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COMPLIANCE TO IRON - FOLIC ACID SUPPLEMENTATION AND ITS ASSOCIATED FACTORS AMONG SAMPLE OF PREGNANT WOMEN IN BAQUBA/DIYALA GOVERNORATE

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ABSTRACT

Background: Iron deficiency anemia in pregnancy increases the risk of complications for both mother and baby, including preterm labor, bleeding, weak immunity, and low birth weight. Compliance with Iron and Folic Acid Supplementations associated with many factors such as knowledge of anemia, and knowledge of iron and folic acid supplementations. **Objectives:** To assess the compliance of pregnant women to iron and folic acid supplementation, to assess the associated factors related to compliance and to assess the knowledge of pregnant women regarding anemia and iron-folic acid supplementations. **Subjects and Methods:** A cross-sectional study was conducted at primary health care centers in Diyala governorate -Iraq, from the 1st of March 2024 to 31st August 2024. Data of 385 pregnant women who attended primary health care centers was collected using modified questionnaire including their compliance to iron and folic acid supplementation and knowledge about anemia and iron and folic acid supplementation. **Results**: Mean age was 27.71±6.224 years. There were 213 (55.3%) participants who were compliance with iron and folic acid supplementation. Compliance with iron and folic acid supplementation was significantly associated with participant who have higher education, employed, employed husbands, family size of 1-3 members, have no children, first antenatal care visit before 4 months, frequency of antenatal care visit was 3-4 visits, Have no anemia during current pregnancy, negative History of anemia, and ≤30 minutes time to reach health care center by walking. While non-compliance was significantly associated with grand multigravida, having ≥5 children, and not getting advice about iron and folic acid supplementation from health professionals, and poor knowledge about anemia and iron and folic acid supplementation. **Conclusions**: About more than half of participants were compliance with iron and folic acid supplementation. Compliance was dominant among participants who have higher education, employed, employed husbands, family size of 1-3 members, have no children, first antenatal care visit before 4 months, frequency of antenatal care visit was 3-4 visits, and ≤ 30 minutes time to reach health care center by walking.

KEYWORDS: There were 213 (55.3%) participants who were compliance with iron and folic acid supplementation.

INTRODUCTION

Anemia during pregnancy is a significant global health concern that affects a substantial number of women worldwide, with a prevalence rate of 30% among women of childbearing age.[1] Today, over two billion people worldwide suffer from dietary deficiencies of vitamins and minerals predominantly in developing countries, resulting in different adverse health outcomes. Nutritional status of a mother during pregnancy plays a vital role to prevent maternal morbidity and mortality and facilitate normal fetal development.[1][2]

Iron deficiency anemia during pregnancy is associated with an increased risk of low maternal weight gain, preterm labor and placenta previa, premature rupture of membranes, cardiac arrest and bleeding, decreased resistance to infection, poor cognitive development, and reduced work capacity.[3][4] Similarly, the effects of iron deficiency anemia on the fetus and newborn are

increased risk of prematurity, low birth weight, and fetal distress, which contribute to perinatal morbidity and mortality.[3][5]

In addition to iron deficiency, currently, folic acid deficiency is one of the most common vitamin deficiencies among pregnant women. Women who intake a low level of folic acid during pregnancy are at risk for weak or poor pregnancy outcomes, such as neural tube defects(NTDs).[6] The different NTDs types, including anencephaly spine, bifida and encephalocele lead to permanent lifelong disability and premature death. Neural tube defects are caused by the failure of the open neural tube to close by the 29th day after conception.[7]

Ensuring compliance with IFAS (iron-folic acid supplementation) is critical in the prevention and treatment of iron deficiency anemia, especially in pregnant women. This population group often experiences an increase in iron demands starting in the second trimester.[8] So, the current study was conducted to assess pregnant women's compliance with iron and folic acid supplementation and assess the associated factors related to compliance.

PATIENTS AND METHODS

Study setting and design

This is a cross-sectional study that was conducted in Diyala/Iraq during a period of six months from the 1st of March to the 31st August 2024.

Inclusion criteria

All pregnant women in the 2nd and 3rd trimester of pregnancy attended the primary health care centers at time of collecting data were included.

Exclusion criteria

Pregnant women in the 1st trimester and pregnant women with anemia due to chronic illness such as haemoglobinopathies were excluded from the study

Data collection and instruments

The data collection was done by direct interview by the researcher using a comprehensive modified questionnaire, which has been developed based on previously validated questionnaires.[9][10][11] Data was collected for six consecutive months; 2 days per week, and 5 hours/day.

Questionnaire consisted of six parts

Part one: Sociodemographic state of pregnant woman and her husband as age, education, occupation, family size.

Part two: Obstetrics and health status characteristics: ask her about Gravidity, gestational age, number of children, first antenatal care Visit, frequency of antenatal care visit, history of anemia, anemia in current pregnancy if she has.

Part three: Health facility related factors ask her about time to reach health care center by walking, if she gets advice about IFAS from health professionals during any antenatal care visit.

Part four: Compliance

Ask her about the numbers of IFAS tablets taken in previous seven days. This was measured based on the woman's self-report of the number of IFA tablets taken in the previous 7 days, which was used as proxy estimate of recommended (90+days) iron folic acid compliance. In this case, pregnant mothers who took ≥ 4 tablets per week were considered compliant.[12]

Part five: Knowledge of anemia:- refer to the knowledge of pregnant woman about anemia and it was assessed using 16 questions (Yes / No Questions).

Scoring System: The Knowledge of anemia consists of 16 statements, one point for each correct answer, and zero point for wrong answer. Total score 16 points.

- Total score equal to/or below the mean considered poor knowledge about anemia.
- A total score above the mean considered as good knowledge about anemia.[11]

Part six: Knowledge of Iron and Folic Acid supplementation: Pregnant women's knowledge of IFA supplementation was assessed by seven questions (Yes / No Questions).

Scoring System

The Knowledge of iron and folic acid supplementation: consists of 7 statements, giving one point for each correct answer, and zero point for the wrong answer. Total score 7 points.

- Total score equal to/or below the mean considered poor knowledge about iron and folic acid supplementation.
- A total score above the mean considered as good about iron and folic acid supplementation.[11]

Ethical approval

Data collection was started after obtaining the approval from the Scientific Committee of Iraqi Board for Medical Specializations, research and development center of ministry of health, and Diyala health directorate. Verbal consent from participants was taken before filling the questionnaire and telling them that the collected data will be kept confidential with no names, and not be divulged except for the study purpose.

Statistical analysis

- Data were entered to Statistical Package of Social Science (SPSS) version (26) and presented in the following way:
- Descriptive analysis was presented in numbers, Percentages (tables, and graphs.)
- Analytical statistic:

- Chi-square test (or fishers exact test) was used to show the association between dependent variables and certain sociodemographic variables.
- P value of less than 0.05 was considered as statistically significant.

RESULTS

There were 385 participants included in the study with mean age of 27.71±6.224 years. Sociodemographic characteristics are illustrated in Table1.

Table 1: Sociodemographic data of participants.

Sociodemographic data		No. (385)	100%
Age group/ years	<20	30	7.8%
	20-29	221	57.4%
	30-39	117	30.4%
	≥40	17	4.4%
Education	Illiterate	68	17.7%
	Read And Write	65	16.9%
	Primary school	87	22.6%
	Secondary school	91	23.6%
	University and above	74	19.2%
Occupation	Employed	61	15.8%
	Self-Employed	17	4.4%
	Unemployed	295	76.6%
	Student	12	3.1%
Occupation for her husband	Employed	142	36.9%
	Self-Employed	151	39.2%
	Unemployed	76	19.7%
	Student	16	4.2%
Family size	1-3	114	29.6%
	4-6	150	39.0%
	>6	121	31.4%

Obstetric and health data of participants are illustrated in Table 2.

Table 2: Obstetrics and health data of participants.

Obstetrics and health data		No. (385)	100%
Gravidity	Primigravida	87	22.6%
	Multigravida 2-4	263	68.3%
	Grand Multigravida ≥5	35	9.1%
Do you have a child?	Yes	295	76.6%
	No	90	23.4%
How many children do you have?	None	90	23.4%
	One	117	30.4%
	2-4	172	44.7%
	≥5	6	1.6%
What is Gestational age now?	Second	157	40.8%
	Third	228	59.2%
First ANC visit	< 4 months	202	52.5%
	≥ 4 months	183	47.5%
Frequency of ANC visit	1-2 visits	232	60.3%
	3-4 visits	144	37.4%
	> 4 visits	9	2.3%
Do pregnant mother has anemia during current pregnancy?		129	33.5%
Do you have history of anemia?		131	34.0%

Health facility data of participants are shown in Table 3.

Table 3: Health facility data of participants.

Health Facility		No. (385)	100%
Time to reach health care center by walking in minutes	≤ 30 minutes	190	49.4%
	>30 minutes	195	50.6%
During any of your ANC visit did you get advice about IFAS from health professionals?		332	86.2%

Regarding compliance, 172 (44.7%) participants were non-compliance with IFAS (took <4 tablets/wk.), and 213 (55.3%) participants were compliance with IFAS (took ≥4 tablets/wk.), as shown in Figure 1.

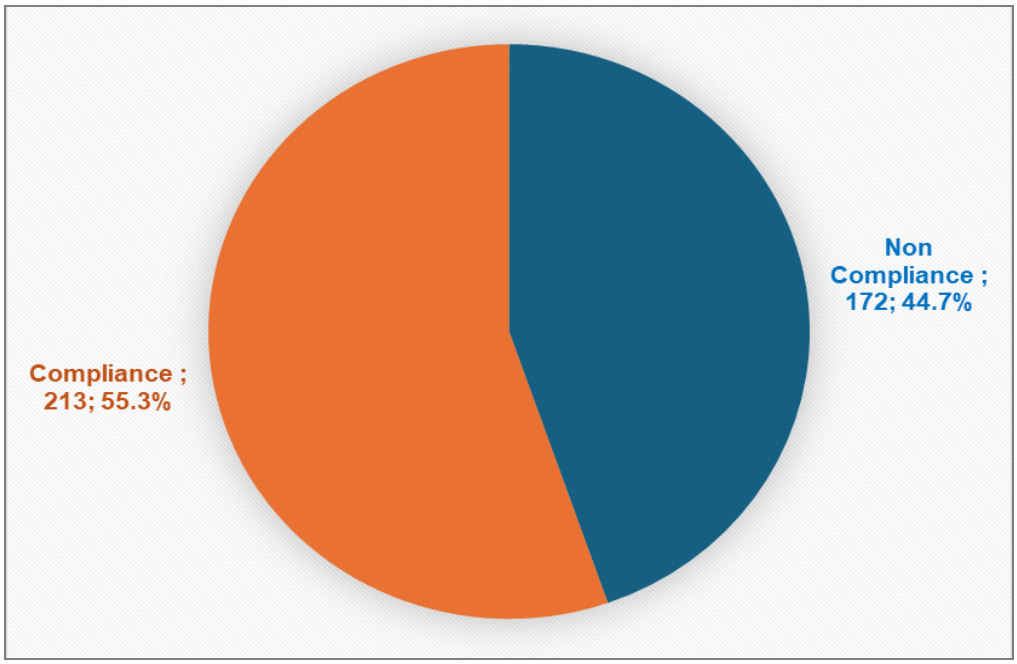

Figure 1: Compliance of participants about how many tablets did they take on previous seven days.

The **mean knowledge score** regarding anemia among the participants was **(7.94),** Most common correct answers for participants' response regarding knowledge about anemia were for questions [Pale skin as the common sign and symptoms of anemia 371 (96.4%), Malnutrition as a cause for anemia 343 (89.1%), pregnant women can protect herself from getting anemia by eating food enriched with iron sources 337 (87.5%), and by NOT Drinking tea after meal 326 (84.7%), and Fatigue as the common sign and symptoms of anemia 308 (80.0%)], as shown in table 4.

Table 4: Participants' response regarding knowledge about anemia.

Knowledge about anemia		Yes		No	
		No.	%	No.	%
Anemia mean	Decrease in Hb level	171	44.4%	214	55.6%
	Increase in red blood cell concentration	221	57.4%	164	42.6%
What are the causes of anemia?	Malnutrition	343	89.1%	42	10.9%
	Sever blood loss	209	54.3%	176	45.7%
	Parasitic infestation	45	11.7%	340	88.3%
	Chronic medical illness	105	27.3%	280	72.7%
Regarding risk of anemia in pregnancy	High parity	279	72.5%	106	27.5%
	Long inter pregnancy interval	243	63.1%	142	36.9%
What are the common sign and symptoms of anemia?	Pale skin	371	96.4%	14	3.6%
	Fatigue	308	80.0%	77	20.0%
	Shortness of breathing	202	52.5%	183	47.5%
	Poor appetite	178	46.2%	207	53.8%
How can pregnant women protect herself from getting anemia?	Eating food enriched with iron sources	337	87.5%	48	12.5%
	Taking IFAC	296	76.9%	89	23.1%
	Drinking tea after meal	59	15.3%	326	84.7%
	Eating fruits rich in vitamin C	184	47.8%	201	52.2%

The **mean knowledge score** regarding iron and folic acid supplementation among the participants was (3.98), Most common correct answers for participants' response regarding knowledge about iron and folic acid supplementation were for questions [Taking the IFAS during pregnancy don't lead to too big baby 347 (90.1%), Why is it important to take IFAS during pregnancy, Because it's important to the mother 315 (81.8%), and What are the benefits of taking IFAS during pregnancy? It's important to prevent maternal anemia 301 (78.2%)].

While the most common wrong answers for participants' response regarding knowledge about iron and folic acid supplementation was for question [Regarding the duration of taking IFAS? It's NOT important to take IFAS for a period of three months postpartum 309 (80.3%)]. Table 5.

Table 5: Participants' response regarding knowledge about iron and folic acid supplementation.

Knowledge about iron and folic acid supplementation		Yes		No	
		No.	%	No.	%
Why is it important to take IFAS during pregnancy?	Because it's important to the mother	315	81.8%	70	18.2%
	Because it's important to the fetus	224	58.2%	161	41.8%
What are the benefits of taking IFAS during pregnancy?	It's important to prevent maternal anemia	301	78.2%	84	21.8%
	Taking IFAS may help to prevent birth defects?	179	46.5%	206	53.5%
Regarding the duration of taking IFAS?	The best time to start taking IFAS during the last three months of pregnancy	154	40.0%	231	60.0%
	It's important to take IFAS for a period of three months postpartum	76	19.7%	309	80.3%
Taking the IFAS during pregnancy don't lead to too big baby?		347	90.1%	38	9.9%

Knowledge about anemia was poor among 141 (36.6%) participants and good among 244 (63.4%) participants, as shown in Figure 2.

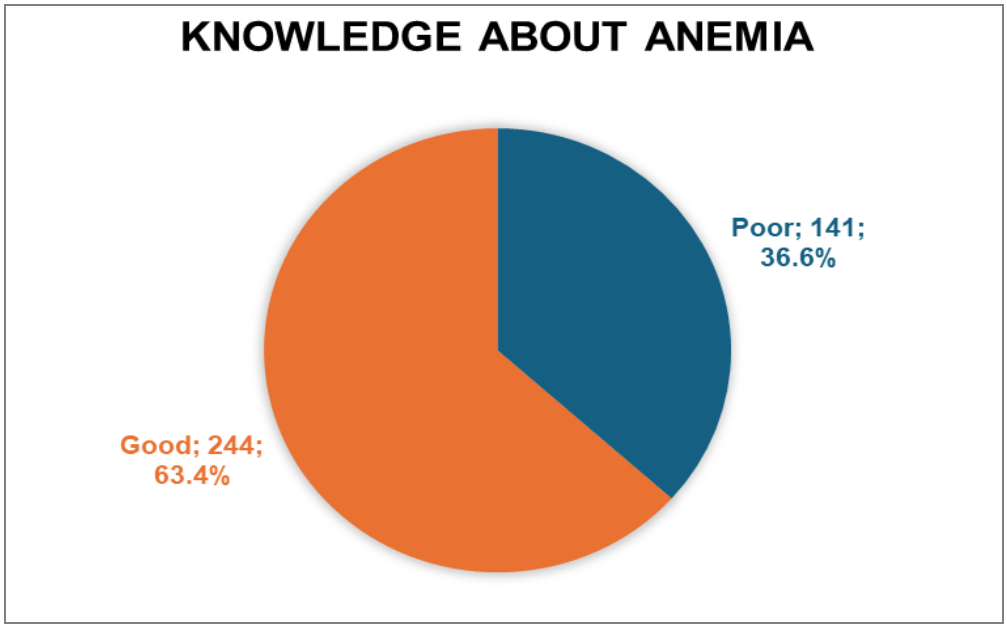

Figure 2: Participants' knowledge about anemia.

Knowledge about iron and folic acid supplementation (IFAS) was poor among 138 (35.8%) participants and good among 247 (64.2%) participants, as shown in Figure 3.

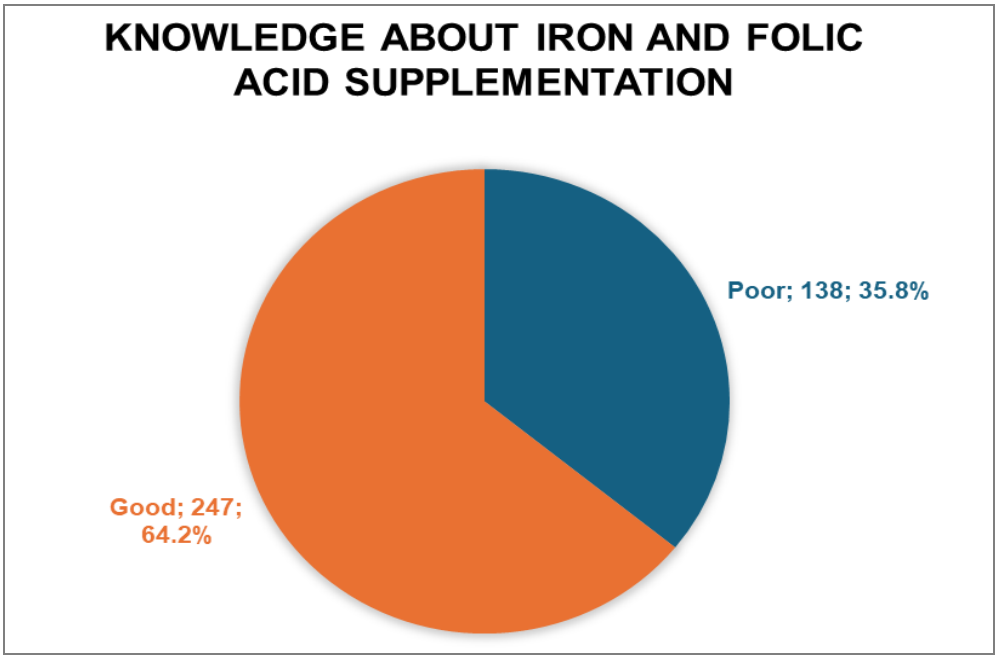

Figure 3: Participants' knowledge about iron and folic acid supplementation (IFAS).

Compliance with IFAS was significantly associated with participant who have higher education (University and above), employed, employed husbands, and family size of 1-3 members, P<0.001. Table 6.

Table 6: A significant association of sociodemographic data regarding participants' Compliance with IFAS.

Variables		Compliance with IFAS				P* value
		Non-Compliance		Compliance		
		No.	%	No.	%	
Age group/ years	<20 (N=30)	16	53.3%	14	46.7%	0.47
	20-29	92	41.6%	129	58.4%	
	30-39	55	47.0%	62	53.0%	
	≥40	9	52.9%	8	47.1%	
Education	Illiterate	46	67.6%	22	32.4%	**<0.001**
	Read And Write	37	56.9%	28	43.1%	
	Primary school	47	54.0%	40	46.0%	
	Secondary school	32	35.2%	59	64.8%	
	University and above	10	13.5%	64	86.5%	
Occupation	Employed	9	14.8%	52	85.2%	**<0.001**
	Self-Employed	5	29.4%	12	70.6%	
	Unemployed	156	52.9%	139	47.1%	
	Student	2	16.7%	10	83.3%	
Occupation for her husband	Employed	38	26.8%	104	73.2%	**<0.001**
	Self-Employed	73	48.3%	78	51.7%	
	Unemployed	55	72.4%	21	27.6%	
	Student	6	37.5%	10	62.5%	
Family size	1-3	36	31.6%	78	68.4%	**<0.001**
	4-6	60	40.0%	90	60.0%	
	> 6	76	62.8%	45	37.2%	

Compliance with IFAS was significantly associated with participant who have no children, first ANC visit before 4 months, frequency of ANC visit was 3-4 visits, Have NOT anemia during current pregnancy, and negative History of anemia, P<0.05. Table 7.

While non-compliance with IFAS was significantly associated with grand multigravida and having ≥5 children, P<0.001. Table 7.

Table 7: A significant association of Obstetrics and health data regarding participants' Compliance with IFAS.

Variables		Compliance with IFAS				P* value
		Non-Compliance		Compliance		
		No.	%	No.	%	
Gravidity	Primigravida	28	32.2%	59	67.8%	**<0.001**
	Multigravida	117	44.5%	146	55.5%	
	Grand Multigravida	27	77.1%	8	22.9%	
Do you have a child?	Yes	142	48.1%	153	51.9%	**0.015**
	No	30	33.3%	60	66.7%	
How many children do you have?	None	30	33.3%	60	66.7%	**<0.001**
	One	46	39.3%	71	60.7%	
	2-4	90	52.3%	82	47.7%	
	≥5	6	100.0%	0	0.0%	
Gestational age	Second	74	47.1%	83	52.9%	0.46
	Third	98	43.0%	130	57.0%	
First ANC visit	< 4 months	61	30.2%	141	69.8%	**<0.001**
	≥ 4 months	111	60.7%	72	39.3%	
Frequency of ANC visit	1-2 visits	130	56.0%	102	44.0%	**<0.001**
	3-4 visits	38	26.4%	106	73.6%	
	> 4 visits	4	44.4%	5	55.6%	
Have anemia during current pregnancy	Yes	81	62.8%	48	37.2%	**<0.001**
	No	91	35.5%	165	64.5%	
History of anemia	Yes	74	56.5%	57	43.5%	**0.001**
	No	98	38.6%	156	61.4%	

Compliance with IFAS was significantly associated with ≤ 30 minutes time to reach health care center by walking, while non-compliance with IFAS was significantly associated with not getting advice about IFAS from health professionals during ANC visit, P<0.001. Table 8.

Table 8: A significant association of health facility regarding participants' Compliance with IFAS.

Variables		Compliance with IFAS				P* value
		Non-Compliance		Compliance		
		No.	%	No.	%	
Time to reach health care center by walking in minutes	≤ 30 minutes	51	26.8%	139	73.2%	**<0.001**
	>30 minutes	121	62.1%	74	37.9%	
During ANC visit did you get advice about IFAS from health professionals?	Yes	128	38.6%	204	61.4%	**<0.001**
	No	44	83.0%	9	17.0%	

Non-Compliance with IFAS was significantly associated with poor Knowledge about anemia and poor Knowledge about iron and folic acid supplementation, P<0.001. Table 3.9.

Table 3.9: Knowledge about anemia and IFAS of participants regarding their Compliance with IFAS.

Variables		Compliance with IFAS				P* value
		Non-Compliance		Compliance		
		No.	%	No.	%	
Knowledge about anemia	Poor	101	71.6%	40	28.4%	**<0.001**
	Good	71	29.1%	173	70.9%	
Knowledge about iron and folic acid supplementation	Poor	105	76.1%	33	23.9%	**<0.001**
	Good	67	27.1%	180	72.9%	

DISCUSSION

Regarding compliance, more than one-half of the participants were compliant with IFAS (took ≥4 tablets/wk.), and the rest were non-compliant with IFAS (took < 4 tablets/wk.), similar compliance was found by other studies that were conducted in, Basrah/ Iraq[8] (59%), Ethiopia[13] 60.1%. On the other hand, these results contradicted other studies in India[14] 77.1%, and 77.0%[15], and in Ethiopia 44%.[9]

It was demonstrated that the majority of the selected sample were aware that, pale skin and fatigue are the common signs and symptoms of anemia, malnutrition is a cause of anemia, and pregnant women can protect themselves from getting anemia by eating food enriched

with iron sources and not drinking tea after meals. While the minority in this study were aware that parasitic infestation and chronic medical illness as causes of anemia. That contradicted Balcha et al., Ethiopia 2022[10] who mentioned that 29% and 32% knew these facts respectively.

The majority were aware that taking IFAS during pregnancy doesn't lead to too big a baby, more than three-quarters knew IFAS is important to the mother, and IFAS is important to prevent maternal anemia. While only a minority knew that important to take IFAS for three months postpartum. That agreed with a study that was done by Yamashita et al., Philippines 2021[16] where 76% knew that IFAS prevents anemia among pregnant females.

Regarding knowledge about anemia, as observed that about two-thirds of the participants had good knowledge and the rest had poor knowledge. The results of the current study agreed with others, Jabbar and Hameed Basrah / Iraq 2023[8] where 72% of the sample were with good knowledge. On the other hand, the results were inconsistent with two other studies, Al-Sattam et al., Iraq 2022[17] where 24.5% had good knowledge, and Mengistu et al., Ethiopia 2023[11] where 55.5% had good knowledge about anemia.

Regarding knowledge about iron and folic acid supplementation (IFAS), about two-thirds of the participants demonstrated good knowledge, while the remaining one-third had poor knowledge that was in line with, Demis et al., Ethiopia 2019[18] where 57.3% of the respondents had good knowledge about the benefits of IFAS.

Compliance with IFAS was found to be significantly associated with participants who have higher education (Secondary and above), employed, and employed husbands. Those results matched other studies, Jabbar and Hameed Basrah/Iraq 2023[8] found that being educated, and employed made them more likely to be compliant than others. The association between compliance and high education could be because educated women are more likely to have knowledge and access to information on iron deficiency anemia and its treatment, supplement benefits, and pregnancy as a whole.

Compliance with IFAS was dominant among participants whose family size was 1-3 members, and participants who had no children, while non-compliance with IFAS was significantly associated with grand multigravida and having ≥5 children. According to Balcha et al., 2022[10] found a significant association between compliance and primigravida women, having less than two and 3 to 4 family size. The higher compliance among participants whose family size is smaller might be explained by the increased worries about their pregnancies which makes them more prone to take supplements regularly, compared to those who had experienced numerous pregnancies who might feel that things would go normal anyway.

Compliance with IFAS was significantly associated with participants whose first ANC visit was before 4 months; the frequency of ANC visits was 3-4 visits. Similar findings were found in other studies, Jabbar and Hameed Basrah / Iraq 2023[8] Gebremariam et al., Ethiopia 2019[9], and Demis et al., Ethiopia 2019[18] who stated that early booking visits and frequency of antenatal care visits are significantly associated with compliance.

Compliance was dominant among those who had no anemia during the current pregnancy, and those who had a negative history of anemia. That went in the same line as Deori et al., India 2021[14], who revealed that non-anemics had higher compliance rates (81.6%) than anemics (73.6%), with a statistically significant difference. The absence of anemia among those who are compliant might be a result of their continuous use, as opposed to those who had anemia, which might be due to their lack of compliance.

This study noted that compliance with IFAS was significantly associated with ≤ 30 minutes time to reach the health care center by walking which was supported by Asres et al., Ethiopia 2022 (4) who reported the same findings. This association might be justified by the fact that a nearer healthcare center provides lesser transportation expenses in addition to time-saving, both of which act as a reinforcer for pregnant women to receive their supplements.

The current study demonstrated that non-compliance with IFAS was significantly related to not getting advice about IFAS from health professionals during ANC visits. That matched other studies by, Gebremariam et al., Ethiopia 2019[9], and Demis et al., Ethiopia 2019[18]+who found that mothers who had obtained counseling about IFAS were more likely to be compliant to IFAS than mothers who had not obtained counseling. The advice would include the benefits of IFAS and complications of anemia for the mother and the baby if missed, thus encouraging pregnant women to take them regularly.

Finally, non-compliance with IFAS was observed to be significantly correlated with poor knowledge about anemia and poor knowledge about iron and folic acid supplementation. That went in the same direction as other studies, Jabbar and Hameed Basrah/Iraq 2023[8], Mengistu et al., Ethiopia 2023[11], and Titaley et al., Indonesia 2017[19] where compared to women who had poor knowledge about anemia and iron and folic acid supplementation, those who had good knowledge were more likely to be compliant with iron and folic acid supplementation. One possible explanation is that knowing about IFAS made moms better aware of the benefits of taking the supplement, how to take it, and the risks of not taking it for the mother and fetus during

pregnancy, labor, and delivery, as a result, it will improve attitudes and practices related to IFAS adherence.

CONCLUSION

About more than half of participants were compliance with iron and folic acid supplementation. Compliance was dominant among participants who have higher education, employed, employed husbands, family size of 1-3 members, have no children, first antenatal care visit before 4 months, frequency of antenatal care visit was 3-4 visits, and ≤ 30 minutes time to reach health care center by walking.

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