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Determinants of compliance with iron-folic acid supplementation among pregnant mothers in Bule Hora district, Southern Ethiopia: unmatched case-control study

Reta Tesfa Merga[1*], Mahlet Birhane[2], Midhagsaa Dhinsa[1], Biranu Muleta[1], Jibril Jemal[3] and Moges Mareg Belay[2]

Abstract

Background The World Health Organization has recommended daily supplementation with iron folic acid, to prevent anemias during pregnancy. However, due to many factors, compliance of pregnant women with this recommendation of iron and folic acid supplementation remains low, both in Africa and Ethiopia. Studies conducted in issue shows setting specific difference regarding determinants of iron and folic acid compliance.

Objective This study aimed to assess the determinants of iron and folic acid supplementation compliance among antenatal care attendee pregnant women in the Bule Hora district, South Ethiopia, in 2024.

Methods A health facility -based, unmatched case-control study was conducted in Bule Hora district from April 2024 to June 2024, via a pretested interviewer-administered questionnaire. The sample size for the study was calculated using Epi Info version 7.2.6 software. A total of 115 cases and 230 controls were included in the study. The sample size was proportionally allocated to each health facility on basis of the number of pregnant women supplemented with iron-folic acid at least one month before the data collection period; after that, systematic sampling techniques were used to select every 2nd participant from each health facility. Binary and multivariable logistic regression was conducted to identify determinants of iron folic acid compliance; AOR at a *P*-value < 0.05 with 95% CI was used to declare a statistically significant association after checking for the absence of multicollinearity (VIF < 1.65, tolerance > 0.6) and the Hosmer and Leme-show test of model fitness (p- value = 0.08).

Results A total of 345 pregnant women were included in the study with, a 100% response rate. Prim gravidity [AOR: 4.67, 95% CI (1.60, 13.57)], antenatal care contact 4 or more times [AOR: 7.84, 95% CI (3.34–18.41)], having a husband/family support to take iron folic acid [AOR: 4.48, 95% CI (2.19–9.13)] and good knowledge on anemia [AOR: 3.79, 95%CI (1.85–7.75)] were significantly associated with iron-folic acid compliance.

Conclusion This study revealed that prim-gravidity, antenatal care contact 4 or more times, having husband support, and good knowledge of anemias were determinants of good compliance. Promotion of husbands' support and

*Correspondence:
Reta Tesfa Merga
tesfareta75@gmail.com; reta.tesfa@du.edu.et

Full list of author information is available at the end of the article

frequency of antenatal care contact and provision of information about anemias are needed to increase compliance with iron folic acid.

Keywords Compliance, Iron folic acid, Antenatal care, Pregnant women

Introduction

Compliance with iron-folic acid supplements refers to how well patients follow their healthcare provider's prescriptions regarding the specified dosage and timing of the supplements, which is usually measured as the number of times pregnant women take the supplements in a week [1, 2]. Iron folic acid supplementation involves the provision of a formulation containing 60 mg of elemental iron and 400 micromilligrams of folic acid, especially during pregnancy. The requirement for iron and folic acid is increased at the time of pregnancy because of hormonal and physiological changes during pregnancy. Poor compliance with the prescription of micronutrients during this period increases the likelihood of folic acid and iron deficiency [3, 4].

Iron and folic acid deficiency is a worldwide micronutrient nutritional public health problem among pregnant women [5]. This iron and folic acid micronutrient deficiency leads to anemias in pregnant women [6].

The problem of iron and folic acid deficiency successively leads to anemia, a dangerous condition affecting both child and mother may result in child and maternal mortality. The effects of iron deficiency anemia during pregnancy include premature birth, low birth weight, prolonged labor, increased risk of infection, intrauterine growth restriction, pre-eclampsia, and increased perinatal and maternal mortality. Furthermore, folate deficiency during pregnancy causes life-threatening congenital fatal anomalies such as neural tube defects [5]. Additional effects of anemia during pregnancy include diminished prepartum blood reserves, impaired immunological function, cardiovascular dysfunction, and an elevated risk of blood transfusion during the postpartum period [7].

In addition to individual health problems, noncompliance with the IFAS program may hinder a nation's economic progress by preventing the attainment of the global nutrition objective set for 2025, which aimed at eliminating anemia in women of fertile age by 50% [8].

Iron folic acid supplementation, iron-fortified staple foods, health and nutrition education, parasite infection control, and enhanced sanitation are the key practical and economical strategies for preventing and treating iron folic acid deficiency anemia in pregnant women [9]. As part of regular antenatal care, the WHO suggested initiation as early as possible and continuing a daily oral dose of 400 μg folic acid and 60 mg iron supplements throughout pregnancy. Taking recommended iron and folic acid supplements throughout pregnancy decreases the risk of iron deficiency anemia by 57% and the risk of all forms of maternal anemia by 70% at term [5].

Despite the role of daily IFAS (Iron folic acid supplementation) in reducing anemia, compliance with IFAS remains moderately low in different parts of Africa, including Ethiopia [10, 11, 12]. Ethiopia aims to ensure that by 2029, 90% of women who are pregnant will receive iron-folic acid supplements for more than 90 days, according to the Ethiopian National Nutrition Program [13]. However, various studies have revealed that IFAS compliance is still unacceptably low with rates varying from 92% in the Somali region to 50% in Addis Ababa [14]. This shows that there was setting specific variation in the level of compliance with IFAS among women who are pregnant, which mainly differs between rural and urban areas of the country. This is one of the main factors for IFAS program failure as many experts believe in these issues [15]. If compliance is the main barrier to addressing IFA deficiency anemia, ways of improving compliance must be found.

A review of different studies on the determinants of compliance with IFAS reveals inconsistent findings [16, 17], and other equally important factors, such as media exposure and husband support have received little attention. The low compliance in the current study area and the noted discrepancies in the findings of previous studies on the determinants of IFAS compliance and few emphasized factors, highlight the necessity of researching the variables affecting iron-folate supplement compliance and a thorough understanding of the determinants of compliance with IFAS intake during pregnancy. To address these gaps the present study used an unmatched case-control study design to identify determinants of compliance with the IFAS among pregnant women in the Bule Hora district, Oromia region, southern Ethiopia.

So in-depth insights gained from revealing the determinants of IFAS compliance in pregnant women in this study bear important implications for the initiation of evidence-based communication and decision-making processes within the health system by revealing the main factors to be focused on. Furthermore, findings gained from the research can help healthcare providers gain more understanding of factors that affect IFAS compliance and challenges pregnant women face when consuming IFAS so that they can focus on those factors while counselling pregnant women about IFAS to improve compliance.

Method and materials

Study area and period

The study was conducted in Bule Hora district, southern Ethiopia. The Bule Hora district is located in the West Guji zone, Oromia region, and is 472 km away from the capital city of Addis Ababa, Ethiopia. It has a latitude and longitude of 5°35′N 38°15′E and an altitude of 1716 m above sea level. The 2023 estimated population of the Bule Hora district is 292,701. The estimated numbers of reproductive age women and of pregnant women in the district is 9415 and 10,157 respectively. There are four health centers, 40 community health posts, and 26 private clinics providing maternal and child health services in the district. The study was conducted from April 2024 to June 2024.

Study design

A health facility-based, unmatched case-control study was employed.

Population

Source population

All pregnant women who were receiving antenatal care and who received iron and folate supplementation.

Study population

Cases: All pregnant women who were receiving antenatal care and who had consumed IFAS for less than 4 days per week in the recent week before the data collection period.

Control: All pregnant women who were receiving antenatal care and who had consumed IFAS for at least 4 days per week in the week before the data collection period [10, 16, 18].

Eligibility criteria

Inclusion criteria

All pregnant women who had antenatal care visits supplemented with IFAS for a minimum of one month prior to the data collection period were included in both cases and control.

Exclusion criteria

Pregnant women who were incapable of responding to the question (i.e., could not hear or talk) were excluded from both cases and control.

Sample size determination

The sample size of the study was calculated using the EPI Info program version 7.26, using two population proportion formulas for the determinants of IFAS compliance and corresponding parameters obtained from a recent case-control study done in Addis Ababa Ethiopia (46); by considering the following assumption: a case to control ratio of 1:2, 80% power and 95% confidence level and AOR = 2.03(Table 1).

The study with the main factor, gravidity, gave a sufficiently large sample size (314), with a percentage of exposed individuals (prim-gravida) among the control (poor compliance) = 35% and a percentage of exposed individuals among the cases (good compliance) = 65.5% and an AOR of 2.03. As a result, 345 participants (115 cases and 230 controls) were used to conduct the study, after considering a 10% nonresponse rate.

Sampling technique and procedure

Based on the sample size required for the study, a proportionate allocation of sample size was done for each health center on the basis of the number of ANC case follow-ups and the total number of pregnant women in all health centers from the previous month's ANC registration logbook. A systematic sampling technique was employed to select participants. The sample interval (K) was calculated by dividing the number of all pregnant women who received IFAS in the previous month from four health facilities in the Bule Hora district which was 731, by the sample size needed to conduct the study which was 345, and the obtained result was 2. The first individual was selected by lottery method, and then every 2nd of the selected individuals was interviewed from each health center on the basis of the allocated sample size until the required sample size was met. Accordingly, 84 participants from Bardaye Health Center, 126 from Garba Health Center, 96 from Killenso Mokonisa HC, and 39 from Killenso Rasa HC participated in the study. (Fig. 1)

Study variables

Dependent variable

Compliance with iron-folic acid supplementation.

Table 1 -Sample size calculation for a study on determinants of IFAS compliance among pregnant women attending ANC services in Bule Hora district, South Ethiopia 2024

S. no	Variable	CI%	Power%	case to control ratio	% of exposure among control	AOR	Calculated sample size			Reference
							Control	Cases	Total	
1	ANC frequency	95	80	1:2	73.1	4.21	84	42	126	[19]
2	Gravidity	95	80	1:2	35	2.03	209	105	314	(46)
3	Knowledge on anemia	95	80	1:2	30	2.3	79	158	237	(14)

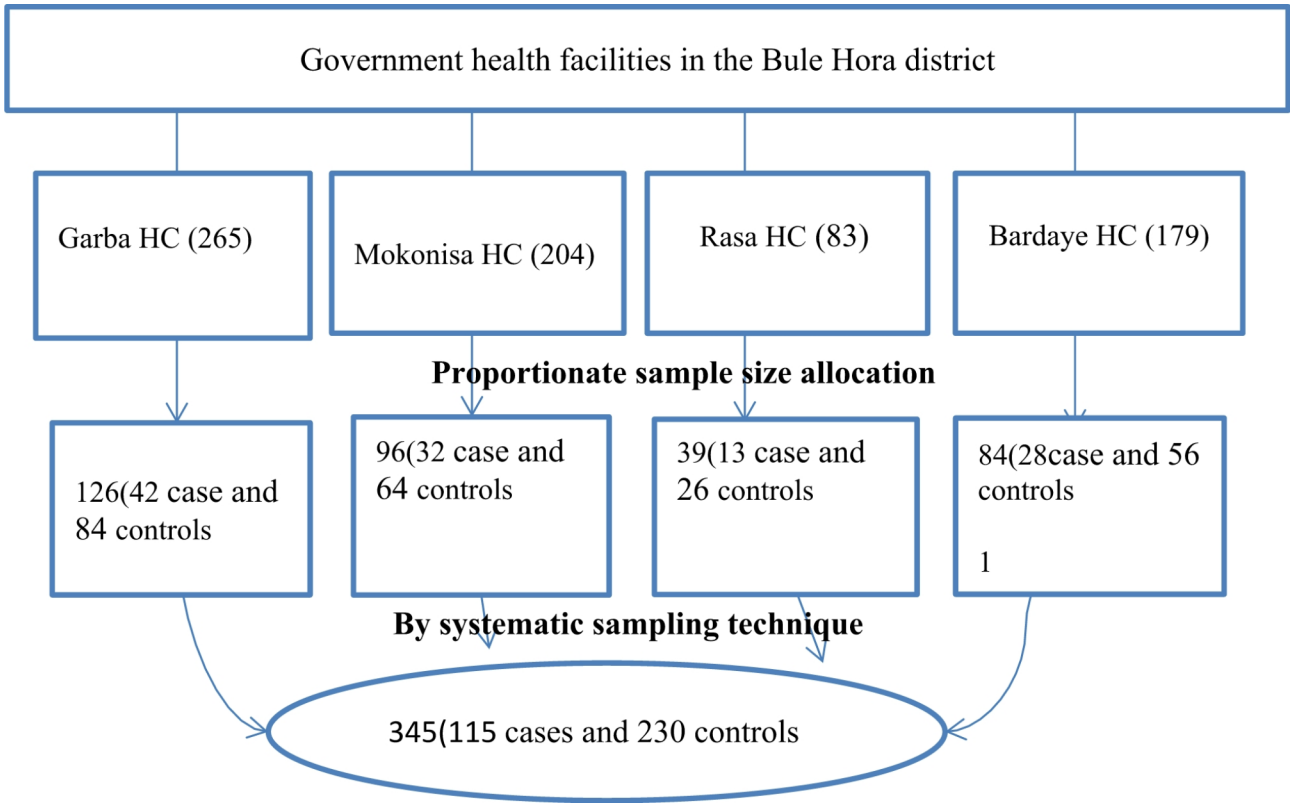

Fig. 1 Schematic representation of the sampling procedure used to obtain study participants from the Bule Hora district, public health facilities, west Guji zone, soutern Ethiopia, 2024

Independent variables

Sociodemographic-related factors: included age, marital status, residence area, father's education level, family size, mother's occupation, and mother's education level.

Obstetric and non-obstetrics-related factors: - ANC registration time, gravidity, number of ANC visits, history of stillbirth and abortion, and current anemia history.

Health service-related factors: Availability of IFAS, distance of home from the health facility, and counseling about iron folic acid during ANC service.

Client-related factors: knowledge about Anemia and IFAS, media exposure, attitudes toward IFAS and anemia, and family/husband support.

Data collection tools and procedure

Data were collected via pretested interviewer-administered questionnaires and a review of patient cards (to confirm the presence of current anemia). The questionnaires were designed after a review of various studies [2, 15, 19–26]. The questionnaire contains a total of 45 items, of which seven items are related to sociodemographic characteristics, 7 items are related to obstetrics and health, 4 items are related to health services, and 27 items are client-related factors. The midwife health professional in each health center determined the case status of the study participants, who were subsequently linked to the data collectors with a unique identification code. A face-to-face interview technique was used to collect data by four clinical nurses under the close supervision of designated supervisors (2 BSc nurses).

Data quality management

The quality of the data was assured by translating the English version of the pre-tested questionnaire to the local language, Afan Oromo, for interviews and then retranslating it back to English for consistency. Two days of orientation were given for supervisors and data collectors on the study purpose and the data collection methods used, by the principal investigator. One week before the actual collection of data pretest of the questionnaire was done by using a 5% sample size of the population (17 participants) in Gwangua health center outside of the study area in the Abaya district. And, internal consistency of the questionnaire was assessed and Cronbach's alpha was computed; knowledge about the IFAS (0.78), knowledge of pregnant women regarding anemia (0.842), and attitudes toward anemia and the IFAS (0.868) which were acceptable. The data collectors were blinded to case status of the study participants. The principal investigator oversaw the entire process of data collection.

Data analysis procedure

The data were entered into EPI Data version 4.1, and then exported to SPSS version 26. Before analysis, data completeness and missing value were checked. Descriptive statistics were computed to summarize categorical and continuous variables. Bivariable analyses were conducted to identify candidate variables at $p < 0.25$, and those variables were further entered into a multivariable logistic regression model and backward variable elimination was used to identify determinants of IFAS compliance among pregnant women and.

Finally, p-values less than 5% with AORs at the 95% confidence level were used to declare variables with statistically significant associations. Tolerance and the variance inflation factor (VIF) were used to test for multicollinearity and determine if there was a linear association between the independent variables. All the variables were retained in multivariable analyses and none of them yielded variance inflation factors greater than 10, tolerances less than 0.1; (VIF < 1.65, tolerance > 0.6). Hosmer and Lemeshow's test was found to be insignificant (p-value = 0.087). Depending on the kind of data collected, the study's results were presented using tables, graphs, and text.

Operational definition

Compliance with IFAS: Pregnant women who received the iron-folic acid supplement at least four days a week during the week before the data collection period (if a women can consume at least 4 tablet per day in a week within 6 month she will consume 96 tablet, which is 90 plus, and we can call it she was compliant to the recommended dosage of IFAS during pregnancy [1, 2, 16, 20, 26].

Good knowledge about iron folic acid supplementation: A questionnaire consisting of 8 closed-ended questions was used to assess women's knowledge of the IFAS (see annex-I, part III). Those who answered yes to the questions received a score of 1, and those who answered no to the questions received a score of 0. When a woman answered greater than or equal to the mean score of composite items, her knowledge of the IFAS was rated as good; if she answered less than the mean score of composite items, her knowledge was rated as poor [26].

Good knowledge about anemia: a questionnaire consisting 6 closed-ended questions was used to measure the knowledge of pregnant women about anemia (see annex-I, part IV). Those who answered yes to the questions received a score of 1, and those who answered no to the questions received a score of 0. The woman's knowledge regarding anemia was categorized as good for those who answered greater than or equal to the mean score of the composite items and poor for those who answered below mean scores of the composite items [20].

Attitudes toward anemia and iron folate supplementation: - Ten closed-ended questions on anemia and IFA were posed to the respondents, and their responses were utilized to assess their attitudes (see annex-I, part VI). A 5-point Likert scale was used to rate each of these items: 1 for "strongly agree," 2 for "agree," 3 for "not sure," 4 for "disagree," and 5 for "strongly disagree." A composite score was determined on the basis of average of the ten items. Two categories were created from the composite score: below mean = positive attitude and, mean and above = negative attitude toward the IFAS and anemia [27].

Current history of anemia: hemoglobin level less than 11 mg/dl (confirmed by client card review).

Media exposure: There are two categories of media exposure: satisfactory and unsatisfactory. Mothers were deemed to have satisfactory media exposure if they watched television or listened to the radio at least once a week; otherwise, they were deemed to have unsatisfactory media exposure [28].

Ethical consideration

The Helsinki Declaration was followed in the conduct of this study. Before data collection, ethical clearance was obtained from the institutional review board of Dilla University's College of Health Science and Medicine (Ref. No: duchm/IRB/026/2024). A support letter was received from Dilla University's Department of Human Nutrition. A permission letter was obtained from the Bule Hora Health Office before data collection. Written informed consent was obtained from participants and included information about the study's objective and methods, possible risks and benefits, voluntary participation, and withdrawal rights. An attempt was made to keep all the respondent data confidential. The respondents were also informed that their answers to the questions were grouped with other respondents' answers and reported as part of a research study. No other ethical issue is related to the study.

Result

Sociodemographic characteristics of the study participants

A total of 345 pregnant women (115 cases and 230 controls) participated in this study, resulting in a response rate of 100%. The mean (SD) age of the study participants was 27.25 (± 5.2) for cases and 26.7(± 5.1) for controls. One hundred eighty-four (53.3%) of the pregnant women who participated in the study were between the ages of 25–34 years, of whom 124(53.9%) were controls and 60(52.2%) were cases. Among all the participants the majority of the 324 (93.6%) pregnant women who participated were married and more than half of the 202(58.6%) were housewives. With respect to their educational status only 72 (20.9%) of them could not read and write.

Table 2 Sociodemographic characteristics of pregnant women attending ANC service at Bule Hora district health facilities, Southern Ethiopia 2024 ($n=345$)

Variable	Categories	Case (%)	Control (%)	Total
Age(in years)	> 35yrs	21(18.3)	28(12.2)	49(14.9)
	25-34yrs	60(52.2)	124(53.9)	184(53.3)
	15-24yrs	34(29.5)	78(33.9)	112(32.5)
Marital status	Divorced	4(3.5)	4(1.7)	8(2.3)
	Widowed	5(4.3)	8(3.5)	13(3.8)
	Married	106(92.2)	218(94.8)	324(93.9)
Educational status of wife	Cannot read and write	25(21.7)	47(20.4)	72(20.9)
	Can read and write	15(13)	55(23.9)	70(20.3)
	Primary education	33(28.7)	69(30)	102(29.6)
	Secondary education and above	42(36.5)	59(25.7)	101(29.3)
Educational status of husband	Cannot read and write	7(6.1)	18(7.8)	25(7.2)
	Can read and write	19(16.5)	48(20.9)	67(19.4)
	Primary education	32(27.8)	54(23.5)	86(24.9)
	Secondary education and above	57(49.6)	110(47.8)	167(48.4)
Occupation	Government employee	21(18.3)	25(10.9)	46(13.3)
	Housewife	67(58.3	135(58.7)	202(58.6)
	Daily laborer	9(7.8)	35(15.2)	44(12.8)
	Merchant	18(15.7)	35(15.2)	
Family size	≥ 6	19(16.5)	48(20.9)	67(19.4)
	3–6	58(50.4)	96(41.7)	154(44.6)
	< 3	38(33)	86(37.4)	124(35.9)

Table 3 Obstetric-related characteristics of pregnant women attending ANC services at the Bule Hora district health facility, Southern Ethiopia 2024($n=345$)

Variable	Categories	Cases (%)	Control (%)	Total
Time of ANC contact	≥ 4months	49(42.6)	67(29.1)	116(33.6%)
	≤ 4months	66(57.4)	163(70.9)	229(66.4%)
Frequency of ANC contact	4 or more times	8(7)	106(46.1)	114(33%)
	Less than 4	107(93)	124(53.9)	231(67%)
Gravidity	Prim gravida	9(7.8)	37(16.1)	46(13.3%)
	Multigravida	106(92.2)	193(83.9)	299(86.7%)
Having a current history of anemia	Yes	31(27)	45(19.6)	76(22%)
	No	84(73)	185(80.4)	269(78%)
Ever had a history of abortion	Yes	7(6.1)	12(5.2)	19(5.5%)
	No	108(93.9)	218(94.8)	326(94.5%)

The study participant's residence areas were rural for 156(67.8%) controls and 70 (60.9%) cases. (Table 2)

Obstetric and non-obstetrics-related characteristics

Among the participants in the study, 106(92.2%) cases and 193(83.9%) were multigravida mothers. Among the total participants, 14(4.1%) and 19(19.5%) had a history of stillbirth and abortion respectively. With respect to ANC services 66(57.4%) cases and 163(709%) controls started ANC follow-up at less than 16 weeks of their pregnancy. (Table 3)

Health service-related factors

With respect to distance from health facilities,200(58%) pregnant mothers travel less than 30 min to reach health facilities accounting 70(35%) cases and 130(65%) controls, but the remaining 35(10.1%) travel more than one hour of which 12(34.3%) cases and 23(65.7) controls travel. The waiting time at health facilities was between 15 and 30 min for the majority of the respondent accounting for 81(70.4%) cases and 169(73.5) controls. With respective to IFAS, 268(77.7%) pregnant women obtained adequate supplements from health facilities, 72(62.6%) of whom were cases and 196(85.2%) of whom were controls. About 258(74.8%), of the participants received counseling from service providers about supplementation, 69(60%) of whom were cases and 189(82.2%) of whom were controls.

Client-related factors

Among the total participants, 186(53.9%) had access to media (radio/television) of whom 61(53%) were cases and

125(54.3%) were controls. Pregnant women who reported husband/family support to take IFA tablets accounted for 175 (50.7%) of the respondents, 31(27%) were cases and 144(62.6%) were controls. (Fig. 2)

Knowledge of pregnant women with IFAS and anemia

Among all the participants, 88 (29.7%) cases and 208 (70.3%) controls were aware of the benefits of taking IFAS tablets during pregnancy. From all participants, 88(29.7%) of the cases and 208(70.3%) of the controls knew that taking iron and folic acid supplements during pregnancy is crucial to the mother. (Table 4)

With respect to the responses of the participants to the questions asked to assess their knowledge of anemia 74(25.3%) of cases and 219(74.6%) of the controls knew that anemia can be prevented. Among all the respondents, only 22(21.2%) cases and 82(78.8%) controls knew that anemic women easily became breathless. (Table 5)

With respect to the overall knowledge of the pregnant women about IFAS and anemia, 220(63.8%) and 183(53%) of them were categorized as having good knowledge of IFAS and good knowledge of anemia respectively. (Table 6)

The attitudes of pregnant women toward IFAS and anemia

With respect to pregnant women's attitudes towards IFAS and anemia 197(57.1%) were categorized as having positive attitude, among whom 45((39.13%) were cases and 152(66.09%) were controls. (Fig. 3)

Determinants of compliance with IFAS among pregnant women

Bivariable analysis revealed that at a *p*-value less than or equal to the0.25 significance level, 13 variables namely occupational status, educational status, residency, gravidity, frequency of ANC contact, time at first ANC contact, current history of anemia, obtaining adequate IFAS tablets from health facilities, receiving counseling from health providers about IFAS, husband/family support to take IFAS, knowledge of anemia and IFAS, and attitudes toward IFAS and anemia were identified as; candidate variables for multivariable logistic analysis. In a multivariable logistic regression, four variables were retained statistically significant at a *p*-value of <0.05 and at the 95% confidence level. Accordingly, gravidity, frequency of ANC contact; husband /family support, and knowledge of anemia were significantly associated with IFAS compliance.

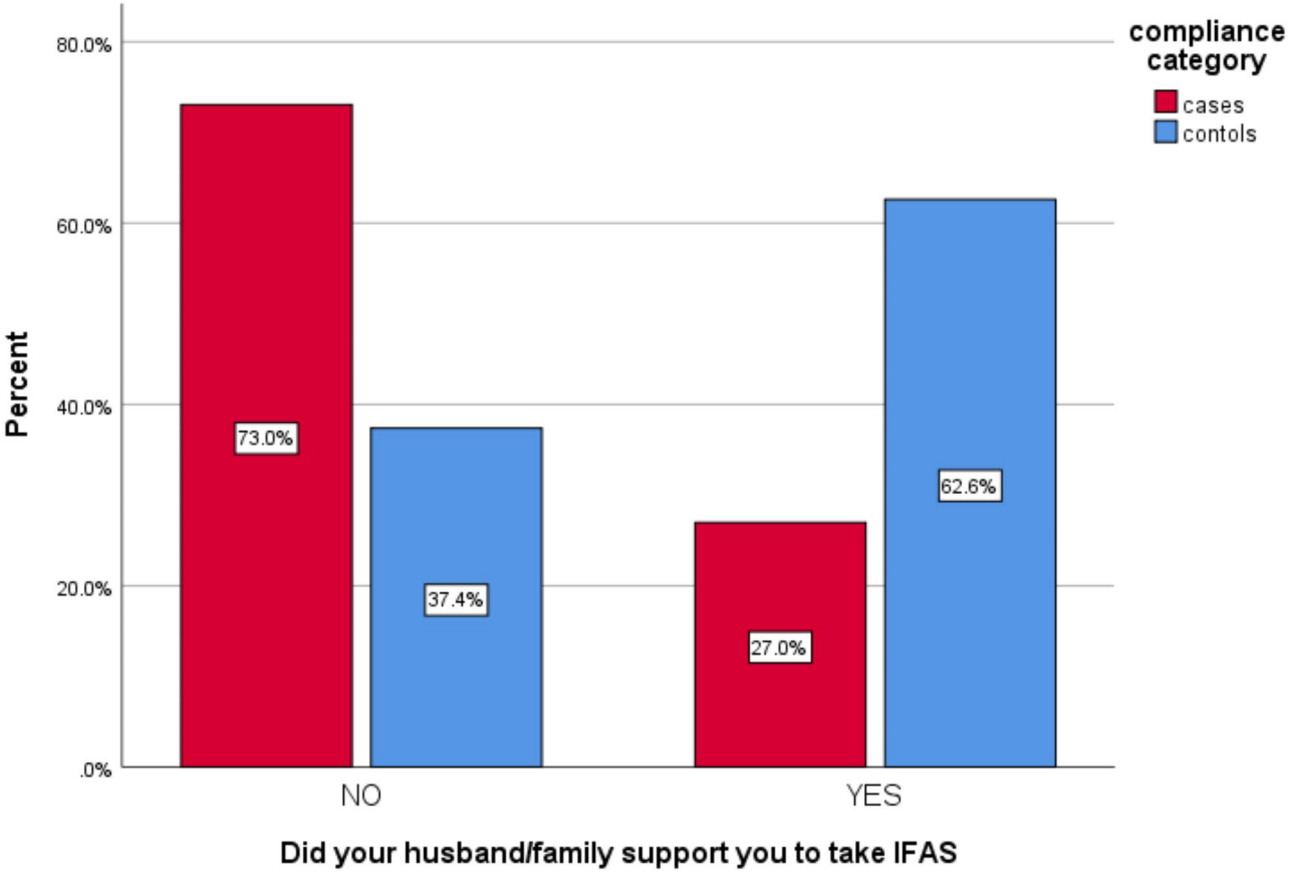

Fig. 2 Number of pregnant women who have husband support to take IFAS, in Bule Hora district health facility, south Ethiopia 2024 ($n=345$)

Table 4 Responses of pregnant women attending ANC services, to IFAS-related questions, in the Bule Hora district health facility, Southern Ethiopia, in 2024 ($n=345$)

s.no	Question	Response	Cases (%)	Controls (%)	Total (%)
1	Have you ever heard about IFAS?	No	33(45.2%)	40(54.8%)	73(21.2)
		Yes	82(30.1%)	190(69.9%)	272(78.8)
2	Taking iron folic acid during pregnancy is crucial for the mother	No	27(55.1%)	22(44.9%)	49(14.2)
		Yes	88(29.7%)	208(70.3%)	296(85.8)
3	Taking iron folic acid during pregnancy is crucial for the fetus	No	47(45.6%)	56(54.4%)	103(29.9)
		Yes	68(28.1%)	174(71.9%)	242(70.1)
4	Taking iron folic acid begins from confirmation of pregnancy and continue	No	88(39.3%)	136(60.7%)	224(64.9)
		Yes	27(22.3%)	94(77.7%)	121(35.1)
5	Taking iron folic acid during pregnancy is crucial to avoid anemia	No	50(60.2%)	33(39.8%)	83(24.1)
		Yes	65(24.8%)	197(75.2%)	262(75.9)
6	Taking IFA tablets continues during the postpartum period	No	90(35.2%)	166(64.8%)	256(74.2)
		Yes	25(28.1%)	64(71.9%)	89(25.8)
7	Consuming IFA tablets during pregnancy does not lead to a big baby	No	62(47.7%)	68(52.3%)	130(37.7)
		Yes	53(24.7%)	162(75.3%)	215(62.3)
8	Taking IFA pills during pregnancy may help prevent birth abnormality	No	63(45.7%)	75(54.3%)	138(40.0)
		Yes	52(25.1%)	155(74.9%)	207(60.0)

Table 5 Responses of pregnant women attending ANC services, on anemia-related questions, in the Bule Hora district health facility, Southern Ethiopia, in 2024 ($n=345$)

s.no	Question	Response	Cases (%)	Controls (%)	Total (%)
1	Pregnancy can make women anemic	No	65(42.8%)	87(57.2%)	152(44.1)
		Yes	50(25.9%)	143(74.1%)	193(55.9)
2	Anemic women become breathless easily	No	93(38.6%)	148(61.4%)	241(69.9)
		Yes	22(21.2%)	82(78.8%)	104(30.1)
3	Anemic women have weaknesses	No	56(56.6%)	43(43.4%)	99(28.7)
		Yes	59(24.0%)	187(76.0%)	246(71.3)
4	Anemic women have pale skin or tongue	No	88(36.2%)	155(63.8%)	243(70.4)
		Yes	27(26.5%)	75(73.5%)	102(29.6)
5	Anemia can be prevented	No	41(78.8%)	11(21.2%)	52(15.1)
		Yes	74(25.3%)	219(74.7%)	293(84.9)
6	Are you aware of the measures taken to prevent anemia?	No	43(70.5%)	18(29.5%)	61(17.7)
		Yes	72(25.4%)	212(74.6%)	284(82.3)

Table 6 Knowledge of pregnant women attending ANC services for IFAS and anemia, in the Bule Hora district health facility, Southern Ethiopia, in 2024 ($n=345$)

Variable	Categories	Cases (%)	Control (%)	Total (%)
Knowledge on IFAS	Poor knowledge	63(54.8)	62(27)	125(36.2)
	Good knowledge	52(45.2)	168(73)	220(63.8)
Knowledge on anemia	Poor knowledge	80(69.6)	82(35.7)	162(47)
	Good knowledge	35(30.4)	148(64.3)	183(53)

According to this study, the odds of good compliance with iron and folic acid supplementation were 4.67 times greater among prim gravida women than among multigravida women. The study also revealed that the odds of having good compliance with IFAS were 7.84 times greater among pregnant women who had ANC contact 4 or more times than among those who had less than 4 ANC contact during their current pregnancy. (Table 7)

Furthermore, women who had good knowledge of anemia were 3.79 times more likely to have compliance with iron and folic acid supplementation than those who had poor knowledge by keeping other variables constant. (Table 7)

The study also revealed that the odds of having good compliance with iron and folic acid supplementation were 4.8 times greater among those who had husband support than among those who had no husband support. (Table 7)

Discussion

The World Health Organization has recommended daily iron and folic acid supplementation starting in the first trimester to prevent anemia during pregnancy. Ethiopia also incorporates this recommendation into a free antenatal program. However, due to many factors, compliance of pregnant women with this recommendation of iron and folic acid supplementation remains low, both in

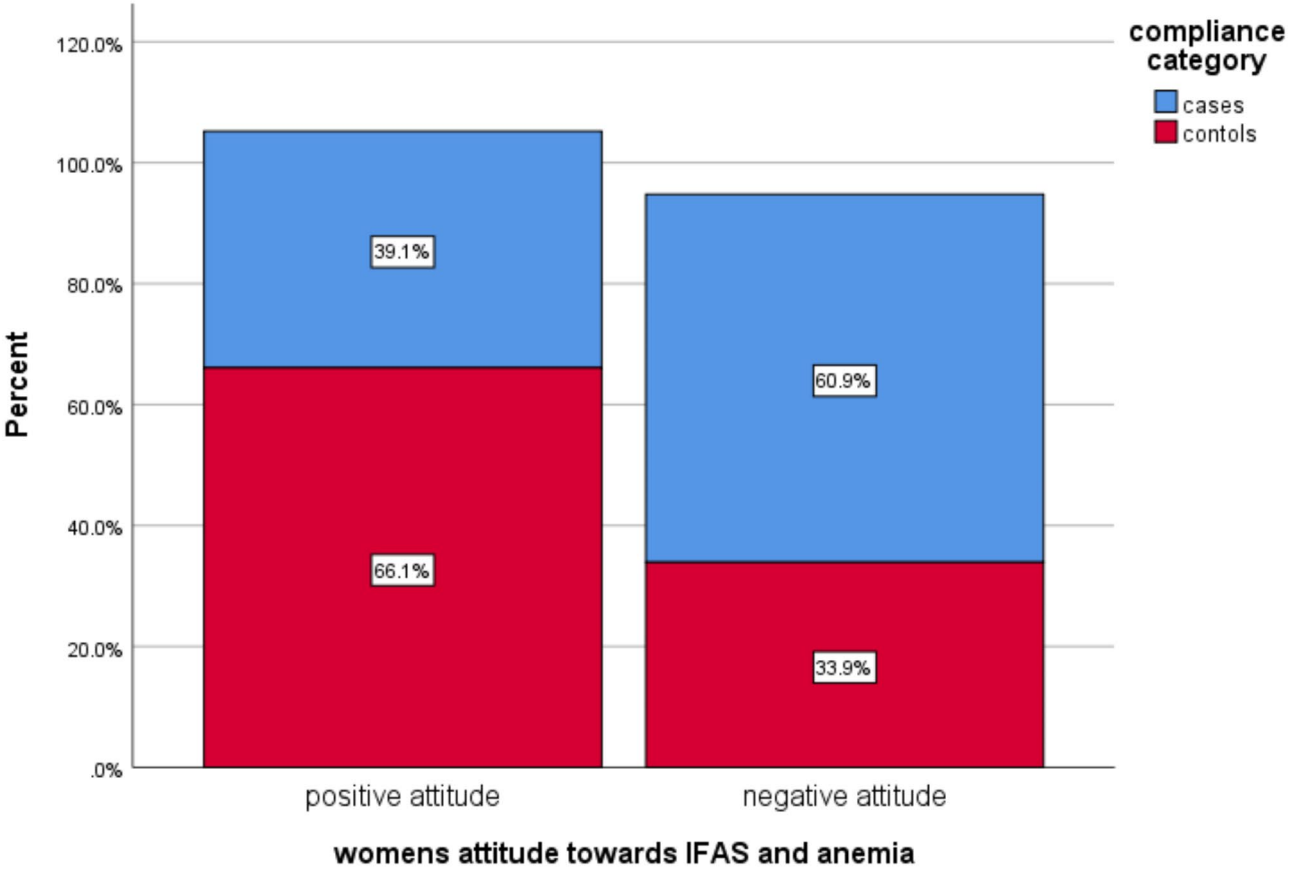

Fig. 3 Attitude of pregnant women attending ANC services, towards IFAS and anemia, in Bule Hora district health facility, southern Ethiopia, 2024 ($n=345$)

Table 7 Bivariable and multivariable logistic regression analysis of determinants of IFAS compliance among pregnant women attending ANC at Bule Hora district, South Ethiopia, 2024 ($n=345$)

Variable	Category	Compliance		COR (95% CI)	AOR (95%CI)	*P*-value
		Cases (%)	Controls (%)			
Gravidity	Multigravida	106(92.17)	193(83.91)	1	1	
	prim gravida	9(7.83)	37(16.09)	2.25(1.05–4.8)	4.67(1.60-13.57)	0.005**
Frequency of ANC contact	Less than 4	107(93.04)	124(53.91)	1	1	
	4 or more times	8(6.96)	106(46.09)	11.43(5.32–24.54)	7.84(3.34–18.41)	< 0.001**
Husband /family support	No	84(73.04)	86(37.39)	1	1	
	Yes	31(26.96)	144(62.61)	4.53(2.77–7.41)	4.48(2.19–9.13)	< 0.001**
Knowledge on anemia	Poor knowledge	80(69.57)	82(35.65)	1	1	
	Good knowledge	35(30.4)	148(64.35)	4.12(2.55–6.66)	3.79(1.85–7.75)	< 0.001**

COR crude odds ratio and *AOR* adjusted odds ratio * $P \leq 0.05$, ** $P < 0.001$

Hosmer and Leme-show test = 0.087

Africa and Ethiopia. This study aimed to assess the determinants of iron folic acid compliance among pregnant women receiving ANC services in the Bule Hora district.

This study revealed that being prim-gravida mother was positively associated with IFAS compliance. This finding was in line with those of cross-sectional studies on adherence to iron and folic acid supplementation during pregnancy in Kenya and in western Uganda [10, 12, 29]. However this finding was different from the findings of studies done at Ayder Comprehensive Specialized Hospital, at Debre Tabor General Hospital in northern Ethiopia, and Asela town, Oromia region, which indicate that multi gravida mothers were more likely to have compliance with IFAS than were prim gravida [23, 30, 31]. The possible explanation for the current finding might be that prim gravida mothers lack birth experience; they perceive a higher level of pregnancy-related risk than do multigravida mothers do, which may explain why they

are more likely to follow health care provider recommendations of IFAS intake.

The other determinant identified in this study was the frequency of ANC contact. In this study, pregnant mothers who had ≥ 4 ANC contact were more likely to have compliance with IFAS than pregnant women who had fewer than four ANC contact. This finding is in line with the findings of studies conducted in the western zone of Tigray, Assela town, Debre Tabor General Hospital, and public hospitals of Dire Dawa [19, 23, 31, 32]. A possible explanation could be that pregnant women who had more ANC visits were more likely to receive more ANC services, including counseling, and were more likely to acquire better information and knowledge about the health benefits of iron and folic acid to prevent anemia during pregnancy [6]. This gives healthcare professionals an excellent chance to address any issues pregnant women may have while taking supplements and to encourage mothers to utilize them as prescribed.

The study also revealed that pregnant women who had good knowledge of anemia were more likely to have compliance with iron and folic acid supplementation than their counterparts. This study was in line with a study conducted in the Tigray region of Adwa town, northern Ethiopia. This finding was also supported by a study done in the Dembia district and the North Wollo zone of northern Ethiopia [22, 24]. This result could be explained by the idea that a mother who knows more about anemia will be able to comprehend its causes, preventative strategies, and potential problems that could harm both the mother and her unborn child. The mothers learn from this how important it is to take IFA as prescribed.

In this study, pregnant mothers whose husbands/families supported them in taking IFAS were more likely to comply with IFAS than those who did not have their husbands' support. This finding was supported by study done in Tigray region of Adwa town in northern Ethiopia [32]. This might be because the husband is the closest person to his wife so he helps remind her to take her IFA tablets daily.

In conclusion, the findings of the current study show that pregnant women who did not have comply with IFAS were those who were multigravida, who had fewer than four ANC contacts during pregnancy, who had low knowledge of the risk of anemia, and who had a negative at titude toward IFAS and anemia.

Limitations of the study

Pregnant women's self-reports provided information on the determinants of compliance with iron-folic acid, which could lead to recall bias and social desirability bias because respondents might report what was expected of them while their actual compliance with IFAS intake might differ. This could lead to misclassification bias when determining study participants' compliance status.

Strengths of the study

The strength of the study was that it was a multicenter study and involved all health facilities in the Bule Hora district, which increased its generalizability. Moreover, the study aimed to address determinants of IFAS compliance and provided specific information on which determinants to be focused on for an intervention plan to enhance compliance with IFAS among pregnant mothers.

Conclusion

In the present study, we found that being prim gravida, having ANC contact 4 or more times, having good knowledge of anemia, and having a husband support to remind them to take IFAS were factors that positively influenced pregnant women's compliance with iron and folic acid supplementation. Therefore, an effort should be carried out to improve compliance with iron-folate supplementation among pregnant women in the study setting through educating pregnant women about anemia, promoting mothers to have ANC contact at least four times, and encouraging of husband's support to remind the pregnant mother to take their supplementation, by the government and other supporting agencies.

Recommendations

On the basis of findings of this study, the following recommendations are proposed:

For health facilities

- Encouraging health professionals to provide health education to increase awareness of anemia consequences during pregnancy.
- Giving attention to multigravida mothers while providing ANC service.
- Encouragement of male involvement in ANC follow-up.

For the district health office

- Raising community awareness of the benefits of iron folate supplementation and the danger of anemia for pregnant women through health education at regular community meetings and mass media campaigns is highly recommended.
- Moreover, trying to increase ANC contact by providing few incentives such as a maternal welcoming package during ANC contact and issuing a certificate to mothers who complete more than four ANC contact could increase IFAS compliance.

For researchers

- Further studies supplemented with in-depth qualitative studies to address sociocultural determinants, through objective compliance measurement methods such as the pill count method are recommended.

Supplementary Information

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Supplementary Material 1

Supplementary Material 2

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Author contributions

R.T. wrote the main manuscript "M.B. and M.M. prepared the figure and edited the manuscript"M.D., J.J., and B.M. reviewed the manuscript and edited gramatical error.

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Data availability

Data is provided as supplemetary information file.

Declarations

Ethics approval and consent to participate

The Helsinki Declaration was followed in the conduct of this study. Before data collection, ethical clearance was obtained from the institutional review board of Dilla University's College of Health Science and Medicine (Ref. No: duchm/IRB/026/2024). A support letter was received from Dilla University's Department of Human Nutrition. A permission letter was obtained from the Bule Hora Health Office before data collection. Informed consent was obtained from participants and included information about the study's objective and methods, possible risks and benefits, voluntary participation, and withdrawal rights. An attempt was made to keep all the respondents data confidential. Respondents were also informed that their answers to the questions were grouped with other respondents' answers and reported as part of a research study. No other ethical issue is related to the study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

[1]Department of Nursing, College of Health and Medical Sciences, Dilla University, P.O. Box: 419, Dilla, Ethiopia

[2]School of Public Health, College of Health and Medical Sciences, Dilla University, Dilla, Ethiopia

[3]East Arsi Zone, Asela Health Office, Oromia, Ethiopia

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