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Determinants of non-adherence to iron folic acid supplementation among pregnant women attending public health facilities in Bishoftu Town, Ethiopia: case–control study

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Abstract

Background Iron folic acid supplementation is one of the most global public health interventions to alleviate iron deficiency anemia during pregnancy. Both folic acid and iron deficiencies constitute the major micronutrient deficiencies in Ethiopian women. Non-adherence to folic acid supplementation is a factor for iron deficiency anemia among pregnant women including at selected study area,

Objective To identify determinants of non-adherence to iron-folic acid intake among pregnant women who attended antenatal care in Bishoftu town public health facilities, Ethiopia 2022.

Methods Facility-based unmatched case–control study was conducted from April 1 to May 30, 2022. A total of 105 cases and 211 controls of pregnant women participated in the study by using systematic random sampling methods for control and consecutive sampling was used for the case. Cases were pregnant women who started ANC service and take iron/folate supplements one month before data collection and who received IFA tablets less than 4 days per week. Controls were pregnant women who started ANC service and take iron/folate supplements one month before data collection and who take IFA tablets greater or equal to 4 days per week. Data were collected by trained health workers using interviewer administered structured questionnaires, entered into Epi-data version 4.6, and exported to Statistical Package for Social Sciences version 25 for analysis. Logistic regression was used to identify determinants of the non-adherence to iron-folic acid supplementation, and the variables with p-value < 0.25 were recruited for multivariable analysis, and an adjusted odds ratio with a 95% confidence interval and a p-value of ≤ 0.05 was used to declare the statistical significance of the variables.

Results Of the identified determinants of non-adherence to iron-folic acid supplementation:- women aged 15–24 years and 25–34 years [AOR = 5.0, 95% CI (3.04, 12.80), AOR = 11.8, 95% CI (8.01, 12.60)], women who started first ANC > 16 weeks (AOR = 2.41, 95% CI:1.11, 5.25), women who received ANC visit two and three [AOR = 5.17, 95% CI (2.50, 13.02), AOR = 2.95 95% CI (1.26, 6.80)], women with inadequate knowledge (AOR = 3.5,95% CI:1.70,7.20), women

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who received 30 and below tablets (AOR = 7.80, 95% CI:4.01, 18.02) were the determinants of non-adherence to iron-folic acid supplementation.

Conclusions Women's age, pregnancy weeks during first ANC, frequency of ANC follow-up, knowledge of women on iron-folic acid supplementation, women who received 30 and below tablets were significant predictors for non-adherence to folic acid supplementation. Thus, the town health office should work on non-adherence to folic acid supplementation during pregnancy to improve knowledge of all age groups of women during ANC visits with concerned stakeholders.

Keywords Determinants, Non-adherence, Iron folic acid supplementation, Pregnant women, Bishoftu town, Ethiopia

Introduction

Non-adherence to iron folic-acid supplementation among pregnant women is a common public health problem in developing countries, particularly in low-income countries, and it is associated with serious adverse health outcomes [1–3]. The non-adherence to iron-folic acid can occur when pregnant women in all settings should not receive 30–60 mg of iron element and 400 μg (0.4 mg) folic acid during pregnancy, due to late or non-initiation of the supplements, suboptimal implementation of the dosing regimen, or early discontinuation of adherence to iron-folic acid supplementation [1, 4, 5]. Iron folic acid intake among pregnant women is a core process indicator of the global nutrition monitoring framework that helps to halt the burden of iron deficiency anemia worldwide [3, 6–8]. Iron deficiency is the most common nutritional disorder in the world and pregnant women are especially at risk [9].

Globally, about 41.8% of pregnant women worldwide are anemic and iron deficiency anemia alone accounts for 22% of all anemia deaths [1, 10]. The most common causes of anemia are poor nutrition, deficiencies of iron, micronutrient deficiencies including folic acid, vitamin A, and vitamin B12 [11]. Iron deficiency anemia is estimated to affect 38.2% of pregnant women globally [12], with the highest prevalence in the regions of South-East Asia at 48.7% and Africa 46.3% [8, 12].

Women of reproductive age are at particular risk due to menstruation, whereas pregnancy and childbirth results in a net iron loss of 580 to 680 mg because of fetal and placental requirements and bleeding during delivery, in young children, rapid expansion in red cell mass results in very high dietary iron requirements [13]. It is also responsible for some pregnancy complications, such as neural tube defects, including spinal bifida and anencephaly, fetal malformation, type 2 diabetes, and obesity in the newborn [14, 15].

In sub-Saharan Africa, anemia contributed to approximately 28.6% of maternal deaths [15] and the overall prevalence of ≥ 90 days of iron supplementation adherence during pregnancy was only 28.7%. Likewise, there is very low adherence to Iron Folic Acid supplementation among pregnant women, which is 11% in Ethiopia [16]. One in every three women had anemia, while one in every two had iron and folic acid deficiency, indicating that both folic acid and iron deficiencies constitute the major micronutrient deficiencies in Ethiopian women [17]. Iron and folic acid are required for appropriate physiological function, growth, and development, as well as life maintenance. Their demand, like that of many other nutrients, rises during pregnancy, necessitating supplementation to meet daily requirements [10].

In Ethiopia, the coverage of iron supplementation during pregnancy is still low and has not fulfilled the World Health Organization (WHO) standard recommendations [18, 19].. According to the Ethiopia's national guidelines for the control and prevention of micronutrient deficiencies, all pregnant women should receive and consume a standard dose of 60 mg iron and 400 mg folic acid daily for 6 months starting from the first month of pregnancy or at the time of their first antenatal visit and three months of postnatal period [1].

Previous studies indicated that, pregnant women were not fully adhered to iron folic acid supplementation because of many factors such as maternal age, didn't get nutritional counseling, history of preterm delivery, knowledge about anemia were associated with a higher likely hood of non-adherence to iron folic acid supplementation (IFAS) among pregnant women [3, 20, 21] Similarly, the studies have also reported that, factors contributing to iron and folic acid non-adherence were forgetfulness, taking too many pills, not knowing the usefulness of iron and folic acid supplementation, fear of the side effects of the iron folic acid including nausea, vomiting, and unpleasant tests of the supplement [22, 23]. In addition, perceived benefits of iron folic acid supplementation and misinformation such as fear to give birth to a big baby, spot-on teeth of children and face of mothers, difficult delivery, not beneficial to babies, mothers experience with no history of having children with neural tube defects, and more bleeding during delivery were associated with non-adherence to IFAS [24, 25]. Women who failed to iron folic acid adherence and not consuming the iron tablets would experience iron folic acid (IFA) deficiency anemia and contribute to the negative effects on the mothers and newborns health outcomes [15].

However, there are limited evidences about the determinants of non-adherence to iron folic acid supplementation due to most of the previous studies conducted in Ethiopia were focused on adherence to iron folic acid supplementation and associated factors using cross-sectional study design, which cannot show cause and effects relationships of the problems. The identification of determinants of non-adherence to iron-folic acid supplementation among pregnant women could be used to take appropriate interventions and alleviate the risk of anemia related complications to the maternal and newborns. Therefore, the study aimed to identify the determinants of non-adherence to iron-folic acid supplementation among pregnant women attending public health facilities in Bishoftu Town, Ethiopia.

Methods and materials

Study design, period, and area

The facility-based unmatched case–control study was conducted in Bishoftu Town, Ethiopia from April 01 to May 30, 2022. Bishoftu Town has 1 public general hospital that provides health services for three sub-cities and five districts with greater than 1.2 million populations. The town has 5 public health centers under the Bishoftu Town Health Bureau and each health center provide service for 40, 000 population. All health facilities have been providing maternal and child health services including iron folic acid supplementation. About 385 health professionals & 193 supportive staff of governmental employers are providing health services to the community. The total population of the town was estimated to be 234,970 in 2022 and the expected number of pregnant women was 8153. Bishoftu town has 1 private hospital, 1 private health center, and 103 all types of private clinics in the town. All the fourteen health posts found in the town started implementing the urban health extension program and providing primary health care services to the town population and nearby communities.

Source and study population

The source population was all pregnant women who attend antenatal care in public health facilities in Bishoftu Town and the study population was all the selected pregnant women who started ANC services in the public health facilities in Bishoftu Town during data collection.

Cases: Pregnant women who started ANC services and take iron/folate supplements one month before data collection period from the selected health facilities and who take IFA tablets less than 4 days per week were considered as cases [4, 22, 26]. **Controls:** Pregnant women who started ANC services and take iron/folate supplements one month before data collection from the selected health facilities and who take IFA tablets greater or equal to 4 days per week were considered as controls [4, 22, 26].

Eligibility criteria

Inclusion criteria

Pregnant women who started ANC services and take iron/folate supplements one month before data collection from the selected health facilities.

Exclusion criteria

Mothers who are critically ill or in emergency condition at the time of data collection and who don't prescribe the IFAS.

Sample size determination

The sample size was calculated based on the double population proportion formula by using Epi Info statistical software version 7.2.2 for unmatched-case–control study design by considering the determinant variables from previous case–control studies conducted in Ethiopia [7] and compared to get a large sample [19]. The predictor variable registration time for antenatal care visit was considered as a significant determinant of the non-adherence to iron-folic acid supplementation from previous studies since it gave the maximum sample size. Among controls, 52% of pregnant women not started ANC visits registration time before 16 weeks, while among cases it was 34% and OR = 2.10 [19]. Using the assumptions of 80% power ($Z\beta = 0.84$), 95% confidence level ($Z\alpha/2 = 1.96$), a case-to-control ratio of 1:2, and after adding a 10% non-response rate, the total sample size was 316 (105 cases and 211 controls).

Sampling procedure

In this study, public health facilities found in the town were included in the study purposefully by considering iron folic acid supplementation is only provided at public health facilities. The number of study participants was assigned to each health facility proportional to the client size attended per year (Fig. 1). These health facilities are chosen for recruiting cases and controls since they are providing ANC services. Finally, 105 cases were selected by consecutive sampling, and 209 controls were selected by systematic random sampling methods using the registration logbook of the clients as a sampling frame for controls currently who start ANC follow-up and who took at least IFA for one month before data collection and $k^{th} = 6$. Out of the calculated sample size of 316, two participants were excluded due to the incompleteness of the data during data collection.

Data collection tool and procedures

The data collection was carried out by using interviewer administered structured questionnaires filled by data collectors. The majority of questionnaires were adapted, modified, and developed by reviewing different literature [3, 4, 26]. The questionnaires include the participant's

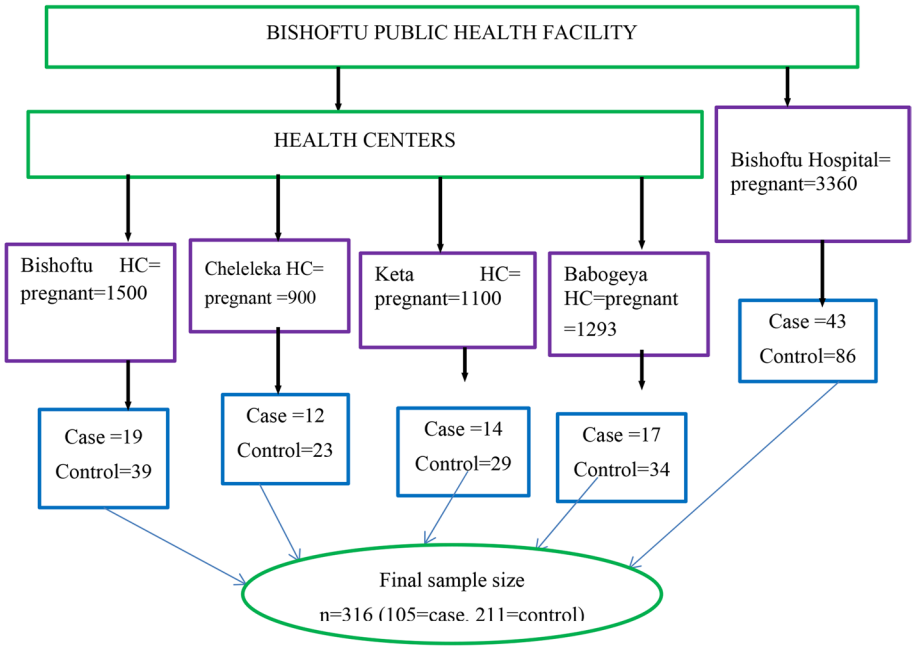


Fig. 1 Schematic presentation of sampling procedures for selecting cases and controls among pregnant women in Bishoftu town, 2022

socio-demographic characteristics, wealth index of household, obstetric and health-related characteristics, health-care-related variables, client-related factors (knowledge), and other topics. During recruitment, relevant information about the study was imparted to clients. ANC registration log was used for the sampling frame.

In addition to this, relevant information was retrieved from the records. The interviews were conducted through face to face with clients about how many IFAS tablets have taken per week. Cases and controls were declared by the data collectors as cases if the client took IFAS less than 4 tablets and controls if clients took IFAS at least 4 and above tablets per week and the questionnaire was filled by the data collectors based on the training given by the principal investigator.

Ten diploma midwives were recruited as data collectors to conduct an interview with respondents who were fluent in the local language and one health officer recruited as supervisor. To collect qualified data the ethical aspect of approaching the patients, and keeping the confidentiality of their knowledge was another focus of the training. Data collectors were given personal protection equipment. The data-gathering method was overseen by the investigator.

Study variable

Dependent Variable

Non-Adherence to Iron Folic Acid supplementation.

Independent Variables

Socio-demographic factors such as maternal age, maternal occupation mothers/husband, residence, educational status of mother/husband, marital status, religion, wealth index.

Obstetric factors such as parity, gravidity, number of ANC visits, ANC initiation time, history of abortion, Stillbirth, History of chronic disease, knowledge of women on the iron foliate supplement, the iron foliate drug, the benefit of iron foliate supplement, health facility-related factors, distance from the health facility, get medical advice, encounter shortage of supplement.

Operational definition

Non-Adherence

When a pregnant woman visited antenatal care clinic and took IFAS tablets for less than four days per week during the 1 month before the data collection period for this study [3, 27].

Adherence

According to the WHO definition of adherence to IFA supplementation, women are considered to have adhered to an iron/folic acid supplement if they took 65% or more of the supplement, equivalent to taking the supplement at least 4 days a week [23, 25, 28].

IFA Supplement

Provision of a specified dose of nutrient preparation containing iron and folic acid compound that can be prescribed to the pregnant women for either treating an

identified deficiency or prevention of the occurrence of folic acid deficiency in an individual [19, 29].

Wealth Index

There are several ways in which wealth, economic status of households, and living standards can be measured. Income, expenditure, and consumption are the three common measurements [30, 31]. The respondents were asked fifteen questions related to the wealth status of the households. After computing the sum score of the total questions, the respondents wealth status were categorized into staus lower, medium and higher wealth staus by using principal component analysis.

Knowledge status of respondent

Pregnant women were asked ten questions which are related to the iron folic acid supplementation using "Yes, No and I don't know" options. The correct answers were given a value of 1 and 0 for incorrect answers. After computing the sum score for each respondent, the minimum points to be scored was 0 and the maximum 10. The variable was dichotomized into having "good knowledge" about iron folic acid supplementation if the respondents scored above and equal to mean score (≥ 6.75) points, and "poor knowledge" about iron folic acid supplementation if the respondents scored below mean score (< 6.75) points [16, 17].

Preconception folic acid supplementation

Standard recommendation of folic acid (400μg/day) for all women from the moment they begin trying to conceive until 12 weeks of gestation should take folic acid supplements [8].

Data quality assurance

The questionnaires were prepared in English language and translated into the local language Afan Oromo, again back to English by an experienced language professional to ensure their validity and consistency. A pretest of the data collection tool was carried out on 5% of the sample size at Dukem health center out of a selected public health facility, which was a similar setup to the study area before the actual data collection. The training was given to data collectors and supervisors on the objectives of the study, how to select eligible study subjects, data collection tools and procedures, and interview methods.

On each data collection tool, the name of the data collectors was recorded to enhance the responsibility for any incomplete data. The collected data were examined by supervisors through daily follow-up of the data collectors with checklists. Incompleteness and missed variables checked during supervision and data processing. The principal investigator also supervises overall data collection, resource scarcity, and any forwarded problem was got immediate solution.

Data processing and analysis

The collected data were checked for completeness, accuracy, clarity, and consistency. The collected data were entered into Epi-data 4.6.2 and exported to SPSS version 25 for processing and analysis. Before analysis, data processing activities such as recording, computing, ranking, and counting were performed. Then, the characteristics of study participants were described using descriptive statistics such as frequency distribution and summary statistics. To identify independent variables, that have association with non-adherence to IFA, binary logistic regression was used. All variables with a P value < 0.25 were considered as candidates for multivariable logistic regression to control for possible confounding effects. Multivariable logistic regression was applied to identify the independent effect of each variable on the outcome variable. Collinearity between and among variables was assessed by variance inflation factor (VIF) and the value of the VIF for all variables were found to be less than 10 (VIF = 6.27), and model fitness was also checked by Hosmer Lemeshow goodness of test and its p-value were 0.79. with Omnibus test significance value of 0.04 which indicates the model is well fit the data. The final results of the association are presented based on AOR at 95% CI and $p < 0.05$ were considered statistically significant. Finally, the result of the study was presented in text and table forms.

Result

Socio-demographic characteristics of respondents

A total of 314 (105 cases and 209 controls) participants were included in the study, which gives a response rate of 99.4%, and 2 participants were excluded due to the incompleteness of the data. Their mean age was 26.8 (SD ± 5.2) years, and 102 (48.8%) among controls were 35 years and 57 (54%) among cases were 25–34 years. The majority of the study participants, 169 (80%) among controls and 91 (87%) among cases were urban residents. Concerning marital status of the respondents, 191 (91%) of the controls, and 96 (91%) of cases were married. Regarding educational status, 66 (31.5%) among controls and 33 (31%) among cases were attended secondary education. Of the respondents, 109 (52%) among controls and 54 (51%) among cases were Oromo by their ethnicity. Concerning religion of the respondents, 84 (40.2%) of controls and 41 (39%) of cases were orthodox. Regarding occupational and wealth status of the participants, 63 (30%) of controls and 26 (24.7%) of cases were housewife and about 86 (41%) among controls and 54 (51%) among cases had higher wealth status (Table 1).

Table 1 Socio-demographic characteristics of respondents among pregnant women attended ANC in public health facility in Bishoftu Town, Oromia, 2022

Variables	Controls		Cases	
	Frequency	%	Frequency	%
Age of participants				
15–24 Age	67	32.1%	39	37%
25 –34 Age	40	19.1%	57	54%
≥ 35 Age	102	48.8%	9	9%
Religions				
Orthodox	84	40.2%	41	39%
Muslim	45	22%	24	23%
Protestant	67	32%	36	34%
Other specify*	13	6%	4	4%
Residence				
Rural	40	19%	14	13%
Urban	169	81%	91	87%
Marital status				
Married/live together	191	91%	96	91%
Others[a]	18	9%	9	9%
Ethnicity				
Oromo	109	52%	54	51%
Amara	56	27%	26	25%
Gurage	25	12%	13	12%
Other specify **	19	9%	12	12%
Mothers Education				
Can't read and write	37	18%	5	5%
Read and write	9	4%	17	16%
Primary (1–8)	45	21.5%	26	25%
Secondary(9–12)	66	31.5%	33	31%
Diploma and above	52	25%	24	23%
Mothers occupation				
Government employee	35	17%	22	21%
Non-governmental employee	52	25%	25	24%
Student	43	21%	22	21%
Housewife	63	30%	26	24.7%
Other(specify)***	14	7%	10	9.3%
Wealth index category				
Lower wealth status	72	34%	35	33%
Medium wealth status	51	24%	16	15%
Higher wealth status	86	41%	54	51%

*wakefata &catholic, **Tigrea & Wolaita, ***farmer, daily laborer, merchant & driver, others[a] Single, widowed and separate

Table 2 Obstetric history related characteristics of pregnant women attended ANC visits in a public health facility in Bishoftu Town, Oromia, 2022

Variables	Controls		Cases	
	frequency	%	Frequency	%
Number of pregnancy				
One pregnancy	75	36%	44	42%
Two and above pregnancy	134	64%	61	58%
Number of delivery				
One delivery	57	43%	29	50%
Two and above delivery	77	57%	29	50%
History of Abortion				
Yes	34	16%	19	18%
No	175	84%	86	82%
Number of ANC Visit				
Two	44	21%	47	45%
Three	39	19%	32	30%
Four and above	126	60%	26	25%
Pregnancy weeks started ANC Visit				
≤ 12 weeks	165	79%	66	63%
> 12 weeks	44	21%	39	37%

Table 3 knowledge about iron and folic acid supplementation among pregnant women in public health facility Bishoftu Town, Oromia, 2022

Variables	Controls		Cases	
	Frequency	%	Frequency	%
Heard about Iron supplementation during pregnancy				
No	19	9%	9	9%
Yes	190	91%	96	91%
Pregnancy weeks when started iron supplementation				
Before 12 weeks	110	53%	57	54%
After 12 weeks	99	47%	48	46%
Knowledge on IFAS				
Poor Knowledge	68	33%	56	53%
Good knowledge	141	67%	49	47%

Obstetric History of pregnant women

Regarding obstetric history of respondents, 134 (64%) among controls and 61 (58%) among cases were had two and above number of pregnancies. Concerning the number of childbirths/deliveries by respondents, 77 (57%) of controls and 29 (50%) of cases had experienced 2–4 deliveries/childbirths. Of the study participants, 175 (84%) among controls & 86 (82%) among cases had not faced abortion in their past pregnancy. All of the study participants received ANC service. Of these respondents, 165 (79%) among controls and 66 (63%) among cases started their first ANC visits at ≤ 12 weeks. Concerning the respondents number of ANC visits, 126 (60%) among controls and 26 (25%) among cases attended four and above ANC visits (Table 2).

Knowledge of iron folate supplementation-related factors

Of the respondents, 190 (91%) among controls and 96 (91%) among cases were heard about iron supplementation during pregnancy. Concerning the respondents pregnancy weeks when started iron supplementation, 110 (53%) among controls and 57 (54%) among cases started IFAS before 12 weeks of their pregnancy. Regarding knowledge status of the respondents, 141(67%) of controls and 49 (47%) of cases had good knowledge about iron folic acid supplementation (Table 3).

Health facility-related factors

Of the respondents, 184 (88%) among controls and 90 (86%) among cases were travel less than or equal to 30 min of time to reach health facility. About 156 (75%) of participants among controls and 79 (75%) amon cases had greater than 30 min of waiting time to get health services.Regarding the number of iron folic acid received, 120 (57%) among controls and 31 (30%) among cases received 90 and above tablets during antenatal care follow up. Of the respondents, 120 (58%) among controls and 56 (53%) among cases had use Health Centers as source of iron folic acid supplementation. Concerning the shortage of the IFAS in the health facility, about 89 (43%) of the respondents among controls and 51 (49%) among controls were faced shortage of iron folic acid supplementation during their past antenatal care follow up visits (Table 4).

Determinants of non-adherence to iron folic acid among pregnant women

Of all assessed determinants of non-adherence to iron-folic acid supplementation tweleve variables showed association in bivariable analysis. All variables with a *p*-value < 0.25 in the bivariable logistic regression analysis were entered into multivariable analysis after adjusting for potential confounders. After multiple logistic regression was conducted using the backward wald method, five variables with p-value less than 0.05 were identified, those variables were age of the respondents, pregnancy weeks during first ANC visit, frequency of ANC visits, knowledge about IFAS, number of iron folic acid tablets received by pregnant women were significantly associated with IFAS. The result of the study showed that, the odds of non-adherence to iron-folic acid supplementation were 5 and 11.8 times more likely to happen among pregnant women aged 15–24 and 25–34 years old as compared to those aged greater than or equal to 35 years respectively [AOR = 5.0, 95% CI (3.04, 12.80) and [AOR = 11.80, 95% CI (8.01, 12.60)]. Those pregnant women who had started their first ANC visits above 12 weeks of pregnancy were 4.8 times more likely to have non-adherence to IFAS than their counterparts [AOR = 4.80, 95% CI (1.11, 5.25)]. The finding of this study also revealed that, those pregnant women who had received two and three ANC visits were 5.17 and 2.95 times more likely to have the odds of non-adherence to IFAS than women who received four and above ANC visits [AOR = 5.17, 95% CI 95% (2.50, 13.01)] and [AOR = 2.95, 95% CI (1.26, 6.80)]. Those pregnant women who had poor knowledge about iron folic acid supplementation were 3.5 times more likely to have the odds of non-adherence to IFAS than women who had good knowledge about IFAS [AOR = 3.50, 95% CI (1.70, 7.20)]. Those pregnant women who had received 30 tablets and less were 7.8 times more likely to have the odds of non-adherence to IFAS than those who received 90 tablets and above (AOR = 7.80, 95% CI (4.01, 18.02) (Table 5.).

Table 4 Health facility-related factors among pregnant women in public health facility Bishoftu Town, Oromia, 2022

Variables	Controls		Cases	
	Frequency	%	Frequency	%
Time to reach a health facility				
Less or equal to 30 min	184	88%	90	86%
Greater than 30 min	25	12%	15	14%
waiting time to get health service				
less or equal to 30 min	53	25%	26	25%
greater than 30 min	156	75%	79	75%
Number of Iron folic acid tablets received				
30 tablets	9	4%	40	38%
60 tablets	80	38%	34	32%
90 tablets	120	57%	31	30%
Source of IFAS				
Health center	122	58%	56	53%
privet pharmacy	74	35%	42	40%
Other health facilities*	13	6%	7	7%
Shortage of IFAS in a health facility				
Yes	89	43%	51	49%
No	120	57%	54	51%

Discussion

The study aimed to assess the determinants of non-adherence to iron-folic acid supplementation among pregnant women attended antenatal care in public health facilities in Bishoftu town, Oromia, Ethiopia. In this study the identified determinants of non-adherence to iron-folic acid supplementation were; the age of respondents, pregnancy weeks during the first ANC visit, frequency of ANC visit, knowledge about IFAS and amount of iron folic acid tablets received were significantly associated with non-adherence to iron folic acid supplementation.

This study revealed that, maternal age was significantly associated with IFA supplementation. Those pregnant women with age categories of 15–24 years and 25–34 years were 5 and 11.8 times more likely to have non-adherence to IFAS than those pregnant women aged greater than or equal to 35 years respectively. The finding of this study is consistent with the study conducted in Kenya [10], that the age of the pregnant woman is closely related to the non-adherence to iron folic acid due to young women may not have awareness about importance of iron folic acid supplementation. Young pregnant women may lack adequate knowledge about the benefits of IFA supplements, older women may start early ANC visits, since they have good level of experiences, and increased age is reported to be associated with IFAS compliance**.** This might be due to poor counseling during ANC visits, and less adherence to iron folic

Table 5 Determinants of non-adherence to iron folic acid supplementation among pregnant women in a public health facility in Bishoftu Town, Oromia, Ethiopia, 2022

Variables	Non-Adherence to iron-folic supplementation		COR (95% CI)	AOR (95% CI)	*P*-value
	Control	Case			
Age of participants					
15–24 Age	67 (32.10)	39 (38.10)	6 (3.60,14)	5 (3.04, 12.80)	0.001*
25 –34 Age	40 (19.60)	57 (55.20)	16 (8.60,35)	11.80 (8.01, 12.60)	0.001*
≥ 35 Age	102 (48.3)	9 (6.7)	1.00	1.00	
Educational status					0.09
Can't read and write	37 (17.71)	5 (3.80)	0.29 (0.06, 0.58)	0.28 (0.07,1.09)	0.07
Read and write	9 (4.80)	17 (16.10)	4 (1.17, 7.20)	2.20 (0.59, 8.29)	0.23
Primary (1–8)	45 (23.40)	26 (21)	1.52 (0.388,1.5)	0.60 (0.25, 1.40)	0.28
secondary(9–12)	66(31.10)	33 (32.4)	1.08 (0.48,1.67)	0.64 (0.27,1.40)	0.30
diploma and above	52 (23)	24 (26.7)	1.00	1.00	
Maternal Occupation					
Government employee	35 (16.7)	22 (20.9)	1	1	
Non-governmental employee	52 (24.9)	25 (23.8)	0.777 (0.34,1.56)	0.73 (0.54, 1.54)	0.79
Daily laborer	13 (6.20)	7 (6.7)	0.86 (0.29, 2.46)	0.84 (0.35, 1.5)	0.39
Student	43 (20.6)	22 (20.9)	0.81 (0.81, 1.78)	0.81 (0.28, 2.54)	0.76
housewife	63 (30.1)	26 (24.8)	0.666 (0.3, 1.3)	0.65 (0.34, 1.36)	0.59
Other(specify)***	3 (1.4)	3 (2.9)	1.59 (0.29, 8.41)	1.65 (0.3, 9.1)	0.23
Faced problems before this pregnancy					
Yes	67 (32.1)	11 (10.5)	0.25 (0.13,0.49)	0.25 (0.09,0.60)	0.01
No	142 (67.9)	94 (89.5)	1.00	1.00	
Pregnancy weeks during the first ANC					
≤ 12 weeks	165 (78.9)	66 (62.9)	1.00	1.00	
> 12 weeks	44 (21.1)	39 (37.1)	2.20 (1.30, 3.71)	2.41 (1.11,5.25)	0.001*
Encountered shortage of IFAS					
Yes	89 (42.6)	51(48.5)	0.79 (0.49, 2.25)	1.29 (0.79, 2.24)	
No	120 (57.4)	54 (51.5)	1	1	1
Frequency of ANC visit					
Two	44 (21%)	47 (45%)	5.17 (2.87,9.30)	5.17 (2.50,13.02)	0.001*
Three	39 (19%)	32 (30%)	3.90 (2.11,7.46)	2.95 (1.26,6.80)	0.01*
Four & above	126 (60%)	26 (25%)	1.00	1.00	
Knowledge about IFAS					
Good knowledge	141 (67%)	49 (47%)	1.00	1.00	
Poor knowledge	68 (33%)	56 (53%)	2.37 (1.466, 3.831)	3.50 (1.70, 7.20)	0.001*
Health Extension worker visits pregnant women					
Yes	158 (75.5)	84 (48.5)	1	1	
No	51 (24.4)	21 (20)	1.29(0.79, 2.2)	0.81 (0.54, 1.84)	
Faced side effects of IFAS					
Yes	73 (34.9)	37 (17.7)	1.08 (0.64, 1.84)	1 (0.65, 1.65)	0.92
No	136 (65.1)	68 (32.5)	1	1	
Health care provider counseled about IFAS					
Yes	137 (65.5)	67 (63.8)	1	1	
No	72 (34.4)	38 (36.2)	1.08 (0.66,1.76)	0.91 (0.54, 1.54)	0.7
Number of iron folic acid tablets received					
30 tablets	9 (4%)	39 (37%)	16.70 (7.30,38.30)	7.80 (4.01, 18.02)	0.001**
60 tablets	80 (38%)	34 (32%)	1.6 (0.90, 2.91)	1.50 (0.60, 3.5)	0.29
90 tablets	120 (57%)	31(30)	1.00	1.00	

acid supplementation, and infrequent ANC follow-up. This finding is inconsistent with the study done in Pakistan [32], according to a study conducted in Pakistan high number of non-adherence were among pregnant women aged above 45 years. Similarly, the study done in Ethiopia showed that pregnant women above 35 years of age had 4 times more likely to have higher odds of non-adherence to IFAS [3]. Also, a study done in Adwa town, Tigray region of Ethiopia, contrasts with this study. The age of the women, between 25 to 29 years, was found to be associated with adherence to iron-folic acid supplementation. The odds of adherence to folic acid among pregnant mothers in this age group of 25–29 years were two times higher than those who were in the age group of greater than 35 years [33].

Pregnant women who started their first ANC visits at greater than 12 weeks of pregnancy were more likely to have non-adherence to IFAS than their counterparts. This finding is in line with the study done in Central Ethiopia [34], Lay Armachiho of Northwest Ethiopia [4], and Hosanna Town of Southern Ethiopia [25]. A study done at Tikur Anbessa specialized hospital showed that, gestational age at the first ANC visit was significantly associated with adherence to IFAS.

Thus, pregnant women who started their ANC follow-up in the first trimester (first 12 weeks) were more likely to adherence to IFAS [35]. Also, this study is in line with a study done in Lay Armacho town, that showed 60% of pregnant women who didn't early register for first ANC visits had non-adherence to IFAS [17]. Pregnant mothers who registered early for ANC visits were 73.3% in this study, and the study conducted in the North Wollo Zone of Ethiopia showed that 57% have early ANC registration, which increases the chance of more ANC visits throughout their pregnancy. This may be helpful for pregnant women in obtaining more knowledge regarding iron deficiency anemia and the benefit of iron and folic acid supplementation than other pregnant women, as well as in receiving counseling from healthcare providers during their frequent ANC visits [7].

It is recommended that, the first contact of the pregnant woman with the ANC visits should be made within the first trimester (less than 12 weeks) of pregnancy. Therefore, early ANC attendance enables the chance of obtaining nutrition counseling for pregnant women, which may improve knowledge on IFA supplementation and hence increase adherence to IFA consumption [10]. The reason might be that pregnant women who start their ANC follow-up greater than 12 weeks have fewer ANC contacts and poor knowledge of iron folic supplementation; these may lead to poor adherence to IFAS.

According to this study, pregnant women who had received ANC visits two and three were more likely to have non-adherence to IFAS than women who received ANC visits four and above visits. This finding is supported by the study conducted in the Wolaita zone of SouthEthiopia, which found that those pregnant women who visited 2 and 3 ANC visits had 78% and 52% of reduced odds of using the supplementation, respectively [36]. Similarly, the study is consistent with the studies done in South Ethiopia [3], North Wollo Zone of Ethiopia [33], and Senegal [37]. This might be due to information about the importance of iron folic supplementation provided by health professionals and the number of ANC contacts that influence the adherence status of pregnant women to the supplement, because pregnant women receive iron supplementation through ANC visits at health facilities.

Also, the study revealed that, those pregnant women who had poor knowledge about iron folic acid supplementation were more likely to have non-adherence to IFAS than women with good knowledge. This finding is in line with a study done in Aykel town, Northwest Ethiopia that showed those women who had poor knowledge of IFAS were more likely to be non-adhered as compared to those who had good knowledge of IFAS [28]. Those pregnant women who know about iron folic supplementation have a direct relationships with non-adherence to iron-folic, and maternal education with secondary and above were contributing factors for iron folic supplementation [38].

The study also showed that, those pregnant women who had received 30 tablets of iron folic acid were more likely to have non-adherence to IFAS than those pregnant women who received 90 plus iron folic tablets. The finding is inconsistent with WHO recommendation [8], but the non-adherence to iron-folic in the current study is in line with the results of the study conducted in Northwest of Ethiopia. This discrepancy may be due to a shortage of iron folic and the unavailability of the drugs (stock out), being unable to take the supplement for different reasons, and poor adherence during each visit.

Strengths and limitations of the study

This study identifies or establishes the temporal relationship between case and control using wealth index rather than economic status. As a limitation of the study, the information on non-adherence to iron-folic acid supplementation was from self-report (electronic and pills counting methods were not used), and the study may have recall and social desirability bias.

Conclusion

The findings from this study were assessed and identified different determinants of non-adherence to iron-folic acid supplementation among pregnant women attending antenatal care in public health facilities. Of all assessed determinants of iron-folic acid supplementation, the

younger age of pregnant women was the factor for non-adherence to iron folic acid supplementation that may contribute to poor maternal and child health outcomes due to their lack of enough understanding about benefits of iron supplementation during early ANC visits. Frequency of ANC visits and pregnancy weeks during the first ANC visits were also the determinants of non-adherence to iron folic supplementation among pregnant women. Those pregnant women who have experienced late ANC visits and less antenatal care follow-up during pregnancy can be at risk of non-adherence to folic acid supplementation, which may have adverse effects on maternal and child health outcomes. Those pregnant women with poor knowledge of iron folic acid supplementation and its benefits were the identified factors for non-adherence to iron-folic acid supplementation. Having a good understanding and knowledge about iron folic acid supplementation during pregnancy are essential in reducing feto-maternal related adverse effects of iron deficiency anemia among pregnant women.

Thus, the town health office should work on non-adherence to iron-folic acid supplementation by strengthening antenatal care services with the frequency of visits through health education and ANC counseling activities to improve maternal knowledge and awareness of pregnant women on iron adherence. Encourage and facilitate the availability and distribution of iron folic acid to overcome the shortage of IFAS. Health professionals should work on transferring appropriate health information to pregnant women about the importance of adherence to iron-folic acid and empowering the women's development army to educate pregnant women through a health extension program on IFAS to initiate pregnant women for early ANC follow-up with the recommended frequency of visits and the correct dose and amount of tablet intake.

Abbreviations

ANC	Antenatal Care
AOR	Adjusted Odds Ratio
CI	Confidence Interval
FA	Folic acid
IFAS	Iron and Folic acid supplementation
NTD	Neural Tube Defect
PI	Principal Investigator
SPSS	Statistical package for social sciences
WHO	World Health Organization

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Authors' contributions
AHG, LA, and TN participated in conceptualization, data curation, formal analysis, investigation, funding acquisition, methodology, project administration, resources, software, supervision, validation, visualization, writing the original draft, writing a review, and editing the manuscript. DG, BSD, HD, EL, Dl, and LA participated in conceptualization, data curation, investigation, methodology, project administration, software, supervision, validation, visualization, writing the original draft, writing a review, and editing the manuscript. Finally, all of the authors reviewed the final manuscript and approved it for submission.

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Data availability
All the data sets generated during and/or analyzed during the study are included in the study and available from the corresponding author upon reasonable request.

Declarations

Ethical approval and consent to participate.
The ethical approval was obtained from Salale University, College of Health Sciences ethical review committee with ethical approval reference number of SLU/878/2022. Letter of permission was obtained from the Bishoftu town health office and respective Hospitals and Health Centers before conducting the study based on the Declaration of Helsinki. The ANC clinic staff was informed about the purpose of the study and written informed consent was obtained from every pregnant woman who attended the ANC visit and for the age of the mother less than 18 years the informed written consent to participate in the study were obtained from their parents/legal guardians. The entire study participants were informed that data was kept private, confidential, and used only for research purposes. Participation was voluntary and they were told that they can withdraw from the study at any time of data collection.

Consent to publication
Not applicable.

Competing of interests
The authors declared that they have no conflicts of interest.

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