Adherence and Associated Factors to Iron and Folic Acid Supplementation Among Pregnant Women

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Abstract: The purpose of this study was to assess the adherence and associated factors to iron and folic acid supplementation (IFAS) among pregnant women (PW) attending antenatal clinics in Federal Police Hospital, Addis Ababa, Ethiopia, 2018. Anemia is a global public health problem affecting both developing and developed countries. Africa has the largest number of women with anemia, next to South and Southeast Asia. However, there is a dearth of information on pregnant women's adherence and its associated factors which need to be known. An institutional-based cross-sectional study involving 418 PW was conducted. A systematic random sampling technique was employed. A pre-tested interviewer-administered structured questionnaire was used for quantitative data collection. The collected data were entered into a statistical package for social science (SPSS) version 22.0 for analysis, and multivariable logistic regressions were fitted to control the effect of confounding. Adjusted Odds ratios (OR) with their 95% confidence intervals (95% CI) were calculated to measure associations. Variables having P-value <0.05 were considered significant. There was high adherence (71.5%) to IFAS among PW. Some factors identified for non-adherence to IFAS were maternal early registration for Antenatal care (AOR=1.778, 95% CI: 1.076-2.936), awareness of IFAS (AOR=2.1, 95% CI: 1.24 -3.56), and history of anemia during current pregnancy (AOR=0.408, 95%CI: 0.224-0.744). The leading reason for adherence was getting medical advice (395, 94.5%). The adherence rate with IFAS among PW was found to be high. Early registration for antenatal care, number of antenatal visits, and anemia status were statistically significant predictors for maternal adherence to iron and folic acid supplementation. Therefore, comprehensive health promotion programs on IFAS should be given to PW to improve their adherence.

Keywords: Iron, Folic Acid, Adherence, Pregnant Women, Antenatal Clinic, Federal Police Hospital

1. Introduction

Anemia is a global public health problem affecting both developing and developed countries. Around two billion people (over 30% of the world's population) are anemic; mainly due to iron deficiency [1]. Almost half of all preschool children, pregnant women, and close to one-third of non-pregnant women are anemic worldwide. Africa has the largest number of women with anemia, next to South and Southeast Asia [2]. According to the Ethiopian Demographic and Health Survey (EDHS) report of 2011 report moderate and mild types of anemia are abundant among the pregnant and non-pregnant mothers in the country, where, 1.2% of the cases are severe [3],

and half of anemia burden is assumed to be due to iron deficiency [4]. It is a reduction of hemoglobin concentration less than 11g/dl with physiological disorder if one of the following micronutrients absent:-Iron, vitamin B12 or folic acid. Many studies documented the adverse effects of maternal anemia, 12.8% and 3.7% of maternal mortality in Asia and Africa respectively is directly attributable to anemia [5-6]. Iron supplementation has been a major strategy in low-income and middle-income countries where micronutrient deficiencies are common to reduce iron deficiency anemia (IDA) in pregnancy [7-8]. The actual prevalence of anemia in pregnant women (PW) in Africa and Asia is estimated to be 57.1% and 48.2% while that of America and Europe is 24.1% and 25.1% respectively [9-10]. Currently, 17% of Ethiopian women age group from 15-49 years are anemic with the highest proportion of PW (22%) than breastfeeding (19%) and neither pregnant nor breastfeeding women (15%). Anemia prevalence also varies among urban and rural residence; a higher proportion of women in rural areas are anemic (18%) than those in urban areas (11%) [11]. In Ethiopia, anemia is the severe problem affecting 62.7% of pregnant mothers and 52.3% non-pregnant women [12-13]. During pregnancy, anemia has negative consequence both for mother and the infant. For the mother, the consequences of anemia include reduced energy and capacity for work, poor pregnancy and birth outcomes including premature delivery, low birth weight, and increased prenatal mortality and increased risk of death during delivery and postpartum. It is estimated that as many as 20% of maternal deaths are caused by anemia, and that anemia may be an associated cause in as many as 50% of maternal deaths worldwide [14]. In Ethiopia, iron or foliate supplementation is the main strategy for anemia control and prevention. However, adherence rate remains very low. A survey done in Ethiopia showed that only 16.1% of PW took the IFAS (Iron and Folic Acid Supplementation) for 90 or more days [15]. The recommended dose by the Ministry of Health is 60 mg/day for 90 days and 400ug/day for folate. According to the EDHS report of 2011, adherence to iron or folate supplements for PW in Ethiopia is very low (0.4%) at national level compared to other studies [16]. The factors for this low adherence are not clearly known. Eighty-three percent of women did not take iron tablets during their last pregnancy. Fifteen percent took them for less than 60 days, and less than 1 percent took them for three months or more during their last pregnancy [17]. A comparison of 2005 and 2011 EDHS data revealed that the percent of women with at least one ANC (antenatal care) visit who took iron tablets increased by 63% [16, 18]. Ethiopia is implementing IFAS through ANC, but adherence to IFAS is very low [19]. This poor accomplishment may be due to low level of education, income, unemployment, multiparty, fewer prenatal consults, inadequate prenatal care, presence of side effects of supplementation during pregnancy, not have been diagnosed with anemia during pregnancy and unavailability of free supplement in sufficient quantities [20]. Even though adherence is a major problem in IFAS programs, limited researches have been done and as there is a dearth of information in the study area with this title. Therefore, this study was done to determine the adherence status and factors associated with adherence of IFAS among PW attending ANC in Federal Police Hospital.

2. Methods and Materials

2.1. Study Area

This study was conducted in Federal Police Hospital which is located in Lideta sub-city of Addis Ababa, Ethiopia. The hospital was administered by Federal government administration and gives 24 hours services to the police community of the country and their families. This hospital provides a broad range of medical services like maternal and child services, emergency services, dermatology, osteology and others services.

2.2. Study Design and Period

An institutional based descriptive cross-sectional study design was employed from January 01 to 30 August 2018 in the Federal Police Hospital, Addis Ababa, Ethiopia.

2.3. Population

All PW who came to ANC in Federal Police Hospital were taken as the source population. While; PW attending ANC clinic in the Federal Police Hospital and supplemented with IFA tablets for at least one month before the date of data collection were taken as the study population.

2.4. Inclusion and Exclusion Criteria

2.4.1. Inclusion Criteria

PW who came at least for second visit to antenatal clinic in Federal Police Hospital and previously supplemented with IFA tablets for at least one month before the data interview.

2.4.2. Exclusion Criteria

PW who come for the first antenatal visit and those who refuse to take the supplement were excluded.

2.5. Sample Size Determination and Sampling Procedure

2.5.1. Sample Size Determination

The required sample size for this study was calculated using single population proportion estimation formula by taking 55.5%; the rate of adherence to iron folic acid supplementation among PW in Debre Markos [21]. The sample size of this study was calculated by using the formula:-

$n = \dfrac{(Z\alpha/2)^2 p(1-p)}{d^2}$ Where, n = the calculated sample size, Z α/2= significance level at α =0.05, d = margin of error of

0.05, P=rate of adherence to IFAS among PW, n $=\frac{(1.96)^2 0.55(1-0.55)}{(0.05)^2}$, accordingly, n=380. With the assumptions of 95% confidence interval, 10% non-responsive rate; the total sample size was 418.

2.5.2. Sampling Procedures

A systematic random sampling technique was used to obtain a total sample of 418 respondents for this study. By using the flow of PW visiting ANC clinic in the previous months as a baseline; there were a total of 798 PW in Federal Police Hospital who fulfill the eligibility criteria during the study period. With the total number of PW (N=798), and the minimum sample size (n=418) an interval; K=N/n=798/418 =2. Starting from the second attendant of ANC; the data were taken with every other PW until the required sample size was addressed.

2.6. Variables

2.6.1. Dependent Variable

Adherence to Iron and Folic Acid Supplementation (Yes/No).

2.6.2. Independent Variables

1) *Socio-demographic factors*: Age, marital status, socioeconomic status, income, family size, maternal education and partner education.
2) *Obstetric factors*: Number of gravidity, parity, number of ANC visit, abortion, still birth, and ANC follow up starting time.
3) *Women Awareness*: Knowledge about anemia, knowledge about benefits of IFA and knowledge about duration of the supplementation.
4) *Individual factors*: Side effects, forget fullness, unpleasant tests, fear of gaining weight, and fear of harm the fetus.
5) *Health care system*: shortage of supplement with in the facility, lack of health education and collected tablet per visit.

2.7. Standard Definition

1) *Adherence*: A condition of PW taking the combine iron and folic acid tablet at least 4days a week for at least three consecutive months during their pregnancy time.
2) *Non-adherence*: PW who have taken combine iron and folic tablet for less than 4days a week consider being not adhere to the supplementation.
3) *Iron and folic acid supplement*: A drug prepared from combination of Iron and Folic acid to be taken by all PW's in order to build up their iron and folic acid nutritional status.
4) *Early registration to ANC clinic*: Those PW who visited the ANC clinic before 16 weeks of gestation.
5) *Late registration to ANC clinic*: Those PW who visited the ANC clinic after 16 weeks of gestation.
6) *Rate of adherence*: is percentage of the prescribed dose of medication actually taken by PW over a specified period.

2.8. Data

2.8.1. Data Collection Procedures

Data were collected by using a pre-tested interviewer administered structured questionnaire. The questionnaires were prepared in English and then translated in to Amharic language (local language) by a language expert. The questionnaire consist of sociodemographic characteristics, obstetrics history, awareness of anemia and folic acid, adherence to iron and folic acid, and health care system factors. Two BSc Midwives and one BSc nurse had participated as data collectors, and one BSc health officer was assigned for supervisor.

2.8.2. Data Quality Assurance

Training was given to data collectors and supervisor for two days on purpose of the study, details of the questionnaire, data collection procedure and filling the questioner. Besides, the questionnaire was pretested on 5% (21) of the study participants at Armed Force hospital, Ethiopia and a modification was made on the basis of the findings. The collected data was checked for its accuracy and completeness on daily basis by supervisor and principal investigator, data cleaning and checking was done before analysis.

2.8.3. Data Processing

Data were entered into statistical package for social science (SPSS) version 22.0 soft-ware for cleaning and analysis. Frequencies distribution and other summary statistics such as mean, standard deviation and percentage were used to describe the data. To identify factors associated with adherence to IFAS, odds ratio with their 95% confidence intervals was calculated using binary logistic regression analysis for each independent variable. First, a bivariate analysis was performed to determine the effect of each independent variable on the outcome variable. Then, variables with p-value ≤ 0.25 were entered into multivariate logistic regression model to control the potential effect of confounding variables and statistical significance was defined at a probability level of 0.05 (p<0.05). The result was presented in the form of text, table and graphs.

2.9. Analysis and Ethical Consideration

Ethical clearance was obtained from Research and Ethical Committee of Santé Medical College, and an Official letter of cooperation to the study area was taken to communicate officials. Data were collected after respondents were communicated about the purpose, potential risks and benefits of participating, and the right to withdraw from the study at any time throughout their interview. Confidentiality was maintained by assuring and maintaining the respondent's answers not to share with anyone other than members of our study team. They were also being told that they can stop or pass to the next during the interview process if they encounter any question they do not want to answer. Participants were interviewed in a place

where they feel comfortable and sitting alone with the interviewer. Instead of study participant names, codes were used for identification purpose to maintain participants' trustworthiness or confidentiality.

3. Results

3.1. Socio-Economic and Demographic Characteristics of PW

Table 1. Socio-economic and demographic characteristics of respondents in Federal Police Hospital, Addis Ababa, Ethiopia, 2018 (n=418).

Variable	Response category	Frequency (N)	Percent (%)
Age (years)	15-19	17	4.1
	20-29	284	67.9
	30-39	111	26.6
	40-49	6	1.4
Educational status of PW	No formal education	27	6.5
	Formal education	21	5.0
	Primary education	38	9.1
	Secondary and above	187	44.7
	Above secondary education	145	34.7
Husband educational status	No formal education	3	.7
	Primary education	7	1.7
	Secondary	167	40.0
	Secondary and above	237	56.7
Family size in number	2	183	43.8
	3-4	199	47.6
	5-7	16	3.8
	>6	20	4.8
Family income in Ethiopian Birr (ETB)	<1000	46	11.0
	1000-2999	215	51.4
	3000-4999	131	31.3
	5000-9999	26	6.2

A total of 418 respondents were participated in the interview, making a response rate of 100% with the mean age was 25.85 years. Majority (67.9%) of the respondents were in the age range of 20 to 29 years [Table 1].

3.2. Obstetric and Health Facility Related Characteristics of PW

The mean current gestational age of the PW was 30.68 ± 5.461 weeks. More than half (59.9%) of the participants were in their third trimester. About 170 (40.7%) of the participants were primigravida and only 1 (0.2%) were multiparous. More than two third 283 (67.7%) of the respondents were visited ANC clinic within their 16 weeks of gestation. About 73 (17.5%) of the respondents had at most four ANC visit [Table 2].

Table 2. Frequency of Obstetric and health facility related characteristics of PW attending ANC clinic in Federal Police Hospital, Addis Ababa, Ethiopia, 2018 (n=418).

Variable	Response category	Frequency (N)	Percent (%)
Gravidity	Primigravida	170	40.7
	≥2 multigravida	248	59.3
Parity	Nulliparous	210	50.2
	Primiparous	207	49.5
	Multiparous	1	.2
Still birth	No	396	94.7
	Yes	22	5.3
Number of still birth	No	398	95.2
	≥2	20	4.8
Abortion	No	367	87.8
	Yes	51	12.2
Number of abortion	1	371	88.8
	≥2	47	11.2
ANC follow up	Yes	1	.2
	No	417	99.8
Number of ANC follow up	2 times	164	39.2
	3 times	144	34.4
	4 times	73	17.5
	More than 4 times	37	8.9
Pervious history of anemia	No	373	89.2

Variable	Response category	Frequency (N)	Percent (%)
Current history of anemia	Yes	45	10.8
	No	375	89.7
Awareness about anemia	Yes	43	10.3
	No	111	26.6
	Yes	307	73.4
Trimester	First	42	10.0
	Second	150	39
	Third	230	59.9
Time of registration	<16weeks (Early)	283	67.7
	≥16weeks (Late)	135	32.3
Number of visits	≤4	385	92.1
	>4	33	8.6
Get medical advice about IFAS	Yes	395	94.5
	No	23	5.5
Adherence to IFAS	Took ≥4 tablets per week	299	71.5
	Took <4 tablets per week	119	28.5
Nutrition counseling	Yes	357	85.4
	No	61	14.6

3.3. Self-Reported Rate of Adherence to IFAS and Reasons

About (71.5%) of PW were adhered to IFAS (took ≥4 tablets per week in the previous one-month preceding the survey) and the rest were non-adhered to it (took <4 tablets per week in the previous one-month preceding the survey). The leading reason for adherence was getting medical advice (395, 94.5%).

3.4. Factors Associated with Adherence to IFAS

The comparison between the profiles of the PW who adhered to IFAS and who did not from multivariable logistic regression analysis after adjusting for each other revealed that, variables that were independent predictors for maternal adherence to IFAS were those early registered for ANC (AOR= 1.778, 95% CI: 1.076-2.936), having four or more antenatal visits (AOR=3.784, 95%CI: 2.073-6.909), and current anemia status of PW (AOR=0.408, 95%CI: 0.224-0.744). This indicates that early registration for ANC and having at least four antenatal visits could affect positively for IFA tablets intake, while current anemia status could affect negatively for IFA tablets intake [Table 3].

Table 3. *A bivariate and multivariate logistic regression analysis of factors associated with adherence to IFAS among PW attending ANC clinic in Federal Police Hospital, Addis Ababa, Ethiopia, 2018 (n=418).*

Variables		Adherence status		COR (95%CI)	AOR (95%CI)
		Adhered	Non-adhered		
		No (%)	No (%)		
Trimester	First	17 (8.0)	22 (12.9)	1	1
	Second	80 (37.6)	58 (33.9)	1.8 (0.87,3.66)	2.2 (0.90,5.45)
	Third	116 (54.5)	91 (53.2)	1.7 (0.83,3.29)	2.5 (0.98,6.21)
Time of registration	Early (≤16weeks)	172 (41)	111 (26)	3.6 (2.27,5.58)	1.778, (1.076 2.936)*
	Late (>16weeks)	48 (12)	87 (21)	1	1
History of anemia during the current pregnancy	Yes	24 (25.8)	69 (74.2)	0.49 (0.29-0.84)	0.408(0.22-0.74)*
	No	109 (41.1)	156 (58.9)	1	1
Knowledge of anemia	Poor	67 (45.5)	80 (54.5)	1	1
	Good	66 (31.2)	145 (68.8)	1.84 (1.190-2.845)	1.208 (0.695-2.099)
Knowledge of IFAS	Poor	34 (26.1)	96 (73.9)	1	1
	Good	99 (43.4)	129 (56.6)	2.16 (1.353-3.470)	.837-2.867)

Notes: * Significant at P-value<0.05, AOR=adjust odds ratio; CI =confidence interval; COR=crude odds ratio.

4. Discussion

The aim of this study was to know the rates of adherence and identify factors associated with IFAS among PW attending antenatal clinics in Federal Police Hospital, Addis Ababa, Ethiopia, 2018.

This study found that the self-report adherence rate of the PW was 71.5 % (95%CI: 32.26%-42.25%) which is higher than the study conducted in India in which 35% of urban residents PW adherent to IFAS [6], and in Nigeria in which 56% of them were adherent to the supplementation [22]. The possible explanation for this difference might be due to difference in socio-economic status of the PW.

In this study, adherence rate was better observed among PW who had anemia during their first visit as compared to those PW who had not anemic. PW who had anemia during the first visit were about 91.3% higher to be adherent to IFAS as compared to PW who had not anaemia during the first visit (AOR 0.408, 95% CI: 0.224-0.744). In the current study, adherence was better observed among PW who were early registered for ANC

service as compared to late registered women in the urban communities in which PW who were early registered for ANC service were about 41% higher to be adherent to IFAS as compared to PW who were lately registered for antenatal service (AOR= 1.778, 95% CI: 1.076-2.936). Similar results were reported by other studies conducted in Lucknow, India (AOR = 1.745, 95% CI: 1.122–2.714) and Kenya (AOR= 1.03, 95% CI: 1.01-1.04) [17, 23]. In the present study, adherence was better among PW who had four or more antenatal visits in which PW who had at least four antenatal visits were about 3.6 times higher to be adherent to IFAS as compared to PW who were less than four ANC visit for ANC service (AOR=3.784, 95% CI: 2.073-6.909). This result is comparable with other studies conducted in Egypt, Tanzania, and Philippines [5, 8, 24]. In the present study, the incidence of anemia was significantly lower among PW who adhered to IFAS as compared to those women who did not adhere to IFAS in which PW who adhered to IFAS were about 60% at lower risk to be anemic as compared to PW who did not adhere to IFAS (AOR=0.408, 95% CI: 0.224-0.744). This result was similar with other studies conducted in Egypt, Nigeria and Malaysia [5, 25, 22]. In the present study, adherence of the PW to IFAS was highly observed among PW ageing greater than 25 years as compared to PW ageing less than 25 years. The possible explanation for this might be due to repeated ANC visits of the PW whose age was greater than 25 years.

5. Limitation of the Study

As a limitation, information on adherence rate was from self-report rather than pills count. Besides, the qualitative approach was not included in the study.

6. Conclusion and Recommendation

6.1. Conclusion

1) In this study, adherence rate with IFAS among PW attending ANC was found to be high.
2) Early registration for ANC services, number of antenatal visits and anemia status during the current pregnancy were a statistically significant independent positive predictors for maternal adherence to IFAS.
3) Being currently anemic, and elder age were statistically significant independent negative predictors for maternal adherence to IFAS during PW.

6.2. Recommendation

Based on this finding, we recommend for the health care workers and the concerned bodies the following points for the betterment especially on identified determinant factors of IFAS for PW as follows:-

1) A comprehensive health promotion programs which focus on anemia prevention, awareness on IFAS and early maternal follow-up should be encouraged.

2) Health care workers should give due attention for lately registered PW.
3) Health care workers should give special attention for PW having anemia during antenatal visits.

Lists of Abbreviations

ANC: Antenatal Care
EDHS: Ethiopian Demographic and Health Survey
IFAS: Iron and Folic Acid Supplementation
PW: Pregnant Women
WHO: World Health Organization

Disclosure

Ethics Approval and Consent to Participate

Ethical clearance was obtained from Research and Ethical Committee of Santé Medical College, and an Official letter of cooperation to the study area was taken to communicate officials. Data were collected after respondents were communicated about the purpose, potential risks and benefits of participating, and the right to withdraw from the study at any time throughout their interview. Confidentiality was maintained by assuring and maintaining the respondent's answers not to share with anyone other than members of our study team. They were also being told that they can stop or pass to the next during the interview process if they encounter any question they do not want to answer. Participants were interviewed in a place where they feel comfortable and sitting alone with the interviewer. Instead of study participant names, codes were used for identification purpose to maintain participants' trustworthiness or confidentiality.

Availability of Data and Materials

The finding of this study was generated from the data collected and analyzed based on stated methods and materials. The original data supporting this finding are available from the corresponding author on reasonable request.

Competing Interests

The authors declare that they have no competing interests.

Authors' Contributions

AS and MA conceived and designed the analysis; collected the data; contributed data or analysis tools; performed the analysis; wrote the paper. ZK, RW, KG, and GM contributed to data analysis, drafting or revising the article. All authors gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

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Acknowledgements

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