

Adherence to weekly iron folic acid supplementation and associated factors among adolescent girls – A mixed-method study

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ABSTRACT

Context: Despite the Weekly Iron folic acid supplementation (WIFS) program, the prevalence of anaemia among adolescent girls remains high. Phase 1 Indian Council of Medical Research (ICMR) task force study conducted in 2016 in Kallur showed that the IFA provision rate for adolescent girls was 72% but the consumption rate was only 15% in the Kallur area. The present study was done to identify the gaps for the difference between provision and consumption rate of weekly IFA tablets among adolescent girls using the WHO conceptual framework in home-based settings. **Materials and Methods:** This cross-sectional study with a mixed-method design was conducted from October 2020 to December 2021. Quantitative data were collected from 972 adolescent girls and their parents using a structured pretested questionnaire, whereas qualitative exploration was done by focus group discussions. Descriptive analysis and bivariate analysis were used to analyse the quantitative data. Qualitative data were analysed and integrated with quantitative results. **Results:** The overall number of girls who were aware of Iron Folic acid therapy (IFAT) was 704 (72%). However, only 132 (13%) adolescent girls were found to be adherent to IFA therapy. Multivariable regression analysis revealed that side effects encountered on intake of IFAT (Odds ratio (OR) = 0.5, $P = 0.009$) were associated with higher rates of nonadherence, whereas regular supply (OR = 13.6, $P = 0.000$), health education to parents (OR = 2.76, $P = 0.002$), and experiencing benefits (OR = 1.72, $P = 0.006$) were associated with higher rates of adherence. These were substantiated by qualitative findings. **Conclusions:** Ignorance on the impact of anaemia on adolescent health, fear of side effects, unpleasant effects experienced on intake of Iron folic acid (IFA), and inadequate counselling determines the adherence to weekly IFA supplements among adolescent girls.

Keywords: Adherence, adolescent girls, factors, IFA therapy, mixed method

Introduction

Iron deficiency anaemia (IDA) is the third most important cause of the loss in disability-adjusted life years among adolescents worldwide. According to the 2012 National Nutrition Monitoring Bureau multistate survey, 60% of adolescents in the age group of 10–17 years have been reported to consume <50% of the recommended dietary allowance of iron.^[1] Thus, adolescent

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anaemia is a major public health problem in our country. In order to prevent anaemia in adolescent girls, Government of India has already launched the weekly IFA supplementation program in the year 2012 under which all adolescent girls and boys will receive a minimum of 52 tablets per year.^[2] This strategy involves fixed day approach for IFA distribution among children by teachers in schools and by Anganwadi workers for non-school-going children.

Despite these efforts, the prevalence of anaemia among girls remains high. According to National Family Health Survey (NFHS)-5, the prevalence of anaemia among nonpregnant women in the age group 15–49 years was reported as 57% in the survey, which was 4% more than the prior NFHS survey.^[3] In the state fact sheet Tamil Nadu from NFHS-5, nearly 53% of adolescent girls were found to be anaemic.^[4]

Low IFAT adherence is a major barrier to programme efficacy. Adherence is a time-dependent behaviour and can be repeated over time enabling us to identify varied causes and consequences on patient outcomes.^[5] The World Health Organization Multidimensional Adherence Model emphasizes five dimensions which interact to influence medication adherence: patient-related factors, social/economic factors, therapy-related factors, condition-related factors, and healthcare system/healthcare team-related factors.^[6] Although earlier research identified a lack of knowledge, adverse effects, and insufficient supply as factors limiting adherence, explanatory studies addressing the aforementioned issues are scarce and vary with time and setting, leaving abundant room for future research.

Phase 1 ICMR task force study was conducted in 2016 in Kallur which showed the prevalence of anaemia among adolescent girl to be 37%. Also, the IFA provision rate for adolescent girls was 72% but only 22% accepted consuming 50% of received IFA tablets in Kallur area.^[7] Thus, we aim to use the WHO conceptual framework to evaluate adherence and related factors among adolescent girls in home-based settings to identify the gaps in the difference between provision and consumption rate of weekly IFA tablets among adolescent girls to enable us to prioritize interventions.

Materials and Methods

Study design and setting

This community-based cross-sectional study with mixed-method design employing a sequential explanatory approach was conducted in two phases from October 2020 to May 2012 in Model Rural Health Research Unit (MRHRU) field practice area, Kallur.

Study participants and sampling

Phase 1: Quantitative part

Eligible participants were enrolled by census sampling. The inclusion criteria were adolescent girls and their parents who

had received IFA therapy and were willing to participate in the study. A total of 972 adolescent girls and their respective parents ($n = 972$) were recruited. We operationally defined the IFAT as a tablet containing iron (60 mg elemental iron) and folic acid compound (400 mcg folic acid) prescribed to adolescent girls. They were said to be adherent to the IFAT if they consumed all four tablets in the prior four weeks (one tablet per week).

Phase 2: Qualitative part

Focus group discussions (FGDs) were conducted for separate groups of adolescent girls and mothers to elucidate the factors influencing IFAT adherence. The study participants were recruited by purposive sampling. A total of eight FGDs were conducted with six to eight participants in each group with an average duration of 45–60 min until achieving saturation point. The FGDs were conducted in the local Anganwadi centre near their residences.

Data collection tool

Phase 1: Quantitative part

Data collection was done using a semistructured pretested questionnaire administered at the homes of the adolescent girls using a trained social worker in the local vernacular language. The questionnaire consisted of details regarding the sociodemographic details, knowledge on anaemia and IFAT, perception of parents towards IFAT and dietary practices with health education, and experience of taking IFAT. After data collection, Principal Investigator (PI) reviewed each questionnaire for data completeness, cross-checking, and correction actions. At the end of the interview, nonadherent participants were counselled regarding the benefits of IFAT. Clarifications were provided on common misperceptions to enhance adherence.

Phase 2: Qualitative part

The lead investigator created an FGD guide containing questions and probes in the local language. It was piloted at higher secondary school after being back-translated into English to ensure that the meaning of the questions was consistent. The purpose of the study was explained to the participants by the principal investigator and obtained their written informed consent to participate and audio record the session. The participants and the researchers were the only people present during the session.

Data analysis

Phase 1: Quantitative part

Data collected were converted to numerical codes and analysed using a statistical package for social sciences version 23. Descriptive statistics (frequency, percentages, mean, and confidence interval) were used to analyse demographic and socioeconomic data. Bivariate and multivariate analyses were used to find out the association between adherence and other variables of interest.

Knowledge of anaemia and IFAT was measured by adding up the responses to questions on anaemia, IFAT, and dietary

practices with IFAT. A correct response was scored “1” and an incorrect response was scored “0”. Participants were considered to have good knowledge if they scored above the median and were considered to have poor knowledge if they scored below the median.

Phase 2: Qualitative part

Verbal data from audio recordings were converted to the verbatim transcript, translated and taken up for framework analysis. The context of the sentences was looked into, and an interpretation was developed. Sections in the text pertinent to the problems and objective were identified and were manually coded. Finally, the integration of results from both the phases was done.

Results

Adherence with IFAT

The number of girls who were adherent to IFAT was 132 (13%) as depicted in Figure 1. The number of girls who were aware of IFAT was 704 (72%). Only 49% of the girls received IFA tablets regularly for the past 6 months. The percentage of girls who consumed at least one IFA tablet in the prior month was 17%. In general, the proportion of students who knew about and had received the tablets was not as much as those who consumed them in the prior month. Among those 617 (63%) who have ever taken the tablet in the last 6 months, nearly 570 (92%) girls were issued the tablets by teachers and took them in their presence. Among those 355 (37%) who have ever missed taking a tablet in the last 6 months, nearly 305 (86%) girls cited that they were not issued the tablets by the concerned teachers.

Socioeconomic factors

The total number of respondents in this current study was 972 with a mean age (SD) of 14.6 (± 2.08). A majority (62%) of the respondents had their ages ranging between 11 and 15 years. A majority (92%) of the adolescent girls were Hindus with 3% and 5% of them affiliated with Islamic religion and Christianity, respectively. Most (90%) of the respondent’s mothers were literate with 40% completing middle school education and 20% completing high school education while very few (5%) had tertiary education and about nearly half (47%) of the mothers were farmers. Most (92%) of the respondent’s fathers were literate with 37% completing middle school education and 19% completing high school education, while very few (7%) had tertiary education and nearly half (50%) of them were farmers. Baseline socioeconomic and demographic characteristics had no association with adherence to IFAT as evident in Table 1.

Patient-related factors

From Table 2, it was evident that parents of the individuals who were adherent to IFA tablets were 1.4 times more likely to agree that IFA therapy is necessary to prevent IDA ($P = 0.16$). Parents of the individuals who were adherent to IFA tablets were 2.5 times more likely to agree that a diet rich in iron is enough to replace IFA therapy ($P = 0.12$). Parents of the individuals who were adherent to IFA tablets were 1.7 times more likely

to agree that child refusal of IFA is annoying enough to stop it ($P = 0.005$). The same aligns with the qualitative data as expressed by participants.

“My daughter takes whatever I offer her to eat, including the veggies. I won’t be concerned even if she doesn’t take the pills.” (Parents FGD 3)

Qualitatively, various other participant’s perceptions were also cited for nonadherence to IFAT.

Skeptical of tablets: *“Whatever pills they offer me when I visit a hospital for medical condition, I will take. However, if something is provided at school, I won’t consume it. (Adolescent FGD-1)*

Peer/neighbour pressure

1. Manure to plants: *“I offer the pills to my friends. I will not take it. My friend will collect all tablets and throw for her rose plants. She says that these tablets are good plant fertilizer” (Adolescent FGD-1)*
2. Throw away: *“I store it in my bag and discard it on the way home. Most of my friends do the same.” (Parents FGD-3)*
3. Spit out: *“We take tablets in front of our teachers. I spit out the pill when she doesn’t look at me and sip water by myself to convince her.” (Adolescent FGD-1)*
4. Pretend: *“My friend pretends to sip from the water bottle. However, she will smash the tablet and hold it in the other hand”. (Adolescent FGD-2)*
5. Exploration: *“Our class boys will break the pill to see the colour of the tablet inside.” (Adolescent FGD-2)*
6. Neighbours influence - *“Sometimes they offer one pill. Sometimes especially when officer arrives they hand out many pills. When my mom sees the strips at home, she will give the pills to neighbors. So every now and then my neighbors ask us to bring tablets for them” (Adolescent FGD-2)*

Misconception: *“My friends advise against using medications regularly. It is not healthy to take a lot of pills at this age” (Adolescent FGD-2)*

Cultural belief: *“After my daughter reached menarche, we stopped sending her to school for the past month.” (Parents FGD-1)*

Therapy-related factors

As evident from Table 3, girls who experience at least one benefit with IFAT were 1.72 times more likely to be adherent. With multiple responses possible, majority (76%) of the adolescent girls felt more energetic from taking the IFA tablet, 27% think that the IFA tablet has helped to improve symptoms like menstrual irregularities, fatigue, leg, and back pain, 24% felt improvement in general appearance, and nearly 10% felt improvement in concentration and performance in class.

“I did not experience any benefit at all. But my friend’s hair grows well.” (Adolescent FGD-1)

“She feels energetic and has increased strength while taking these tablets.” (Parents FGD-1)

Table 1: Sociodemographic characteristics and adherence to IFAT among adolescent girls

Characteristics	Number (%)	Weekly IFAT		P
		Adherent (n=132)	Nonadherent (n=840)	
Age group (years)				
11–15	605 (62%)	90 (68%)	515 (61%)	0.13
16–19	367 (38%)	42 (32%)	325 (39%)	
Education status				
School going	941 (97%)	130 (99%)	811 (96%)	0.25
School dropouts	31 (3%)	2 (1%)	29 (4%)	
Parents education				
Mother (n=969)				
Literate	871 (90%)	119 (90%)	752 (90%)	0.815
Illiterate	98 (10%)	12 (10%)	86 (10%)	
Father (n=921)				
Literate	851 (92%)	118 (91%)	733 (87%)	0.803
Illiterate	70 (8%)	11 (9%)	59 (13%)	
Parents occupation				
Mother (n=969)				
Employed	620 (64%)	85 (65%)	535 (64%)	0.893
Unemployed	349 (36%)	46 (35%)	303 (36%)	
Father (n=921)				
Employed	907 (98%)	129 (98%)	778 (93%)	0.69
Unemployed	14 (2%)	3 (2%)	14 (7%)	
Per capita income				
>7533	404 (42%)	56	348	0.323
3766–7532	388 (40%)	44	344	
2260–3765	97 (10%)	17	80	
1130–2259	68 (7%)	13	55	
<1129	15 (1%)	2	13	
Type of family				
Nuclear family	784 (80%)	107 (81%)	677 (80%)	0.90
Joint family	188 (20%)	25 (19%)	163 (20%)	
Number of siblings				
1	61 (6%)	7 (5%)	54 (6%)	0.62
≥2	911 (94%)	125 (95%)	786 (94%)	

Experiencing side effects with IFAT intake ($P = 0.03$, $OR = 0.5$) had an inverse association with adherence [Table 3]. Among 93 participants who had side effects on IFA intake, a majority, 74 (79%), experienced a metallic taste, 60 (65%) had nausea followed by vomiting 28 (30) and abdominal pain 20 (22%). The most common reasons reported for not consuming IFA tablets were unpleasant taste, smell, and colour (65%) [Figure 1]. Unpalatability and side effects were the prime cited reasons in FGDs as well.

“My daughter has frequent burping taking the tablet. She has nausea too.” (Parents FGD-2)

From Table 2, it was evident that parents of the individuals who were adherent to IFA tablets were 2.55 times more likely to agree that the side effect is annoying enough to stop IFA ($P = 0.001$). Parents of the individuals who were adherent to IFA tablets were 2.1 times more likely to agree that it is possible to get rid of IFA side effects if given in the proper way ($P = 0.02$). The same aligns with the qualitative data as expressed by participants.

“My daughter puked after taking this medication. Therefore, I don’t force her to take it. She already consumes less food. If she throws up,

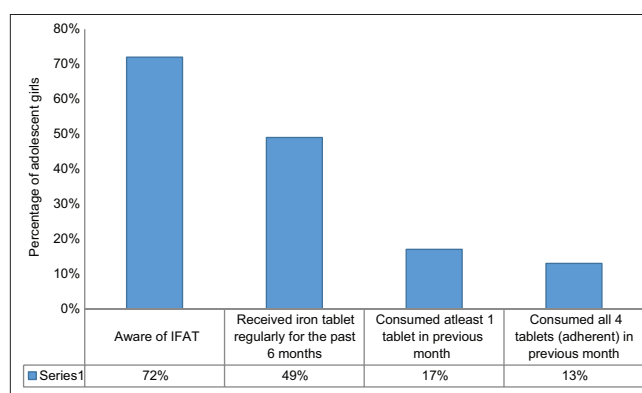


Figure 1: Cascade level of awareness, supply and consumption rate of weekly ifat among adolescent girls.

she skips all meals that day. So we stopped giving her tablets.” (Parents FGD-3)

While probing, it was explicit that the quality of the IFAT such as smell and the taste impacts the intake. Some of the participants felt the need for a change in the formulation of the drug as they prefer iron syrups to tablets. Few perceptions were also prevalent.

Table 2: Bivariate analysis of parent's attitude affecting adherence to weekly IFAT among adolescent girls

Factors	n (%)	Adherent n=132 (%)	Nonadherent n=840 (%)	OR	95%CI
IFA therapy is necessary to prevent iron deficiency anaemia					
Agree	813 (84)	116 (88)	697 (83)	1.48	0.85–2.59
Disagree	159 (16)	16 (12)	143 (17)		
Diet rich in iron is enough to replace IFA therapy					
Agree	922 (95)	129 (98)	793 (94)	2.54	0.78–8.3
Disagree	50 (5)	3 (2)	47 (6)		
Child refusal of IFA is annoying enough to stop it					
Agree	477 (49)	80 (61)	397 (47)	1.71	1.18–2.49
Disagree	495 (51)	52 (39)	443 (53)		
The side effect of IFA is annoying enough to stop it					
Agree	582 (60)	96 (73)	486 (58)	1.94	1.29–2.91
Disagree	390 (40)	36 (27)	354 (42)		
It is possible to get rid of IFA side effects if given in the proper way					
Agree	826 (85)	114 (86)	712 (85)	1.13	0.669–1.93
Disagree	146 (15)	18 (14)	128 (15)		
Do you doubt the quality of IFA tablet given to your child?					
Yes	133 (14)	18 (14)	115 (14)	0.99	0.58–1.69
No	839 (86)	114 (86)	725 (86)		
Do you think why a nonprescribed tablet be given to your child?					
Yes	162 (17)	19 (14)	143 (17)	0.82	0.48–1.376
No	810 (83)	113 (86)	697 (83)		
Do you think a visit to doctor is required to start IFA therapy?					
Yes	297 (30)	35 (27)	262 (31)	0.79	0.52–1.20
No	675 (70)	97 (73)	578 (69)		

Unpalatability of tablet: “She claims that the tablet tastes and smells metallic. It seems like the odor lingers in the mouth for hours. She will feel sick as a result of that smell. After taking the tablet, I’ll ask her to eat to mask the effect.” (Parents FGD-2)

“I experienced no negative side effects. However, I dislike how the tablet smells. It has a rotten egg odour.” (Adolescent FGD-2)

Formulation Change: “My daughter experienced frequent fatigue. She was prescribed nutrition syrup in a private hospital. She consumed it regularly for three months and said it tasted good. Similar to private hospitals, sweet and delectable syrups can be administered here.” (Parents FGD-1)

Do not like tablets: “I receive IFA tablets. However, I don’t typically take any pills. I only take medication when I am extremely ill.” (Adolescent FGD-3)

Health care system-related factors

As evident from Tables 2 and 3, regular supply of IFA tablets ($P = 0.0001$, OR = 13.6) and proper health education to adolescent girls ($P = 0.007$, OR = 2.55) and parents ($P = 0.0001$, OR = 3.01) had a positive association with adherence. Also, girls who received tablets from their teachers were 6.16 times more likely to be adherent ($P = 0.0001$). Knowledge on practices with IFAT was significantly associated with adherence. ($P = 0.0001$, OR = 2.76). Thus, faulty practices on IFA consumption were minimal in the adherent group. Table 4 depicts additional health care related barriers and facilitators of IFA therapy identified in FGDs but overlooked in quantitative analysis. The same were quoted in FGD’s.

“Sometimes, tablets are not provided in the actual school. If provided, we accept it.” (Adolescent FGD-2)

“No details will be taught to us separately. Only those said by the teacher, our kids tell us when they get home.” (Parents FGD-3)

“They just describe it as a tablet that offers nutrition and ask us to consume it. If we inquire about anything, they merely refer to it as a nutrition pill.” (Adolescent FGD-1).

Multivariate analysis

A multivariate logistic regression was performed to assess the relation between nonadherence and the explanatory variables. Data were checked for multicollinearity with the Belsley–Kuh–Welsch technique. Heteroskedasticity and normality of residuals were assessed respectively by the White test and the Shapiro-Wilk test. A P value 0.05 was considered statistically significant. Side effects encountered on intake of IFAT (OR = 0.5, $P = 0.009$) was associated with higher rates of nonadherence. Regular supply (OR = 13.6, $P = 0.000$), health education to parents (OR = 2.76, $P = 0.002$), and experiencing benefits (OR = 1.72, $P = 0.006$) were associated with higher rates of adherence [Table 5]. Multivariate analysis was performed with EasyMedStat (version 3.12).

Discussion

Despite the numerous initiatives implemented to combat adolescent anaemia, it still prevails as a serious public health issue. Anaemia is

Table 3: Bivariate analysis of various factors affecting adherence to weekly IFAT among adolescent girls

Factors	n (%)	Adherent n=132 (%)	Non-Adherent n=840 (%)	OR	95%CI
Patient related factors					
Knowledge about anaemia and IFAT					
Good	271 (28)	39 (30)	232 (28)	1.09	0.73–1.64
Poor	701 (72)	93 (70)	608 (72)		
Knowledge on dietary practices with IFAT					
Good	249 (26)	59 (45)	190 (23)	2.76	1.89–4.04
Poor	723 (74)	73 (55)	650 (77)		
Knowledge of parents about anaemia and IFAT					
Good	237 (24)	36 (27)	201 (24)	1.19	0.78–1.805
Poor	735 (76)	96 (73)	639 (76)		
Knowledge on practices with IFAT					
Good	298	70 (53)	228 (27)	3.03	2.08–4.40
Poor	674	62 (47)	612 (73)		
Taking nutritious food rather than IFAT can prevent anaemia (n=333)					
Yes	187 (56)	23 (56)	164 (56)	1.0	0.51–1.92
No	146 (44)	18 (44)	128 (44)		
Benefits can occur with IFAT (n=972)					
Yes	554 (57)	61 (46)	493 (59)	0.60	0.41–0.87
No	418 (43)	71 (54)	347 (41)		
Therapy-related factors					
H/O additional pill intake other than IFAT (n=972)					
Yes	31 (3)	1 (1)	30 (4)	0.20	0.02–1.52
No	941 (97)	131 (99)	810 (96)		
Experienced benefits (n=617)					
At least 1	214 (35)	59 (45)	155 (32)	1.72	1.16–2.54
Nil	403 (65)	73 (55)	330 (68)		
Experienced side effects (n=617)					
At least 1	93 (15)	12 (9)	81 (17)	0.5	0.26–0.94
Nil	524 (85)	120 (91)	404 (83)		
Duration of therapy (n=972)					
>5 years	488 (50)	29 (22)	459 (55)	0.23	0.15–0.36
<5 years	484 (50)	103 (78)	381 (45)		
Health system-related factors					
Avail Anganwadi services					
Yes	547 (56)	94 (71)	453 (54)	2.11	1.42–3.15
No	425 (44)	38 (29)	387 (46)		
Provider of IFAT					
Teacher	570 (59)	116 (88)	454 (54)	6.16	3.59–10.5
Others	402 (41)	16 (12)	386 (46)		
Regular supply of IFA tablets					
Yes	475 (49)	120 (91)	355 (42)	13.6	7.43–25.11
No	497 (51)	12 (9)	485 (58)		
Health education to adolescent girls					
Yes	375 (39)	82 (62)	293 (35)	3.07	2.1–4.47
No	597 (61)	50 (38)	547 (65)		
Health education to parents					
Yes	182	46 (35)	136 (16)	2.76	1.852–4.14
No	790	86 (65)	704 (84)		

a complex issue that calls for comprehensive strategies to manage and control it. The primary obstacle in treating anaemia is adherence to IFA therapy. In the present study, adherence to weekly was low (13%). This was similar to the study conducted by Sajna and Jacob which also found adherence to be low (15%).^[8] In another study conducted in rural West Bengal, the adherence to weekly IFAT among adolescent girls was found to be less than 50%.^[9]

The current study showed that sociodemographic characteristics (age, type of family, education and occupation of parents, and type of family) were not associated with IFAT adherence in contrast to various studies. The main impediment was the absence of a regular supply of IFA tablets at schools, which was cited in other studies as well.^[10,11] In our study, majority of adolescent girls (96%) obtained IFA tablets from their school.

Table 4: Health care-related facilitators and barriers – qualitative analysis**FACILITATORS**

Teacher's motivation: "My class teacher tells that it provides iron and highly beneficial for health especially for girls" (Adolescent FGD 2)

Supervised intake: "She must swallow it in front of the teacher at school. It's quite rigorous in school. The taste and smell bother her. I advised her to quit taking it. She accepts it anyway as she is terrified of her teacher. I concurred because she didn't experience any negative consequences" (Parents FGD 4)

Fixed day approach: "We are provided with tablets every Thursday in the afternoon. We'll be taking in biology class. Our teacher will give us advice and reinforce us to take it. She will offer guidance each week" (Adolescent FGD 3)

Sharing of benefits: "My friend had a good hair growth. I have been taking the pill for 2 weeks. But till now I didn't achieve any benefit" (Adolescent FGD 1)

BARRIERS

Lack of awareness: "My older daughter is 21 yrs old. She is married. She is pregnant. She is taking IFA tablets. Nurse also insisted on the importance of IFA tablets to mother and baby. But before marriage and pregnancy she didn't take any tablets" (Parents FGD 2)

Lack of patient provider communication: "Since I am really disobeying, my teacher is quite stern with me. Most of the students in our class don't like her either. Therefore, we don't take the medicines she gave us" (Adolescent FGD 1).

Change of school: "In my daughter's former school, teachers would enforce even the pupil who don't like the pill to consume it. She switched schools nevertheless after fifth grade. They are not as rigorous here. Sometimes they give them medications and ask them to swallow. Students just discard it." (Parents FGD 1)

Pandemic: "Since schools were locked during COVID, we didn't receive any tablets. We were unaware that anganwadi centers provide them too. (Parents FGD 2)

Among the 31 girls who were school dropouts, 50% received IFA from Anganwadi centres, and the other 50% received no tablets. Nearly 44% of girls do not avail Anganwadi services, and thus, they were unaware of IFA supply from these centres as well. Maintaining an adequate supply of IFA tablets in schools and bolstering WIFS through Anganwadi centres are essential.^[12]

The organoleptic properties of IFA tablets supplied affected adherence. The repugnant smell and taste of IFA tablet and the side effects such as nausea, vomiting, heartburn, and constipation negatively influenced adherence to IFAT similar to other studies.^[8,13,14] The primary causes of concern among parents were the child's refusal and side effects of IFAT. These can be minimized by educating the students to consume the tablets half an hour after lunch.

Another issue raised by this study was that over 70% of the participants had little knowledge about anaemia and IFAT. Among the self-reported reasons, nearly 53% of adolescent girls did not take tablets without any specific reason. Further, the enduring belief of parents that an appropriate diet rich in iron alone would suffice to correct anaemia complicates the issue of perceived susceptibility in the present study.

This blatantly implies their unawareness about anaemia and IFA therapy. Regular weekly iron supplementation without health education invariably results in nonadherence. In our study, health education sessions for adolescent girls and parents about anaemia and IFA therapy had a significant association with adherence. Periodic health education sessions and engaging mothers can contribute success to IFA programme.^[15]

The duration of IFA therapy negatively correlated with adherence. This may be ascribed to independent decision-making with age which is largely influenced by peer population. The main variable that positively correlated with adherence was experiencing the benefits of IFAT. In our study, many girls linked IFA tablets to correcting menstrual irregularities and promoting hair growth which was corroborated in both quantitative and qualitative analysis. But the majority are unaware of the other perceived benefits of IFA therapy. Some myths such as weight gain and dark complexion of skin still prevail among them. Peer support groups can be encouraged with emphasis on age-appropriate real-world scenarios and sharing of experiences.^[16-18] The intended benefits of IFAT can be translated into measurable benefits by estimating haemoglobin levels, nutritional parameters, and learning outcomes.^[19]

The limited patient-provider relationship had an impact on adherence. IFA tablet provision via schools is an effective strategy for regulating IFA consumption.^[20] However, adherence appeared to be significantly impacted by teacher counselling in a study conducted in rural Pondicherry as well as in a systematic review, which was consistent with our findings.^[21,22]

Limitations

The study is based on self-reporting of adherence which is an unreliable method to measure adherence. There is a possibility of recall bias. Second, the WIFS supply chain and provider-related factors were not evaluated. Third, the present study did not include adolescent girls from private schools. Hence, the differences in adherence for the same could not be assessed. Last, the haemoglobin levels were not assessed.

Policy implications

- Annual stock maintenance registers and monthly adolescent compliance reports should be submitted
- Better formulations of IFAT like capsules and syrups can be provided
- Periodic health education sessions, role play, and problem-based learning module for both adolescent girls and their parents should be organized
- Weekly fun-filled lunch sessions with teachers and IFA provision after lunch can reduce GIT effects and enhance the patient-provider relationship
- Peer educator activities can be prompted to improve the attitude and perception of adolescent girls.

Table 5: Multivariate analysis – logistic regression of factors associated with adherence to IFA in adolescent girls

Factors	Non-Adherence to IFAT	OR (CI OF 95%)	P	AOR (95%CI)
Benefits can occur with IFAT				
Yes	493 (0.89%)	0.60 (0.41–0.87)	0.000	0.331 (0.209–0.522)
No	347 (0.83%)			
Experienced benefits				
At least 1	155 (0.724%)	1.72 (1.16–2.54)	0.006	1.933 (1.208–3.091)
Nil	330 (0.819%)			
Experienced side effects				
At least 1	81 (0.871%)	0.5 (0.26–0.94)	0.009	0.405 (0.205–0.799)
Nil	404 (0.771%)			
Duration of therapy				
>2 years	459 (0.941%)	0.23 (0.15–0.36)	0.933	1.022 (0.613–1.706)
<2 years	381 (0.787%)			
Avail Anganwadi services				
Yes	453 (0.828%)	2.11 (1.42–3.15)	0.066	1.531 (0.972–2.41)
No	387 (0.911%)			
Regular supply of IFA tablets				
Yes	355 (0.747%)	13.6 (7.43–25.11)	0.000	5.803 (3.071–10.966)
No	485 (0.976%)			
Provider of IFAT				
Teacher	454 (0.796%)	6.16 (3.59–10.5)	0.156	0.596 (0.291–1.219)
Others	386 (0.96%)			
Health education to adolescent girls				
Yes	293 (0.781%)	3.07 (2.1–4.47)	0.481	1.174 (0.751–1.834)
No	547 (0.916%)			
Child refusal of IFA is annoying enough to stop it				
Agree	397 (0.832%)	1.71 (1.18–2.49)	0.037	1.543 (1.027–2.318)
Disagree	443 (0.895%)			
The side effect of IFA is annoying enough to stop it				
Agree	486 (0.835%)	1.94 (1.29–2.91)	0.006	1.847 (1.189–2.87)
Disagree	354 (0.908%)			
Health education to parents				
Yes	136 (0.747%)	2.76 (1.852–4.14)	0.0025	1.695 (1.068–2.692)
No	704 (0.891%)			

Conclusion

In conclusion, irregular supply, ignorance of the impact of anaemia on adolescent health, unpleasant effects experienced on intake of IFA, and inadequate counselling determine the adherence to weekly IFA supplements among adolescent girls. The study emphasized the need for community capacity building through intensified interpersonal behaviour change and communication. Future studies can be planned by creating multicomponent intervention strategies in the form of participatory learning and action, peer support model, family-centred adherence model, community-based distribution model, and WIFS monitoring tool.

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Conflicts of interest

There are no conflicts of interest.

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