Magnitude and Determinants of Adherence to Iron Supplementation among Ethiopian Pregnant women: A Cross-Sectional Study from A National Survey

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Abstract

Introduction: Iron supplementation is a crucial strategy to prevent anemia during pregnancy. Studies showed that numerous women have poor iron supplementation adherence. This study determined the magnitude and factors associated with iron supplementation adherence among pregnant women in Ethiopia.

Methods: The data from 2,650 women who participated in the 2016 Ethiopian demographic and health survey was analyzed. Those women who took iron tablets for ≥ 90 days during pregnancy were considered as adherent to iron supplementation while the rest were considered as non-adherent. Descriptive statistics were used to describe the findings and logistic regression was used to determine the association between the dependent and independent variables.

Results: Among 2,650 women, 424 (13.4%) of them took iron tablets for ≥ 90 days. The residents of Tigray, Benishangul and Addis Ababa have higher adherence to iron supplementation. Additionally, early and frequent antenatal care visits were positively associated with adherence to iron supplementation.

Conclusion: In Ethiopia, the adherence of pregnant women to iron supplementation remains unacceptably low. Efforts need to continue to improve the coverage and utilization of antenatal care throughout the country. Additionally, equitable health access should be ensured throughout the country.

Keywords: Iron supplementation, Adherence/Compliance, Antenatal, Determinants, Ethiopia.

Introduction

Anemia is one of the most common public health concern in both developed and developing countries [1]. Due to plenty of factors associated with pregnancy and childbirth, pregnant women are even at higher risk for anemia compared to the general population. World Health Organization (WHO) defined anemia among pregnant women as having of hemoglobin concentration of <11.0 g/dL [2]. According to WHO estimation, 41.8% of pregnant women around the World and 55.8% of pregnant women in Africa are anemic [1]. In the case of Ethiopia, 2016 Ethiopian Demographic and Health Survey (EDHS) showed that the prevalence of anemia among pregnant women was 29% [3]. This makes anemia a moderate public health problem in Ethiopia [2].

In pregnant women iron deficiency, vitamin deficiencies, Human Immunodeficiency Virus (HIV), Tuberculosis, and parasitic infections can cause anemia. However, iron deficiency alone is responsible for at least 50% of the anemia burden in the World [4,5]. Due to the increment of iron deposition in the placenta and fetus, a pregnant woman needs an additional 700-850 mg of iron than a non-pregnant woman [2]. Since it is difficult for most women to obtain this amount of iron from their diet, WHO recommended supplementing pregnant women with 30-60 mg of iron throughout pregnancy [4].

Though efforts have been made to prevent iron deficiency anemia through supplementation of iron tablets during pregnancy, studies showed that mothers' adherence remains low. A large population based study conducted among 22 Sub-Saharan African countries showed that only 28.7% of women took iron supplements for ≥ 90 days during pregnancy [6]. According to the 2016 EDHS, 58% of women did not take any iron supplementation during their last pregnancy while only 5% of the women took iron tablets for ≥ 90 days [3]. A Meta-analysis of 12 studies also showed that the pooled prevalence of compliance with iron-folic acid (IFA) supplementation in Ethiopia was 43.63% [7].

Researches mentioned that different factors could be associated with iron supplementation compliance during pregnancy. These factors can be socio-demographic factors (maternal age, maternal education, place of residence wealth index, maternal employment status, marital status, family size or obstetric factors (number of antenatal care (ANC) visits, no of living children, develop complications during the previous pregnancy, timing of first ANC visit and gravidity [6,8-13].

Though different studies have been conducted in Ethiopia to assess the magnitude and factors associated with iron supplementation adherence, these studies were conducted on a small number of participants and lack representativeness of the general population. Besides, most of these studies were carried out among pregnant women attending ANC services in health facilities which might inflate their findings. Thus, we conducted this study using the 2016 EDHS data to determine the magnitude and factors associated with iron supplementation adherence among Ethiopian pregnant women.

Methodology

Data source and study participants

The data used for this study was obtained from the 2016 EDHS. It was the fourth demographic survey conducted in the country. The EDHS used a two-stage cluster sampling technique to select representative samples. In the first stage, enumeration areas (EAs) were selected while in the second stage households were selected from the chosen EAs. All women between the ages of 15-49 and reside in the selected households were eligible participants. Among the selected 16,583 women from 16,650 households, 15,683 of them were interviewed which resulted in 94.6% of the response rate. Further information about EDHS is available at http://dhsprogram.com/publications/index.cfm.

Among 3,266 mothers who gave birth five years before the survey and received iron tablets during pregnancy, 2,650 of them gave complete information about their socio-demographic characteristics, obstetric history, and the number of days they have taken the iron tablets. In order to increase the representativeness of the findings, EDHS used a weighted

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sample size. In this study, the actual sample sizes were unweighted counts while the percentages were weighted percentages.

Study variable

The outcome variable of this study was adherence to iron supplementation during pregnancy. In EDHS, mothers who gave birth five years before the survey and those reported as they receive iron tablets during their last pregnancy were asked the number of days they have been taken the iron tablets. In our study, we categorize those women who took iron tablets for ≥ 90 days as an adherent to iron supplementation while the rest were considered as non-adherent.

The independent variables were socio-demographic variables (age of mother, region of residence, place of residence, educational level of mothers, occupation of mothers, family size and wealth index) and obstetric related factors (number of ANC visits, the timing of the 1st ANC, gravidity, previous pregnancy complications, birth order, number of living children and distance from health facility).

Though EDHS has seven maternal age categories, we have merged the age category of 45-49 with the age category of 40-44 in order to have an adequate number of participants. The marital status of the women was not also considered since all of the mothers included in our study were married/living with a partner. Family size was defined as the number of usual residents plus the number of visitors who slept in the household the previous night. Gravidity was defined as the total number of pregnancies the mother had before the survey despite the outcome. It was computed as the total number of children ever born plus several previous pregnancies ended as miscarriage, abortion or stillbirth.

Data analysis

Since EDHS uses sample weighting and two-stage cluster sampling, the data was analyzed using SPSS complex samples analysis. Descriptive statistics (frequencies and percentage) were used to describe the findings. To identify factors associated with adherence to iron supplementation during pregnancy, first binary logistic regression was conducted between each of the independent variables and dependent variable. Those variables with P-value <0.2 in binary logistic regression were entered into the final model. Those variables with a P-value <0.05 in multiple logistic regression analysis were considered as the predictor of adherence to iron supplementation during pregnancy.

Results

Socio-demographic characteristics of the study participants

Five hundred and ninety nine (21%) and 823(32.7%) women were found between 20-24 and 25-29 years of age respectively. Four hundred sixty six women were from the Tigray region while 331(28.7%) were from Amhara,

221(25.9%) were from Oromia and 338(22.8%) were from Southern Nation Nationality and People Region (SNNPR) regions. Regarding their place of residence and education, 80.7% of the respondents were residing in rural areas and more than half (53%) of the women had no education. More than one third (38.2%) of the women were living with up to five family members. Nearly one-quarter (24.1%) of the respondents were from the richest wealth index (Table 1).

Obstetric history of the study participants

More than half (55.3%) of the participants had four or more ANC visits. Among those mothers who had ANC visits, 1,060 (35.2%) make their first ANC visit during the first trimester of their pregnancy, 1,395 (55.5%) of them had their first ANC during the second trimester of their pregnancy and the rest 195 (9.3%) women had their first ANC in the third trimester of pregnancy. One thousand one hundred and sixteen (41.3%) women had up to 2 pregnancies, 704 (26.1%), 437 (17.2%), 275 (11.2%) and 118 (4.1%) women had 3-4, 5-6, 7-8 and more than 9 pregnancies. About 62% of mothers had less than four living children, while the rest had four or more living children. Two hundred seventy (9.4%) women had miscarriage, abortion or stillbirth during their previous pregnancies. For 1,112 (46.5%) women, distance to a health facility was a big problem to receive health services (Table 2).

Magnitude and factors associated with adherence to iron supplementation during pregnancy

Among the 2,650 women who were supplemented with iron tablets during pregnancy, 424 (13.4%) of them took the iron tablets for ≥ 90 days. On average, the study participants took iron tablets for about 39.4 ± 1.3 days which is about one iron tablet per week.

During binary logistic regression analysis region of residence, place of residence, maternal level of education, wealth index, number of ANC visits, the timing of ANC visits, number of living children, birth order and distance from a health facility were associated with the outcome variable (P-value <0.2). In the final model, a region of residence, number of ANC visits and timing of 1st ANC visits were significantly associated with adherence to iron supplementation during pregnancy.

Women living in the Tigray region were 2 times more likely to take iron tablets for 90 or more days than women residing in SNNPR [AOR= 2.0, 95% CI (1.2, 3.2)]. Also, the odds of adherence to iron supplementation were higher among women living in Benishangul and Addis Ababa. Pregnant mothers who had 3 ANC visits were 4 times [AOR= 4.0, 95% CI (1.5, 10.7)] more likely to adhere to iron supplementation and women who had 4 or more ANC visits were 6 times [AOR= 6.3, 95% CI (2.3, 16.7)] more likely adhere to iron supplementation than women who had 1 ANC visit. Those mothers who registered for ANC during the first

Table 1: Socio demographic characteristics of the study participants (n= 2,650).

Variables	N (%)
Age of mother	
15-19	129 (4.5)
20-24	599 (21.0)
25-29	823 (32.7%)
30-34	543 (20.6)
35-39	368 (13.5
40-49	188 (7.6)
Place of region	
Tigray	466 (12.8)
Afar	173 (0.8)
Amhara	331 (28.7)
Oromia	221 (25.9)
Somali	176 (2.3)
Benishangul	241 (1.4)
SNNPR	338 (22.8)
Gambela	143 (0.3)

Harari	179 (0.3)
Addis Ababa	198 (4.1)
Dire Dawa	184 (0.6)
Place of residence	
Urban	781 (19.3)
Rural	1869 (80.7)
Mother's educational level	
No education	1306 (53.0)
Primary	847 (32.0)
Secondary	303 (9.3)
Higher	194 (5.7)
Mother's occupation	
Not working	1390 (52.5%)
Working	1260 (47.5%)
Family size	
≤3	450 (16.4)
4-5	981 (38.2)
6-7	738 (29.3)
8-9	353 (12.0)
≥ 10	128 (4.1)
Wealth index	
Poorest	582 (15.4)
Poorer	441 (20.6)
Middle	381 (19.2)
Richer	384 (20.7)
Richest	862 (24.1)

Table 2: Obstetric characteristics of the study participants (n= 2,650).

Variables	n(%)
Number of ANC visits	
1	149 (4.8)
2	290 (11.5)
3	643 (28.3)
≥ 4	1568 (55.3)
Timing of 1st ANC	
1st trimester	1060 (35.2)
2nd trimester	1395 (55.5)
3rd trimester	195 (9.3)
Gravidity	
Primigravida	585 (22.1%)
Multigravida	2065 (77.9%)
Number of living children	
<4	1655 (61.7)
≥ 4	995 (38.3)
Birth order	
1	624 (23.1)
2	536 (19.2)
3	378 (14.9)
4	318 (11.8)
≥ 5	794 (31.0)
Pervious pregnancy complications	
No	2380 (90.6)
Yes	270 (9.4)
Distance from health facility	
Big problem	1112 (46.5)
Not a big problem	1538 (53.5)

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Table 3: Factors associated with iron supplementation during pregnancy in Ethiopia.

Variables	COR (95% CI)	AOR (95%CI)	P-value
Place of region			
SNNPR	Ref	Ref	
Tigray	2.2 (1.4, 3.5)	2.0 (1.2, 3.2)	
Afar	1.0 (0.5, 2.1)	1.0 (0.4, 2.4)	
Amhara	1.0 (0.5, 1.9)	1.0 (0.6, 2.0)	
Oromia	1.0 (0.5, 1.7)	1.0 (0.6, 1.8)	
Somali	0.8 (0.4, 1.7)	1.0 (0.5, 2.3)	0.03
Benishangul	2.5 (1.5, 4.3)	2.4 (1.4, 4.3)	
Gambela	0.6 (0.3, 1.3)	0.5 (0.2, 1.0)	
Harari	1.4 (0.8, 2.5)	1.2 (0.7, 2.4)	
Addis Abeba	3.4 (2.1, 5.5)	2.2 (1.2, 4.0)	
Dire Dawa	1.3 (0.7, 2.2)	1.0 (0.5, 1.8)	
Timing of 1st ANC			
1st trimester	11.2 (3.9, 32.5)	5.0 (1.6, 15.6)	
2nd trimester	7.0 (2.4, 20.3)	3.8 (1.3, 11.7)	0.05
3rd trimester	Ref	Ref	
Number of ANC visits			
1	Ref	Ref	
2	2.6 (0.8, 8.4)	2.6 (0.8, 8.2)	
3	4.6 (1.7, 12.3)	4.0 (1.5, 10.7)	<0.01
≥ 4	9.4 (3.7, 24.4)	6.3 (2.3, 16.7)	

trimester had 5 times higher odds [AOR= 5.0, 95% CI (1.6, 15.6)] of adhering to iron supplements than women who initiate ANC during the third trimester of pregnancy. Additionally, women who started ANC follow up during the 2nd trimester of pregnancy were 3.8 times [AOR= 3.8, 95% CI (1.3, 11.7)] more likely to take the recommended dose of iron supplement compared to women who started ANC follow up during the third trimester of pregnancy (Table 3).

Discussion

Our study was conducted to determine the magnitude and factors associated with iron supplementation adherence among Ethiopian pregnant women. The study showed that only 13.4% of pregnant women had taken iron supplementation for 90 or more days during pregnancy. During multiple logistic regression analysis we have found that region of residence, number of ANC visits and timing of 1st ANC visits were significantly associated with adherence to iron supplementation during pregnancy.

The magnitude of compliance to iron supplementation in our study was low compared to other studies. A systematic review and Meta analysis study by Workineh et al. showed that the overall prevalence of compliance with iron-folic acid supplementation was 43.63% [7]. Another systematic review and Meta analysis research by Desta et al. also showed that 46.15% of Ethiopian women had adhered to iron and folic acid supplementation [14]. This difference could be explained by the fact that most of the studies included in both Meta analysis were conducted among pregnant women attaining health facilities for ANC checkups. It is possible that those women were exposed to information on the importance of iron supplementation which in turn increases their utilization. The other reason could be that most of the studies excluded emerging regions like Afar and Somali. Since these regions are disadvantageous in many aspects of health services it might have decreased the magnitude of compliance to iron supplementation in our study. Additionally, our finding could be affected by recall bias since it involves mothers who gave birth five years before the survey.

In our study, women residing in Tigray, Benishangul and Addis Ababa had a higher adherence rate for antenatal iron supplementation than women in SNNPR. This might be because ANC coverage in these regions was high. According to the 2016 EDHS, 90% of mothers in Tigray and 96.8% of mothers in Addis Ababa had at least one ANC visit during pregnancy [3]. It is more likely that women who had ANC had knowledge about the importance of iron supplementation.

Our study showed that the timing of the first ANC visit was one of the important predictors for the duration of iron intake during pregnancy. This finding was in accordance with previous studies. The study conducted at the University of Gondar Hospital indicated that mothers who made the first ANC visit during the first trimester of pregnancy were 2.4 times more likely to adhere to IFA supplementation during pregnancy. Another study conducted in Debre Tabor General Hospital also showed that mothers who started ANC follow-up before 16 weeks of gestation were 3.67 times more likely to be adherent to IFA supplementation [12]. This finding can be explained by the fact that women who initiate ANC at the early stages of pregnancy could also be made frequent ANC visits. This could increase their knowledge about iron supplementation and result in higher utilization.

Furthermore, our study revealed that those women who had frequent ANC visits were more likely to take iron tablets for the recommended period of time. This finding was similar to studies conducted in Tigray [9] and Misha district [10]. Additionally, a study conducted in eight rural Woredas of Ethiopia revealed that those women who had less than four ANC visits were less likely to adhere to iron supplementation [15] A Meta analysis studies also indicated that having four or more ANC visits increased the compliance of mothers to iron supplementation [7,14]. The possible reason could be that those mothers who had repeated ANC might be exposed to repeated counseling on anemia and iron supplementation benefits. Additionally, they might have a chance to discuss how to manage its side effects.

Our study has both strengths and limitations. As a strength, we used national survey data which was representative for all mothers in Ethiopia. Additionally, EDHS is one of the national surveys with acceptable data quality. However, the findings of this study should be interpreted with caution due to its limitations. The first limitation was that the study participants were those women who gave birth five years before the survey. This could cause a recall bias on the number of days that iron tablets were taken. The other limitation was that essential variables such as knowledge about anemia and iron supplementation and the reasons for not taking iron tablets for the recommended period of time were not available in the survey. Thus, it was impossible to assess the relationship between those variables and adherence to iron supplementation.

Conclusion

Though iron deficiency anemia is a moderate public health problem in Ethiopia, adherence to iron supplementation during pregnancy was low.

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In our study, a region of residence, timing of first ANC and number of ANC visits were found to be the predictors of adherence to antenatal iron supplementation. The 2016 EDHS showed that only 32% of pregnant women had four or more ANC visits and 20% of women had their first ANC during the first trimester of pregnancy [3]. This implies as a country, Ethiopia should improve the coverage and utilization of ANC service to increase the intake of iron supplementation during pregnancy. Also, efforts should be made to ensure mothers residing in different regions have equal access to maternal health services.

Ethical guidelines

The methods used in EDHS were performed in accordance with the relevant guidelines and regulations. Federal Democratic Republic of Ethiopia Ministry of Science and Technology and the Institutional Review Board of ICF International approved the overall survey protocol (both questionnaire and biomarker data collection protocols) of EDHS. Participation in the survey was voluntary and written informed consent was secured from each of the study participants. All data files from 2016 EDHS were stored on a password protected computer in Central Statistics Agency (CSA) central office to assure the confidentiality of the data.

Authors' contributions

YBB and GAL came up with the research idea, extract, analyze and interpret the data. AFG and MKM were responsible for the preparation of the manuscript. All of the authors agreed to take accountability regarding all aspects of the work after reading the manuscript.

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