Factors Influencing Adherence to Iron and Folic Acid Supplementation among Pregnant Women attending Antenatal Care in Rubanda District, South Western-Uganda

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Abstract

Purpose: Globally, about 40% of pregnant women have anemia. Pregnant women are at high risk of iron and folic acid deficiency anemia due to increased nutrient requirement during pregnancy. Iron/folic acid supplementation with optimal adherence is the main cost-effective strategy for prevention of iron deficiency anemia in pregnant women. However, there remains poor adherence to iron and folic acid supplementation in pregnancy in many countries especially low-income countries. The aim of this study was to evaluate the level of adherence and the factors influencing adherence to iron and folic acid supplementation among pregnant women attending antenatal care in Rubanda District, south Western-Uganda.

Methodology: A multi-Health facility based observational and descriptive cross-sectional study was done. One hundred seventy two (172) pregnant mothers attending antenatal clinic in six selected health facilities in Rubanda District were enrolled in this study from December 2021 to March 2022. The interviewer administered questionnaire was used to study the participant characteristics and logistic regression was used to identify the factors influencing adherence to iron and folic acid supplements.

Findings: Majority of women were aged between 20-29 years (57.56%), married (94.77%) and unemployed (80.23%). More than half of the respondents (62.21%, 95% CI 54.89%-69.53%) had taken at least 80% of the prescribed iron and folic acid tablets. This reflected good adherence level. Factors independently influencing adherence included maternal age below 20 years (aOR 3.83, 95% CI 1.12-13.08, p-value 0.032), age between 20-29 years (aOR=4.86, 95%CI: 2.03-11.63, p value <0.001), adherence partner (aOR=2.82, 95%CI: 1.34-5.91, pvalue <0.001) and being counselled on importance of iron and folic acid tablets (aOR=4.42, 95%CI: 2.08-9.42, p-value <0.001).

Recommendations: Intensive counselling during antenatal care about the importance of iron and folic acid supplements should be done on a daily basis with particular attention to women aged 30 years and above.

Keywords: *Adherence, iron and folic acid supplementation, antenatal care*

INTRODUCTION

Pregnant women are particularly at high risk of iron and folic acid deficiency due to increased nutrient requirement during pregnancy. Folic acid requirements are increased in pregnancy because of the rapidly dividing cells in the fetus and elevated urinary losses. Since neural tube closes by day 28 of pregnancy, World Health Organization recommends that folic acid supplementation should be initiated as early as possible to decrease the risk delivering babies with neural tube defects [1]. Iron/folic acid supplementation with optimal adherence is the main cost-effective strategy for prevention and control of iron deficiency anemia in pregnant women [2].

Anemia during pregnancy is defined as a blood hemoglobin (Hb) concentration below 11.0 g/dl. It is the world's second leading cause of disability, and one of the most serious global public health problems. Globally, above 25% (around 2 billion) of population are highly affected by anemia [3]. In 2011, about 42.6 % of children, 38.2 % of pregnant women, and 29 % of non-pregnant women and 29.4 % of all women of reproductive age had anemia globally [4]. The hemoglobin concentration is lower in pregnant women than non- pregnant women. This means children and pregnant women are the most at-risk sub populations. The prevalence of anemia in pregnant women was highest in South-East Asia region (48.7 %) and Africa region (46.3 %) and lowest in Western pacific region (24.3 %) and region of the Americas (24.9%) [4].

Approximately 50% of cases of anemia are considered to be due to iron deficiency. Other causes of anemia include other micronutrient deficiencies (e.g. folate, riboflavin, vitamins A and B12), acute and chronic infections (e.g. malaria, cancer, tuberculosis and HIV), and inherited or acquired disorders that affect hemoglobin synthesis, red blood cell production or red blood cell survival (e.g. hemoglobinopathies) [5]. Anemia during pregnancy is a major public health problem especially in low-income countries and contributes to increased maternal and perinatal mortality and morbidity and in Africa, the prevalence of anemia (>40%) is regarded as a severe public health problem as defined by World Health Organization [4, 6].

Iron deficiency anemia contributes adverse effects on mother and child health. Fetal and neonatal risks this deficiency include low birth weight, prematurity, fetal distress which all contribute to perinatal morbidity and mortality. Infants born to anemic mothers will more likely to become anemic themselves. Similarly, maternal risks may occur including low weight gain, lowered resistance to infection, preterm labor, placenta previa, premature rupture of membrane, cardiac arrest, hemorrhage, poor cognitive development and reduced work capacity [7].

Therefore, to reduce the risk of maternal anemia , iron deficiency and poor pregnancy outcomes, World Health Organization (WHO) recommends a standard daily oral dose of 30-60 mg of elemental iron and 400μg of folic acid supplements throughout pregnancy, to begin as early as possible as a part of routine antenatal care (ANC) programs. In addition, where the prevalence of anemia in pregnancy is over 40% like in Africa, a daily dose of 60 mg of elemental iron is preferred over a lower dose of 30 mg [1]. Adherence to oral iron and folic acid supplementation is recommended as part of the antenatal care to reduce the risk of low birth weight, maternal anemia and iron deficiency. WHO therefore recommends that even in absence of folic acid, pregnant women must receive iron supplements.

As a policy, every pregnant woman in Uganda must receive folic acid 5mg throughout the first trimester (preferably starting 90 days before conception) and thereafter ferrous (200mg) /folic acid (400mcg) once daily throughout pregnancy to prevent iron and folate deficiency [8]. Since

malaria worsens the burden of anemia in pregnancy, in Uganda where malaria is endemic, provision of iron and folic acid supplements is implemented in conjunction with measures to prevent, diagnose and treat malaria like monthly intermittent preventive treatment in pregnancy" (IPTp) with the antimalarial drug sulfadoxine-pyrimethamine [9]. Other key policies being implemented in Uganda to reduce anemia include fortification of foods, deworming of pregnant women and children less than 14 years and delayed cord cutting.

Iron and folic acid supplements are given to mothers during antenatal care at no cost in all public health facilities. However, due to occasional stock outs, over 39% of women in Mulago Hospital receive less than 14 tablets to last a month which affects their adherence to these supplements [10]. This study aimed at determining the level of adherence and factors influencing adherence to iron and folic acid supplementation (IFAS) among women attending antenatal care in Rubanda District, south western Uganda.

RESEARCH METHODOLOGY

Study Setting, Study Design and Study Population

This was a cross-sectional research design conducted in 6 selected health facilities within Rubanda District conducted from December 2021 to March 2022. Rubanda District is about 440km from Kampala, the capital city of Uganda. In 2014 National population census, Rubanda had a total population of 196,896 people (92,011 males and 104,885 females) and the projected population of 2019 was 206,600 people [11]. The District has a total of 2 health centre IVs and 8 health centre IIIs that are well equipped to provide antenatal care services and conduct deliveries and another 29 health centre IIs. All these facilities are able to provide ANC services, however, majority of women seek care at HC III and IV. During ANC, routine iron and folic acid supplements are provided to mothers to prevent anemia.

The study population was all pregnant women attending antenatal care from the selected facilities within Rubanda District. Pregnant women attending antenatal care for at least the second time were eligible to participate in the study after consent because they were expected to be taking iron and folic acid received on their previous visit. Pregnant women coming in for their first time were excluded from the study.

Sample Size and Sampling

The sample size was estimated using Kish Leslie formula at 95% confidence interval and used a precision of 0.05.

$n = Z^2 pq/d^2$

Where,

z= the standard normal value of α at 95% confidence level corresponding to =1.96

p=the estimated proportion of pregnant women adhering to iron folic acid supplementation

q=1-p

d= the maximum error at 5% (0.05)

The estimated proportion of pregnant women adhering to iron folic acid supplementation (p) to calculate the sample size was taken as 11.6% from a study that was conducted in Mulago National Referral Hospital, Uganda [10]. This gave a sample size of 156 participants and after adjusting for the 10% non-response, the final sample size was 172 participants. All the two health centre IVs (Muko HC IV and Hamurwa HC IV) were selected as they see most of the mothers seeking ANC services and 4 other health centre IIIs (Rubanda PHC, Bubare HC III,

Ikumba HC III and Muko NGO) were selected by simple random sampling. Proportionate sampling was employed basing on the number of women seen during antenatal care in 2019 from each of the selected health facilities and we employed simple random sampling by lottery method to enroll 40, 39, 31, 25, 14 and 23 from Hamurwa HC IV, Muko HC IV, Rubanda PHC, Bubare HC III, Ikumba HC III and Muko NGO respectively.

Data Collection and Study Variables

An interviewer-administered, structured questionnaire was used to collect data from the study participants. The outcome variable was the adherence level and this was assessed by considering the number of tablets swallowed in the 30 days preceding the study. A woman was regarded to have adhered to IFAS if she took at least 80% of the prescribed pills [12, 13]. The questionnaire collected information on independent variables which included socioeconomic factors, and health facility factors. The socioeconomic determinants of adherence studied included maternal age, marital status, education level, occupation, income, gestational age, parity, gravidity and presence of an adherence partner who was either a spouse, family member or peer. Health system factors included counselling on importance of iron and folic acid, number of tablets received, presence of private space during counselling, being on other medications for chronic illnesses and presence of side effects.

Data Management and Analysis

The questionnaires were checked on a daily basis for completeness. Data obtained from the questionnaires was entered in Microsoft excel and later exported into Stata version 17 for data cleaning and analysis. The level of adherence was obtained as the number of women who has swallowed at least 80% of the prescribed tablets in the 30days preceding the study divided by total number of participants. The percentage and its 95% confidence interval was then reported. Univariate analysis was used to describe the baseline characteristics of participants. To determine the factors associated with adherence, logistic regression was used. At bivariate analysis, all variables with a p value less than 0.2 and those that are biologically plausible were entered into the multivariable logistic regression model. Statistical significance was considered at p-values <0.05 and the Odds ratios with their corresponding 95% confidence intervals were recorded.

RESULTS

Table 1: Baseline characteristics of study participants (N=172)

Patient Characteristics	Number (n)	Percentage (n/N*100%)
Age		
10-19years	28	16.28
20-29years	99	57.56
30+ years	45	26.16
Marital Status		
Unmarried	9	5.23
Married	163	94.77
Education status		
Primary or less	48	27.91
Above Primary	124	72.09

Occupation		
Unemployed	138	80.23
Employed	34	19.77
Reminder		
No	101	58.72
Yes	71	41.28
Residence		
Rural	134	77.91
Town-council	38	22.09
Average monthly income		
Less 100,000shs	145	85.80
100,000shs or more	24	14.20
Gravidity		
Primigravida	33	19.19
Multigravida	139	80.81
ANC visit number		
ANC 2	55	31.98
ANC 3	31	18.02
ANC 4	52	30.23
ANC 4+	34	19.77
Tabs received on previous visit		
Less than 15	19	11.05
15 or more	153	88.95

As shown in table 1, majority of women were aged between 20-29years (57.56%), married (94.77%), multigravida (80.81%) and had attained at least primary level education. However, majority were unemployed (80.23%) and earning less than 100,000 shillings in a month (85.8%).

Adherence to IFAS

Figure 1: Proportion of women with adherence to iron folic acid supplementation among women attending ANC in Rubanda District

The proportion women attending antenatal care in Rubanda District who adherence to iron folic acid supplementation defined as taking at least 80% of the prescribed tablets is 62.21% (95% CI 54.89% - 69.53%).

Table 2: Socio-demographic factors influencing adherence to IFAS among women attending ANC in Rubanda District at bivariate analysis.

Variable	No Adherence	Adherence	Bivariate analysis	p-value
	n/N (%)	n/N (%)	cOR (95% CI)	
Age category (years)				
10-19	11 (16.92)	17 (15.89)	1.93 (0.74-5.04)	0.179*
20-29	29 (44.62)	70 (65.42)	3.02 (1.45-6.26)	0.003**
≥30	25 (38.46)	20 (18.69)	Ref	
Marital status				
Not married	6 (9.23)	3 (2.80)	Ref	
Married /Lives with Partner	59 (90.77)	107 (97.20)	3.53 (0.85-14.62)	0.082*
Highest education Level				
Primary or less	16 (24.62)	32 (29.91)	Ref	
Above Primary	49 (75.38)	75 (70.09)	0.77 (0.38-1.54)	0.454
Employment status				
Unemployed	55 (84.62)	83 (77.57)	Ref	
Employed	10 (15.38)	24 (22.43)	1.59 (0.71-3.58)	0.263
Area of residence				
Rural	52 (80.00)	82 (76.64)	Ref	
Town council	13 (20.00)	25 (23.36)	1.22 (0.57-2.59)	0.606
Current ANC visit				
<4th visit	31 (47.69)	55 (51.40)	Ref	
4th Visit or more	34 (52.31)	52 (48.60)	0.86 (0.46-1.60)	0.637
Average monthly income				
<100,000shs	53 (81.54)	92 (85.98)	Ref	
At least 100,000shs	12 (18.46)	15 (14.02)	0.72 (0.31-1.65)	0.439
Booking visit in 1st trimester				
Yes	30 (46.15)	45 (42.06)	Ref	
No	35 (53.85)	62 (57.94)	1.18 (0.63-2.20)	0.599

Has a reminder to take IFAS				
No	47 (72.31)	54 (50.47)	Ref	
Yes	18 (27.69)	53 (49.53)	2.56 (1.32-4.97)	0.005**
Gravidity				
Primigravida	14 (21.54)	19 (17.76)	Ref	
Multigravida	51 (78.46)	88 (82.24)	1.27 (0.59-2.75)	0.542
No. of living children				
None	20 (30.77)	26 (24.30)	Ref	
1-2	18 (27.69)	32 (29.91)	1.37 (0.60-3.11)	0.455
3-5	20 (30.77)	45 (42.06)	1.73 (0.79-3.80)	0.171*
More than 5	7 (10.77)	4 (3.74)	0.44 (0.11-1.71)	0.236

*cOR: Crude Odds Ratio CI: Confidence Interval Ref: Reference category * p value <0.2 **p value <0.05*

As highlighted in table 2, among the socio-demographic factors, being between 20-29 years of age and having a reminder were the only factors associated with adherence to IFAS at bivariate analysis. Women who were aged between 20-29 years were about 3 times more likely to adhere to IFAS compared to those aged 30 years and above. Women who had any adherence partner to remind them take their supplements were about 2.6 times more likely to adhere to IFAS compared to those who did not have a reminder.

Table 3: Health system determinants of adherence to IFAS among women attending ANC in Rubanda District at Bivariate analysis

Variable	No Adherence	Adherence	Bivariate analysis	p-value
	n/N (%)	n/N (%)	cOR (95% CI)	
Taking other medications				
No	47(72.31)	94 (87.85)	Ref	
Yes	18(27.69)	13 (12.15)	0.36 (0.16-0.80)	0.012*
Counselled on IFAS use				
No	40 (61.54)	37 (34.58)	Ref	
Yes	25 (38.46)	70 (65.42)	3.03 (1.60-5.74)	0.001**
Side effects				
No	60 (92.31)	93 (86.92)	Ref	
Yes	5 (7.69)	14 (13.08)	1.81 (0.62-5.27)	0.279

Number of tablets dispensed				
<15 tablets	5 (7.69)	14 (13.08)	Ref	
≥15tablets	60 (92.31)	93 (86.92)	0.55 (0.19- 1.62)	0.279
Availability Private space for ANC				
No	46 (70.77)	88 (82.24)	Ref	
Yes	19 (29.23)	19 (17.76)	0.52 (0.25-1.08)	0.081

*cOR: Crude Odds Ratio CI: Confidence Interval Ref: Reference category **p value <0.05*

In this study, the health system determinants of adherence to IFAS at bivariate analysis were counselling and taking other medications as shown in Table 3. Women who had been counselled on the importance of taking IFAS were about 3 times more likely to adhere to the supplements compared to those who had received no counselling (cOR 3.03, CI 1.60-5.74, p value 0.001). Women who were on medications for other illnesses were less likely to adhere to IFAS compared to those who are not on other medications (cOR 0.36, CI 0.16-0.80, p value 0.012).

Table 4: Socio-demographic and health system factors influencing adherence to IFAS among women attending ANC in Rubanda District at multivariable logistic analysis.

Variable	No Adherence	Adherence	Bivariate analysis	p-value	Multivariable analysis	p-value
	n/N (%)	n/N (%)	cOR (95% CI)		aOR (95% CI)	
Age category (years)						
10-19	11 (16.92)	17 (15.89)	1.93 (0.74-5.04)	0.179	3.83 (1.12-13.08)	0.032**
20-29	29 (44.62)	70 (65.42)	3.02 (1.45-6.26)	0.003	4.86 (2.03-11.63)	0.00 **
≥30	25 (38.46)	20 (18.69)	Ref		Ref	
Has a reminder to take IFAS						
No	47 (72.31)	54 (50.47)	Ref		Ref	
Yes	18 (27.69)	53 (49.53)	2.56 (1.32-4.97)	0.005	2.82 (1.34-5.91)	0.006**
Gravidity						
Primigravida	14 (21.54)	19 (17.76)	Ref		Ref	
Multigravida	51 (78.46)	88 (82.24)	1.27 (.59-2.75)	0.542	2.28 (0.87-5.99)	0.095
Taking other medications						
No	47(72.31)	94 (87.85)	Ref		Ref	
Yes	18(27.69)	13 (12.15)	0.36 (0.16-0.80)	0.012	0.46 (0.19-1.15)	0.098

Counselled on IFAS use						
No	40 (61.54)	37 (34.58)	Ref		Ref	
Yes	25 (38.46)	70 (65.42)	3.03 (1.60-5.74)	0.001	4.42 (2.08-9.42)	0.000**

*cOR: Crude Odds Ratio **aOR**: Adjusted Odds Ratio **CI**: Confidence Interval **Ref**: Reference category **p value <0.05*

At multivariable analysis, the socio-demographic factors influencing adherence to IFAS were maternal age and having a reminder. Women who were aged between 10-19 years were about 3.8 times more likely to adhere to IFAS compared to those age 30 years and above (aOR 3.83, CI 1.12-13.08, p value 0.032) while women who were 20-29 years were about 4.9 times more likely to adhere to IFAS compared to women aged 30 years and above (aOR 4.86, CI 2.03-11.63, p value 0.000). Women who had any form of reminder to take their supplements were about 2.8 times more likely to adhere to IFAS compared to those who did not have a reminder (aOR 2.82, CI 1.34 -5.91, p value 0.006).

In this study, the only health system factor associated with adherence to IFAS was counselling. Women who had been counselled on the importance of taking IFAS and anemia were about 4.4 times more likely to adhere to the supplements compared to those who had received no counselling (aOR 4.42, CI 2.08- 9.42, p value 0.000).

DISCUSSION

Adherence to IFAS

In this study, the adherence level to IFAS was at 62.21% representing the proportion of women who had taken 80% of the prescribed medications over one month preceding the study. This adherence level is relatively high and could be explained by the regular stocks of IFAS in the health facilities as well as provision of ANC on a daily basis.

This finding was similar to a study conducted in Addis Ababa, Ethiopia among pregnant women attending ANC from various government health facilities in Gulele Sub city where the level of adherence was 62.3% [14]. Similar levels of adherence were found in other studies like one conducted at Tikur Anbessa Specialized Hospital, Ethiopia (63.6%), Kenya at Kakamega level 5 hospital where the adherence level was 60.6% and a study done in South India where adherence level to iron folic acid supplements was 64.7%) [15-17]. The possible explanations why adherence level in our study is similar to all these studies include similarities in the study settings, study population as well as the criteria used to consider a woman to be adherent to iron folic acid supplements.

The women's level of adherence in this study is higher than the findings in 22 countries within Sub-Saharan Africa where the pooled level of adherence was 28.7% [18]. This study considered findings from the countries' demographic health survey day which are often community based and therefore tend to underestimate the adherence level. The adherence also depended on taking IFAS for at least 90 days which also explains why the adherence level in this study is high. Other findings with a low prevalence were found in Uganda (11.6% in Mulago National Referral Hospital and 34.5% in Bwindi Community Hospital) and Tanzania (20.3%) [10, 19, 20]. This is explained by the stringent criteria used for classifying Adherence in these studies.

Some studies have also reported higher levels of adherence to IFAS among women attending antenatal care. A study conducted among pregnant women attending antenatal care in public

hospitals of Dire Dawa, Eastern Ethiopia reported an adherence level of 71.8% and a cross sectional study conducted in North West province, South Africa reported an adherence level of 93% [21, 22]. The possible explanation in these studies include differences in study populations and the less strict criteria used to classify women as adherent or not. For example, in the study done in Eastern Ethiopia, 59% of the women had attained at least secondary education, majority were government employees and hence these are likely to have knowledge on importance of adhering to IFAS and also considered anyone who took at least 4 tablets per week to have adhered to IFAS.

Factors Influencing Adherence to IFAS

In this study, the factors affecting adherence to IFAS among pregnant women attending ANC in Rubanda District included maternal age, having an adherence partner and counselling.

Maternal Age

In this study, women younger than 30 years were likely to adhere to IFAS compared to those women who are 30years or more. Similar findings have been found in other studies for example in a study done in Tigray Ethiopia, women who were more than 25 years were 0.527 times less likely to adhere to IFAS and women above 45 years were about 3.6 times more likely to have poor adherence to IFAS compared to those below 25 years of age [23, 24]. The possible explanation is that most of the young women are also of low parity and therefore likely to adhere to their medications to optimise foetal outcomes as opposed to old women who may feel they have experience with pregnancy.

Adherence Partner

In this study, women who received a reminder to take their tablets were 2.8 times more likely to adhere to their medication that those who did not. This observation has also been found in other studies. In a cross-sectional study conducted among pregnant mothers in governmental health institutions of Adwa town, Tigray, Ethiopia, women who had support from their partners were about 2.2 times more likely to adhere to IFAS compared to their counterparts [25]. In Kenya and Ethiopia, adherence partners have been identified to change women's behaviour towards iron and calcium supplementation during pregnancy [26]. Spouses, family members and peers help remind women to take their tablets hence minimising forgetfulness which has been identified as a common reason for not taking the pills [17, 22, 27].

Health System Factors Influencing Adherence to IFAS

Counselling

In this study, the only health system factor associated with adherence to IFAS was counselling. Women who had received counselling from health workers regarding IFAS were 4.4 times more likely to adhere compared to those who did not receive counselling. This has also been found in studies done in Tanzania, Senegal and Ethiopia [20, 28, 29].

Counselling increases the mothers' knowledge about the importance of taking IFAS and consequences of non-adherence and this in turn facilitates adherence to IFAS. Some studies have identified the number of antenatal care visits attended by the woman as independent factor that increases adherence to IFAS since women get many sessions of counselling, however this was not found to be an independent factor in this study [23, 29, 30].

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

The level of adherence to IFAS among women attending ANC in Rubanda District is relatively high (6 in every 10 women). Women who are less than 30 years, those who have an adherence partner and those who receive full counselling from health workers are more likely to adhere to IFAS.

Recommendations

1. Based on the study findings, It was recommended that intensive counselling about the importance of IFAS during pregnancy be embraced by all health care providers especially to mothers who are 30 years of age or older.
2. Based on the study findings, It was recommended that a qualitative study to be done to have an in-depth understanding of why some women do not take IFAS as prescribed.

Limitations

The level of adherence was assessed basing on the participants' self-report. This could have overestimated the adherence.

Ethical Considerations

Institutional approval.

Scientific approval was obtained from graduate school of Bishop Stuart University while Ethical approval was obtained from The AIDS Support Organisation Research Ethics Committee (TASO REC), Reference **TASO-2021-36**.

Beneficence and non-maleficence.

Participants were informed that participating in this study carried no risk on their lives or the pregnancy itself, but will instead help policy making towards improving adherence to iron folic acid and subsequently increase the associated benefits to the unborn babies.

Autonomy and Informed consent

Once the study participants understood the benefits of participating in the study, they were asked to provide informed written consent voluntarily before they were interviewed. The respondents were assured that they had the right to be involved or not to be involved in the study, and that non-involvement would not in any way affect the quality of antenatal care services given to them.

Privacy and Confidentiality

Confidentiality was guaranteed throughout the study by ensuring no participant's name is written on the questionnaire and the filled questionnaires were kept in a lockable cupboard accessed only by the principal investigator.

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