ORIGINAL RESEARCH

Adherence to Iron with Folic Acid Supplementation Among Pregnant Women Attending Antenatal Care in Public Health Centers in Simada District, Northwest Ethiopia: Using Health Belief Model Perspective

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Introduction: Even though the World Health Organization recommends daily oral iron with folic acid (IFA) supplementation as part of the antenatal care to prevent anemia, still the utilization remains low in Sub-Saharan Africa, particularly in Ethiopia. Therefore, the aim of this study was to assess the magnitude of adherence of iron with folic acid supplementation and associated factors among pregnant women who were attending antenatal care (ANC).

Methods: A facility-based cross-sectional study was conducted from February 24 to March 23, 2020. Four hundred and twenty-two participants were selected using systematic random sampling technique. Data were collected using a structured questionnaire through face-to-face interview. Data were entered and analyzed using EpiData and SPSS version 20.0, respectively. Bivariate and multivariable logistic regression analyses were done to identify associated factors of adherence, and $P<0.05$ was used as cutoff to determine statistical significance at multivariable logistics regressions.

Results: In this study, 414 (98%) pregnant women participated. The mean age of the respondents was 28.69 ±SD 5.49 years. The magnitude of adherence of IFA supplementation among pregnant women was 67.6% (95%CI: 63.3–72.5). Pregnant women who had a past history of preterm delivery (AOR=3.70; 95%CI: 1.46–9.37), counseling on IFA supplementation (AOR=2.28; 95%CI: 1.15–4.53), high perceived benefit (AOR=2.72; 95%CI: 1.25–5.90) and high self-efficacy (AOR=2.91; 95%CI: 1.40–6.04) were found to be significant associated factors of adherence to IFA supplementation.

Conclusion: In this study, adherence to IFA supplementation among pregnant women is relatively high. Past history of preterm delivery, counseling on IFA supplementation, perceived benefit and self-efficiency had association with adherence to IFA supplementation. Proper counseling and health education should be given to pregnant women to increase their adherence.

Keywords: adherence, iron with folic acid supplementation, health belief model

Background

Anemia refers to a condition in which the hemoglobin content of the blood is lower than normal as a result of a deficiency of essential nutrients.[1] It is a major public health problem throughout the world, particularly for women of reproductive age in developing countries. Globally, about 42.6% of the general populations are highly

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affected by anemia. At least half of the anemia worldwide is due to iron deficiency and the rest is due to folate, vitamin B12, vitamin A deficiency, chronic inflammation and parasitic infections. Globally anemia in pregnancy is estimated to be 38% (32 million) and it is around 46.3% in Africa.[2] According to an Ethiopian demographic and health survey (EDHS) 2016, prevalence of anemia in pregnant mothers was 29% nationally and 17% in Amhara Region.[3] During pregnancy, anemia has a significant impact on the health of the fetus and mother. Maternal risks include low weight gain, preterm labour, placenta previa, premature rupture of membrane, cardiac arrest, hemorrhage, lowered resistance to infection and reduced work capacity. Prematurity, low birth weight, neural tube defect and fetal distress are contributors to morbidity and mortality of the new born as a result of maternal iron with folic acid (IFA) deficiency.[4,5] In most of the cases, anemia is largely preventable and easily treatable if detected in time. The World Health Organization (WHO) recommended daily oral IFA supplementation as part of the antenatal care to reduce the risk of low birth weight, maternal anemia and iron deficiency.[6] Similarly, the Ethiopian national guideline for micronutrient deficiencies recommends the need of daily IFA supplementation for at least six months during pregnancy and three months postpartum period.[7] Adherence of IFA supplementation is the extent to which mothers take medication or bonding to the dose and time as prescribed by the health care providers. In sub- Sahara Africa, the overall prevalence of ≥90 days iron supplementation adherence during pregnancy was only 28.7%.[8] Likewise, there is very low adherence to IFA supplementation among pregnant women, which is 11% in Ethiopia.[9,10]

According to the health belief model (HBM) behavioral motivation to take action to prevent, to screen or to control diseases conditions would be determined by perceived susceptibility, perceived seriousness, perceived benefits, perceived barriers to the behavior, cues to action, and perceived self-efficacy.[11,12] Results of different studies show that there is a relationship between HBM constructs and treatment adherence, ie perceived susceptibility, perceived benefit, and perceived barrier to treatment.[13]

Even though daily oral IFA supplementation is recommended as part of the antenatal care to reduce the risk of low birth weight, maternal anemia and iron deficiency, still the adherence is low due to different factors such as poor knowledge, living in a rural area, poor antenatal care (ANC) follow-up, and low educational level.[14,15]

Currently there is a dearth of research on adherence to IFA supplementation and its associated factors holistically. Therefore, the aim of this study was to assess the magnitude of adherence to IFA supplementation and its associated factors among pregnant women who were attending ANC in Public Health Centers in Simada district, Northwest Ethiopia using HBM.

Methods
Study Design
A facility-based cross-sectional study was done among pregnant women who have been attending antenatal care in public health centers from February 24 to 23 March, 2020.

Study Area
The study was conducted in Simada district which is found in South Gondar Zone, Northwest Ethiopia. The district is located about 770 km from Addis Ababa, the capital city of Ethiopia. The district has a total of 28 kebeles (the lowest administrative unit in Ethiopia) and has a population of 183,362 of whom 50% are female. Nearly, 6179 women were expected to get pregnant in a year. The district has one primary hospital, seven health centers, 31 health posts, and three private clinics which are providing health care services for the district. An average of 1424 pregnant women were visiting the health centers monthly for ANC service.[16]

Source and Study Population
The source population for this study was all pregnant women who were attending ANC service in Simada district health centers. All pregnant women who were visiting the health centers during the study period and women who had the chance of being randomly selected from the source population at a facility level during the study period were the study population.

Inclusion Criteria and Exclusion Criteria
The inclusion criteria for this study were pregnant women who took IFA supplementation for at least one month were included and pregnant women who were not able to respond due to severe illness or emergency conditions were excluded.

Sample Size Determination and Sampling Procedure
The sample size for this study was determined using single population proportion estimation formula and considered the following assumptions; the magnitude of adherence to

IFA supplementation among pregnant women was taken 52.9% 15, 95% confidence interval and 5% acceptable margin of error.

n=(za/2)2 p (1-p)

d2

n=(1.96)2x0.529x(1–0.529)=383,

(0.05)2

Considering a 10% nonresponse rate the final sample size was 422. Systematic random sampling was employed to select the study participants. First, we estimated the number of ANC service users before the study. Then we calculated the K Th Interval which was three. Then the lottery method was employed to identify the first pregnant women to be interviewed. Consequently, the participants were interviewed at every K[th] which was every 3 intervals among ANC service users.

Operational Definitions

Adherence to IFA: pregnant women were said to be adherent to IFA supplement if they took the supplement at least four days per week in the last one month.[17]

Good knowledge on anemia and IFA: pregnant women were said to have good knowledge on anemia and IFA if they scored above the mean to eight knowledge measurement questions.[17]

Counseling about IFA: pregnant women were said to have counseling about IFA if health care providers gave counseling to them about the benefits IFA supplementation and the risks of deficiency of IFA.

Measurements of HBM Constructs

Perceived susceptibility: beliefs about the chances of getting a condition and it was measured by six questions containing five-point Likert scale and categorized using mean as they had high and low perceived susceptibility.[18]

Perceived severity: beliefs about the seriousness of a condition and its consequences and it was measured by six questions containing five-point Likert scale and categorized using mean as they had high and low perceived severity.[18]

Perceived benefits: beliefs about the effectiveness of taking actions to reduce risk or seriousness and it was measured by six questions containing five-point Likert scale and categorized using mean as they had high and low perceived benefit.[19]

Perceived barriers: beliefs about the material and psychological costs of taking action and it was measured by six questions containing five-point Likert scale and classified using mean as they had high and low perceived barrier.[19]

Cues to action: factors that activate readiness to change. It was measured by six questions containing five-point Likert scale classified by using mean as they had high and low cues/motivation to action.

Self-efficacy: confidence in one's ability to take action and It was measured by six questions containing five-point Likert scale and classified using mean as they had high and low self-efficacy.

Data Collection and Analysis

The questionnaire was adapted from reviewed different literature,[13,18,20–22] consisted of five parts: sociodemographic characteristics, obstetrics characteristics, knowledge measurement, adherence of IFA and health belief model measurements (perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action and self-efficacy), and modified based on the results of elicitation study. It was developed in English and translated into the local language, Amharic. Data were collected using the pretested and structured questionnaire through face-to-face interview with data collectors. Seven diploma midwife nurses were trained for one day and each assigned for data collection and two BSc midwives participated in the training as supervisors. The training included the objectives of the study, data collection techniques, contents of the questionnaire, procedures, and issues related to confidentiality. EpiData version 4.6.0.2 and Statistical Package for Social Sciences (SPSS) version 20.0 were used for data entry and analysis respectively. Bivariate and multivariable logistic regression analyses were done to identify associated factors of adherence to IFA supplementation.

Results
Sociodemographic Characteristics of the Respondents

Four hundred and fourteen (414) pregnant women participated with a response rate of 98%. The mean age of the respondents was 28.69 ±SD, 5.49 years. About 243 (58.7%) of the respondents were aged between 25 and 34 years. The majority of the respondents 332 (80.2%), 403 (97.3%) and 288 (69.9%) were Orthodox Christian, married and housewife, respectively (Table 1).

Obstetrics History of Respondents

Among the total respondents, 331 (80%) were multigravid and (79.7%) were multipara. Two hundred and sixty-nine (65%) of

the respondents were at third trimester and 218 (52.7%) of them registered for ANC after four months (Table 2).

Magnitude of Adherence and Perceptions of Mothers to IFA Supplementation

Among the total respondents, 280 (67.6%) (95%CI: 63.3–72.5) of them had good adherence to IFA supplementation.

Table 1 Sociodemographic Characteristics of Pregnant Women in Simada District, South Gondar Zone, Northwest Ethiopia, March, 2020 (n=414)

Variable	Category	Frequency	Percent
Age in years	15–24	99	23.9
	25–34	243	58.7
	35–44	72	17.4
Religion	Orthodox	332	80.2
	Muslim	63	15.2
	Protestant	19	4.6
Marital status	Single	9	2.2
	Married	403	97.3
	Separated	2	0.5
Residence	Urban	120	29.0
	Rural	294	71.0
Educational status	Cannot read and write	152	36.7
	Can read and write	77	18.6
	Grade 1–8	68	16.4
	Grade 9–12	38	9.2
	College and above	79	19.1
Husband educational status	Cannot read and write	145	35.3
	Can read and write	53	12.9
	Grade 1–8	81	19.7
	Grade 9–12	57	13.9
	College and above	75	18.2
Family size	1–4	247	59.7
	Above 4	167	40.3
Current occupation	Housewife	288	69.6
	Government employee	66	15.9
	Private employee	2	0.5
	NGO	6	1.4
	Student	11	2.7
	Merchant	41	9.9

Table 2 Knowledge and Obstetrics History of Pregnant Women in Simada District, South Gondar Zone, Northwest Ethiopia, March, 2020 (n=414)

Variables	Frequency (%)	Variables
Gravidity	Multigravid	331 (80.0)
	Primigravid	83 (20.0)
Parity	Nullipara	84 (20.3)
	Multipara	330 (79.7)
ANC visit	1st	44 (10.6)
	2nd	139 (33.6)
	3rd	143 (34.5)
	4th	88 (21.3)
Time of ANC registration	Before 4 months	196 (47.3)
	After 4 months	218 (52.7)
Trimester	1st	14 (3.4)
	2nd	131 (31.6)
	3rd	269 (65.0)
History of abortion	Yes	23 (5.6)
	No	390 (94.4)
History of anemia	Yes	90 (21.7)
	No	324 (78.3)
History of preterm delivery	Yes	59 (14.3)
	No	355 (85.7)
Counseling about IFA	Yes	325 (78.5)
	No	89 (21.5)
Knowledge about IFA and anemia	Good	203 (49.0)
	Poor	211 (51.0)

Pregnant women who had high perceived susceptibility and perceived severity were (54.6.2%) and (51.7%), respectively (Figure 1).

Factors Associated with Adherence to Iron with Folic Acid Supplementation

Bivariate logistics regression analysis was done to assess the association between all independent variables with adherence to IFA supplementation after checking normality. All variables at P-value <0.20 in bivariate logistic regression were fitted to multivariable logistic regression and identified the significant associated factors of adherence and $P<0.05$ was used as the cutoff to determine statistical significance at multiple regressions. Thus, in multivariable analysis, preterm delivery, counseling about IFA supplementation, perceived benefit and self-efficacy were found to be significantly associated variables.
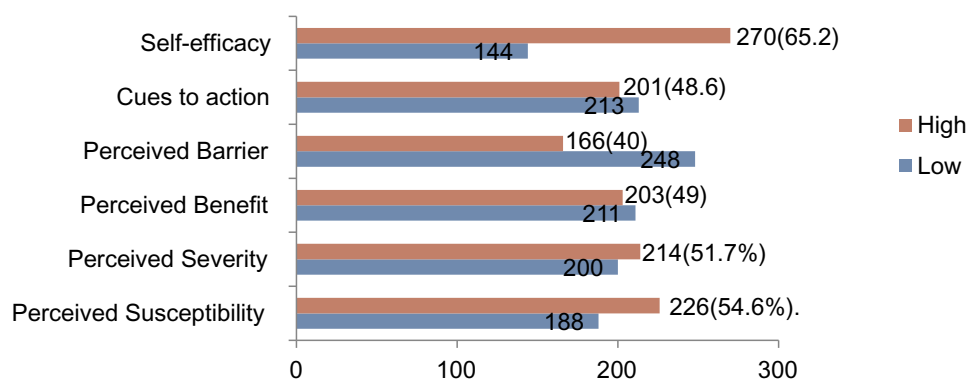
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Figure 1 Frequency of pregnant women's perception toward IFA supplementation.

Pregnant women who had history of preterm delivery were 3.70 times more likely to be adherent to IFA supplementation in comparison to those who had no history of preterm delivery (AOR=3.70, 95%CI: 1.46–9.37). Pregnant women who had counseling on IFA supplementation were 2.28 times more likely to take four or more IFA tablets per week in the last one month (AOR=2.28, 95%CI: 1.15–4.53). Pregnant women who had high perceived benefit (AOR=2.72, 95%CI: 1.25–5.90) and high self-efficacy (AOR= 2.91, 95% CI: 1.40–6.04) were 2.72 times and 2.91 times more likely adherence to IFA supplementation compared to their counterparts, respectively (Table 3).

Discussion

The aim of this study was to determine the magnitude of adherence to IFA supplementation and its associated factors among ANC attending pregnant women in the perspective of HBM. Accordingly, the study found that the prevalence of adherence to IFA supplementation among pregnant women in the Simada district was 67.6% (95% CI: 63.3–72.5). Past history of preterm delivery, counseling on IFA supplementation, perceived benefit and self-efficiency were significantly associated with adherence to IFA supplementation. The magnitude of adherence in this study is consistent with studies conducted in Shire (64.7%)[23] and Mizan Aman town, Ethiopia (70.6%).[5] However, the finding is higher than studies conducted in Dembia (52.9%),[15] Aykel (47.6%),[24] North Wollo (43.1%),[25] Hawassa (38.3),[26] Debre Tabor town,[17] and Southern Italy (22.4%).[38] This difference might be due to multiple ANC visits (three and above) (55.8%) and majority of them are multigravid (80%) in this study; this leads them to receive counseling from health care providers about IFA. In contrast the finding is lower than studies conducted in India (80.5%),[27] the Philippines (85%)[28] and

Vietnam (85%).[29] This difference might be due to qualities of service delivery facilities (tertiary hospital compared to health centers) and sociocultural differences of study groups and settings.

In this study, history of preterm delivery showed a significant association with adherence to IFA supplementation. Pregnant women who have had a history of preterm delivery were 3.70 times more likely adherent to IFA supplementation than those who had no previous history of preterm. This finding is supported with study done in Pakistan.[30] This might be because of pregnant women who had a history of preterm delivery may have high perceived fear that preterm delivery can happen again. As a result, this may promote them to give emphasis to their ANC and adherent to IFA supplementation.[5]

In this study, receiving counseling about anemia and IFA supplementation by health care providers was significantly associated with adherence. Pregnant women who got counselling on IFA were 2.28 times more likely adherent to IFA than those who did not get counselling. This result is supported by other studies in Ethiopia[17,31,32] and West Africa, Senegal.[33] The possible justifications for these may be getting advice may increase the level of knowledge, attitude and practice toward IFAS adherence.

Another factor that had a significant association with adherence to IFA supplementation in the present study was perceived benefit of the pregnant women. Pregnant women with high perceived benefit of IFA supplementation were 2.72 times more likely to be adherent to IFA supplementation than those who have low perceived benefit. The finding is consistent with other studies conducted in Sudan and Vietnam.[34,35] Pregnant women, who have a high perceived benefit of IFA supplementation, provides healthy baby and protects them from anemia were more motvated and adhered to IFA. This implies that the women's view of

Table 3 Factors Associated with Adherence to Iron with Folic Acid Supplementation Among Pregnant Women in Simada District, Northwest Ethiopia, March, 2020 (n=414)

Variables	Adherence		COR (95%CI)	AOR (95%CI)
	Good n (%)	Poor n (%)		
Residence				
Urban	97 (80.8)	23 (19.2)	1.00	1.00
Rural	183 (62.2)	111 (37.8)	0.39 (0.23–0.65)	0.58 (0.28–1.19)
ANC visit				
1st	25 (56.8)	19 (43.2)	1.00	1.00
4th	78 (88.6)	10 (11.4)	5.9 3(2.44–14.41)	2.22 (0.70–7.05)
History of preterm delivery				
No	230 (64.8)	125 (35.2)	1.00	1.00
Yes	50 (84.7)	9 (15.3)	4.54 (1.66–12.40)	3.70 (1.46–9.37)*
History of anemia				
No	203 (62.7)	121 (37.3)	1.00	1.00
Yes	77 (85.6)	13 (14.4)	3.53 (1.88–6.62)	1.67 (0.74–3.76)
Counseling on IFA				
No	34 (38.2)	55 (61.8)	1.00	1.00
Yes	246 (75.7)	79 (24.3)	5.04 (3.06–8.28)	2.28 (1.15–4.53)*
Knowledge on IFA				
Poor	105 (51.0)	101 (49.0)	1.00	1.00
Good	175 (84.1)	33 (15.9)	5.10 (3.22–8.09)	1.24 (0.65–2.36)
Perceived susceptibility				
Low	83 (44.1)	105 (55.9)	1.00	1.00
High	197 (87.2)	29 (12.8)	8.59 (5.29–3.95)	1.50 (0.71–3.15)
Perceived severity				
Low	86 (43)	114 (57)	1.00	1.00
High	194 (90.7)	20 (9.3)	12.86 (7.50–22.04)	2.00 (0.88–4.58)
Perceived benefit				
Low	94 (44.5)	117 (55.5)	1.00	1.00
High	186 (91.6)	17 (8.4)	13.70 (7.69,–4.39)	2.72 (1.25–5.90)*
Perceived barrier				
Low	210 (84.7)	38 (15.3)	1.00	1.00
High	70 (42.2)	96 (57.8)	0.13 (0.08–0.21)	0.61 (0.31–1.18)
Cues to action				
Low	107 (50.2)	106 (49.8)	1.00	1.00
High	173 (86.1)	28 (13.9)	6.12 (3.78–9.90)	1.76 (0.91–3.42)
Self-efficacy				
Low	44 (30.6)	100 (69.4)	1.00	1.00
High	236 (87.4)	34 (12.6)	15.77 (9.52–26.14)	2.91 (1.40–6.04)*

Note: *P<0.05

usefulness of IFA in reducing the risk of developing anemia and awareness of the benefits of IFA for them and their infants; tend to adopt adherence to IFA supplementation.[36]

Furthermore, self-efficacy was significantly associated with adherence to IFA supplementation. Pregnant women with high self-efficacy to IFA supplementation were 2.91 times more likely to be adherent to

IFA supplementation than those who had low self-efficacy. The finding is supported with a study done in Sudan.[35] This implies that pregnant women who have enough confidence and motivation to sustain a certain behavior; there could be high probability of adherence to IFA supplementation.[37]

Limitations of the Study

IFA supplementation adherence was determined by pregnant women's response (self-reported), which might not reflect the actual rate; hence, social desirability bias might be introduced. Furthermore, since this study was a quantitative cross-sectional study, it might not be fully describing the perceptions of pregnant mothers about IFA supplementation.

Conclusions and Recommendations

Adherence of IFA supplementation was higher compared to the current EDHS report and other studies. This might be due to the fact that the sample population was from women who attended ANC, ie facility-based study. This may increase the adherence to IFA supplementation because these women are able to attend the clinics compared with their counterparts. Previous history of preterm delivery, health care provider counseling about IFA utilization, high perceived benefit and high self-efficacy were statistically associated factors for adherence to IFA. Health care providers should deliver appropriate health education and counseling concerning with the benefit of taking IFA and the risks and consequences of anemia especially during pregnancy period. And suggestions are forwarded to researchers to conduct a mixed, ie community-based quantitative and qualitative research approach to explore further barriers.

Abbreviations

ANC, antenatal care; AOR, adjusted odds ratio; COR, Crude odds ratio; EDHS, Ethiopian Demographic Health Survey; HBM, health belieF model; IFA, iron with folic acid.

Data Sharing Statement

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate

Ethical clearance was obtained from the Ethical Review Committee of Institute of Public Health, Collage of Medicine and Health Sciences, University of Gondar. A formal letter from the College of Medicine and Health Sciences, Institute of Public Health was written to the district health office. And then the permission and support letter was obtained from the respective district health office. The data was collected from each participant after obtaining informed, voluntary, written and signed consent before the start of data collection. Respondents' names were not written on the questionnaire for anonymity and confidentiality of their information. Assent was obtained from participants under the age of 18 years and was approved by the research and the Ethical Review Committee of Institute of Public Health, Collage of Medicine and Health Sciences, University of Gondar to provide informed consent on their behalf. Individuals were informed that it was fully voluntary, they could withdraw from the study at any time or refuse to answer, could ask anything about the study and that would not affect them. This study was conducted following the Declaration of the Helsinki.

Author Contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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