non-compliance to the consumption of Iron Tablets in pregnant women in Indonesia

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Keywords

Summary

Introduction. *The low non-compliance to the consumption of Iron Tablets in pregnant women is an obstacle in the implementation of government programs to prevent and overcome the anemia problems in pregnant women. This study was conducted to determine the probability of non-compliance of pregnant women in the consumption of iron tablets in Indonesia.*

Methods. *A cross-sectional study using the 2017 IDHS data. The sample was 12,466 women of childbearing age 15-49 years in Indonesia who consumed Iron Tablets during their last pregnancy. Univariate analysis used proportion measure, the bivariate analysis using chi-square test and multivariate used binary logistic regression test. Statistical analysis using SPSS-26 software.*

Results. *The level of non-compliance to the consumption of Iron Tablets during pregnancy in Indonesia is only 48.47%. The risk factors for quantity (p = 0.000, OR 2.085), and quality (p = 0.000,*

OR 1.655) Antenatal Care (ANC) was not good, examiners were pregnancy not health workers (p = 0.000, OR 1.816), residence in rural areas (p = 0.000, OR 1.262), and very poor socioeconomic status (p value = 0.000, OR 2.041) were significantly related to non-compliance with Iron Tablets consumption. The probability of non-compliance to the consumption of Iron Tablets in pregnant women with risk factors is 88%.

Conclusion. *Quantity of ANC and socioeconomic have a high influence on compliance to consumption of iron tablets, so it is important to bring nutrition workers at ANC activities to educate pregnant women about the benefits, side effects, and ways of consumption of iron tablets, reactivate supervisors for consumption of iron tablets, increase access health services in rural areas and families with low socioeconomic status, as well as providing free health care programs for the poor.*

Introduction

Anemia is a public health problem that has a serious impact. Groups that are susceptible to anemia are women of childbearing age and pregnant women [1]. Anemia in pregnancy is a condition where the hemoglobin level is less than 11 g/dl. The impact of anemia in pregnancy results in abortion, easy infection, antepartum bleeding, shock, premature rupture of membranes, postpartum hemorrhage can occur. The World Health Organization (WHO) estimates that 40.1% of pregnant women worldwide experience anemia and the prevalence of anemia in pregnant women throughout Asia is around 48.2% [2]. The prevalence of anemia in pregnant women aged 15-49 years in Indonesia was 41.98% in 2016, where this percentage increased from the previous year's percentage of 40.53% in 2015 [3]. Based on the results of the Basic Health Research (2018), the prevalence of anemia in pregnant women in Indonesia increased to 48.9% when compared to the Basic Health Research (2013) which was 37.1% [4].

It is estimated that 50% of anemia in women worldwide is caused by iron deficiency. Most cases of anemia are due to iron deficiency from food, low iron absorption in the body, increased iron requirements during pregnancy or growth, and increased iron loss due to menstruation and worms (intestinal worms) [5]. Giving Iron Tablets to pregnant women at least 90 tablets is one of the

Indonesian government's efforts to prevent and overcome the problem of iron anemia [6]. WHO recommends the consumption of supplements of iron and folic acid in pregnant women with a daily dose of 30 to 60 mg of iron and 400 mcg (0.4 mg) of folic acid to prevent pregnant women have anemia, puerperal sepsis, low birth weight, and premature birth [7].

There are still many obstacles in the implementation of giving Iron Tablets in the community, one of which is the low compliance of pregnant women in the consumption of iron tablets according to the recommendation of at least 90 points during pregnancy [8]. Basic Health Research (2018) report, it was reported that only 38.1% of pregnant women in Indonesia consumed as recommended (≥ 90 tablets) [4]. The Indonesian Health Demographic Survey (IDHS) 2017 report shows that there are pregnant women who do not consumption of iron tablets during pregnancy 13% (2017), as many as 29.4% of pregnant women consume Iron Tablets < 60 tablets, consumption of 60-89 tablets by 8.9%, don't know 5.1% and the percentage of women who take Iron Tablet according to the recommendation of at least 90 tablets is only 44%, but this presentation has not changed in the last 10 years [9].The achievement of pregnant women consumption of Iron Tablets has decreased from 2018 (81.2%) to 64% in 2019, and this figure is still far from the national target, which is 98% [10].

Fig. 1. Samples Selection Stage in the 2017 IDHS Data.
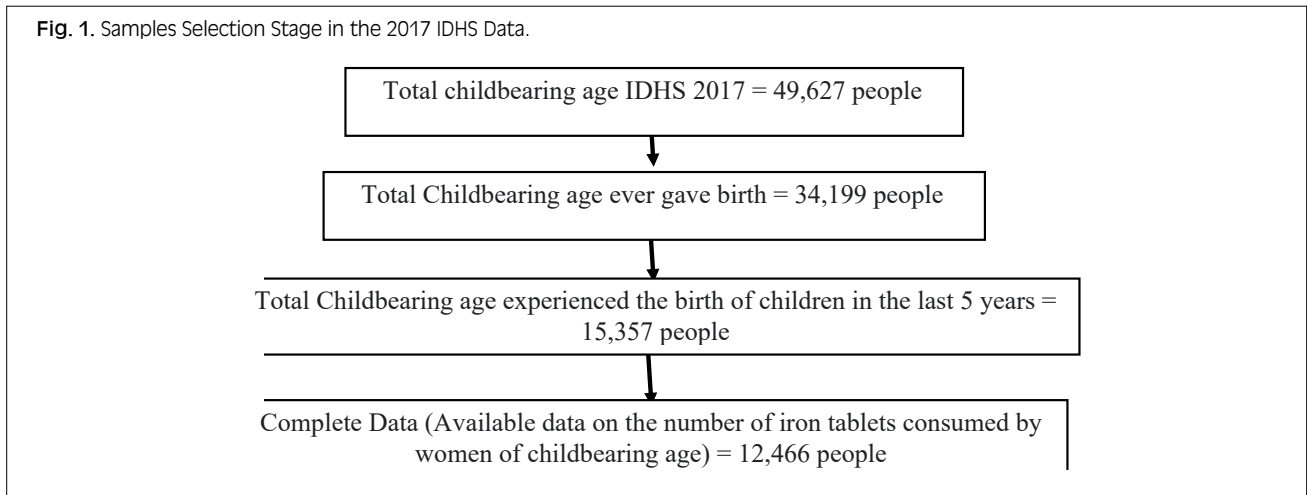
Compliance consumption of Iron Tablets in pregnant women is influenced by various factors, namely maternal age, occupation, education, parity, a quantity of ANC, a quality of ANC, place of residence, socio-economic status, and antenatal care workers [1, 11-15]. Research is generally in certain areas and locations with a small sample size so generalizations are limited. Research results that explain the determinants and the probability of compliance to Iron Tablets consumption in pregnant women using national survey data are still rarely done. This study used the 2017 IDHS data to determine the probability of non-compliance with the consumption of Iron Tablets in Indonesia based on risk factors for pregnant women. The results of this study are expected to be the basis for making policies to overcome anemia in pregnant women.

Methods

POPULATION AND SAMPLE

This study used the 2017 Indonesian Health Demographic Survey (IDHS) data with approach *cross sectional*. The population is all women of childbearing age (15-49 years) in Indonesia recorded in the 2017 IDHS survey. The research sample is women of childbearing age (15-49 years) with children born within 5 years prior to the 2017 IDHS survey. The unit of analysis for in this study, women of childbearing age (15-49 years) with their last child were pregnant. The sampling method used in this study follows the 2017 IDHS sampling process. The 2017 IDHS sampling design is designed to present estimates at the national and provincial levels. The 2017 IDHS sample covers 1,970 census blocks covering both urban and rural areas in Indonesia. The 2017 IDHS sample framework uses the master census block sample from the 2010 population census (PS 2010). While the household selection sample framework uses a list of ordinary households generated from updating the selected census block households [16] detect all complications of pregnancy and take the necessary actions, respond to complaints, prepare for birth,

and promote a healthy lifestyle. This study aims to analyze interregional disparities in ≥ 4 ANC visits during pregnancy in Indonesia. Methods Data was acquired from the 2017 Indonesian Demographic and Health Survey (IDHS.

Of the 49,627 women of childbearing age, there are 34,199 childbearing age who have given birth, and childbearing age who have given birth to children in the last 5 years are 15,357 people and the number of childbearing age who become the research sample is 12,466 people. Based on the results of a survey conducted by the 2017 IDHS, the researchers selected a sample among the population that was in accordance with this study, namely childbearing age aged 15-49 years who consumed Iron Tablets during their last pregnancy. The stages of sample selection are described in Figure 1.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The 2017 IDHS activities received research ethics approval from the *Institutional Review Board* ICF (*International Classification of Functioning*) with ICF Project No. 132989.000. Whereas in this study itself, before the research was conducted, a research ethics permit was first submitted to the Health Research Ethics Commission of the Bengkulu Ministry of Health Polytechnic with the *Ethical Clearance* Number KEPK.M/021/05/2021. Respondents who had been involved in this study, had previously given written informed consent after explanation.

STATISTICAL ANALYSIS

Data analysis used univariate analysis to describe the characteristics of each research variable. Bivariate analysis used test *Chi Square* to show different test proportions of non-compliance to Iron Tablet consumption and to identify candidate variables that would be included in the multivariate analysis, and multivariate analysis used binary logistic regression to determine the determinants of compliance to Iron tablet consumption. Then calculated the probability of non-compliance to the consumption of Iron Tablets based on the final model of multivariate logistic regression.

Tab. I. Proportion of Iron Tablet consumption in Pregnant Women based on Indonesian Region.

Regional	Consumption of Iron Tablets	
	Recommendation (≥ 90 tablet)	Not Recommendation (< 90 tablet)
Region: Sumatera	38.17	61.83
Region: Java-Bali	65.65	34.35
Region: Nusa Tenggara	45.65	54.35
Region: Kalimantan	56.25	43.75
Region: Sulawesi	27.03	72.97
Region: Maluku Islands	41.99	59.01
Region: Papua	42.81	57.19
Indonesia	48.47	51.53

Results

Table I shows that 48.47% of pregnant women in Indonesia consume the number of Iron Tablets that are not as recommended. Based on the Indonesian region, the proportion of non-compliance with Iron Tablet consumption was highest in Sulawesi region (72.97%) and Sumatra region (61.83%). The proportion of pregnant women who consume Iron Tablets according to the highest recommendation in the Java-Bali region (65.65%) and Kalimantan region (56.25%).

Table II shows the majority of pregnant women in Indonesia aged 20-35 years (72.3%), most of the mother's education (57.5%) was secondary education (graduated from junior high school/equivalent and high school/equivalent), more than half (53.6%) of Pregnant women with working status, most (61.7%) Pregnant women with more than one parity (multipara), the majority (78.1%) with good ANC quantity (once in the

Tab. II. Frequency Distribution of Maternal Characteristics and Family Characteristics in Indonesia.

Characteristics	Frequency (n = 12,466)	Percentage (%)
Age		
20-35 Years	9,016	72.32
< 20 Years	314	2.52
> 35 Years	3,136	25.16
Education		
Higher education	7,162	17.89
Secondary education	2,231	57.45
Primary education	2,954	23.69
No school	119	0.95
Employment		
Working	6683	53.64
Not Working	5775	46.35
Parity		
Primipara	7,695	31.27
Multipara	3,899	61.72
Grande multipare	872	6.99
ANC Quantity		
Good (≥ 4 times)	9573	78.07
Less (< 4 times)	2689	21.92
ANC Quality		
Good (10T)	9149,	74 88
Less (< 10T)	3069	25.11
ANC examiner		
Health workers	11 953	96.25
Non health workers	465	3.74
Residential		
Urban	6,301	50.55
Rural	6,165	49.45
Socio-Economic Status		
Very Rich	2,177	17.46
Rich	2,322	18.62
Medium	2,383	19.12
Poor	2,481	19.90
Very Poor	3,103	24.89

Tab. III. Correlation between the characteristics of pregnant women with Consumption of Iron Tablets in Indonesia.

Characteristics	Consumption of iron tablets				Total		p-value
	Recommendation (≥ 90 tablet)		Not Recommendation (< 90 tablet)				
	n	%	N	%	n	%	
Age							
20-35 Years	124	2.05	190	2.96	314	2.52	
<20 Years	4,380	72.49	4,636	72.17	9,016	72.32	
>35 Years	1,538	25.46	1,598	24.87	3,136	25.16	0.005*
Education							
Higher education	1,208	19.99	1,023	15.92	2,231	17.70	
Secondary education	3,525	58.34	3,637	56.62	7,162	57.45	
Primary education	1,277	21.14	1,677	26.11	2,954	23.70	0.000*
No school	32	0.53	87	1.35	119	0.95	
Employment							
Working	3,284	54.37	3,399	52.96	6,683	53.64	
Not Working	2,756	45.63	3,019	47.04	5,775	46.36	0.119*
Parity							
Primipara	3,756	62.16	3,939	61.32	7,695	61.73	
Multipara	1,958	32.41	1,941	30.21	3,899	31.28	
Grande multipare	328	5.43	544	8.47	872	6.99	0.000*
ANC Quantity							
Good (≥ 4 times)	5,161	85.86	4,412	70.58	9,573	78.07	
Poor (< 4 times)	850	14.14	1,839	29.42	2,689	21.93	0.000*
ANC Quality							
Good(10T)	4,817	81.19	4,332	68.93	9,149	74.88	
Poor (< 10T)	1,116	18.81	1,953	31.07	3,069	25.12	0.000*
ANC examiner							
Health workers	5,898	97.75	6,055	94.85	11,953	96.26	
Non health workers	136	2.25	329	5.15	465	3.74	0.000*
Residential							
Urban	3,476	57.53		43.98	6,301	50.55	
Rural	2,566	42.47	2,825 3,599	56.02	6,165	49.45	0.000*
Socio-Economic Status							
Very Rich	1,376	22.77		12.47	2,177	17.46	
Rich	1,270	21.02	801	16.38	2,322	18.63	
Medium	1,204	19.93	1,052 1,179	18.35	2,383	19.12	
Poor	1,070	17.71	1,411 1,981	21.96	2,481	19.90	0.000*
Very Poor	1,122	18.57		30.84	3,103	24.89	

*Multivariate Candidates (p ≤ 0.25).

Tab. IV. Determinants of Non-compliance with the Consumption of Iron Tablets in Pregnant Women in Indonesia.

Variable	B	p value	OR (95% CI)
Quantity of ANC			
Good			1
Poor	0.735	0.000	2.085 (1.897-2.292)
Quality of ANC			
Good			1
Poor	0.504	0.000	1.655 (1.515-1.807)
ANC examiner			
Health workers			1
Non health workers	0.597	0.000	1.816 (1.467-2.248)
Residential			
Urban			1
Rural	0.233	0.000	1.262 (1.162-1.371)
Socio-Economic Status			
Very Rich			1
Rich	0.306	0.000	1.358 (1.201-1.535)
Medium	0.377	0.000	1.459 (1.289-1.651)
Poor	0.578	0.000	1.783 (1.571-2.023)
Very Poor	0.713	0.000	2.041 (1.792-2.324)
Constant	-0.788		

Overall Percentage = 60.9%

first trimester, once in the second trimester, and twice in the third trimester), more than half (59.8%) had good ANC quality, almost all (96.3%) Pregnant women had their pregnancy checked by health workers, about 50.55% of Pregnant women in Indonesia lived in urban areas, and their socioeconomic status most are very poor at 24.89%.

Table III shows the proportion of consumption that is not according to the recommendation is higher in pregnant women aged 20-35 years (72.17%) followed by pregnant women aged more than 30 years (24.87%), working pregnant women (52.96%), multiparity(61.32%), good ANC quantity (70.58%) and good ANC quality (68.93%), pregnant women living in rural areas (56.02%), social very poor economy (24.89%), poor (19.90%). The lower the socioeconomic status of the family, the higher the proportion of pregnant women who do not comply with consumption of iron tablets. The results of the bivariate analysis in Table III show all variables as candidates for analysis by multivariate logistic regression test (value *p ≤ 0.25*).

Table IV shows the final model of the multivariate logistic regression analysis. Factors related to non-compliance with Iron Tablet consumption are ANC quantity and ANC quality are not good, antenatal care workers are not health workers, residence in rural areas, and low socioeconomic status. Pregnant women with poor ANC quantity are at risk of 2.1 times (95% CI: 1.897-2.292) to consume Iron Tablet not according to recommendations compared to Pregnant women with good ANC quantity. Likewise, Pregnant women with poor ANC quality are at risk of 1.7 times (95% CI: 1.515-1.807) to consume Iron Tablet not according to recommendations compared to pregnant women with good ANC quality. Pregnant women who did not check their pregnancy with health workers had a risk of 1.8 times (95% CI: 1.467-2.248) to consume Iron Tablet not according to the recommendations compared to pregnant women who checked their pregnancies with health workers. Meanwhile, pregnant women who live in rural areas are at risk of 1.3 times (95% CI: 1.162-1.371) for consumption of iron tablets not according to recommendations compared to Pregnant women who live in urban areas. The results also show that the poorer the mother, the higher the risk of consumption of iron tablets not according to recommendations. Pregnant women with very poor socioeconomic status are at risk of 2 times (95% CI 1.792-2.324), Pregnant women with very poor socio-economic status are at 1.8 times (95% CI 1.571-2.203) risk for consuming Iron Tablet not according to recommendations compared to Pregnant women with social status very rich economy.

The final model in table 3 shows that the most dominant factors related to non-compliance with iron intake consumption in pregnant women in Indonesia are the quantity of ANC that is not good and very poor socioeconomic status. Based on the Overall Percentage value of 60.9%, shows that 60.9% non-compliance with iron intake consumption can be explained because the quantity and quality of the ANC is not good,

socioeconomic status is low, check-ups are pregnancy not provided by health personnel, and the mother lives in rural areas. Overall, 60.9% non-compliance with Iron Tablet consumption can be corrected by improving the risk factors in the final model. Based on the final model of multiple logistic regression, the logistic regression equation model is obtained as follows:

Logit P (non-compliance to consumption of Iron tablets) = -0.788 + (0.735*Quantity of ANC is poor) + (0.504*Quality of ANC is poor) + (0.597*Non health workers) + (0.233*Rural) + (0.713*Very poor).

The probability of non-compliance to pregnant women consumption of Iron Tablets based on predictor values is calculated by the following equation:

$$P = \frac{1}{1+e^{-(\alpha+\beta_1 X_1+\beta_2 X_2+\beta_3 X_3+\cdots kX_k)}}$$

$$P = \frac{1}{1+e^{-(-0.788+0.735+0.504+0.597+0.233+0.713)}}$$

$$P = \frac{1}{1+e^{-(1.994)}} = \mathbf{0.88} = \mathbf{88\%}$$

The above equation means that pregnant women with poor quantity and quality of ANC, live in rural areas, check pregnancy not with health workers and verypoor socioeconomic status have a probability of consuming Iron supplement tablets not according to recommendations (< 90 tablets) by 88% compared to pregnant women without risk factors.

Discussion

The results of the study found that only 48.47% of pregnant women in Indonesia consumed iron tablets according to the recommendation (≥ 90 tablets). The proportion of non-compliance of pregnant women based on regional regions of Indonesia in consumption of iron tablets, there is a statistically significant difference. This difference in the proportion of consumption of Iron tablets occurs because demographically and geographically, Indonesia's regional characteristics vary. The highest non-compliance with consumption of iron tablets was in the Sulawesi and Sumatra regions, while the proportion of Iron supplement consumption according to the recommendations was highest in the Java-Bali and Kalimantan regions. This coverage is still far from the target set by the Indonesian government in the Health Development Strategic Plan in 2017 of 90%, the 95% target and in 2018 and the 98% target in 2019 [10]. The non-compliance rate for pregnant women's in consumption of iron tablets in Indonesia is higher than in India (36.9%) [17], in Adwa, Tigray Ethiopia (40.9%) [18], in Hawassa, Southern Ethiopia (38.3%) [19], and in Kiambu County, Kenya (32.7%) [20]. However, it is lower than several other studies such as in Gondar, Ethiopia (55.3%) [21], in Debre Markos, Western Ethiopia (55.5%) [22], in Sri Lanka (80.1%) [23], and a study in Iran. West reports

that the compliance to iron supplement consumption in pregnant women is relatively high (71.6%) [24].

The main reasons pregnant women do not comply with consumption of iron tablets are dislike, nausea/vomiting due to pregnancy, boredom, forgetfulness, and side effects of tablets [4]. Findings from a qualitative study revealed that since Iron Tablets were consumption at night, pregnant women forget to consumption of iron tablets during the day because they are busy with various jobs and at night because they are tired and fall asleep. Lack of attention to compliance can also cause pregnant women to forget to consume iron tablets. In addition to forgetting, fear of the side effects of Iron Tablets such as nausea, vomiting, diarrhea, and constipation is also a reason for non-compliance. The fear of side effects was caused by a lack of counseling from health care providers and a decrease in women's knowledge about anemia and iron tablets. Through better education regarding iron tablets, non-compliance due to fear of side effects will be reduced [22]

One effort to overcome the high prevalence of anemia in pregnant women is to provide iron supplements as much as 1 tablet every day for 90 days during pregnancy. Iron tablets are given by health workers to pregnant women who come to check their pregnancy at health service centers such as Community Health Centers, Integrated Service Post or village health workers through ANC (antenatal care) [25]. However, there are still problems faced by Pregnant women, namely Pregnant women often forget to consume them, or Pregnant women do not want to consume them because they are bored, do not like the side effects and other reasons. In order to maximize iron absorption, it is recommended to drink with boiled water and vitamins, and reduce the consumption of foods containing substances that can inhibit iron absorption, such as coffee and tea when consumption of Iron Tablets [26].

This study found that pregnant women who had poor Quantity of ANC had 2 times the risk of consuming Iron Tablets that were not as recommended compared to pregnant women who had good ANC visits. This finding is supported by researchinDenbiya District, Ethiopia [27]. ANC visits are an opportunity to improve maternal compliance because there are meetings and discussions between Pregnant women and health workers who provide information regarding the benefits of iron supplements [16].

The quality of the ANC also affects the compliance of pregnant women consumption of iron tablets, Pregnant women with ANC quality who are less at risk 1.7 times to consumption of Iron Tablets that are not as recommended compared to pregnant women with good ANC quality. Each element of antenatal care must be carried out in full following the minimum service standard of "10 T" [28]. One of the important activities during ANC is giving Iron supplement tablets and counseling. Research in Addis Ababa, Ethiopia revealed effective counseling during ANC visits was the main reason for good compliance to consumption of Iron Tablets [29].

This study also revealed that pregnant women who did not check their pregnancy with health workers had a risk of 1.8 times to consume Iron Tablet not according to the recommendations compared to pregnant women who had their pregnancy checked by health workers. In a study in Tamil India, pregnant women have a positive perception of the services provided by health workers so that satisfaction with health services can affect compliance to iron supplement consumption [30]. The behavior of health workers is able to provide optimal counseling, especially about the importance of consuming of iron supplements for pregnant women to maintain the health of the mother and fetus. In addition, the attention given by health workers such as providing services with a smile, as well as providing feedback on previous visits can increase satisfaction with the services provided so that it is expected that pregnant women's compliance in consumption of iron tablets can be improved [31].

Pregnant women who live in rural areas are at 1.3 times risk of consumption of iron tablets not according to recommendations compared to pregnant women who live in urban areas. This study is in line with research in Gondar Ethiopia, pregnant women who live in urban areas have the privilege of supporting factors compared to pregnant women who live in rural areas, namely having better access to health facilities [21]. However, in this study, maternal age, education, occupation and parity were not statistically significant with compliance to blood-supplementing tablet consumption in pregnant women in Indonesia.

Pregnant women with very poor socioeconomic status are at risk of 2 times consumption of iron tablets not according to recommendations compared to pregnant women with very rich socioeconomic status. This is in line with research in Kiambu, Kenya which states that socioeconomic factors, especially high income, have an effect on good compliance in consuming of iron tablets [20]. Income affects family socioeconomic, low family income tends to influence pregnant women to disobey the consumption of Iron Tablets compared to families with higher incomes [32]. Low family income causes a decrease in daily food needs [33]. Macronutrient deficiencies are more commonly caused by poor dietary intake, but in particular deficiencies of iron, calcium, folate, zinc, thiamin, riboflavin, and vitamins A, D, B6, and B12 are very common and of concern among women of childbearing age, the cause is low income levels and lack of education about healthy practices such as healthy eating patterns [34]. This is different from the study in Lucknow, India which stated that socioeconomic status had no effect on the intake of iron tablets, but in this study explaining social background needs special attention. Often the social environment and cultural constraints become obstacles in finding the right health care not only for the consumption of Iron Tablets but also for improving the health status of the mother so that the root causes of economic problems must be compliance [17].

Conclusion

The prevalence of compliance to the consumption of Iron Tablets in pregnant women in Indonesia is mostly not according to recommendations (48.47%). ANC quantity, ANC quality, antenatal care workers, place of residence, and socioeconomic status were statistically significant with compliance to blood-supplementing tablet consumption in pregnant women in Indonesia. The most dominant factor related to compliance is the quantity of ANC. Therefore, it is important to bring nutritionists at ANC activities to educate pregnant women about the benefits, side effects, and ways of consumption of iron tablets, reactivate supervisors for consumption of iron tablets, increase access to health services in rural areas, and organize free health care programs for the poor.

Acknowledgments

Thank you to the Central Statistics Agency, National Family Planning Coordinating Board, and the Ministry of Health for providing IDHS data and giving permission to access and use the data for further analysis.

Conflict of interest statement

The authors declare no conflict of interest.

Authors' contributions

S.N.: conceived of the presented idea, collect the data, perfomed the analysis, conceived and designed the analysis, contributed data or analysis tools. D.S.: verified the analytical methods, contributed to the interpretation of the results, designed the model and the computational framework. All Authors discussed the resulst and contributed to the final manuscript.

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