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Is ignorance of the weekly iron and folic acid scheme among adolescents the deciding factor for its suboptimal utilization and ineffectiveness? A cross-sectional study

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Abstract:

INTRODUCTION: Targeting the huge burden of adolescent anemia, the Weekly Iron and Folic acid Supplementation (WIFS) was launched by the Government of India. Few studies have been done to assess the effective functioning of the program since its inception. The present study was done to assess the knowledge WIFS among adolescents of Madhya Pradesh and the associated factors.

MATERIALS AND METHODS: A cross-sectional study was done in a total of six districts (3 districts where the national adolescent program was implemented and 3 districts where it was not) of Madhya Pradesh. Multistage stratified random sampling technique was used for the enrollment of 3213 adolescent boys and girls, and a prestructured and validated tool was used to collect paperless data. Ethical approval and consent from the participants were obtained. Statistical analysis was performed using SPSS v21.

RESULTS: It was observed that the knowledge of WIFS was more among adolescent girls (29.3%) as compared to adolescent boys (14.1%). More of the adolescent girls received Iron and folic acid tablets as compared to adolescent boys (60.8% girls vs. 24.1% boys). Mostly, the adolescents got Iron tablets from school followed by Anganwadi and PHC/CHC. Girls, rural location, literacy, below poverty line status, knowledge of anemia, adolescents who got iron and albendazole tablets, and adequate consumption of iron tablets (>4) were associated with higher knowledge of WIFS.

CONCLUSION: The knowledge of WIFS was found to be less in adolescent boys. There is a hint of the fact that effective execution of the program among its beneficiaries leads to an automatic increased knowledge of the program, at least among the beneficiaries. Thus, an indirect but significant indirect finding is that the nationwide WIFS program needs to be put to greater focus among the adolescent boys, apart from its major focus on the female gender among most age groups.

Keywords:

Adolescents, anemia, cross-sectional study, dietary supplements, India, iron tablets, literacy

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Introduction

Globally, anemia affects 1.62 billion individuals, which correspond to 24.8% of the population, with iron-deficiency anemia contributing to maximum disability-adjusted life years among adolescents.[1-4] It is estimated that the absence of investment in the prevention of anemia would result in 265 million more cases of anemia in women including adolescent girls by 2025.[4] The majority of the world's adolescent population (88%) resides in developing countries; India has the largest national population of adolescents (243 million), followed by China (207 million).[1,5] As per

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the Census 2011, adolescents comprise 20.9% of the country's total population.[5-8] About 60% of adolescents in the age group of 10–17 years have been reported to consume <50% of the recommended dietary allowance of iron, according to the 2012 National Nutrition Monitoring Bureau multistate survey.[3] Thus, adolescent anemia is a major public health problem in our country with 56% of adolescent girls and 24% of adolescent boys in India being anemic (NFHS-IV).[1,3,6,7,9,10] Adolescence is a period of transition from childhood to adulthood, marking the onset of rapid physical, hormonal, and biological changes which lead to psychosocial, behavioral, and sexual transformations in the individual.[11] Due to this growth spurt, there is a considerable increase in nutritional requirements for both boys and girls.[7,11]

At the population level, iron deficiency anemia can be tackled through deworming, iron supplementation, food fortification with micronutrients, dietary diversification, appropriate and adequate dietary education, and improved food security.[3,4] Out of these measures, Weekly Iron and Folic acid supplementation (WIFS) along with a diet rich in micronutrients is the most cost-effective way of improving the iron status of adolescents, especially in the context of developing nations like India; with about 33% reduction in the risk of anemia, that too within few months.[3-6,9,11-13] Taking cognizance of this, National Iron Plus Initiative-Life cycle approach for iron deficiency anemia and WIFS for adolescent girls and boys were the initiatives taken by the United Nations International Children's Emergency Fund (UNICEF) to control adolescent anemia in the year 2000 in a phased manner all over the world.[1,3,4]

In 2013, Ministry of Health and Family Welfare, Government of India, launched the WIFS Program, popularly known as "Solid Bano India-With just one Blue pill a week" under RMNCH + A (Reproductive, Maternal, Newborn, Child, and Adolescent Health) approach in National Health Mission (NHM) across all States/UTs to reduce the prevalence and severity of nutritional anemia among the 13 crore adolescent population (10–19 years) in convergence with the key stakeholder ministries – Ministry of Women and Child Development and Ministry of Human Resource Development.[1,6,7,9,11,12,14] This included an iron and folic acid tablet (100 mg elemental Iron and 500 μg Folic acid) to be given to each student on a fixed day in a week, i.e., Monday ("Iron day") during the school calendar year by their teacher for a year to be consumed under direct supervision. It also included biannual deworming (Albendazole 400 mg every 6 months) and Nutrition Health Education for improving dietary intake and for taking actions for prevention of intestinal worm infestation. All the medications are to be given free of cost to the target group.[1,5,6,11,14] Weekly Iron Folic acid is more effective and is recommended for the prevention of anemia as it has fewer side effects and lower costs when compared to daily supplementation.[3,5,6,12] The major obstacles to effective iron supplementation programs worldwide were found to be a lack of knowledge about the program, poor compliance with the consumption of iron tablets due to the potential adverse effects of these tablets, and irregular supply of good-quality iron tablets.[3]

Since it is a relatively new program and only a few studies have been done on the evaluation and effectiveness of WIFS Program to control anemia in India.[5,11] Therefore, the present study was done with the objectives of assessing the knowledge of the WIFS among both adolescent boys and girls of Madhya Pradesh and the influencing factors, assessing the implementation of the WIFS in government schools and Anganwadi centers, ascertaining the recent trends in the prevalence of anemia, and for exploring the impact of knowledge about WIFS program on the optimal implementation and outcomes of the program. This would help to improve on the factors which need to be focused on for better implementation, functioning, and outcome of the program, thereby giving rise to a population of educated and empowered adolescents.

Materials and Methods

Study design and setting

It was a cross-sectional study carried out over a period of 6 months. It was conducted across five divisions in Madhya Pradesh in a total of 51 districts, out of which eleven districts were those where the RKSK program had been implemented and 40 districts where it had not been implemented yet.

Study participants and sampling

The participants for the study were adolescents (10–19 years of age); both male and female. The sampling technique used was multistage stratified random sampling technique. This study is a subset of Adolescent Health Baseline Survey, Madhya Pradesh (2017–2018), where the prevalence of hypertension (P) (Sharma *et al*. –8%)[15] was used to determine the sample size. At 95% confidence level, 15% relative Error (1.23 absolute error [d]), and with a design effect of 1.5, the minimum required sample size was calculated to be 2862. Taking 15% nonresponse, the sample size of 3213 was finalized for the study.

So the sample size formula was:

$$N = ([Z^2 \times P \times (1-P)]/d^2) \times \text{Design effect} \times [1 + (\text{nonresponse rate}/100)]$$

Table 1: Association of knowledge of weekly iron and folic acid supplementation with sociodemographic characteristics of the adolescent boys and girls (*n*=3213)

Variable	Total adolescent boys (*n*=1600), *n* (%)	Knowledge of WIFS		*P*	Total adolescent girls (*n*=1613), *n* (%)	Knowledge of WIFS		*P*
		Yes (*n*=454), *n* (%)	No (*n*=1146), *n* (%)			Yes (*n*=944), *n* (%)	No (*n*=669), *n* (%)	
Residence								
Urban	335 (20.9)	54 (16.1)	281 (83.9)	0.000***	339 (21.0)	153 (45.1)	186 (54.9)	0.000***
Rural	1265 (79.1)	400 (31.6)	865 (68.4)		1274 (79.0)	791 (62.1)	483 (37.9)	
Age group								
Early adolescence (11–14 years)	709 (44.3)	186 (26.2)	523 (73.8)	0.006**	634 (39.3)	350 (55.2)	284 (44.8)	0.014*
Late adolescence (15–19 years)	891 (55.7)	268 (30.0)	623 (70.0)		979 (60.7)	594 (60.6)	385 (39.4)	
Educational status								
Illiterate	5 (0.3)	0	5 (100)	0.002**	18 (1.1)	7 (38.9)	11 (61.1)	0.004**
Primary	127 (7.9)	19 (15.0)	108 (85.0)		116 (7.2)	53 (45.7)	63 (54.3)	
High school	1179 (73.7)	344 (29.2)	835 (70.8)		1224 (75.9)	723 (59.1)	501 (40.9)	
Intermediate and above	289 (18.1)	91 (31.5)	198 (68.5)		255 (15.8)	161 (63.1)	94 (36.9)	
Occupation								
Unemployed	1319 (82.4)	367 (27.9)	952 (72.1)	0.000***	1433 (88.8)	804 (56.2)	629 (43.8)	0.009*
Employed	281 (17.6)	87 (30.9)	194 (69.1)		180 (11.2)	140 (77.7)	40 (22.3)	
Mothers education (*n*=1554)					Mothers education (*n*=1574)			
Illiterate	686 (44.1)	174 (25.4)	512 (74.6)	0.025*	767 (48.7)	430 (56.0)	337 (44.0)	0.039*
Literate	868 (55.9)	265 (30.5)	603 (69.5)		807 (51.3)	495 (61.3)	312 (38.7)	
Fathers education (*n*=1505)					Fathers education (*n*=1510)			
Illiterate	285 (18.9)	61 (21.4)	224 (78.6)	0.002**	318 (21.1)	179 (56.3)	139 (43.7)	0.035*
Literate	1220 (81.1)	372 (30.5)	848 (69.5)		1192 (78.9)	705 (59.1)	487 (40.9)	
Mothers occupation (*n*=1554)					Mothers occupation (*n*=1574)			
Unemployed	686 (44.1)	166 (24.2)	520 (75.8)	0.002**	752 (47.8)	423 (56.2)	329 (43.8)	0.013*
Employed	868 (55.9)	273 (31.5)	595 (68.5)		822 (52.2)	502 (61.0)	320 (39.0)	
Type of family								
Nuclear	539 (33.7)	136 (25.2)	403 (74.8)	0.047*	1164 (72.2)	668 (57.4)	496 (42.6)	0.136
Nonnuclear	1061 (66.3)	318 (30.0)	743 (70.0)		449 (27.8)	276 (61.5)	173 (38.5)	
SES								
APL	416 (26.0)	134 (32.2)	282 (67.8)	0.005**	323 (20.0)	215 (66.6)	108 (33.4)	0.000***
BPL	1062 (66.4)	292 (27.5)	770 (72.5)		1114 (69.1)	645 (57.9)	469 (42.1)	
No card	122 (7.6)	28 (23.0)	94 (77.0)		176 (10.9)	84 (47.7)	92 (52.3)	

*P<0.05, **P<0.01, ***P<0.005. WIFS=Weekly iron and folic acid supplementation, SES=Socioeconomic status, APL: Above poverty line, BPL: Below poverty line

So N = ([$1.96^2 \times 0.08 \times (0.92)$]/$0.0123^2$) × 1.5 × (1 + 0.15)

So N = 2862 × 1.15 = 3213

From the 11 districts located in three different geographic zones of Madhya Pradesh where RKSK had been implemented and 40 districts where it has not been implemented yet, one intervention and one control district were randomly selected from each geographic zone by Lottery method. Then, in the next stage, three administrative blocks were randomly selected from each district (9 RKSK blocks and 9 non-RKSK blocks). Then, from the sampling frame of villages (Census 2011), seven villages were randomly selected per block. Thus, overall, 126 villages were selected through systematic random sampling technique (63 RKSK villages and 63 non-RKSK villages). Then, in each village field, investigators went to each household and enquired for the presence of any adolescent in the household till a sample of 13 adolescent girls and boys was randomly selected from each village. In households with more than one adolescent, only one adolescent fulfilling the selection criteria and consenting to participate in the study was selected.

Data collection tool and technique

A team of experts from NHM, UNICEF, AIIMS, and

Table 2: Association of knowledge of weekly iron and folic acid supplementation with knowledge of anemia, availing services under weekly iron and folic acid supplementation and severity of anemia among the adolescent boys and girls (*n*=3213)

Variable	Total adolescent boys (*n*=1600)	Knowledge of WIFS		*P*	Total adolescent girls (*n*=1613)	Knowledge of WIFS		*P*
		Yes (*n*=454)	No (*n*=1146)			Yes (*n*=944)	No (*n*=669)	
Heard about anemia (*n*=1600)					Heard about anemia (*n*=1613)			
Yes	250 (15.6)	96 (38.4)	154 (61.6)	0.000***	369 (22.9)	258 (69.9)	111 (30.1)	0.000***
No	1350 (84.4)	358 (26.5)	992 (73.5)		1244 (77.1)	686 (55.1)	558 (44.9)	
Correct knowledge about anemia (*n*=250)					Correct knowledge about anemia (*n*=369)			
Yes	127 (50.8)	53 (41.7)	74 (58.3)	0.000***	217 (58.8)	163 (75.1)	54 (24.9)	0.000***
No	123 (49.2)	43 (35.0)	80 (65.0)		152 (41.2)	95 (62.5)	57 (37.5)	
Got iron tablets (*n*=1600)					Got iron tablets (*n*=1613)			
Yes	387 (24.1)	380 (98.1)	7 (1.9)	0.000***	631 (60.8)	613 (97.1)	18 (2.9)	0.000***
No	1213 (75.9)	74 (6.2)	1139 (93.8)		982 (39.2)	331 (33.8)	651 (66.2)	
Place of obtaining tablets (*n*=387)					Place of obtaining tablets (*n*=631)			
School	319 (82.4)	303 (94.9)	16 (5.1)	0.000***	347 (54.9)	317 (91.3)	30 (8.7)	0.000***
Anganwadi	54 (13.9)	51 (94.4)	3 (5.6)		251 (39.7)	227 (90.4)	24 (9.6)	
PHC/CHC	11 (2.8)	10 (90.9)	1 (9.1)		25 (3.9)	18 (72.0)	7 (28.0)	
Others	3 (0.7)	2 (66.7)	1 (33.3)		8 (1.2)	6 (75.0)	2 (25.0)	
Number of tablets consumed (*n*=387)					Number of tablets consumed (*n*=631)			
<4	182 (47.0)	132 (72.5)	50 (27.5)	0.000***	317 (50.2)	239 (75.3)	78 (24.7)	0.000***
4	150 (38.7)	121 (80.6)	29 (19.4)		251 (39.7)	198 (78.8)	53 (21.2)	
>4	55 (14.2)	49 (89.0)	6 (11.0)		63 (9.9)	55 (87.3)	8 (12.7)	
Received albendazole (*n*=1600)					Received albendazole (*n*=1613)			
Yes	446 (27.9)	187 (41.9)	259 (58.1)	0.000***	412 (25.5)	350 (85.0)	62 (15.0)	0.000***
No	1154 (72.1)	267 (23.1)	887 (76.9)		1201 (74.5)	594 (49.5)	607 (50.5)	
Anemia (*n*=1424)					Anemia (*n*=1613)			
No	1006 (62.9)	336 (33.4)	670 (66.6)	0.048*	689 (42.7)	489 (70.9)	200 (29.1)	0.036*
Mild	418 (26.1)	88 (21.1)	330 (78.9)		435 (27.0)	225 (51.7)	210 (48.3)	
Moderate	172 (10.8)	29 (16.9)	143 (83.1)		458 (28.4)	218 (47.5)	240 (52.5)	
Severe	4 (0.3)	1 (25.0)	3 (75.0)		31 (1.9)	12 (38.8)	19 (61.2)	

*P<0.05, **P<0.01, ***P<0.005. WIFS=Weekly iron and folic acid supplementation

UNFPA developed the study tool for AH baseline survey which was pilot tested and validated. Paperless and real-time data collection was done through the use of mobile-based digital data collection tools. Statistical analysis was performed using Statistical analysis was performed using SPSS (Statistical Package for the Social Sciences, IBM corporation, Chicago, Illinois, United States of America) for Windows (version 21.0). Categorical data were presented as frequency and percentage (%). Pearson's Chi-square test was done to evaluate differences between groups for categorized variables. All tests were performed at 5% level of significance. Multivariate logistic regression technique was employed to assess the net influences of multiple explanatory variables after controlling other relevant predictor variables, and forest plot was used to depict the Adjusted Odds Ratios (AOR).

Ethical consideration

Ethical approval was obtained from the Institutional Human Ethics Committee, AIIMS Bhopal. Confidentiality of the data and privacy of the participants was ensured.

Results

A total of 1600 adolescent boys and 1613 adolescent girls were interviewed regarding their knowledge of WIFS and the associated factors. It was observed that the knowledge of WIFS was more among adolescent girls (29.3%) as compared to adolescent boys (14.1%) [Figure 1].

The knowledge of WIFS was more among both rural adolescent boys (31.6%) and girls (62.1%) as compared to those residing in urban areas (16.1% and 45.1%, respectively), and the association was found to be

statistically significant. The knowledge was also found to be more among boys (30.0%) and girls (60.6%) in the late adolescent phase; the association being statistically significant. Higher education attainment was significantly associated with more proportion of adolescents having knowledge of WIFS, with 31.5% and 63.1% of the adolescent boys and girls with intermediate and above level of education, respectively, having knowledge of WIFS. Furthermore, the employed boys (30.9%) and girls (77.7%) had higher knowledge of WIFS; the association is statistically significant. Mothers educational and employment status had a significant association with adolescent's knowledge of WIFS, with more of the adolescents whose mother was literate or employed having knowledge of WIFS as compared to those who had an illiterate or unemployed mother. Father's educational status was also found to be significantly associated with adolescents having knowledge about WIFS. The knowledge of WIFS was reported to be more among adolescents boys belonging to nonnuclear family (30.0%) as compared to those belonging to nuclear families (25.2%) and also among adolescents boys and girls having APL socioeconomic status as compared to BPL; the association is statistically significant [Table 1].

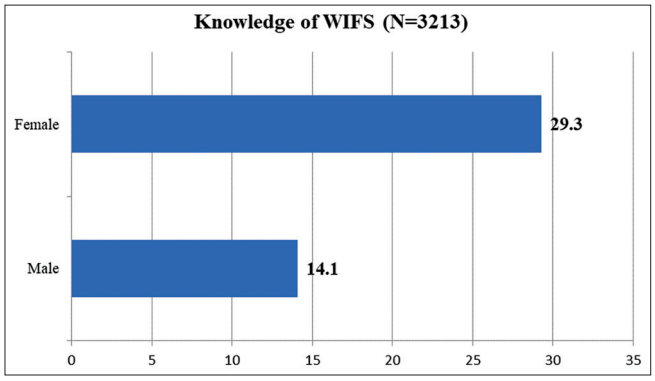

Figure 1: Knowledge of Weekly Iron and Folic acid Supplementation among adolescent boys and girls (*N* = 3213)

Most of the adolescent girls had heard about anemia (22.9%) and had correct knowledge about anemia (58.8%) as compared to adolescent boys (15.6 and 50.8%, respectively). More proportion of adolescent boys and girls who had heard about anemia and had correct knowledge about anemia had knowledge about WIFS; the association is statistically significant. More of the adolescent girls received iron and folic acid tablets as compared to adolescent boys (60.8% girls vs. 24.1% boys). Mostly, the adolescents got iron tablets from school followed by Anganwadi and PHC/CHC. For adolescent boys, the major source was school (82.4%) and very few of them were getting it from either Anganwadi or PHC/CHC or any other source. However, for adolescent girls, though school was still the major source (54.9%), a significant two-fifth (39.7%) of them got these tablets from Anganwadi. The knowledge of WIFS was found to be significantly associated with the place of procurement of these tablets. The majority of the adolescent boys and girls who consumed >4 tablets had knowledge of WIFS; the association isstatistically significant. Availability of albendazole was also significantly associated with knowledge of WIFS. Anemia was found to be more among girls (66.5%) as compared to boys (37.1%). The knowledge of WIFS was found to be significantly associated with having anemia and the severity of anemia, with less proportion of adolescents with knowledge having anemia or severe anemia [Table 2].

The above figure shows predictors for knowledge of WIFS among adolescents. Figure 2 shows predictors for knowledge of WIFS among adolescents. Factors found

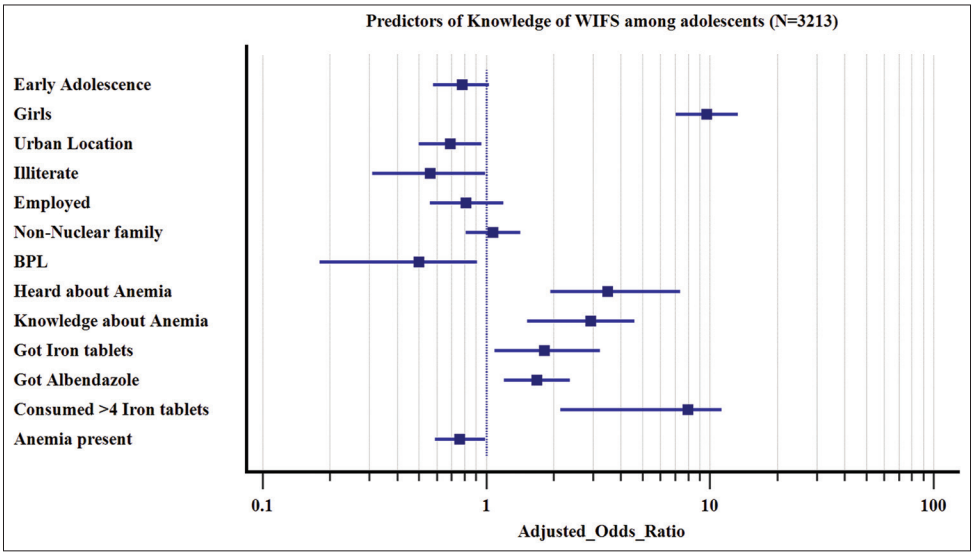

Figure 2: Logistic regression for Adjusted Odds Ratio for predictors of knowledge of Weekly Iron and Folic acid Supplementation among adolescents (*n* = 3213)

to be statistically significant in bivariate analysis were subjected to conditional multiple logistic regression for adjustment and controlling the effect of confounding variables. Adolescent girls were more likely to have knowledge of WIFS as compared to adolescent boys (AOR for Girls vs. boys = 9.69 [confidence interval (CI): 7.05–13.31]). Urban adolescents were less likely to have knowledge of WIFS versus rural adolescents (AOR urban vs. rural = 0.69 times [CI: 0.50–0.95]). Adolescent girls who belonged to BPL SES were 0.50 times (CI: 0.18–0.91) less likely to know about WIFS as compared to those who were APL. Adolescents who had heard about anemia were 3.49 times (CI: 1.93–7.39) more likely to have knowledge of WIFS as compared to those who had not heard of anemia. Furthermore, those adolescents who got iron tablets and albendazole were 1.82 (CI: 1.09–3.22) and 1.68 (CI: 1.20–2.36) times, respectively, more likely to know about WIFS as compared to those who did not get these tablets. In addition, those adolescents who consumed adequate Iron tablets (>4) were 7.97 times (CI: 2.14–11.26) more likely to know about WIFS as compared to those who did not consume them.

Discussion

Evidenced and established by a plethora of researches in the field of women health, anemia status among women can be well controlled if satisfactory iron stores are built up during the critical period of adolescence.[7,16] If not checked on time, it further propagates the intergenerational cycle of anemia.[7] To add to their woes, the socio-cultural milieu of India predisposes young girls for early marriage and teenage pregnancy, increasing the already present threat.[7] To counteract this major public health problem, WIFS had been instituted by GOI, but the reach of this program targeting adolescents was found to be limited, data unavailable, and adolescent health-seeking suboptimal.[2,7] The paucity and absence of rigorous interventional research forming a base for future interventions is one of the major constraints in highlighting and addressing the barriers associated with adolescent health, especially that for younger adolescents and adolescent boys.[2]

The present study reported quite low knowledge of WIFS,[4,13] especially among boys, adolescents residing in urban areas, illiterate adolescents, and those belonging to BPL socioeconomic status, which is in contrast to that reported by Sarada and Thilak, in their study in Kerala.[11] Similar pattern was observed in knowledge about anemia with only 15.6% of the boys having heard of anemia as compared to 22.9 girls. However, out of those who had heard about anemia, approximately similar proportion of girls and boys had correct knowledge about anemia (58.8 and 50.8%, respectively). The findings are in concurrence with that reported by Dubik *et al*., in their study in one of the developing nations of the world.[4] The findings of the present study are in complete contrast with those reported worldwide;[1,6,7,11,17] however, the male preponderance for low knowledge was found to be universal.[1,6,7,17] As corroborated from various researches, being aware of anemia is itself a motivation for consumption of iron tablets.[4] Therefore, emphasis must be given on acquainting the adolescents for maintaining the functionality and compliance to the program.[4,7]

In the present study, 24.1% and 60.8% of the adolescent boys and girls received iron tablets under WIFS. The majority (82.4%) of the boys received it from school, whereas about half (54.9%) of the girls received it from school and about two-fifth (39.7%) from AWC. Only 14.2% of the boys and 9.9% of the adolescent girls took more than four iron tablets. Further, the distribution of albendazole tablet showed a similar pattern with about one-fourth of the adolescents (both boys and girls) receiving it. The coverage and compliance of WIFS are quite low when compared to studies done by Angadi and Balu[5] (58.4%) and Divakar *et al*.[7] (85.2%) in Karnataka, Kaur *et al*.[6] (67.1%) in Uttar Pradesh, Sau[12] (67.7%) in West Bengal, and Priya *et al*.[16] (97.1%) and Dhikale *et al*.[17] (85.8%) in Pondicherry, similar to that reported by Sudfeld *et al*.[18] (approximately 40%) and higher than Dubik *et al*.[4] (26.2%), Sarada and Thilak[11] (25%), Sajna and Jacob[19] (15%), Shrivastava and Maliye[20] (11.5%), and Khapre *et al*.[21] (16%) in their studies within and outside the country. Knowledge about WIFS was found to play a pertinent role in both coverage and optimal utilization with more of the adolescent boys and girls, having knowledge about the scheme, receiving iron and albendazole tablets, and complying with the correct dosage as compared to those who were not aware of this scheme.

About 37.1% of the boys and 57.3% of the girls were found to be anemic in the present study, which is similar to that reported by NFHS-4 (29.1 and 54% for 15–19-year age group adolescent boys and girls).[10] While comparing with the findings documented in NFHS-3 (30.2 and 55.8%, respectively),[22] not much improvement in the anemia status has been recorded over the decade. This is quite astounding as despite the launch of WIFS, the findings are more or less the same; raising questions on the implementation, functioning, and effectiveness of this scheme. Similar findings have been reported in a study done by Priya *et al*. in Pondicherry.[16] However, in contrast to the present study, much lower prevalence of anemia has been reported by Angadi and Balu[5] and Divakar *et al*.[7] in Karnataka and Rakesh *et al*.[23] in Kerala and higher in studies done by Shah *et al*.,[9] Bhardwaj *et al*.,[13] and Khapre *et al*.[21] in various parts of the country. In

addition, Rakesh *et al*. observed no difference in the prevalence of anemia between boys and girls which is not in agreement with the findings of the current study.[23] Taking knowledge as a proxy for utilization in the present study, anemia was found to be more among those adolescent boys and girls who had no knowledge of WIFS;[9,23] however, contrary to this, no difference was observed in a study done by Shrivastava and Maliye in Central India.[20] The high prevalence of anemia, especially among adolescent girls, could be attributed to sociocultural differentiation and gender bias, illiteracy, poverty, and poor access to health care.[13]

It can also be inferred from the findings of the present study that the valuable insights gained from the successful WIFS pilot have not been fully translated and assimilated into the nationwide program roll-out, encompassing inclusion of all stakeholders, peer group advocacy, prompt redressal of implementation issues, sustained availability of supplements, and technical and supervisory support.[18]

The weekly administration of iron and folic acid supplements is the most feasible and cost-effective strategy for the prevention of anemia among adolescents,[5,6,13,23] with adherence or compliance to iron tables being the critical decisive factor for the successful implementation of the scheme.[4,19,23] Thereby, lack of awareness regarding the scheme is undeniably the prime reason behind this low coverage and nonadherence.[4,16,20] Ensuring availability of tablets, surveillance for side effects, training of the school authorities and health personnel, strengthening of both the school as well as Anganwadi component of the program, invoking a sense of accountability in both the health and education department, strict monitoring and evaluation of the program and supportive supervision are some of the other plausible measures for enhancing service delivery and assuring quality.[4,7,13,16,17,18,19,21] As the role of teachers and the health department cannot be undermined therefore an integrated, multisectoral, and focused approach involving all stakeholders and emphasizing effective behavior change communication for dietary modification and a combination of abovementioned strategies is required to attain the desired objectives of the scheme.[4,7,16,18,21,23]

Limitation and recommendation

The reported studies on the knowledge and another aspect of the WIFS program are limited; therefore, the present study is critical in highlighting the importance of making adolescents aware and well informed of the WIFS program and its impact on their anemia status.[19] The study novelty is that it indirectly points out that the focus of the iron and folic acid supplementation program needs to be put to the adolescent boys as well, where traditionally it has been deficient. Apart from limitations associated with cross-sectional study design, social desirability bias and lack of in-depth exploration of factors associated with poor knowledge of the scheme using qualitative approach were the other main shortcomings of the present study. In addition, as baseline hemoglobin measurements before the commencement of the program were not taken, so link between WIFS program knowledge, coverage, and tablet adherence and anemia prevalence cannot be explored. Future studies on large scales are warranted to delineate the factors associated with the implementation and functionality of WIFS and to recommend the way forward for promptly addressing the identified gaps in order to fully avail the proposed benefits of the program.[18,21]

Conclusion

Despite the recent strides in the implementation and operationalization of WIFS program, there still exists a huge scope for improvement, especially in the provision of knowledge to adolescents with respect to their nutritional status and the WIFS program. The gaps identified in this study are critical to modifying the interventions for the adolescents in Madhya Pradesh and in the rest of the country, since this is one of the few studies on a very specific domain of a specific program. Perhaps educational interventions based on problem-based learning and behavioral change theories might help to increase the awareness among the target groups as suggested by the studies of Sabouri *et al.* and Karimi *et al.*, in this case, the adolescent boys.[24,25] Sensitization and outreach programs, harnessing potential of mass media and peer advocacy for increasing awareness and generating demand from the community, robust involvement of all stakeholders for optimal functioning of the program, and reorientation of all frontline functionaries envisaging a common vision and sense of accountability is warranted for improving adolescent health.

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Conflicts of interest

There are no conflicts of interest.

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