



Association of Iron Pills Consumption during Pregnancy with Incidence of Maternal Anemia in Indonesia (IFLS 5 Advanced Analysis Study)

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Article Information

Article history:

Submitted: January 2019

Accepted: March 2019

Published: April 2019

Keywords:

iron pills;
the incidence of maternal
anemia; IFLS 5

Abstract

Background: Indonesia Family Life Survey (IFLS) data in this study focused on the consumption of iron pills (Fe) during pregnancy and maternal anemia in Indonesia (Study analysis continued IFLS 5). The aim of this research was knowing the relationship of consumption of iron pills during pregnancy with the incidence of maternal anemia in Indonesia.

Methods: Study was an observational analytic study with a cross sectional design using IFLS 5 data which taken in 2014-2015.

Results: From the results of multiple logistic regression tests, the variables of education, mother's residence and history of bleeding at delivery were significantly associated with the incidence of maternal anemia with OR (95% CI) sequentially 1.38 (1.003-1.92), 0.63 (0.46-0.88) and 1.74 (1.01-3.00). While consumption of iron-added pills during pregnancy was not associated with the incidence of maternal anemia in Indonesia ($p = 0.760$) and OR (95% CI) = 1.05 (0.76-1.43).

Conclusion: There was no significant relationship between the consumption of poor iron pills during pregnancy with the incidence of maternal anemia in Indonesia. There was a significant relationship between maternal education, maternal residence and bleeding history at birth with the incidence of anemia in the mother.

BACKGROUND

Anemia is a global problem that is common in developing countries and in low socioeconomic conditions. In adulthood, anemia occurs in women of reproductive age. This is in line with the research of Steven *et al.* (2013), where anemia affects half a billion reproductive-age women worldwide. In 2011 there were 29% (496 million) of nonpregnant women and 38% (32 million) of pregnant women. The most severe prevalence of anemia Occured between 1995 and 2011, almost 10% in African countries and 6% in South Asia. West and central Africa and in South Asia have the lowest average hemoglobin concentration level (Stevens, 2013).

The causes of anemia are diverse, it is estimated that there are half cases of anemia due to lack of iron. Recorded in the Riset Kesehatan Dasar 2013 (Riskesdas), nationally, iron deficiency anemia is still a public health problem with the highest prevalence rate in pregnant women at 37.1% while for children under five only 28.1%, children 5-12 year 29%, young women 13-18, years and women of childbearing age 15-49 years each at 22.7%.

WHO (2014) states that iron deficiency anemia is caused by iron imbalance (caused by iron intake or absorption), increased iron requirements such as during pregnancy or growth and an loss of iron due menstruation and intestinal worms infestations, the presence of infections, deficiencies of other nutrients, especially folate and, vitamin B12, vitamins A, and C and the presence of genetic conditions such as sickle cell disease, thalassemia and the presence of chronic inflammation.

About 500 mg of iron (Fe) from food sources must be stored in the body of pregnant women outside of the source of iron supplementation. While the iron needs of pregnant women in a day ranges from 700-1400 mg / day, so there needs to be additional iron consumption from other sources, namely by the presence of food fortification or iron supplementation (Prakash, 2015). Based on Minister of Health Regulation No. 88/2014, the recommended dose of iron supplement for pregnant women is at least 90 tablets during pregnancy

Women of childbearing age are an ex-

pression for a woman of reproductive age where the WHO classifies them as 15-49 years old. At this age refers to the period starting from adolescence, namely women who have the potential to get pregnant, then the periods of pregnancy-lactation and during the period between pregnancies (Achadi, 2008). WHO (2011) states that to assess whether fertile mothers / women (without pregnancy) are anemia or not, can be seen from the Hb level (blood hemoglobin) Hb <12.0 g / dl then the mother is affected by anemic (WHO, 2011).

The Indonesia Family Life Survey (IFLS) is a longitudinal survey conducted since 1993 which is a national survey with 7,224 families spread across 13 of 26 provinces so that it can represent 83% of Indonesia's population at that time. Since 1993 at least 5 waves of IFLS have been carried out. Until the IFLS 5 (2014-2015), the number of respondents had grown to 16,024 families and 50,148 people. IFLS data is designed to understand behavior change and health outcomes. The aim of this research was knowing the relationship of consumption of iron pills during pregnancy with the incidence of maternal anemia in Indonesia.

METHOD

This study was an analytical observational study with a cross sectional design using IFLS 5 data (2014-2015), to analyze the relationship between consumption of iron pills (Fe) during pregnancy and the incidence of maternal anemia in Indonesia.

The study population was all women in Indonesia who were selected as respondents to the IFLS 5 study, namely women aged 15-49 years who had been married. The study sample were an IFLS 5 study respondent, who met the inclusion and exclusion criteria. Inclusion criteria: mothers with a pregnancy period ending at the age of 9 months or more, mothers with their pregnancies ending in 2010-2015, and mothers whose Hb level obtained the IFLS research 5. Exclusion criteria: Mothers whose data were not completed.

The IFLS 5 survey was held at the end of 2014 until the beginning of 2015 using the same respondents as IFLS 4, namely 16,204 households, 50,148 individuals, and 2,662 individuals

who died since IFLS 4 (Strauss, 2016). From the IFLS 5 data, there were 18,825 female respondents who answered questionnaires. Then, from this data, it was re-selected based on inclusion and exclusion criteria. There were 722 study samples that were obtained according to inclusion and exclusion criteria.

The dependent variable in this study is the incidence of anemia in the mother. The independent variable is consumption of iron pills during pregnancy, and the outside variables are maternal age, maternal education, mother's residence, ANC visits (Antenatal Care), gravida number (pregnancy) and bleeding. The analysis is divided into 3 parts, namely, univariate, bivariate and multivariate analysis. Univariate analysis can be presented in the form of frequency distribution, which in this study describes the characteristics of consumption of iron pills, maternal age, maternal education, mother's residence, ANC (Antenatal Care), Gravida (pregnancy), bleeding and anemia in mother.

Bivariate analysis is an analysis performed on 2 (two) variables. The test carried out in this study is a relationship test, which connects the independent variables and bound or the relationship between external variables and dependent variables, including the consumption of iron pills during pregnancy with maternal anemia in Indonesia or connecting outside variables (maternal age), the last education of the mother, mother's place of residence, ANC visit (Antenatal Care), number of gravida (pregnancy), bleeding with the incidence of maternal anemia in Indonesia. The data presented in this bivariate analysis is in the form of a 2x2 table. The statistical test uses Chi-square test by setting a null hypothesis (α) acceptance limit of 5%, and CI (Confident Interval) of 95% and the calculation of odds ratios.

Multivariate analysis was conducted to test the strength of the relationship between dependent variables with independent variables and external variables. The statistical test used is multiple logistic regression test, because all the data used have been categorized and in the dependent variable in the form of dichotomous categories, where the variables that will enter into this multivariate analysis are variables that have a p value $<0, 25$ in bivariate analysis. Sev-

eral models created to identify the existence of confounding variables and modifier effects that can affect the results of the study, where the output of the test results is considered significant if the value of p value <0.05 with a confidence level of 95%.

The procedures in the IFLS were previously tested and approved by Institutional Review Boards (IRBs) in the United States (RAND Corporation) since IFLS 1. All data processed in this study came from IFLS 5 data which conducted by Survey Meter and RAND corporation.

RESULTS AND DISCUSSION

The results of the analysis showed that mothers who consumed the iron pills well (min 90 pills during pregnancy) as much as 56.93%. And anemic women were 32.83%. most of the mother in this study in the age range of 20-35 years (80.33%). Mother's did not graduate from high school or is still in high school or under high school (59.56%). The majority of maternal places are domiciled in the city area (57.89%). During pregnancy, most mothers come to the place of health care facilities that do not meet the minimum set standards, which is less than 4 visits (61.22%). Based on the history of pregnancy, the mother experienced a number of pregnancies (gravida) of less than 4 pregnancies (97.23%), and based on a history of bleeding during childbirth, 8.03% of women experienced bleeding.

Bivariate analysis in this study used the chi-square statistical test to see the relationship between consumption of iron pills and the incidence of anemia and to calculate the Odds Ratio (OR) with 95% Confidence Interval (CI).

In IFLS 5, consumption of iron pills as a dependent variable, while the independent variables consisted of anemia status, maternal age, maternal education, place of residence, ANC visit, number of pregnancies, and bleeding.

This bivariate analysis aims to see the relationship of each independent variable (consumption of iron pills) and external variables with the dependent variable incidence of anemia. The relationship between independent and external variables with the incidence of anemia can be seen in table 2.

Respondents who consumed iron pills of at least 90 pills during pregnancy and anemia were 56.12%, while respondents who consumed <90 pills during pregnancy and anemia were 43.88%. The difference in the proportion of the incidence of anemia in the consumption group of iron pills good and bad was 12.24%.

In table 2 it was found that the consumption of iron pills was not significantly associated with the incidence of anemia, this can be seen from the results of the chi square test p value is 0.760 (> 0.05). At the confidence interval (95% CI) past number 1 which is 0.75-1.45, meaning that OR (Odds Ratio) between consumption of iron pills with the incidence of anemia is equal

to one (= 1) and the null hypothesis is accepted. there is no relationship between consumption iron pills consumption with maternal anemia.

In the external variables, there are two variables that have a p value <0.05, namely the first place where the mother lives related to the incidence of anemia, with the chi square test with a p value of 0.007 (<0.05) and there is a significant relationship between mother's residence with the incidence of maternal anemia

Second, there is no relationship between bleeding history and education with the incidence of maternal anemia. When viewed from a multivariate analysis, multiple logistic regression tests showed a relationship between maternal education, maternal residence and bleeding history, where the OR (95% CI) respectively was 1.38 (1.003-1.92); 0.63 (0.46-0.88); and 1.74 (1.01-3.00). Whereas iron pills consumption did not have a significant relationship with the incidence of anemia with OR (95% CI) = 1.05 (0.76-1.43). If the difference between the adjust OR on the 3 variables with crude OR is not more than 10%, and the value of the p-value of the three variables (<0.05), then the 3 variables enter the part of the modifier .

Consumption of iron pills for pregnant women has been regulated in the Decree of the Minister of Health of the Republic of Indonesia No. 88/2014 which is as much as a minimum of 90 tablets during pregnancy. Consumption of iron pills for pregnant women is still below the standard, this study most respondents still consuming of less than 90 tablets during pregnancy, reaching 43.07%. This exceeds the 2013 Riskesdas data which states that 33.3% of pregnant women consume at least 90 tablets of blood added during their pregnancy.

Various causes of the lack of consumption of iron pills are because among them are mothers who are not properly informed about the importance of iron pills and the risk of anemia in the mother. Information about iron pills or about the danger of anemia in the mother, can be known through health services. This is evidenced from the number of maternal visits during pregnancy to the health service center (ANC), which are not in accordance with the Minimum Service Standards (SPM) that have been determined, which at least 4 visits (61.22%).

Table 1. Variables in this research

| Variable | n (n = 722) | % |
|------------------------------------|----------------|------|
| Iron pills consumption | | |
| Good | 411 | 56.9 |
| Bad | 311 | 43.1 |
| Anemia | | |
| Not anemia | 485 | 67.2 |
| Anemia | 237 | 32.9 |
| Maternal age | | |
| Not risk (20-35 years) | 580 | 80.3 |
| risk (<20 years dan >35 years) | 142 | 19.7 |
| Maternal education | | |
| High | 292 | 40.4 |
| Low | 430 | 59.5 |
| Living place | | |
| Urban | 418 | 57.9 |
| Rural | 304 | 42.1 |
| ANC visit | | |
| Based standard | 280 | 38.8 |
| Not based standard | 442 | 61.2 |
| Total pregnancies (Gravida) | | |
| Not risk (pregnancies <4x) | 702 | 97.2 |
| Risk (pregnancies ≥ 4x) | 20 | 2.8 |
| Bleeding | | |
| No | 664 | 91.9 |
| Yes | 58 | 8.0 |

Table 2. Association between outer variable with anemia incidence

| Variable | Not Anemia (n =622) | | Anemia (n =100) | | p-value | OR (95% CI) |
|------------------------------------|---------------------|-------|-----------------|-------|---------|--------------------|
| | n | % | n | % | | |
| Iron pills consumption | | | | | | |
| Good | 278 | 57.32 | 133 | 56.12 | 0.760 | 1.05 (0.75-1.45) |
| Bad | 207 | 42.68 | 104 | 43.88 | | |
| Maternal age | | | | | | |
| Not risk (20-35 years) | 384 | 79.18 | 196 | 82.70 | 0.263 | 0.79 (0.51-1.20) |
| Risk (<20 years and >35 years) | 101 | 20.82 | 41 | 17.30 | | |
| Maternal education | | | | | | |
| High | 208 | 42.89 | 84 | 35.44 | 0.056 | 1.36 (0.98-1.91) |
| Low | 277 | 57.11 | 153 | 64.56 | | |
| Living place | | | | | | |
| Urban | 264 | 54.43 | 154 | 64.98 | 0.007* | 0.64 (0.46-0.88)** |
| Rural | 221 | 45.57 | 83 | 35.02 | | |
| ANC visit | | | | | | |
| Based on standard | 185 | 38.14 | 95 | 40.08 | 0.615 | 0.92 (0.66-1.28) |
| Not based on standard | 300 | 61.86 | 142 | 59.92 | | |
| Total pregnancies (Gravida) | | | | | | |
| Not risk (pregnancies <4x) | 474 | 97.73 | 228 | 96.20 | 0.240 | 1.70 (0.61-4.58) |
| Risk (pregnancies ≥ 4x) | 11 | 2.27 | 9 | 3.80 | | |
| Bleeding | | | | | | |
| No | 453 | 93.40 | 211 | 89.03 | 0.042* | 1.74 (0.97-3.10) |
| Yes | 32 | 6.60 | 26 | 10.97 | | |

Research by Subarda *et al.* (2011), status of good ANC services, defined as pregnant women have received services include examining anemia determination (with Hb measurement), giving iron tablets and nutritional consultation. Whereas ANC services are not good if only one or two types of services are obtained by the mother.

Based on the value of p value obtained, examination of anemia determination, nutrition consultation and maternal knowledge had a significant relationship with the compliance of mothers taking iron pills ($p < 0.05$). Based on the chi square test, there was a significant correlation between ANC services in anemia management and adherence of pregnant women to taking iron pills ($p = 0.001$; prevalence ratio = 1.82; 95% CI = 1.22-2.7) (Subarda, 2010). However, in this study, there was no signifi-

cant relationship between ANC visits and the incidence of maternal anemia in Indonesia $p = 0.615$ ($p > 0.05$) and the confidence interval passed the number 1 (0.66-1.28). This study is directly proportional to the research of Natalia (2015), showing that there is no correlation between the coverage of ANC and Fe tablets with the prevalence of anemia ($p > 0.05$). This is due to the lack of coverage of mothers to come to the ANC. The low coverage of ANC visits according to Titaley *et al.* (2010) can be caused by three things, namely the presence of economic factors, maternal knowledge factors and the existence of access to the service place.

Good knowledge can be influenced by high levels of education. Information about pills plus blood and the danger of anemia in the mother can be easily obtained and the mother can easily consume iron pills in accordance

with the recommendation which at least 90 pills during pregnancy, so that it is expected to reduce the risk of anemia in the mother. This is in line with Mariza (2016), where there is a relationship between education and anemia of pregnant women with p value 0.026 ($p < 0.05$). As well as other studies on education and knowledge such as the research of Abdillah and Azam (2016), explained that there was a significant relationship between health education and an increase in the knowledge and attitudes of respondents to leprosy, each of which had a p value of 0.08 and 0.016 ($< 0, 05$). In addition, there is also research conducted by Wantini and Indrayani (2018), showing an increase in the median value of knowledge before (68%) and after (91%) breast cancer health education. After being tested, there were differences in interest in doing Breast Self Examination before and after health education ($p = 0,000$).

In this study, maternal education was mostly low (59.56%), ie mothers had not graduated from high school or were sitting in high school or under high school. Based on multivariate analysis, education has a significance for the incidence of maternal anemia OR (95% CI) = 1.389 (1.003-1.923), with a value of $p = 0.048$ ($p < 0.05$). Mothers with low education will have an impact of 1,389 times for the occurrence of anemia in mothers compared to mothers who have a higher education level.

There are other things that cannot be investigated in this study which can affect the consumption of iron pills other than this knowledge, such as family support and the presence of maternal complaints when taking iron pills (nausea, dizziness, unpleasant smells of iron pills). This is in line with the research conducted by Juwita (2018), stating that there is a significant relationship between family support and the level of compliance of pregnant women consuming iron pills with p value 0.029. And in the study of Saptarini *et al.* (2015) that complaints about taking iron tablets provide a significant relationship to consumption of iron pills in pregnant women ($p = 0.002$). Mothers without complaints have a 3.4 times greater chance to consume iron pills as recommended (at least 90 tablets during pregnancy) compared to mothers who complain of taking iron pills.

In this study multivariate analysis

showed no association between consumption of iron pills and the incidence of maternal anemia where p value was 0.760 (> 0.05) with OR 1.05 (95% CI , 0.76-1.43). Supporting research such as the Hasanah (2012) study where there was no relationship between consumption of iron tablets and the incidence of anemia ($p > 0.05$) where the most iron needs were met from sources of food intake rather than consumption of iron tablets.

There are other factors not examined in this study that have a greater impact on the incidence of maternal anemia. One of them is the level of consumption of iron (Fe) derived from food cannot be investigated, because in this IFLS 5 there is no source of iron from the respondents' food consumption quantitatively, so researchers have difficulty calculating the amount of iron (Fe) consumed in a day and other substances that can support iron metabolism in the body / enhancer (such as protein, vitamin C), this is useful to assess whether the respondent is sufficient or lacking in daily iron consumption. This theory is in line with Paputungan *et al.* (2016), that there was a significant relationship between iron and protein intake on the incidence of anemia, where the significance value $p = 0.001$ and $p = 0.003$ ($p < 0.05$).

The other outside variables in this study were related to the incidence of maternal anemia, was the location where mother resides. Most of the mothers live in cities (57.89%), they were suffering with anemia by 64.89%. There was a significant relationship between mother's residence and maternal anemia $p 0.006$ ($p < 0.05, 95\% \text{ CI } 0.46-0.88$). Urban mother with a high level of employment make they did not have time to eat breakfast and of course there was a lack of good diet. A working mother with a poor diet could have higher risk of anemia compared to those having good diet. Study by Fitri (2016), shows that there was a significant relationship between diet and anemia in female workers at PT. IKPP $p = 0.011$ ($p < 0.05$). In the study it was stated that the dietary patterns of respondents were not diverse, and the types of food consumed were incomplete.

In this study, mothers living in the village had a protective value for the incidence of anemia of 0.63 times (63%) compared to mothers living in the city. This was because the

mothers who live in the villages of the IFLS 5 respondents were likely to have enough deep energy consumption in a day, so it can reduce the risk of anemia. In line with the research of Setyaningsih, *et al.* (2015), sufficient and balanced daily energy consumption will reduced the risk of anemia with an OR = 0.06 (95% CI 0.01-0.33).

The history of bleeding during childbirth in this study had a significant relationship to the incidence of anemia in the mother ($p = 0.044$) with a confidence level of OR = 1.74 (95% CI 1.01-3.00). In the Solovyova study (2018), anemia was a common condition in women of childbearing age that are associated with a widespread hyperplastic process in the uterus (leiomyomas, etc.) and abnormal and / or excessive uterine bleeding (Abundant Uterine Bleeding). The results of this study found that the average level of hemoglobin in the blood (Hb) varied from 82-145 g / l ($116.2 + 2.3$ g / l). The lowest Hb level was found in women with submucosal localization predominance of 82-99 g / l ($90.8 + 1.6$ g / l). The number of women with anemia was 158 (54.1%).

Other external factors that determine the significance of the incidence of anemia in the mother can be influenced by other factors not examined in this study. As explained earlier, there is a respondent's dietary pattern without the level of food based iron consumption and other substances that can support iron metabolism in the body / enhancer (such as protein, vitamin C) quantitatively every day.

CONCLUSION

There was a significant relationship between mother's residence and the incidence of maternal anemia in Indonesia. In this study, the majority of respondents lived in urban areas (57.89%), with 64.89% were anemic. There was a significant relationship between maternal education and the incidence of maternal anemia in Indonesia. There was a significant relationship between history of bleeding during childbirth and the incidence of maternal anemia in Indonesia. In multivariate analysis, maternal age, ANC visit and number of gravidas did not have a significant relationship to the incidence of maternal anemia.

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