

**ADHERENCE AND ASSOCIATED FACTORS ON IRON FOLATE SUPPLEMENT USE AMONG PREGNANT WOMEN ATTENDING ANTENATAL CARE IN SELECTED HEALTH FACILITIES OF BAHIR DAR TOWN, NORTHWEST ETHIOPIA 2015.**

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**ABSTRACT**

**Introduction:** Iron-deficiency anemia is the most common micronutrient deficiency in the world, affecting more than two billion people globally and more specifically pregnant women. Anemia is estimated to contribute to more than 115,000 maternal deaths and 591,000 perinatal deaths globally per year. But adherence rate to iron folate supplement to prevent anemia remains very low. **Objective:** To

assess rate of adherence and associated factors on iron folate supplement use among pregnant women attending antenatal care in selected health facilities of Bahardar town, Amhara, Ethiopia. **Method:** An institution based cross sectional study which comprised 395 study participants was conducted. Data was entered to Epi-info and transported to SPSS for data analysis. Descriptive statistics was computed and multivariate logistic regression analysis was performed to identify the factors associated with adherence to IFA use. Associations between adherence to IFA and predictors was summarized by using crude odds ratio (COR), adjusted odds ratio (AOR) and statistical significances was tested by Wald chi-square test at 95% confidence interval (CI). COR and AOR were reported with 95% CI. All tests were two-

sided and  $p$ -value  $< 0.05$  was considered statistically significant. **Result:** The rate of self-reported adherence to iron folate supplement use among pregnant women attending antenatal care clinics of Baharedare town was 41.5%. The independent predictors for maternal adherence to iron folic acid supplement use were parity (multiparous [AOR=2.28, CI 1.12-4.69] and primiparous [AOR=3.45, CI 1.73-6.89]), presence of IFA supplement intake side effects [AOR=7.53, CI 4.48-12.67] and obtaining any encouragement from family member to take their daily IFA tablets [AOR=2.48, CI 1.41-4.37]. **Conclusion:** Adherence to IFA supplement utilization is still very low in the study area. Parity, presence of encouragement from family member and side effects of the IFA supplement/tablet were significantly associated to adherence to supplement use. An effort to minimize the tablet related side effects and health education to improve encouragement from family member and educate mothers during their ANC visit on the benefits of taking IFA supplement as well as promotion and strengthening of ANC service to increase adherence should be considered.

## 1. INTRODUCTION

Pregnancy places a higher demand for iron on woman's body both as her own blood volume expand to carry the pregnancy and her child demands for normal development, and as this increased demand is not supplied enough it results in anemia.<sup>[1]</sup> Anemia, defined as blood hemoglobin level below established cut-off points, is a pervasive global public health problem. An estimated 2 billion people are affected, or more than one third of the world's population. Anemia is the most common disease and one of the leading causes of adverse maternal and foetal outcomes during pregnancies.<sup>[2]</sup> Iron deficiency anemia contributes to low birth weight, lowered resistance to infection, poor cognitive development and reduced work capacity. Pregnant and postpartum women and children aged 6–24 months are usually the most affected groups.<sup>[3]</sup>

Anemia is a condition in which the number of red blood cells (and consequently their oxygen-carrying capacity) is insufficient to meet the body's physiologic needs. Iron deficiency is thought to be the most common cause of anemia globally, but other nutritional deficiencies (including folate, vitamin B12 and vitamin A), acute and chronic inflammation, parasitic infections, and inherited or acquired disorders that affect hemoglobin synthesis, red blood cell production or red blood cell survival, can cause anemia.<sup>[4]</sup>

The devastating consequences of anemia in women range from increased fatigue, decreased cognitive ability, decreased work productivity and consequent economic costs of increased

morbidity and mortality. Folic acid deficiency during pregnancy, apart from the neural tube defects (NTDs), has also been reported associated with increased risk of preterm delivery, low birth weight and foetal growth retardation.<sup>[6,7]</sup>

Iron deficiency is the most prevalent nutritional deficiency and the major cause of anemia worldwide. The world health organization (WHO) estimates that iron deficiency is responsible for approximately 50% of all anemia cases.<sup>[2]</sup> Anemia is a global public health problem affecting both developing and developed countries with major consequences for human health as well as social and economic development. It occurs at all stages of the life cycle, but is more prevalent in pregnant women and young children. In 2002, iron deficiency anemia (IDA) was considered to be among the most important contributing factors to the global burden of disease.<sup>[5]</sup> Anemia prevalence is highest in developing countries. Although both males and females of all ages are affected, the most vulnerable groups are pregnant women and young children.

Currently the global prevalence of anemia is estimated to be 30.2% in non-pregnant women rising to 41.8% during pregnancy. Anemia prevalence among pregnant women is around 24.1% in the Americas, 48.2% in South East Asia, 25.1% in Europe, 44.2% in East Mediterranean, 30.7% in West Pacific and highest in Africa at 57.1%.<sup>[8, 9]</sup> In Ethiopia, 17% of reproductive age women are estimated to be anemic and particularly 22% of pregnant women are anemic. According to Ethiopian Demographic Health Survey (EDHS) 2011, the coverage of iron supplementation is disappointingly low as only 17.3% of women took the supplement during their recent pregnancy in the preceding 5 years and only 0.4% were supplemented for 90 or more days. Despite the assumption that iron supplementation is an integral part of Antenatal Care (ANC), only 37% of women who had ANC received iron supplements.<sup>[8, 10]</sup> A rapid, initial assessment on distribution and consumption of IFA tablets among pregnant women through ANC clinics which was conducted on four selected regions (Tigray, Amhara, Oromia and SNNP regions) revealed that result of Tigray region indicates that the rate of consumption of IFA tablets reported in the previous pregnancy was less than 4% which is very low.<sup>[23]</sup>

Most countries in Sub-Saharan Africa, including Ethiopia, have a national policy to prevent and treat anemia in pregnancy. This includes the provision of haematinics (ferrous sulphate and folic acid) to all pregnant women. In Ethiopia, iron/folate supplementation is the main strategy for anemia control and prevention. According to the WHO and Ethiopia's national

guidelines for control and prevention of micronutrient deficiencies, all pregnant women should receive and consume a standard dose of 60mg iron + 400 µg folic acid daily for 6 months starting from the first month of pregnancy or at the time of their first antenatal visit. However, adherence rate remains very low and effectiveness and success of such interventions depends on the adherence of the Iron folic acid tablets.<sup>[11, 12]</sup>

Iron deficiency anemia is the most widespread nutritional problem among women and has severe consequences for both their productive and reproductive roles. Maternal mortality rates, infant mortality rates and the incidence of prematurity among anemic women are significantly higher. Iron deficiency anemia is often associated with inadequate maternal weight gain and labor and delivery complications with an increased risk of maternal mortality.<sup>[13]</sup> Anemia is one of the world's most widespread health problems. It affects more than 2 billion people worldwide – one third of the world's population and is a significant public health problem throughout the developing world. In almost all developing countries, between one-third and one-half of the female and child populations are anemic. Prevalence among pregnant women and children under 2 years of age (the groups at highest risk) is typically more than 50 percent.<sup>[14]</sup>

Among women, iron deficiency prevalence is higher than among men due to menstrual iron losses and the extreme iron demands of a growing fetus during pregnancies, which are approximately two times the demands in the non-pregnant state. Worldwide, it is estimated that about 20% of maternal deaths are caused by anemia; in addition, anemia contributes partly to 50% of all maternal deaths. First, anemia reduces women's energy and capacity for work and can therefore threaten household food security and income. Second, severe anemia in pregnancy impairs oxygen delivery to the fetus and interferes with normal intra-uterine growth, resulting in intrauterine growth retardation (IUGR), stillbirth, and low birth weight (LBW) and neonatal deaths. Therefore, anemia is a major contributor to poor pregnancy and birth outcomes in developing countries as it predisposes to premature delivery, increased perinatal mortality and increased risk of death during delivery and postpartum.<sup>[15]</sup>

The consequences of anemia in women are enormous as the condition adversely affects both their productive and reproductive capabilities. In fact, women with severe anemia in pregnancy have a 3.5 times greater chance of dying from obstetric complications compared with non-anemic pregnant women.<sup>[6]</sup> Anemia has also major consequences on human health as well as social and economic development. Anemia is the world's second leading cause of

disability and is responsible for about 1 million deaths a year, of which three-quarters occur in Africa and South-east Asia.<sup>[16]</sup> In terms of lost years of healthy life, iron deficiency anemia causes 25 million cases of Disability Adjusted Life Years (DALYs); this accounts for 2.4 per cent of the total DALYs worldwide.<sup>[17]</sup> In the WHO/World Bank rankings, iron deficiency anemia (IDA) is the third leading cause of DALYs lost for females aged 15–44 years.<sup>[18, 19]</sup>

Children and women of reproductive age are most at risk, with global anemia prevalence estimates of 47% in children younger than 5 years, 42% in pregnant women, and 30% in non-pregnant women aged 15–49 years. Africa and Asia account for more than 85% of the absolute anemia burden in high-risk groups.<sup>[20]</sup> Anemia is estimated to contribute to more than 115,000 maternal deaths and 591,000 perinatal deaths globally per year. Analysis of data on global prevalence shows that anemia is disproportionately concentrated in low socioeconomic groups, and that maternal anemia is strongly associated with child anemia.<sup>[21]</sup>

According to 2011 EDHS, <1% women took iron tablets for at least 90 days during their last pregnancy and 17% of women has anemia of any form while 44% children and 4 out of 10 infants of 6-59 months are anemic. As estimated that about 20% of maternal deaths are caused by anemia and consequently there were 37 neonatal, 22 post neonatal, 46 perinatal, 59 infant, 31 child and 88 under five deaths out of 1000 live births. The maternal mortality rate is about 676 deaths out of 100,000 which range from 541 to 810.<sup>[10]</sup>

Adherence describes the degree to which a patient correctly follows a medical advice. Many experts believe that one of the main reasons that national iron supplementation programs have failed is women's "non-compliance".<sup>[13]</sup> Many researches suggests that adherence to IFA is the result of rational decision-making by the patient about the costs and benefits of prescribed actions, depending upon many factors including individual's socio-demographic, economic, cultural, obstetric, knowledge about benefits IFA intake, tablet related issues, personal (patient) and behavioral factors etc. However studies showed that there is inconsistency regarding adherence prevalence in different parts of the world.<sup>[24, 40, 30]</sup> Factors influencing adherence to these supplements, however, remain unknown. Exploring these factors and improving adherence is therefore, essential for prevention and control of anemia, to make iron supplementation programs successful and the knowledge is also fundamental to planning and execution of effective interventions by health authorities. Thus the purpose of this study was to assess the status of adherence and factors associated with utilization of iron

folic acid supplementation among mothers during pregnancy in Bahardare town, Amhara, Ethiopia.

## 2. METHODS

### Study area, period and Study design

The study was conducted in Bahir dar town, one of the towns found in Amhara national regional state, in, Northwest Ethiopia. It is located at 595 km from the capital of Ethiopia, Addis Ababa. The study area has a total population of the town is 129,000 of which 67, 854 (52.6%) were male, and the rest 61, 146(47.4%) were female. Among these, 4, 257 (3.3%) were pregnant women.<sup>[53]</sup> The study area is characterized by household food insecurity The total numbers of kebeles were 24. The total number of expected pregnancies during the study period is 77362. The town is found at an altitude of 2470 to 2550 meters above sea level and the temperature ranges from 15-17 °c. There are 10 sub cities in the town. At present there are five hospitals (one public referral, one public general and three private hospitals), eight health centers and twenty seven private clinics. The major agricultural products found in Bair dar town are teff, cereals, grains, vegetables, fruits, roots, animal products like meat, poultry and milk and milk products. ANC coverage of the town is 92%.

### Sampling size determination, Sampling technique and procedure

The sample size for this study was determined using single population proportion by assuming an expected adherence rate (P) for iron folate supplement use of 37.2%<sup>[42]</sup>, 95% confidence level, 5 % margin of error (d) and a non-response rate of 10%.

$$n = \frac{Z_{\frac{\alpha}{2}}^2 * P * (1 - P)}{d^2}$$

Therefore, by adding 10% of non-response rate, the total sample size was 359+36=395.

Therefore, the total sample size required for this study was 395. This study was done on 1 hospital and 5 health centers which were selected randomly from the total of 12 health facilities that are providing maternal and child health (MCH) service. The calculated sample size was proportionally allocated to these 6 randomly selected health facilities using the annual plan of ANC follow up visit. Consecutive sampling method was used to select the study individual from each health facility until the required sample size was obtained.

## **Data collection technique and procedures**

### **Data collection tool**

Data was collected using structured and pretested questionnaire. A questionnaire was developed after reviewing of different literatures of similar studies. It was prepared first in English language and then translated into Amharic and then was translated back to English to check its simplicity and consistency. Finally the questionnaires were administered both Amharic language. A total of Four (two midwives and two laboratory technical) trained data collectors and two BSc Nurse supervisors with a minimum of one year work experience including the principal investigator was involved in the data collection. The questionnaire was used to assess the socio-economic and demographic characteristic, reproductive factors, dietary pattern and dietary diversity assessment, and anthropometric measurements.

### **Data quality control**

Training was given to the data collectors and supervisors for two days on the objective, relevance of the study, confidentiality of information, respondent's right, about pre-test, informed consent and techniques of interview, and how to interview the subjects and record responses accurately and uniformly. Before going to data collection, pretest was conducted in adjacent health center which was not selected for actual study to ensure the validity of the survey tool and to standardize the questionnaire and the questionnaire was modified after pretest. The supervisor and the principal investigator were made frequent checks on the data collection process to ensure the completeness and consistency of the gathered information and errors found during the process were corrected.

### **Data analysis**

Data was first coded and entered in Epi Info version 3.5.1 software and exported to the SPSS version 20.0 software for analysis. Descriptive statistics was computed using standard statistical parameters such as frequencies, percentages, graphs, mean (+SD) for continuous normally distributed data and median (IQR) for continuous not normally distributed data.

Binary logistic regression analysis was performed to see the independent effect of predictors on adherence to IFA use. Bivariate logistic regression analysis was used to select potential candidates for the full model; variables that fulfill the P-value  $\leq 0.25$  were potential candidates for the full model. Multivariable binary logistic regression analysis was performed to identify the independent effect of predictor's on IFA adherence status after controlling for potential confounders. Associations between adherence to IFA and independent predictors



was summarized using Crude odds ratio (COR), Adjusted odds ratio (AOR) with 95% confidence interval (CI). All tests were being two-sided and p-value < 0.05 will be considered statistically significant.

### 3. RESULT

#### 3.1 Socio-demographic and economic characteristics of study participants

A total of 395 pregnant mothers who came for their antenatal follow up at Bahir Dar town were enrolled in this study, with a response rate of 100%. The mean age was 28.07 ( $\pm$  6.09 SD) years. Above eight in ten (82.8%) were Orthodox in religion and almost all (98.5%) were married. Two third of the mothers were primary or secondary level of education. More than nine in ten (91.9%) were urban residents. Above four in ten of the mothers were housewives and about nine in ten (89.4%) had less than 5 family size. About three fourth of the mothers had greater than 2000 birr monthly income (Table 1).

**Table 1: Socio-demographic and economic characteristics of pregnant women attending antenatal care at governmental health institutions of Bahir Dar town, 2015. (n=395)**

Variables	Frequency	Percent
Age		
≥25 years	238	60.3%
<25 years	157	39.7%
Religion		
Orthodox	327	82.8%
Muslim	56	14.2%
Protestant	5	1.2%
Catholic	7	1.8%
Marital status		
Married	389	98.5%
Divorced	2	0.5%
Widowed	3	0.8%
Single	1	0.2%
Mothers educational status		
No formal education	21	5.3%
Primary	122	30.9%
Secondary	144	36.5%
Above secondary	108	27.3%
Residence		
Urban	363	91.9%
Rural	32	8.1%
Mother occupation		
House wife	175	44.3%
Government employee	83	21%
Private employee	67	17%



Student	49	12.4%
Others	21	5.3%
Husband education		
No formal education	5	1.3%
Primary	48	12.3%
Secondary	115	29.6%
Above secondary	221	56.9%
Husband occupation		
Government employee	159	40.9%
Private employee	58	14.9%
Self employee	138	35.5%
Others	34	8.7%

**Table 1: Socio-demographic and economic characteristics of pregnant women attending antenatal care at governmental health institutions of Bahir Dar town, 2015. (n=395)**

Variable	Frequency	Percent
Family size		
< 5	353	89.4%
≥5	42	10.6%
Income		
<1000	44	11.1%
1001-2000	60	15.2%
≥2001	291	73.7%

## 5.2 Obstetric and Medical history of study participants

From a total of all respondents almost all were in their second and third trimester (99.2%) of gestational age. About three fourth of the mothers (75.4%) were multi gravid whereas more than four out ten (47.1%) and more than a quarter of the mothers (28.6%) were multiparous and nulliparous respectively and the rest (24.6%) were primiparous. Around seven out of ten of the respondents (69.1%) were registered for a ANC after 16 weeks of gestation (late registration). Only two out of ten of mothers (20.5%) follow the recommended ANC visit (≥4 visits). More than five out of ten of mothers (58.7%) were diagnosed and treated for other diseases other than anemia during their ANC visit (Table 2).

**Table 2 Obstetric and medical history of pregnant women attending antenatal care at governmental health institutions of Bahir Dar town, 2015. (n=395)**

Variables	Frequency	Percent
Gestational age(Trimester) at current visit		
First	3	0.8%
Second	149	37.7%
Third	243	61.5%
Gravidity		
Primigravida	97	24.6%
Multigravida	298	75.4%
Parity		
Nulliparous	113	28.6%
Primiparous	96	24.3%
Multiparous	186	47.1%
GA when first register for ANC		
Late (>16 weeks)	122	30.9%
Early(<16 weeks)	273	69.1%
ANC visit		
2	196	49.6%
3	118	29.9%
≥4	81	20.5%
Any other disease other than anemia		
Yes	232	58.7%
No	163	41.3%

### 5.3 Health service related characteristics, mother's knowledge status on anemia and benefits of IFA tablets.

Majority of the respondents (93.2%) were in their second and third trimester of gestational age when their Hgb level was first recorded on ANC register. Based on the previous and current Hgb level more than two out of ten of mothers (27.6%) and one out of ten of mothers (14.9%) were anemic respectively. The mean Hgb concentration of the previous and current ANC visit was  $12.05 \pm 1.30$  SD and  $12.39 \pm 1.08$  SD respectively. About nine out of ten (96.5%) of the respondents were obtained nutrition counseling from health workers in their previous ANC visits and more than six out of ten of mothers (64.3%) had given information on iron folate supplement use during the nutrition counseling session. Almost all respondents obtained adequate IFA tablets during their ANC visit, but only around two out of ten of the mothers (19.5%) were participated in community conversation related to health. About nine out of ten of (89.4%) respondents required less than 30 minutes time to reach at health facilities but around seven out of ten (73.4%) required more than 30 minutes (waiting time) to get services. Regarding mother's knowledge of anemia and IFA, more than five out ten

(55.4%) and about half of the mothers (50.9%) did not have satisfactory knowledge respectively (Table 3).

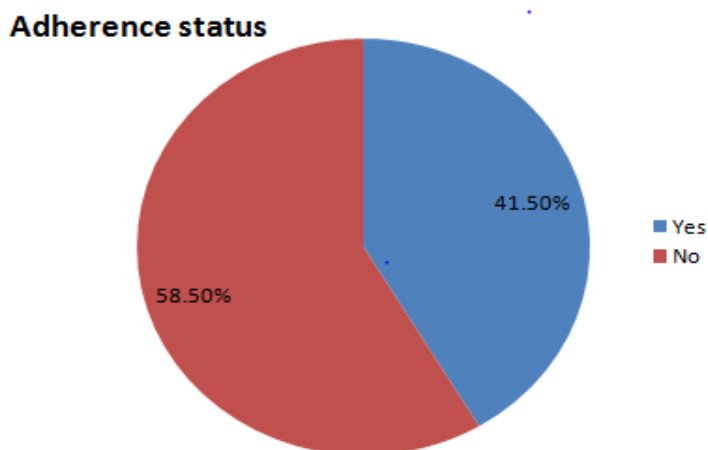
**Table 3: Health service related characteristics, mother's knowledge status on anemia and benefits of IFA tablets of pregnant women attending antenatal care at governmental health institutions of Bahir Dar town, 2015. (n=395)**

Variables	Frequency	Percent
GA (trimester) when Hgb was first recorded		
First	153	38.7%
Second	215	54.4%
Third	27	6.8%
Previous Hgb level and anemia status		
Anemia	109	27.6%
Non anemic	286	72.4%
Current Hgb level and anemia status		
Anemic	59	14.9%
Non anemic	336	85.1%
Nutrition counseling		
Yes	381	96.5%
No	14	3.5%
Information on IFA		
Yes	254	64.3%
No	141	35.7%
Obtain adequate IFA		
Yes	393	99.5%
No	2	0.5%
Community participation		
Yes	77	19.5%
No	318	80.5%
Time to reach HF		
≤30 minutes	353	89.4%
>30 minutes	42	10.6%
Waiting time at HF		
≤30 minutes	105	26.6%
>30 minutes	290	73.4%
Knowledge about anemia		
Satisfactory	176	44.6%
Non satisfactory	219	55.4%
Knowledge about IFA		
Satisfactory	194	49.1%
Non satisfactory	201	50.9%

#### 5.4 Self-reported adherence status and other characteristics of study participants

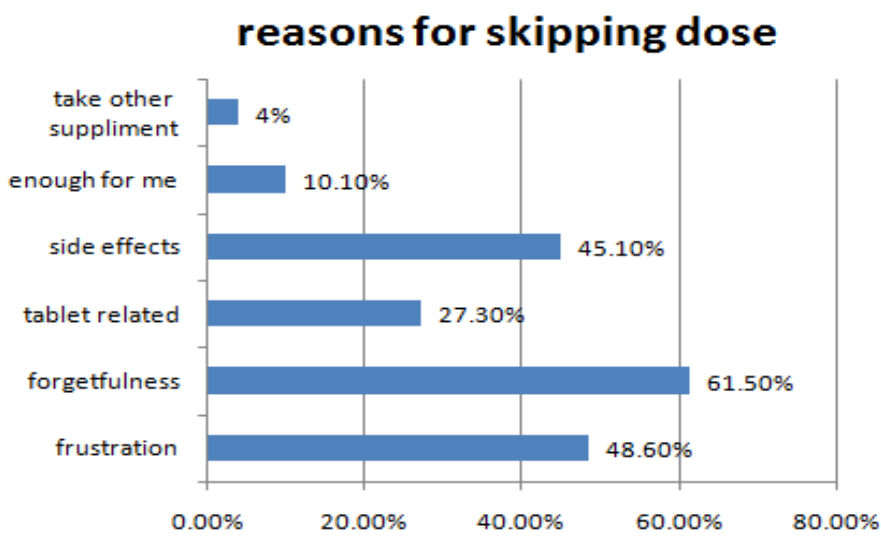
About four out of ten (41.8%) and more than five out of ten (54.9%) of the respondents were in second and third trimester of gestational age when they first receive IFA supplement.

Almost all participants (100%) used IFA tablet in the last previous month but only four out of ten mothers (41.5%) adhered to the IFA supplement use (Figure 3). More than half (55.2%) of the respondents did not obtained any encouragement to take their supplement daily from their family member (Table 4).



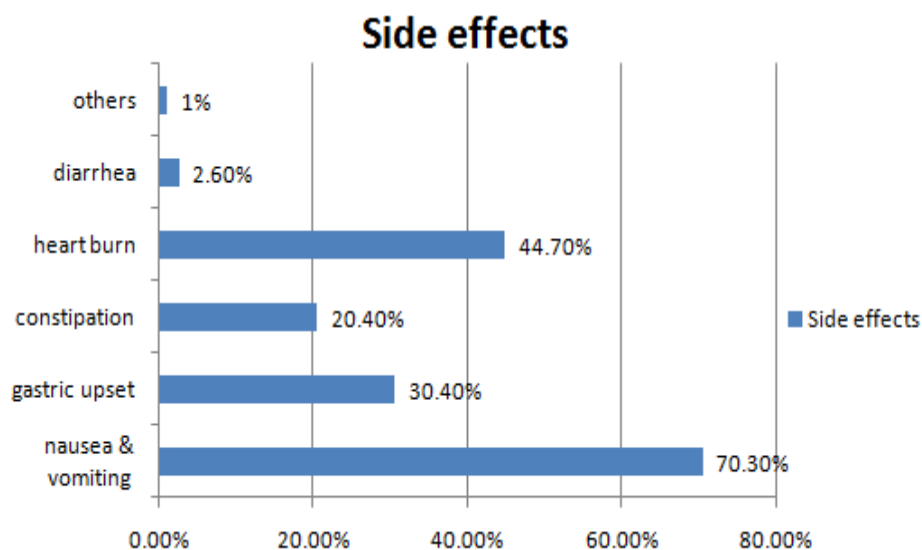
**Figure 1: Adherence status of pregnant women to IFA supplement use attending antenatal care at governmental health institutions of Bahir Dar town, 2015.**

Among the major reasons for not taking IFA supplement daily were forgetfulness to take daily (61.5%), frustration of having to take many tablets (48.6%), due to side effects (45.1%) tablet related issues like taste, size, color, coating etc (27.3%) and thinking that it is enough for them (10.1%) (Figure 4).



**Figure 2: Reasons for skipping IFA dose among pregnant women to IFA supplement use attending antenatal care at governmental health institutions of Bahir Dar town, 2015**

About eight out of ten of the mothers (79%) reported the presence of IFA intake side effects and the major specific intake side effects reported were nausea and vomiting (70.3%), heart burn (44.7%), gastric upset (30.4%) and constipation (20.4%) (Figure 5).



**Figure 3: Common side effects responded to IFA dose among pregnant women to IFA supplement use attending antenatal care at governmental health institutions of Bahir Dar town, 2015.**

**Table 4: Self-reported adherence status of mothers to IFA tablets and other characteristics of pregnant women attending antenatal care at governmental health institutions of Bahir Dar town, 2015 (n=395).**

Variables	Frequency (n=395)	Percent
GA when first receive IFA		
First	165	41.8%
Second	217	54.9%
Third	13	3.3%
Use IFA tab in the last month		
Yes	395	100%
No	0	0%
Adherence to IFA supplement use		
Yes	164	41.5%
No	231	58.5%
Encouragement		
Yes	177	44.8%
No	218	55.2%

### 5.5 Analysis of factors associated to iron folate supplement use among pregnant women attending antenatal care

On bivariate logistic regression analysis; mother's age, religion, residence, mothers occupational status, parity, ANC visits, current Hgb level, anemia status, given any information on IFA supplement use during nutrition counseling, waiting time at health facility, knowledge of anemia and IFA supplement tablets and presence of intake side effect were statistically significant variables with adherence to IFA supplement use.

After adjustment was made multivariate logistic regression was conducted for variables which have significant association in bivariate analysis to determine the independent predictors of adherence to IFA supplement use during pregnancy and those variables that were identified as significantly associated with adherence to IFA supplement use were parity (multiparity and primiparity) intake side effect and obtaining encouragement.

Multiparous mothers [AOR=2.28, CI 1.12-4.69] and primiparous mothers [AOR=3.45, CI 1.73-6.89] were 2.28 and 3.45 times more likely to adhere to IFA supplement use as compared to nulliparous mothers, respectively. Mothers who did not reported the presence of IFA supplement intake side effects were 7.53 times [AOR=7.53, CI 4.48-12.67] more likely to adhere to IFA supplement use when compared to those who did reported presence of any intake side effect. Similarly mothers who did obtained any encouragement from family members to take their daily IFA tablets were 2.48 times [AOR=2.48, CI 1.41-4.37] more likely to adhere to IFA supplement use during pregnancy as compared to those who did not obtained any encouragement to take daily tablet (Table 5).

**Table 5: Bivariate and multivariate analysis of predictors of IFA adherence among pregnant mothers attending ANC in governmental health institutions, Bahir Dar town, 2015 (n=395)**

Variables	Adherence to IFA		COR ( 95%CI)	AOR ( 95%CI)
	Yes	No		
Mother age				
≥25 years	93(39.1%)	145(60.9%)	1	1
<25 years	71(45.2%)	86(54.8%)	1.29(0.86-1.94)*	1.55(0.85-2.81)
Religion				
Orthodox	143(43.7%)	184(56.3%)	1.04 (0.23-4.70)*	0.59(0.29-1.23)
Muslim	16(28.6%)	40(71.4%)	0.53(0.11-2.66)*	0.25(0.03-1.86)
Protestant	2(40%)	3(60%)	0.89(0.09-9.16)*	1.32(0.24-7.12)
Catholic	3(42.9%)	4(57.1%)	1	1

Residence				
Urban	154(42.4%)	209(57.6%)	1.62(0.75-3.52)*	1.17(0.46-2.98)
Rural	10(31.2%)	22(68.8%)	1	1
Mother occup.				
Unemployed	87(38.8%)	137(61.2%)	1	1
Employed	77(45%)	94(55%)	1.29(0.86-1.93)*	1.55(0.95-2.55)
Parity				
Nulliparous	43(38.1%)	70(61.9%)	1	1
Primiparous	51(53.1%)	45(46.9%)	1.85(1.06-3.21)*	3.45(1.73-6.89)**
Multiparous	70(37.6%)	116(62.4%)	0.98(0.61-1.59)*	2.28(1.12-4.69)**
ANC visits				
<4 visits	125(39.8%)	189(60.2%)	0.71 (0.44-1.16)*	1.35(0.76-2.40)
≥4 visits	39(48.1%)	42(51.9%)	1	1
Current Hgb level and anemia status				
Anemic	19(32.2%)	40(67.8%)	0.63(0.35-1.13)*	1.30(0.66-2.59)
Non anemic	145(43.2%)	191(56.8%)	1	1
Given information on IFA supplement				
Yes	113(44.5%)	141(55.5%)	1.41(0.93-2.16)*	0.81(0.47-1.40)
No	51(36.2%)	90(63.8%)	1	1
Waiting time at HF				
≤30 minutes	37(35.2%)	68(64.8%)	1	1
>30 minutes	127(43.8%)	163(56.2%)	1.43(0.90-2.28)*	1.17(0.66-2.06)
Knowledge of anemia				
Non satisfactory	79(36.1%)	140(63.9%)	0.60(0.40-0.90)*	1.32(0.56-3.09)
Satisfactory	85(48.3%)	91(51.7%)	1	1

**Table 5: Bivariate and multi variate analysis of predictors of IFA adherence among pregnant mothers attending ANC in governmental health institutions, Mekelle town, 2016. (n=395)**

Variables	Adherence to IFA		COR ( 95%CI)	AOR ( 95%CI)
	Yes	No		
Knowledge of IFA				
Non satisfactory	74 (36.8%)	127(63.2%)	0.67(0.45-1.00)*	0.85(0.56-3.09)
Satisfactory	90 (46.4%)	104(53.6%)	1	1
Side effects				
Yes	118(37.8%)	194(62.2%)	1	1
No	46 (55.4%)	37(44.6%)	2.04(1.25-3.34)*	7.52(4.47-12.67)**
Encouragement				
Yes	97 (54.8%)	80 (45.2%)	2.73 (1.81-4.13)*	2.48(1.41-4.37)**
No	67 (30.7%)	151(69.3%)	1	1

N.B. 1=reference, \*=significant at P-value ≤ 0.25, \*\*=significant at P-value < 0.05.



## 6. DISCUSSION

Anemia is a widespread global public health problem. Women are particularly vulnerable, and more than half of all pregnant women in developing countries suffer from anemia. The consequences of anemia are serious and include economic losses, maternal mortality and adverse birth outcomes. Effective anemia prevention and control requires analysis of the main causes of anemia in the target population followed by implementation of a package of relevant interventions, integrated within existing structures and services, including health care, agriculture and education, and the private sector. One of the strategies to control and prevent maternal anemia is provision of a standard dose of 60mg iron and 400µg folic acid daily for 6 months duration. However, maternal adherence to the regimen plays a major role in the prevention and treatment of iron deficiency anemia.<sup>[11]</sup> The aim of this study was to assess the rates of adherence to IFA supplement use and identify factors associated with IFA supplementation among pregnant women attending antenatal clinics.

The present study found that self reported adherence level to IFA supplement was 41.5%. This result was in line with a study conducted in Egypt (41.1%), Philippines (40.1%) and Pakistan (38%).<sup>[38, 24, 34]</sup> However, it was higher than similar studies done in Ethiopia.<sup>[23, 42, 43]</sup> This may be due to the reason that these studies were conducted at rural and semi urban areas of the country and as general the comprehensive knowledge about causes and prevention of anemia, benefits, utilization and side effects of IFA tablet of the less urban people may be less than urban residents and these aspects may directly affects the compliance to the regimen. But this finding was less than a study done in rural districts of Ethiopia (74.9%).<sup>[41]</sup> This marked difference may be due to self-reporting of currently pregnant mothers and women who had given birth in the preceding year were enrolled in the study and there is a greater chance of recall bias and results in over estimation. In addition, our result revealed less adherence rates as compared to studies conducted in Sudan (92.1%), India (67.9%) and Nepal (55.7%).<sup>[40, 28, 27]</sup> This difference may be attributed due to difference in geographical location as well as difference in socio-economic, educational status of mothers, dissemination of information and awareness on the benefits of the supplement.

The present study showed that only 32.2% of anemic mothers according to previous Hgb level and 39.4% anemic mothers according to current Hgb level were adherent to IFA supplement use which indicated that anemic mothers were less adherent to the regimen. This result is supported by a study from Egypt which showed that only 37.5 % of anemic mothers

were adherent.<sup>[38]</sup> Even though being anemic is a pre-disposing factor for IFA utilization lower knowledge about causes, prevention, sign and symptoms of anemia and benefits of IFA tablets may account for this lower compliance.

According to our result the main reasons for skipping the IFA regimen dose were forgetfulness to take the tablets daily (61.5%) frustration of having to take many tablets (48.6%), due to perceived as well as experienced side effects (45.1%) and tablet related issues like the taste and color (27.3%). Among the side effects the most frequently given were nausea and vomiting (70.3%), sensation of heart burn (44.7%) and gastric up set (30.4%). This finding was comparable for the finding from Egypt as frustration to take many tablets was reported to be 54.3%.<sup>[38]</sup> In case of forgetfulness to take tablets daily our result was higher than results from studies of South India (25.14%), cross sectional study in urban slum of India (48.8%) and Malaysia (33.9%).<sup>[29, 32, 36]</sup> This may be due to the reason that lower comprehensive knowledge about anemia and benefits of IFA tablets which leads to negligence toward ones compliance to supplement utilization. But our result was smaller than results from Pokhara Nepal (73.6%) and Philippines (78.8%).<sup>[27, 24]</sup> It may be due to ones negligence because of thinking I would get enough from daily dietary intake.

This study found parity, obtaining or presence of any encouragement to take daily tablets from family members and presence of perceived as well as experienced side effects were factors associated to adherence to IFA supplement use. According to present study multiparous mothers were 2.28 times [AOR=2.28, CI 1.12-4.69] and primiparous mothers were 3.45 times [AOR=3.45, CI 1.73-6.89] more likely to adhere to IFA supplement use as compared to nulliparous mothers. Our finding was not consistent with studies done in Tanzania, Rohtak India and Lucknow India.<sup>[39, 28, 31]</sup> This compliance (of primiparous and multiparous mothers) toward IFA supplement use may be due to the reason that as primiparous and multiparous mothers do have experience of relief from symptoms, fear of further complications due to blood loss during delivery, tolerance of side effects and provider may give more emphasis for these women (clients) as they are decreasing iron stores because of repeated pregnancies on counseling compared to nulliparous women.

Our study also found that obtaining or presence of any encouragement to take daily tablets from family members did have a positive effect towards adherence to IFA supplement use. According to our study 44.8% of pregnant mothers got family support to take their daily IFA tablets. This is higher than a finding from Cambodia (33%). This may be due to the better

social life and interaction of Ethiopian families than Cambodians. Our result showed that mothers who did obtain any encouragement from family member to take their daily IFA tablets were 2.48 times [AOR=2.484, CI 1.41-4.37] more likely to adhere to IFA supplement use during pregnancy as compared to those who did not obtain any encouragement to take daily tablet. This finding is supported by other studies done in Pakistan, Cambodia and Egypt.<sup>[34, 35, 38]</sup>

In addition this study found that side effects commonly related to gastro-intestinal problems can affect mothers' level of adherence to IFA use. According to our result 79% of pregnant mothers did experience intake side effect and among these only 37.8% of mothers were found to be adherent. This is not in line with findings from Nepal (22%), Cambodia (21%) and Philippines (24.3%).<sup>[27, 35, 24]</sup> This difference may be attributed due to their better feeding habit as tablet intake along with some fruits or tasty and sweet foods may minimize occurrence of side effects. The present study showed that mothers who did not report the presence of IFA supplement intake side effects were 7.53 times [AOR=7.53, CI 4.48-12.67] more likely to adhere to IFA supplement use when compared to those who did report presence of any intake side effect. This is in line with a study done in Ethiopia, India and Egypt.<sup>[23, 28, 38]</sup> However, this study is not consistent with the study done in Cambodia.<sup>[35]</sup> This may be due to cultural and feeding differences as they may take their tablet along with sweet foods or fruits.

### **Strengths and limitations**

As any other study, this study has limitations. The adherence status of pregnant mothers was assessed by self-report which cannot rule out potential susceptibility of recall bias as well as false reporting of mothers toward IFA utilization by exaggerating or under estimating adherence. The other limitation could be due to the design which does not show the cause and effect relationship. However, the study has adequate sample size and response rate which could be the strengths.

## **7. CONCLUSION AND RECOMMENDATIONS**

Adherence to IFA supplement utilization is still very low in the study area. Parity, presence of encouragement from any family member and perceived as well as experienced side effects of the IFA supplement/tablet were factors associated with adherence to IFA supplement. Forgetfulness to take daily IFA supplement, frustration to take many tablets and presence of side effects were identified as major reasons for skipping a dose; while nausea and vomiting,

sensation of heart burn and gastric upset were the most frequently responded side effects. Health authorities, professionals and any concerned body should give greater priority towards adherence and the factors that are associated with it. It is very important to educate and counsel pregnant mothers during their ANC visit about the potential side effects of supplement utilization and how to deal with it in addition to educating them about the benefits of adhering to IFA supplement regimen. At national level in collaboration with pharmaceutical companies there should be an effort to minimize the tablet related side effects by trying to import or formulate newer forms of IFA tablet such as sprinkles, candies, intermittent type tablets or beverages as these have a potential to reduce side effects and increase the compliance. Health education should also be given to the community on the positive impact of encouragement and support from any family members to initiate mothers to take their daily tablets and every member should take responsibility and commitment towards this action.

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## **9. AUTHORS' CONTRIBUTIONS**

AM, ZA, and GM: initiation of the study, design, analysis and writing of the manuscript. AM, ZA and GM: assisted in the design, participated in organizing the data collection process and writing manuscript. All authors read and approved the final manuscript and have equal contribution.

## **10. COMPETING INTERESTS**

The authors declare that they have no competing interests.

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