

## Compliance with weekly iron folic acid supplementation and associated factors among secondary school adolescent girls, in Jimma Arjo District, West Ethiopia, 2022: A mixed method cross-sectional Study

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### Abstract

**Background:** Iron deficiency anemia is a prevalent and major public health problem in low- and middle-income countries among adolescent girls. The risk of Iron deficiency anemia and its consequences are prevented by taking and complying with a weekly iron-folic acid supplement. However, there was no information regarding compliance and its associated factors in Ethiopia. The study aimed to determine the magnitude of compliance with weekly Iron-folic acid supplementation and associated factors among Jimma Arjo secondary school adolescent girls.

**Methods:** Institutional-based cross-sectional study was conducted on 417 adolescent girls in three secondary schools of Jimma Arjo, West Ethiopia from March 1<sup>st</sup> to 31<sup>st</sup>, 2022 using interviewer-administered structured and semi-structured questionnaires. Bivariable and multivariable logistic regression analyses were used to determine the association of variables.

**Results:** Compliance with iron-folic acid supplementation was 29.3% with 95% CI (24.9, 33.3). Mother's secondary level of education (AOR=4.94 (95% CI:2.45,9.94)), awareness of anemia (AOR=4.23 (95% CI:2.35,7.61)), good knowledge about iron-folic acid supplementation (AOR=3.96 (95% CI:2.17,7.22)), lack of iron-folic acid supplementation (AOR=0.42 (95% CI:0.23,0.75)), and iron-folic acid supplementation side effects (AOR=0.17 (95% CI:0.08,0.37)) were factors significantly associated with iron-folic acid supplementation compliance. Misconceptions about iron-folic acid supplementation, forgetfulness of tablet, lack of access to drinking water, and irregularity of school weekly iron-folic acid supplementation days were identified as the main barriers to adolescent girls' compliance with iron-folic acid supplementation in a qualitative study.

**Conclusions:** Weekly iron-folic acid supplementation compliance was low at 29.3%. Scheduled health education, parental participation in the program, access to drinking water, refresher training for school focal persons, and fixed weekly iron-folic acid supplementation days can improve compliance with iron-folic acid supplementation and are recommended.

**Keywords:** Compliance; Weekly iron-folic Acid; Supplementation; School adolescent girls

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## 1. Introduction

Iron deficiency anemia is a low level of hemoglobin concentration in the blood, as evidenced by reduced quality or quantity of red blood cells [1]. The World Health Organization lists Iron deficiency anemia as a major cause of anemia, as one of the risk factors in developing countries for loss of disability-adjusted life years (DALYs) in adolescent girls [2]. Iron deficiency anemia is caused by chronic low Iron intakes, poor Iron source bioavailability, or high requirements of iron, such as during early childhood, adolescence, and pregnancy, when the body grows quickly, or during times of excess Iron loss because of hookworm infection, bleeding disorders, or significant menstrual blood loss [3,4].

Adolescence (10-19 years) is the most rapidly developing period after childhood, resulting in the expansion of blood volume and muscle mass [5]. Adolescence is characterized by a variety of changes, including pubertal growth, menstrual blood loss, changes in height (15–20%), weight (25–50%), and bone mass (45–50%) happened during this period [6,7]. For this reason, it was the greatest nutritional demand, as well as the second window of opportunity for growth, and development was addressed during this period [4].

Globally, about two billion people suffer from anemia with Iron deficiency anemia accounting for 50% of the total cases, which is caused by persistently low Iron levels [8]. Also all over the world, the prevalence of anemia among non-pregnant women including adolescent girls was 30% as well as in South Asia and West and Central Africa, the prevalence of Iron deficiency anemia among non-pregnant women, including adolescent girls, was 50%, and 49%, respectively [9]. In Sub-Saharan Africa, 36% of adolescent girls and non-pregnant women in the reproductive age group suffer from anemia [10].

Ethiopian Demographic Health Survey (EDHS), 2016 secondary data analysis showed that the prevalence of anemia among adolescent girls was 23.8% [11]. Another study found that the prevalence of Iron deficiency anemia among adolescent girls in three Ethiopian districts ranged from 24 % to 38% [12]. These, the high prevalence of Iron deficiency anemia in adolescent girls indicates that this problem ranges from mild to severe public health concerns [3].

It is predicted that a lack of global investments in anemia prevention and control will lead to an additional 265 million cases of anemia, 800,000 child deaths, and 7,000 - 14,000 maternal deaths by 2025 [13]. Additionally, the high prevalence of Iron Deficiency Anemia (IDA) in adolescent girls is lowering adolescent work productivity due to poor physical and cognitive development, decreased academic performance, increased illness, and decreased well-being, as well as decreased learning capacity [3]. When adolescent girls begin menstruation, these negative outcomes can lead to a long-term, irreversible, and serious condition that affects the quality of life and causes economic loss for both individuals and countries [23].

Although IDA can be prevented with rigorous compliance to weekly iron-folic acid supplementation, its prevalence is rising in adolescent girls, especially in low- and middle-income countries which indicates poor compliance with weekly iron-folic acid supplementation [15]. This can be attributed mainly to the accelerated increase of Iron needs, socio-economic problems, adolescent girls-related problems; lack of information about anemia and iron-folic acid supplements, and infrastructure problems in the effective prevention of IDA [16,17].

Given the widespread negative health effects of anemia, the World Health Assembly (WHA) and the Sustainable Development Goals (SDG) attempted to reduce anemia prevalence by half by 2025 by combining weekly iron-folic acid supplementation with school health education, school health coordinator training, and strict compliance to weekly iron-folic acid supplementation (WIFAS) worldwide [18,19].

For the prevention and control of Iron deficiency anemia among adolescent girls weekly iron-folic acid supplementation is the best strategy and a cost-effective way for preventing iron-deficiency anemia in adolescent girls [20]. Even though WIFAS is now being implemented by many developing countries, including Ethiopia, through the school-based approach, few studies have been conducted to identify the gaps in compliance with weekly iron-folic acid supplementation, and associated factors among school adolescent girls [21]. Moreover, to the extent of investigators' knowledge, in Ethiopia particularly in the study area there is a gap in the literature that assesses the magnitude of compliance with weekly iron-folic acid supplementation and associated factors among school adolescent girls. This is due to the late introduction of the program for school adolescent girls in the country. Therefore, this study aimed to determine the magnitude of compliance with weekly iron-folic acid supplementation and its associated factors among secondary school adolescent girls in the study area.

## **2. Methods and Materials**

### **2.1. Study Area and Period**

The study was conducted at Jimma Arjo district secondary schools from March 1<sup>st</sup> to 31<sup>st</sup>, 2022. The district is found in East Wollega zone, Oromia region, Western Ethiopia, which is 378 kilometers away from Addis Ababa, the country's capital city, and 50 kilometers from Nekemte, the Zonal capital city.

### **2.2. Study Design**

An institutional-based cross-sectional study with a convergent mixed method was employed.

#### *2.2.1. Source and the study population.*

All adolescent girls attending secondary schools in the Jimma Arjo district were the source population, whereas all randomly selected adolescent girls attending secondary schools were on weekly iron-folic acid supplementation programs in a study setting were the study population.

#### *2.2.2. Inclusion and Exclusion criteria*

During the study period, all adolescent girls between the ages of 10 and 19 who were enrolled in secondary schools for the 2021/2022 academic year were included while adolescent girls who were pregnant, and currently receiving anemia treatment, were excluded from the study.

### **2.3. Sample Size Determination**

The sample size of this study was calculated using a single population proportion formula with the assumption of a 95% confidence level, 5 margins of error, and the proportion of compliance in school adolescent girls (50%) since no similar study has been published in Ethiopia. Finally, by considering a 10% possible non-response rate, the final sample size was 422 school adolescent girls.

### **2.4. Sampling Procedures**

The study was conducted purposively among 3 secondary schools (Jimma Arjo, Haro Kumba, and Gombo schools) because they were implementing the WIFAS program. Based on the number of adolescent girls in the district, the required sample size was allocated proportionally to each of the district's secondary schools. Using school WIFAS registration as a sampling frame, the final study subject was selected using simple random sampling techniques from each secondary school (a computer-generated random number for each school).

### **2.5. Study variables**

Compliance with weekly iron-folic acid supplementation was the dependent variable, whereas social demographic characteristics, adolescent girls-related factors, and school-related factors were independent variables.

### **2.6. Operational Definitions**

Compliant to IFAS – Adolescent girls who consumed at least six tablets of the expected dose in the previous seven weeks (one IFAS tablet per week) which was equivalent to consuming 80% or more of the expected dose before the date of data collection. Adolescent girls who consumed iron-folic acid tablets less than six tablets in the previous seven weeks were recognized as non-compliant [15].

Knowledge of anemia –Adolescent girls who scored responses higher than the mean score on the anemia questionnaires were considered to have good knowledge of anemia, and adolescent girls who scored less than the mean score were considered to have poor knowledge of anemia [22].

Knowledge of IFAS Program - Adolescent girls who answered questions on the IFAS program with scores above the mean score were considered to have good knowledge of it, while those who answered questions with scores below the mean score were considered to have poor knowledge of it [22].

## 2.7. Data Collection Tools and Procedures

The data were collected using structured and interviewer-administered questionnaires and a tool that has been adapted and updated based on a review of the literature [19,23,25,38]. The questionnaire consists of socio-demographic items for both study participants and parents and five items school-related items. The data was collected through face-to-face interviews with three BSc nurses and one supervisor. All measurements and reviews of student age were conducted using pre-tested structured questionnaires and checklists by trained data collectors.

## 2.8. Data Quality Assurance

The data collection tool was prepared in English and translated into Afan Oromo language and back-translated into English by a language expert to check for consistency of the questionnaire. Training was given to data collectors on the objectives and relevance of the study, data collection, confidentiality of the information, and informed consent.

A week before the actual data collection pre-test was conducted on 21(5%) adolescent girls to check the clarity, the validity of the question, and the respondent's reaction to the question. After data collection, the principal investigator checked the completeness of the data, gave a non-overlapping numerical code for each questionnaire, and entered it into Epi data version 3.1.

## 2.9. Data Analysis Technique

Data were cleaned manually, coded, and entered into Epi data version 3.1 and analyzed by SPSS version 24 statistical software.

Descriptive statistics such as mean, frequencies, and percentages were calculated, and the bivariable logistic regression analysis was used to determine the association between the dependent and independent variables. In binary logistic regression, variables having a P value <0.25 were selected for the final model. After the effect of multicollinearity was checked with VIF the candidate variables were entered into the multivariable logistic regression for further analysis. The strength of the association was measured using an odds ratio and interpreted by using a 95% confidence interval and a p-value less than 0.05 were considered statistically significant. Model goodness of fit was tested using the Hosmer Lemeshow test with p values greater than 0.05. Then the result of the data was presented using text, table, figures, and graphs.

## 2.10. Ethical approval and consent to participate

Ethical clearance was obtained from Wollega University's research and ethical review committee. A letter of permission was taken from Jimma Arjo's education and health office to secondary schools. Finally, data were collected after adolescent girls under the age of 18 years had given their informed assent with permission taken from school home teachers and given informed consent from their parents to get a thumbprint/sign showing agreement to their child to participate in the study, as well as those who are 18years and above, were required to have informed consent.

## 3. Results

A total of 417 school adolescent girls participated in this current study, accounting for 98.8 % of the response rate. The mean age of the adolescent girls with standard deviation (SD) was 17.50 ±1.050 years. Among the study participants,360 (86.3%) were found between the ages of 17-19 years of age category (Table 1).

**Table 1** Socio-demographic characteristics of the study participants, Jimma Arjo secondary schools, March 2022 (n=417)

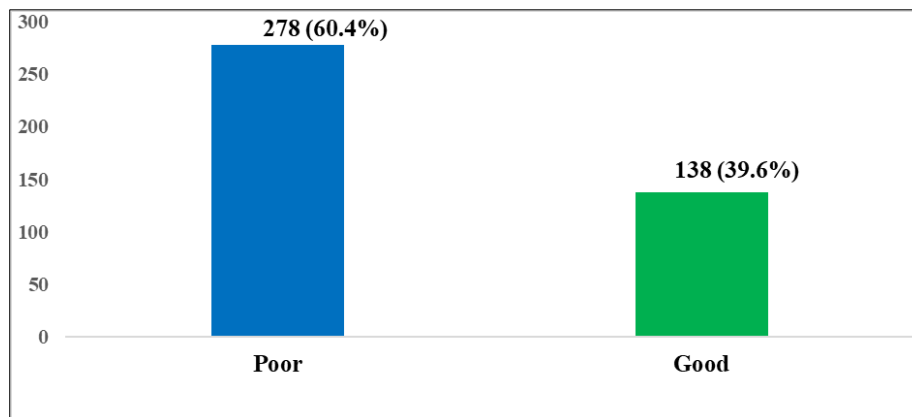
Variables	Category	Frequency	Percent
Residence F	Urban	167	40.0
	Rural	250	60.0
Age category	14-16	57	13.7
	17-19	360	86.3
Grade Level	9 &10	178	42.7
	11&12	239	57.3

The religion of the respondent	Protestant	223	53.5
	Orthodox	155	37.2
	Muslim	24	5.8
	Others	15	3.6
Mother`s level of education	No Formal education	193	46.3
	Primary	110	26.4
	Secondary	90	21.5
	College or University	24	6.8
Father`s level of education	No formal education	116	27.8
	Primary	135	32.4
	Secondary	99	23.7
	College or University	67	16.1
Mother`s Occupation	Unemployed/Housewife	288	69.1
	Merchant	82	19.7
	Government employee	35	8.4
	Others	12	2.9
Father`s Occupation	Unemployed	30	7.2
	Merchant	65	15.6
	Government employee	100	24
	Farmer	204	48.9
	Others	18	4.3

Key: Others for religion include; - Catholics and Wakeffata, for occupation, - retirement, and daily laborers

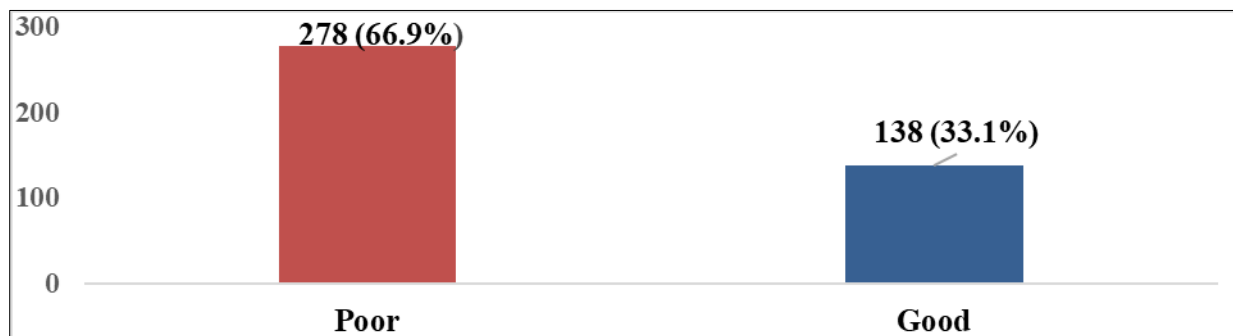
### 3.1. Adolescent girl's related factors

Of the total study participants, 232 (56.6%) of the study participants had no awareness of anemia, whereas 185 (44.4%) of the school adolescent girls had an awareness of anemia. The mean total knowledge score for anemia with a standard deviation was 10.69 ( $\pm 2.95$ ). The study participants who scored less than the mean score (10.69) were considered as having poor knowledge about anemia while those scores greater than the mean score (10.69) were considered as having good knowledge about anemia. In this current study, it was found that 252(60.4%) study participants had poor knowledge about anemia whereas 165 (39.6%) had good knowledge about anemia (Fig1).



**Figure 1** Knowledge about anemia among study participants, Jimma Arjo secondary schools, March 2022

The total mean score for the iron-folic acid supplementation program was 8.5 ( $\pm 3.08$ ). The study participants who scored less than the mean score (8.5) were considered as having poor knowledge about the iron-folic acid supplementation program whereas those greater than the mean scores were considered as having good knowledge about iron-folic acid supplementation. In this study, the majority of study participants (278 (66.9%)) had poor knowledge about iron-folic acid supplementation programs whereas 138 (33.1%) had good knowledge about the IFAS program (Fig2).



**Figure 2** Knowledge about the IFAS program among study participants, Jimma Arjo secondary schools, March 2022

### 3.2. School-related factors of the study participants

In the current study, 215 (51.6%) study participants reported the lack of iron-folic acid supplementation program teaching aids in the school compound, whereas 202 (48.4%) of the study participants reported the presence of iron-folic acid supplementation program teaching aids.

Three hundred and fourteen (75.3%) of the school adolescents who participated in this study reported that the school girls' club was present in the school compound, whereas 103 (24.7%) reported that it was not. Although 227 (72.3%) of the respondents said that the existence of a school girls club was not functional, only 87 (27.7%) of the clubs were functional

Of the study participants included in the study, 221 (53%) reported a lack of iron-folic acid supplementation health education program in the school compound, while 196 (47%) of the school adolescent girls reported the presence of an IFAS health education program. Of the study participants who cited the presence of the IFAS health education program, 129 (65.82%) of the health education program were given every month, 36 (18.36%) were given every quarter, and 31 (15.81%) were given every week.

### 3.3. Compliance with weekly Iron-Folic Acid supplementation

In this study, the overall compliance with the IFAS was 29.3% with 95% CI (24.9, 33.3). In the seven weeks before the data collection, only 122 (29.3%) of the school adolescent girls consumed six or more IFAS tablets. Majority, 378 (90.6%) had ever taken the weekly IFAS. Of the total, 311 (74.6%) were taking the tablet currently, 166 (53.4%) taken for the prevention of anemia. Of the total, 343 (82.3%) who were currently taking the IFAS tablet have ever missed taking the tablet, and 99 (28.9%) have missed it because of a negative side effect they experienced.

**Table 2** Compliance with weekly iron-folic acid supplementation of the study participants, Jimma Arjo secondary schools, 2022 (n=417)

Variables	Category	Frequency	Percent
Ever taken an IFAS tablet	Yes	378	90.6
	No	39	9.4
Currently taking IFAS tablet	Yes	311	82.3
	No	67	17.7
Reason for taking IFAS tablet	Advice from teachers	47	15.1
	Free cost to take	20	6.4

	Friends taking	33	10.6
	Prevent anemia	166	53.4
	Improve school performance	45	14.5
Number of IFAS tablets received in the last 7 weeks	<6 tabs	295	70.7
	≥6 tabs	122	29.3
Always taking under supervision	Yes	160	38.4
	No	257	61.6
Ever take IFAS on an empty stomach	Yes, most of the time	24	5.8
	Yes, sometimes	108	25.9
	Yes once/twice	63	15.1
	No never	222	53.2
Ever missed taking the tablet	Yes	343	82.3
	No	74	17.7
Reason for missing the tablet	Due to side effects	99	28.9
	Parents wish not to take	34	9.9
	Forgot the date	75	21.9
	Don't know	33	8.8
	Absent from school	96	28
	Bad test	25	7.3
	Others	48	10.3

Key: Others, including, those who didn't take the tablet, are afraid because it is a contraceptive, and friends don't think to take the tablet.

**Table 3** Multivariable logistic regression analysis of associated factors with WIFAS Compliance among study participants, Jimma Arjo secondary schools, March 2022 (n =417)

Variables	Compliance status		COR (95% CI)	AOR (95% CI)
	Yes	No		
Mother`s level of education				
Non-formal education	34(17.6)	159(82.4)	1	1
Primary	29(26.4)	81(73.6)	1.67 (0.95, 2.94)	1.86 (0.90, 3.83)
Secondary	50(55.6)	40(44.4)	5.84 (3.35, 10.20) *	4.94 (2.45, 9.94) ***
College and above	9(37.5)	15(62.5)	2.80 (1.13, 6.94) *	1.83 (0.46, 7.23)
Fathers` occupation				
Un employment	8(26.7)	22(73.3)	1	1
Merchant	26(40)	39(60)	1.83 (0.71 ,4.73)	1.45 (0.45, 4.62)
Government Employee	32(32)	68(68)	1.29 (0.52, 3.22)	0.66 (0.20 ,2.11)
Farmer	46(22.5)	158(77.5)	0.80 (0.33,1.91)	0.86 (0.31, 2.38)
Others	10(55.6)	8(44.4)	3.43 (1.00, 11.79) *	2.04 (0.44,9.40)
Mother`s Occupation				

Housewife		74(25.7)	214(74.3)	1	1
Merchant		25(30.5)	57(69.5)	1.27 (0.74 ,2.17)	1.35(0.65, 2.77)
Government Employee		18(51.4)	17(48.6)	3.06 (1.50 ,6.25) *	2.75 (0.91, 8.34)
Others		5(41.7)	7(58.3)	2.06 (0.63, 6.70)	0.79 (0.18, 3.51)
Awareness of Anemia	Yes	79(42.7)	106(57.3)	3.27 (2.10, 5.09) *	4.23 (2.35, 7.61) ***
	No	43(18.5)	189(81.5)	1	1
Knowledge of Anemia	Good	58(25)	107(75)	1.59 (1.03, 2.44) *	1.19 (0.64, 2.19)
	Poor	64(25.4)	188(74.6)	1	1
Knowledge IFAS program	Good	68(49.3)	70(50.7)	4.04 (2.58, 6.32) *	3.9 (2.17, 7.22) ***
	Poor	54(19.3)	225(80.7)	1	1
IFAS Teaching Aids	Yes	70(32.6)	145(67.4)	0.72 (0.46, 1.09) *	0.71 (0.40, 1.24)
	No	52(25.7)	150(74.3)	1	1
Health education program	Yes	158(80.6)	38(19.4)	1	1
	No	137(62)	84(38)	0.39 (0.25, 0.61) *	0.42 (0.23, 0.75) **
School girls club presence	Yes	35(34)	68(66)	1.34(0.83, 42.16) *	1.67 (0.87, 3.19)
	No	87(27.7)	227(72.3)	1	1
IFAS side effect	Yes	14(14)	85(86)	0.26 (0.14,0.48) *	0.17 (0.08, 0.37) ***
	No	108(38.7)	171(71.3)	1	1

Key: \* a p-value less than 0.25 in binary logistic regression, \*\* a P-value less than 0.05, and \*\*\* a p-value less than 0.001 of the multivariable logistic regression, and 1, is the reference category.

### 3.4. Qualitative result

For the qualitative study part, 36 adolescent girls were enrolled. The mean age of the FGD participants was 18.5 ( $\pm$  0.50 SD), ranging from 18-19 years. The focus group discussion (FGD) study included 23 schoolgirls from rural areas and 13 students from urban areas.

#### 3.4.1. Themes

Three main themes, including IFAS program knowledge, perception and peer pressure, adolescent girls-related issues, and school-based problems emerged from the data analysis of focus group discussions. Nine sub-themes or categories were again identified under the main themes. Examples of emergent themes and sub-themes or categories are summarized in the table (Table 6).

#### 3.4.2. Information about IFAS -health education program

In the opinion of the study participants, initially, the information regarding the IFAS tablet and its advantages was, relatively positive, but later, health education completely ceased. Some of the study participants had a rough understanding of the fact that menstruating women and school adolescent girls are given iron-folic acid to prevent anemia. As they have already noted, a scheduled health education program is one of the most effective ways to raise school girls' knowledge of the program and its significant benefits. The sample response includes: -

*"In our schools, most school adolescent girls and I don't take the tablet very regularly due to a lack of specific information on iron-folic acid supplements and detailed usage instructions. -----"(18 years old from FGD 2).*

Some participants stated that they did not receive health education continuously, regarding the availability of iron-folic acid supplementation programs and anemia from both health professionals and school IFAS focal teachers.

*"We have not seen any health education programs, and most of the school adolescent girls didn't take part in any that was well-planned by the program focal person of the schools and health professionals -----" (19 years old from FGD2).*



### 3.4.3. Misconceptions about iron-folic acid supplementation, peers' discouragement

One of the things that prevented school girls from continuously using the tablet was the persistent rumors and false information about IFAS intake. The participants noted that reports were going through the community, regarding the IFAS tablet, which is a family planning medicine, and it is coming to lower the population growth and could cause infertility in school-aged adolescent girls. Most of the rumors, chitchat, and misleading information are spread by boys.

The participants reported that removing misconceptions and falsehoods about iron-folic acid supplements can be done by raising awareness through organized and focused methods. The sample response includes:

*"Rumors and misconceptions prevent the consumption of IFAS tablets, so you must intensify your efforts to raise awareness if you want to continue consuming Iron folic acid weekly. Example; It is a family planning medicine that results in sterility to reduce the number of population -----" (19 years old from FG3).*

The study participants also reported taking the tablet at school, throwing it away without swallowing, and just doing so out of fear of the myths and misconceptions they had already heard about the tablet from their peers.

*"Adolescent girls in schools were not interested in consuming the tablet most of the time because of fear of infertility for the future, and we sometimes obtained the tablet during distribution and threw it away without even trying to take the tablet-----" (18 years old from FGD3).*

### 3.4.4. Perceived iron-folic acid supplementation side effect

The study participants reported that perceived iron-folic acid supplementation side effects of the tablet prevented consistently consuming iron-folic acid supplementation as well as potential impacts on compliance with the tablet. The participants reported that there was a myth about the negative effects of iron-folic acid supplementation among school girls and in the community, particularly among women, which had a big impact on whether or not they continued taking the tablet. The participants mentioned that community members and school girls regularly complained of heartburn, abdominal cramps, and changing the color of stool. The sample response includes;

*"Some of the school's adolescent girls talked to us about why they don't take the IFAS tablet every week because they are worried about its adverse effects, and some of the side effects heard from the community such as; heartburn, and abdominal cramps... ...." (18 years old from FGD3).*

Theme: II Adolescent girls-related problems

Adolescent girls-related issues were the second theme found after the data from the focus group discussions (FGD) was analyzed. One sub-theme or category (forgetfulness of the tablet) was identified within the main theme.

Forgetfulness' IFAS tablet intake place

According to some study participants, taking the iron-folic acid tablet at home for longer than two weeks at a time causes forgetfulness. These incidents might be avoided by only giving out the IFAS tablet at school while being supervised by the school program focal points.

*"Most of the time, the school adolescent girls are required to consume at home. Those who are reminded to take the tablets will do so, while others may never consume and the tablets may go unused, which poses a significant barrier to tablet consumption----" (19 years old from FGD2).*

Theme: III school-based problem's IFAS- distribution

The IFAS distribution of the school-based problem was the third theme identified during the focus group discussion (FGD) data analysis. Five sub-themes or categories were found under the main theme, including inconsistent WIFAS day, lack of peer educators, lack of school girls club, lack of drinking water at the school, and lack of motivation of the school IFAS program focal person.

### 3.4.5. Inconsistent school WIFAS or Iron days -Inconvenient days of IFAS distribution

Participants reported that a lack of consistent weekly iron-folic acid supplementation or Iron days was one of the school-based problems that led students to forget the days of distribution, which then resulted in a lack of continuity in the

consumption of tablets by school adolescent girls. This problem could be resolved by creating fixed and convenient days for school girls that are not fasting days (for example; Wednesday and Friday). The following responses supported the findings.

*“School adolescent girls took the tablet occasionally on Mondays, occasionally on Wednesdays, and occasionally on Fridays in our school compound, ---- contributing to not reminding the date, the tablet and the distribution date was on Wednesdays and Fridays which was inconvenient days for some of the students -----” (18 years old from FGD 1*

**3.4.6. Peer educators; School girls’ clubs**

According to the reports of the respondents, there were no peer educators in the school who may assist in the distribution of iron-folic acid supplementation and support the adolescent girls in education, which may be related to the low use of Iron supplements. The following sample quote supports these; -

*“There were no peer educators in my school's compound who could assist schoolgirls in using an IFAS tablet distribution.....” (19 years old from FGD3).*

In addition, some of the respondents claimed that the school girls club was merely symbolic and inactive, in the school compounds and they did not support the distribution of iron-folic acid tablets.

*“In our school, there were no functional school girls, who are supporting the Iron folic acid supplementation distribution program implementation” (19 years old from FGD2).*

**3.5. Lack of drinking water**

The findings demonstrate that some of the participants noticed that there was not enough drinking water available in the school compound, which had a significant impact on how much iron-folic acid was consumed there. For these reasons, the school's adolescent girls were required to take tablets taken at home, which increased their forgetting about tablet intake. These are supported by the following quote: -

*“Most of the school adolescent girls were unable to take immediately the tablet in front of the school focal person due to a lack of drinking water in the school; therefore, they took the tablet at home.... occasionally not remind to take the tablet at home” (18 years old from FGD1).*

**Table 5** Themes and sub-themes identified from Focus group discussion (FGD), March 2022

Themes	Categories (sub-themes)
Iron folic acid (IFAS) knowledge, perception, and peer pressure	Information about IFAS tablet -Health education program Misconceptions about iron-folic acid supplementation & Discouraging not taking the tablet Perceived IFAS tablet Side effect
School-based problems -IFAS distribution	Inconsistent and inconvenient WIFAS days Lack of peer educators; support IFAS implementation Lack of school girls club functionality Drinking water in the school School focal person motivation

**4. Discussion**

This study assessed the magnitude of compliance with weekly iron-folic acid supplementation and its associated factors among school adolescent girls in Jimma Arjo district of East Wollega zone.

The magnitude of compliance with the WIFAS was found to be low in this study (29.3% ) as compared to the WHO standard, the compliance of WIFAS among school adolescent girls is 80% or more [15]. This finding is lower than a similar study conducted in Iran which found the magnitude of compliance with WIFAS to be 62.3%[17], and another

study conducted in urban Puducherry, India found the magnitude of compliance with IFAS to be 67.7 % [23], as well as a similar study conducted in Ghana, which found that compliance with IFSA is 56 % [24]. However, this study's finding is similar to that of S. Dajaan Dubik which was found to be low (26.2%) [16] and greater than a study conducted in Thrissur, India found that the magnitude of adherence with weekly iron-folic acid supplementation found to be (15%) [25].

This disparity may be attributed to differences in the socioeconomic status of the study populations, cultural differences, and the time of the study. Also, the extent of IFAS training of school focal persons and their expertise in instructing adolescent girls on the health benefits of IFAS may differ.

The current research reveals that the level of education of adolescent girls' mothers had a significant effect on WIFAS compliance. Adolescent girls whose mothers had secondary education were 4.94 times more likely to comply with WIFAS than those whose mothers had no formal education.

This finding was supported by a study conducted in two north Indian states that found that adolescent girls' mother's education was significantly associated with the utilization of IFAS tablets among school adolescent girls [26], and another study conducted in Ghana metropolis revealed that adolescent girls whose mothers had the secondary school were strongly associated with compliance with IFAS tablets among school adolescent girls [16]. The possible explanation may be that mothers are the primary providers and caregivers for their families, especially for their children and adolescent girls.

The current research reveals that adolescent girls' awareness of anemia had a significant positive effect on their compliance with weekly iron-folic acid supplementation. School-adolescent girls who were aware of anemia were more than four times more likely to be compliant with IFAS than those who were unaware of anemia. This finding was in line with a study conducted in Ghana, Metropolis found that anemia awareness was strongly and positively associated with WIFAS compliance among school adolescent girls, [16] and supported by another study in Bohari, India found that poor awareness of the IFAS program was the major factor affecting the level of WIFAS tablet consumption [27].

The possible explanation for this may be aware of anemia causes, effects, and prevention through health education intentionally creating learning opportunities for some communication about issues with WIFAS tablet consumption as well as increasing compliance with WIFAS tablets, and self-confidence among school adolescent girls.

This study also showed that the magnitude of compliance among school adolescent girls was significantly influenced by their knowledge of the iron-folic acid supplementation (IFAS) program. School adolescent girls who had a good knowledge of the iron-folic acid supplementation program were 3.96 times more likely to be compliant with iron-folic acid supplementation when compared to those who had poor knowledge about the IFAS program.

The study result was comparable with a study conducted at Ghana Metropolis illustrated that school adolescent girls who had good knowledge about the IFAS program were strongly associated with the magnitude of WIFAS compliance [16], and another study conducted in Kotadpok, Indonesia found that school adolescent girls' knowledge of anemia and IFAS programs were strongly and positively associated with Iron folic supplementation compliance [28]. This might be the study participants taking the tablet and being familiar with the iron-folic acid supplementation program after knowing about it and its health benefits.

This study also found that the lack of the IFAS health education program and the lack of participation of school adolescent girls in the program had a significant impact on WIFAS tablet compliance among respondents in the study area.

The odds of compliance with weekly iron-folic acid supplements among the respondents who cited a lack of an IFAS health education program were 58% times less likely as compared to those who cited the presence of the IFAS health education program. This study was supported by a study conducted in Iran found that adherence with weekly iron-folic acid was strongly associated with the person teaching the program and implementation of the educational program in the school [29], and another study conducted in Kota Depok, Indonesia found that teacher-educated students about IFAS tablet benefit and anemia have significantly associated with IFAS adherence among school adolescent girls [28], as well as a study conducted in Ghana found that school-level factors responsible for the coverage and adherence with WIFAS among school adolescent girls [24]. Similar to this, the focus group discussion (FGD) discussant found that while the health education program was initially effective and encouraging, it eventually lost its focus and became poorly organized, which had a significant impact on consumption and compliance with WIFAS. The possible explanations may be a lack of concentration, as well as poorly planned health education programs on the IFAS program by school staff and

health facility professionals, and the study participants' awareness and knowledge of the WIFAS program declined. These issues may lead to low IFAS tablet compliance and consumption.

The IFAS tablet's side effects had a significant effect on the magnitude of compliance among school adolescent girls in this study area. About 83% of adolescent girls who experienced WIFAS tablet side effects were less likely to comply with weekly iron-folic acid supplementation as compared to the respondents who did not experience side effects from the tablet. This finding was supported by a study conducted in central Delhi, India found that the main reason for non-compliance with WIFAS tablets among adolescent girls was tablet intolerance or side effects, [30] as well as a study in rural Pondicherry, India, which found that the side effect of the IFAS tablet had negatively affected the magnitude of compliance with weekly iron-folic acid supplementation [31]. Along with the quantitative research findings focus group discussion (FGD) discussant revealed that perceived iron-folic acid supplementation side effects of the tablet prevented consistently consuming iron-folic acid supplementation as well as potential impacts on compliance with the tablet. The possible explanation may be the lack of a specified time for tablet distribution in school that is closer to mealtime and insufficient counseling to deal with adverse side effects may affect study participants' compliance and consumption of IFAS tablets.

The qualitative findings of this study revealed that misconceptions about the IFAS tablet it is family planning, forgetfulness, lack of access to drinking water, inconsistent school WIFAS days and lack of motivation of school IFAS program focal persons were the major barriers to compliance with IFA supplements among study participants in the study area. The participants also indicated that IFAS tablet is provided for school adolescent girls and menstruating women for the prevention of anemia. A similar study was reported in Iran and Burkina Faso [17,32].

### *Abbreviations*

- AOR: adjusted odd ratio,
- CI: confidence interval,
- COR: crude odd ratio,
- DALY: disability-adjusted live years,
- EDH: Ethiopian demographic health survey,
- IDA: Iron deficiency anemia,
- IFAS: iron-folic acid supplementation,
- LMIC: low and middle-income countries,
- SDG: Sustainable development goal,
- SPSS: statistical package for social science,
- UNICEF: united nation international child emergency fund,
- WHA: world health assembly,
- WHO: world health organization,
- WIFAS: weekly iron-folic acid supplementation,
- WRA: women reproductive age

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## **5. Conclusions**

The findings of this study revealed that compliance with weekly iron-folic acid supplementation among school adolescent girls was low. Mother's educational level, awareness of anemia, and Knowledge about the iron-folic acid supplementation program were found to be strongly and positively associated with weekly iron-folic acid supplementation compliance, whereas lack of iron-folic acid supplementation program health education, and iron-folic acid supplementation tablet side effects were found to be negatively associated with iron-folic acid supplementation compliance among school-adolescent girls.

Misconceptions about iron-folic acid supplementation, forgetfulness, a lack of drinking water in the school compound, the irregularity of weekly iron-folic acid supplementation days, and lack of motivation of school iron-folic acid supplementation program focal person were identified through qualitative study as the main barriers to the weekly iron-folic supplementation compliance.

### *Recommendations*

The following recommendations have been forwarded to different concerned bodies based on the study's findings:

- For schools and health centers

- To improve IFAS compliance and distribute information during the event, using a fixed WIFAS day strategy is recommended.
- The parent-teacher association, the school community, and the healthcare system must all collaborate to ensure that information about weekly iron-folic acid supplements is widely disseminated.
- The IFAS health education program should be implemented in the school on the appointed days.
- School adolescent girls should receive counseling and follow-up to reduce the tablet's sideeffects.
- Establish the school's peer educators to minimize the influence of peers.

District education and health offices, as well as those above them

- Teaching aids such as brochures, leaflets, and posters are produced and distributed to school adolescent girls and communities to raise anemia and IFAS program awareness.
- To ensure the level of compliance with IFAS, refresher training for school focal persons and periodic monitoring and evaluation are required.
- For school-aged adolescent girls to consume and comply with IFAS tablets, access to Drinking water on the school grounds is essential.

## RESEARCHERS

Further research should be needed to determine the effect of weekly iron-folic acid Supplementation among school adolescent girls is needed to determine the level of hemoglobin.

### *Limitations of the study*

The quantitative part of the findings in this study was reported by school adolescent girls, and there is a potential for recall bias. The study was conducted among school adolescent girls, and generalizing those out of the school is unfeasible.

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## **Compliance with ethical standards**

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### *Disclosure of conflict of interest*

The authors declare that they have no conflicts of interest. The views expressed in this article are those of the authors.

### *Statement of ethical approval*

The participation of human subjects in this study was approved by the Wollega University Research Ethical Review Committee with ethical approval protocol number WU1R0524/2014.

### *Statement of informed consent*

All study participants received information before data collection and provided informed verbal consent for participating in the study as well those who were under the age of 18 years had given their informed assent with permission taken from school home teachers and given informed consent from their parents to get a thumbprint/sign showing agreement to their child to participate in the study

### *Authors contributions*

DD contributed to the study design, conducted the data analysis, and drafted the manuscript. KT, SK, DG, and YB designed the study, contributed to the data analysis, reviewed the overall manuscript, edited the manuscript, and manuscript finalization. All authors have read and approved the final manuscript for publication.

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### *Availability of data and materials*

All statistical data used in this study are available from the corresponding author upon reasonable request.

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