ASSOCIATION BETWEEN KNOWLEDGE AND COMPLIANCE OF TAKING IRON/FOLIC ACID SUPPLEMENTS DURING PREGNANCY

CHRISTIANA R TITALEY[1]*, ENRIKA RAHAYU[1], RITA DAMAYANTI[1,2], DINI DACHLIA[1], RATU AYU DEWI SARTIKA[1,3], AMRY ISMAIL[1], ADHI SANJAYA[4], ELVINA KARYADI[4]

[1]Center for Health Research, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia. [2]Department of Health Education and Behaviour Science, Faculty of Public Health Universitas Indonesia, Depok, Indonesia. [3]Department of Public Health Nutrition, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia. [4]Micronutrient Initative, Indonesia. Email: christiana_rialine@yahoo.com

ABSTRACT

Objective: In Indonesia, pregnant women are recommended to take a minimum of 90 tablets of iron/folic acid (IFA), to prevent iron deficiency anemia. Our analysis aimed at examining the extent to which improved knowledge on IFA supplementation is associated with women's compliance with taking a minimum of 90 IFA tablets during their last pregnancy in four districts in Indonesia.

Methods: Data were derived from a cross-sectional study conducted in four districts, that is, Lebak and Pandeglang District (Banten Province) as well as Purwakarta and Subang District of West Java Province, Indonesia on June 2014. We used information from 436 mothers who delivered their baby in the last 6 months from the time of the survey and received at least 90 IFA tablets during her last pregnancy. Logistic regression analysis was used to examine the role of knowledge after controlling for confounders and other significant predictor on compliance with taking a minimum of 90 IFA tablets during pregnancy.

Result: Significant association was found between knowledge of IFA supplements and compliance. Compared to women with poor knowledge of IFA supplementation, the odds of taking a minimum of 90 IFA tables increased by almost 100% in women with moderate knowledge (adjusted odd ratio [aOR]=1.96, 95% confidence interval [CI]: 1.17-3.30, p=0.011); and by more than four times (aOR=5.42, 95% CI: 1.76-16.68, p=0.003) in women with good knowledge of IFA supplementation. Other factors associated with compliance was attendance in at least four antenatal services (aOR=5.71, 95% CI: 1.28-25.53, p=0.023) and pregnant women experience of no side effects resulting from taking IFA tablets during pregnancy (aOR=2.70, 95% CI: 1.63-4.46, p<0.001).

Conclusions: Efforts to increase women's knowledge on IFA supplementation through community-based education will increase women's compliance of taking IFA supplements. Strengthening counseling services on potential side effects of IFA supplementation and ways to manage them will also help to improve compliance.

Keywords: Iron/folic acid supplementation, Knowledge, Compliance, Indonesia.

INTRODUCTION

Iron deficiency anemia is one of the most common form of undernutrition in both developed and developing countries [1,2]. Children, pregnant, and post-partum women are adversely impacted by iron deficiency anemia [2]. Around 42% of pregnant women experienced anemia and around 50% are due to iron deficiency [3]. The effect of iron deficiency anemia on women and infant have been reported, including increased risk of maternal and neonatal mortality [4-6]. One of the interventions globally conducted to prevent iron deficiency anemia among pregnant women is by providing iron/folic acid (IFA) supplements during pregnancy.

Although pregnant women in Indonesia are recommended to take at least 90 IFA tablets, the 2012 Indonesia Demographic and Health Survey showed that nationally, only 32.7% women taking IFA tablets or syrup for 90 days or more during pregnancy [7]. Similarly, the 2012 Basic Health Survey reported that only 33.3% pregnant women in Indonesia took IFA tablets for at least 90 days [8].

A cross-sectional survey was conducted in June 2014 by Center for Health Research Universitas Indonesia funded by Micronutrient Initiative aimed at examining the coverage and compliance of IFA supplementation among pregnant women in Lebak and Pandeglang District (Banten Province) and Purwakarta and Subang District (West Java Province). This analysis aimed at examining the extent to which improved knowledge on IFA supplementation among those women is associated with their compliance with taking a minimum of 90 IFA tablets during pregnancy in those districts.

METHODS

Data source and study sites
Data were derived from a cross-sectional study conducted from June 06, 2014 to June 22, 2014, in Lebak and Pandeglang District (Banten Province) as well as Purwakarta and Subang District of West Java Province, Indonesia (Fig. 1).

Study design
The survey used a multistage cluster design. At the first stage, 64 clusters (village) were selected using the probability proportionate to size method. From each cluster, one hamlet was randomly selected using simple random sampling method. Household listing was carried out to identify all households and potential respondents living in the selected hamlet. Of the listed potential respondents, 10 women recently delivered in the last 6 months before the survey were randomly selected using systematic random sampling. Household interviews were then carried out to interview selected respondents at their house. Interviews were conducted by local trained interviewers.

Respondents and samples of the study

Respondents of this study were mothers who delivered their baby in the last 6 months from the time of the survey and received at least 90 IFA tablets during her last pregnancy.

This analysis used information collected from 436 mothers, consisted of 67 (15.5%) mothers in Pandeglang; 74 (16.9%) mothers in Lebak; 169 (38.7%) mothers in Purwakarta; and 126 (29%) mothers in Subang.

Outcome variable

The outcome variable is women's compliance with taking a minimum of 90 IFA during her last pregnancy. This variable was constructed based on two questions addressed to mothers who reported that they received any IFA tablets (government and/or private tables) during their last pregnancy. The questions were: (1) "How many government IFA tablets (show the picture of government IFA tablets) did you take when you were pregnant?" (2) "How many private IFA tablets (show the picture of some examples of private IFA tablets) did you take when you were pregnant?" If women mentioned that they took both government and private tablets, the total number of IFA tablets was added.

Main study factor

The main study factor in this analysis is improved knowledge of IFA supplementation is associated with women's compliance with taking a minimum of 90 IFA tablets during their last pregnancy in four districts in Indonesia. This composite variable was constructed based on three questions: (1) "Have you ever heard of iron tablet? (scored '1' if women answered 'yes' and '0' if women answered "no")"; (2) "How many iron tablets should a pregnant woman take during pregnancy? (scored '1' if women answered '90+ tablets' and '0' if women answered '<90 tablets' or 'do not know')"; and (3) "What are the benefits of taking iron tablets during pregnancy? (score '1' was assigned to all correct answers provided, including 'to prevent anemia and its signs,' 'to prevent maternal death,' 'to prevent excessive bleeding at childbirth,' 'to prevent preterm infants,' and 'to prevent low birth weight infants')." The scores from these questions were added and divided into three groups (thirtiles) to represent three categories of knowledge, that is, poor, moderate, and high level of knowledge.

Other covariates

There were four groups of covariates examined: (1) Sociodemographic characteristics; (2) health-care services received during pregnancy; (3) knowledge about anemia; and (4) previous experience with IFA supplementation (Table 1). Variable of knowledge about anemia were constructed based on three variables: (1) Ever heard of anemia (score "1" for yes and "0" for no) and (2) knowledge about sign of anemia (score "1" for all correct answers, such as weakness,pale, tired, drowsiness; and score "0" for all incorrect answers); and (3) knowledge about prevention of anemia (score "1" for all correct answers, such as take IFA tablets or consume iron-rich food; and score "0" for all incorrect answers). The scores were added and divided into three categories of knowledge, that is, poor, moderate, and high level of knowledge. In the group of previous experience with IFA supplementation, two variables were included which were: (1) Age of pregnancy when mother took IFA tablet for the first time and (2) any previous experience of any side effects after taking IFA tablets.

Household wealth index was constructed using the principal components analysis method [9] using 13 variables: Main material of roof, wall, floor, main source of drinking water, ownership of toilet, type of toilet, type of final fecal disposal, and possession of radio, television, telephone or mobile phone, fridge, bicycle, and motorcycle. Using this composite variable, all households were then ranked then divided into quintiles, that is, poorest, poor, middle, rich, and richest.

Data analysis

Frequency distribution of all variables included in this study was examined using contingency tablets. This was followed by logistic
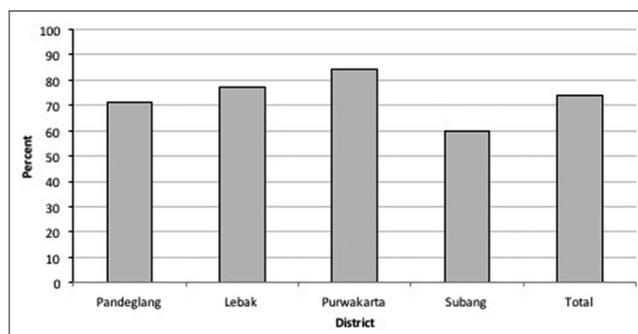

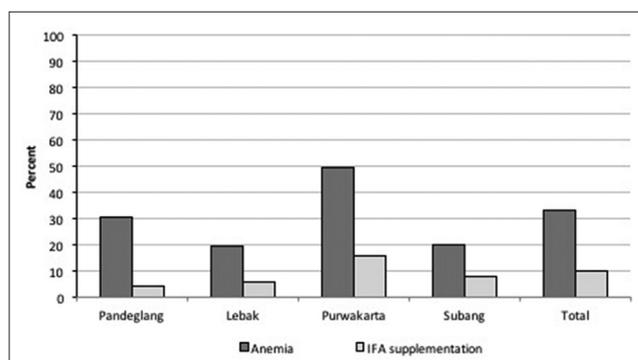**Fig. 1: Consumption of a minimum 90 iron/folic acid tablets during pregnancy by district**

Fig. 2: Knowledge about anemia and iron/folic acid supplementation

regression analyses aimed at assessing the association between study outcome variable and the main study factor. In the first stage of logistic regression analysis, bivariate regression analyses were carried out to examine the relationship between the study outcome and the main study factor as well as other potential predictors, independently. In the second stage, multivariate analyses were performed to assess the association between study outcome and the main study factor after adjusting for both confounders and factors significantly associated with the outcome. The estimated measures of association were assessed using odds ratio (ORs). In the multivariate analyses, we employed backward elimination method to remove factors not significantly related to the study outcome using the significance level of 0.05 as well as non-confounders. Variable representing the district was retained in the final model regardless of its level of significance. In the final model, adjusted OR (aOR) and 95% confidence intervals (95% CIs) were reported for all variables in the model. All estimates were weighted by sampling probabilities taking into account the complex sample design. Stata/MP software (version 14.1; StataCorp) was used for all analyses.

Ethics and research clearance

Ethical clearance for this research was acquired from the Ethics Committee, Faculty of Public Health, Universitas Indonesia. Administrative clearance was obtained from the Ministry of Internal Affairs Republic of Indonesia and National Unity and Community Protection Office (Kesbanglinmas) at provincial and district level. Informed consent from respondents was obtained before the interview.

RESULTS

Our analysis found that of 436 mothers who delivered their baby in the last 6 months from the time of the survey and received at least 90 IFA tablets during her last pregnancy, 73.9% (323 mothers) took at least 90 IFA tablets during pregnancy (71.1% in Pandeglang; 77.1% in Lebak; 84.5% in Purwakarta; and 59.6% in Subang).

The distribution of respondents by sociodemographic characteristics, health services received during antenatal care services, knowledge about anemia, and IFA supplementation as well as experience with IFA supplementation is presented in Table 1. Fig. 2 shows that overall, only 10% of women had high level of knowledge about IFA supplementation; ranging from only 4.3% in Pandeglang to 15.9% in Purwakarta.

After adjusting for all significant predictors, our analyses found a significant association between knowledge of IFA supplementation and women's compliance of taking a minimum of 90 IFA tablets during their last pregnancy. The odds of taking a minimum of 90 IFA tablets among women with moderate level of knowledge were doubled (aOR=1.96, 95% CI: 1.17-3.30, p=0.011) the odds of women with poor level of knowledge. The odds in women with a high level of knowledge were more than 5 times (aOR=5.42, 95% CI: 1.76-16.68, p=0.003) the odds of women with poor level of knowledge. Other factors associated with women's compliance with taking a minimum of 90 IFA tablets were women's attendance in at least four antenatal services (aOR=5.71, 95% CI: 1.28-25.53, p=0.023) and experience of no side effects from taking IFA tablets during pregnancy (aOR=2.70, 95% CI: 1.63-4.46, p<0.001).

Table 1: Frequency distribution of respondents by different characteristics and consumption of a minimum 90 IFA tablets during pregnancy

Variables	n (%)	
	Weighted	**Consumption of a minimum 90 IFA tablets**
Sociodemographic characteristics		
District		
Pandeglang	67.43 (15.46)	47.94 (71.1)
Lebak	73.51 (16.86)	56.64 (77.06)
Purwakarta	168.8 (38.72)	142.6 (84.45)
Subang	126.2 (28.95)	75.22 (59.59)
Age of mother		
≤20 years	62.13 (14.25)	40.71 (65.52)
21-25 years	94.11 (21.58)	64.97 (69.04)
26-30 years	137.6 (31.56)	101.7 (73.92)
31-35 years	92.53 (21.22)	74.68 (80.71)
36+years	49.65 (11.39)	40.33 (81.22)
Education of mother		
No school/incomplete	14.98 (3.43)	11.62 (77.6)
Completed primary school	143.6 (32.93)	109.6 (76.37)
Completed junior high school	126.7 (29.07)	87.41 (68.97)
Completed senior high school	118.9 (27.27)	89 (74.86)
Academy/university	31.83 (7.3)	24.71 (77.62)
Occupation of mother		
Homemaker	380.7 (87.32)	280.1 (73.58)
Working/student	55.29 (12.68)	42.24 (76.41)
Hosehold wealth index		
Q1 richest	144.7 (33.2)	104.3 (72.08)
Q2	91.09 (20.89)	69.91 (76.75)
Q3	69.19 (15.87)	54.3 (78.47)
Q4	74.54 (17.1)	52.14 (69.94)
Q5 poorest	56.44 (12.95)	41.71 (73.89)
Services received during pregnancy		
Number of ANC visit		
<4 ANC	8.11 (1.86)	3.071 (37.88)
4+ANC	427.9 (98.14)	319.3 (74.62)
Type of services received during ANC		
Less variety	202.6 (46.48)	146.8 (72.46)
Good variety	233.4 (53.52)	175.6 (75.23)
Knowledge about anemia and IFA supplementation		
Knowledge of anemia		
Poor	207.4 (47.57)	147.3 (71.01)
Moderate	83.77 (19.21)	57.02 (68.06)
Good	144.8 (33.22)	118.1 (81.54)
Knowledge about IFA supplementation		
Poor	238 (54.58)	152.9 (64.23)
Moderate	154 (35.32)	128.2 (83.21)
Good	44 (10.09)	41.36 (94)
Experience with IFA supplementation		
Time first taking IFA tablets in the last pregnancy		
1st month	92.04 (21.11)	62.66 (68.08)
2nd month	121.8 (27.94)	101.7 (83.45)
3rd month	75.64 (17.35)	55.3 (73.12)
4th month	95.29 (21.86)	68.76 (72.16)
5 month or more	50.17 (11.51)	33.41 (66.6)
Experience of any side effects		
Yes, any side effects	109.7 (25.15)	71.77 (65.44)
No, no side effects	325.3 (74.61)	250 (76.86)
Not taking IFA tablets	1.053 (0.24)	0.59 (56.17)

IFA: Iron/folic acid

The results of univariate and multivariate analysis of factors associated with consumption of a minimum 90 IFA tablets during pregnancy are described in Table 2.

DISCUSSION

Main findings

Our study found that improved knowledge of IFA supplementation was significantly associated with women's compliance of taking a minimum of 90 IFA tablets during pregnancy. The likelihood of taking at least 90 IFA tablets during pregnancy increased along with the increased knowledge of IFA supplementation about whether women had ever heard of IFA tablets, the number of IFA tablets pregnant women should take during pregnancy and the benefits of taking IFA tablets

for pregnant women and their children. Other factors significantly associated with compliance with taking a minimum of 90 IFA tablets during pregnancy were attendance in at least four antenatal care visits and women's experience of no side effects after taking IFA tablets. The results of this study provide insights about factors associated with women's compliance of taking IFA tablets during pregnancy. These factors should be therefore addressed, particularly by health workers to increase use of IFA supplements during pregnancy.

Knowledge of IFA supplementation and compliance with taking IFA supplements

Our study found that improved knowledge of IFA supplementation is associated with women's compliance with taking a minimum of 90 IFA

Table 2: Univariate and multivariate analysis of factors associated with consumption of a minimum 90 IFA tablets during pregnancy

Variable	Univariate			Multivariate		
	OR	95% CI	p	aOR	95% CI	p
Sociodemographic characteristics						
District						
Pandeglang	1					
Lebak	1.23	0.69-2.18	0.480	1.53	0.82-2.85	0.178
Purwakarta	2.07	1.13-3.79	0.019	1.75	0.90-3.40	0.100
Subang	0.64	0.35-1.14	0.129	0.55	0.29-1.03	0.063
Age of mother						
≤20 years						
21-25 years	1.15	0.63-2.11	0.650			
26-30 years	1.32	0.72-2.41	0.376			
31-35 years	1.89	0.92-3.9	0.085			
36+ years	0.9	0.95-4.89	0.067			
Education of mother						
No school/incomplete						
Completed Primary School	1.59	0.57-4.44	0.372			
Completed Junior High School	1.09	0.39-3.05	0.873			
Completed Senior High School	1.38	0.47-4.10	0.557			
Academy/University	1.84	0.43-7.96	0.411			
Occupation of mother						
Homemaker	1.06	0.5-2.24	0.872			
Working/student	2.92	2.34-3.63	0			
Household wealth index						
Q1 richest						
Q2	1.04	0.54-2.02	0.904			
Q3	1.52	0.75-3.09	0.241			
Q4	0.86	0.46-1.60	0.633			
Q5 poorest	0.82	0.44-1.53	0.536			
Services received during pregnancy						
Number of ANC visit						
<4 ANC						
4+ ANC	0.5	1.51-24.90	−0.98	5.71	1.28-25.53	0.023
Type of services received during ANC						
Less variety	0.75	0.43-1.30	0.301			
Good variety	1.67	1.03-3.52	0.038			
Knowledge about anemia and IFA supplementation						
Knowledge of anemia						
Poor						
Moderate	0.86	0.5-1.49	0.593			
Good	1.51	0.91-2.48	0.108			
Knowledge about IFA supplementation						
Poor						
Moderate	2.02	1.25-3.26	0.004	1.96	1.17-3.30	0.011
Good	4.84	1.68-13.95	0.004	5.42	1.76-16.68	0.003
Experience with IFA supplementation						
Time first taking IFA tablets in the last pregnancy						
1st month						
2nd month	1.01	0.53-1.93	0.978			
3rd month	0.63	0.32-1.24	0.182			
4th month	0.56	0.28-1.12	0.100			
5 month or more	0.53	0.25-1.12	0.097			
Experience of any side effects						
Yes, any side effects						
No, no side effects	2.28	1.44-3.57	0.000	2.70	1.63-4.46	<0.001

tablets during pregnancy. This result confirmed findings from other studies showing the role of education, knowledge, and awareness with compliance [10-12].

Increasing women's knowledge and awareness could be conducted through effective counseling about IFA supplementation by health workers, for example, during antenatal care contact [13,14]. Studies showed that inadequate counseling was shown to be a barrier for women to consume IFA tablets [15]. Providing women with clear instructions about the intake of IFA tablet and educate them on the benefits of the tablets will improve compliance [16,17]. Taking into account the important role of health workers in improving compliance, efforts to improve health workers counseling skills is vital. Training or refresher training could target health workers, particularly midwives and cadres who are regularly in a close contact with pregnant women. Such trainings will help to increase their knowledge and skills in conducting health education and counseling to mothers [18].

Furthermore, provision of information, education, and counseling materials was also reported as an effective tool in improving positive health practices [19]. A study conducted in Indonesia reported that providing booklet regarding anemia improves knowledge and compliance with taking IFA tablets during pregnancy [20].

Other factors associated with compliance
This study shows that women who attended at least four antenatal care services were more likely to take a minimum of 90 IFA tablets during pregnancy, as shown other studies [21,12]. This indicates that effort to urge pregnant women to attend antenatal care regularly is important. Health workers and cadres should be encouraged to actively invite women to attend antenatal care through every contact opportunity. Moreover, side effects experienced by mothers due to taking IFA tablets were found as a barrier for compliance. This finding was supported by other studies [16,22]. This highlights the importance of increasing women awareness and knowledge including side effects that might occur after taking IFA tablets and how to overcome them.

Strengths and limitations
This analysis used a large sample size that provides adequate power to examine the role of improved knowledge about IFA supplementation and other potential predicators and compliance with taking IFA supplements during pregnancy. The use of mothers who delivered within the last 6 months before the time of survey will reduce recall bias.

Nevertheless, there are several potential predictors for compliance not available in the dataset, for example, the supply of IFA tablets as well as availability and quality of nutrition counseling and education by health workers. Similar to other cross-sectional surveys, this analysis also has the limitation of showing a cause and effect relationship. However, these limitations are unlikely will reduce the validity of the results of the analyses.

CONCLUSION
Our study confirmed the significant association between level of knowledge about IFA supplementation and women's compliance of taking a minimum of 90 IFA tablets during pregnancy. The compliance increased along with the increase levels of knowledge. This finding shows the need to increase mothers' awareness about IFA supplementation. Strengthening the counseling services to educate mothers about the benefits until the side effects and how to deal with the side effects of IFA supplementation is essential. Efforts to increase health workers' skills in delivering appropriate counseling are also important. The use of IEC materials such as leaflets or posters, could be conducted to provide information to mothers and their family members about IFA supplementation to increase mothers' compliance of taking a minimum of 90 IFA tablets during pregnancy.

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