Evaluation of the Iron Aid Program Process in Iranian girls' high school: A national study

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Abstract

Background: One of the most important health and social problems in adolescent girls is iron deficiency anemia. The purpose of this study was to evaluate the Iron Aid National Program for high school girls.

Methods: This cross-sectional study was performed on cluster random sampling from northern, southern, eastern, western and central regions of Iran with a sample size of 399 high school girl students. A valid and reliable researcher-made questionnaire was used for data collection. Data were analyzed by SPSS 20 software.

Results: The most important reasons for not taking iron supplements from the students' viewpoints were the bad taste of iron supplements, nausea after consumption, non-prescription of the iron supplement by a physician. Most students believed that inviting health professionals and film/video screenings had the most impact on encouraging them to intake iron supplements. About 45 % of students reported that they had no training program on iron supplementation, and only 28 % of students received educational content. Also, 71 % of students said there were not enough glasses for the consumption of supplement iron. There was a significant relationship ($p < 0.05$) between the person distributing the supplements in the schools, the availability of adequate drinking water, the time allocated to the implementation of the program, and the person teaching the program with the number of supplements consumed by the students ($p < 0.05$).

Conclusion: Based on the results of this study, attention was paid to different aspects of the Iron Aid National Program such as providing quality supplements, providing appropriate environmental conditions, designing training programs, public information and providing appropriate human resources for successful implementation of Iron Aid National Program are essential.

Background

Iron deficiency has been recognized as one of the most important health and social problems in adolescents, especially girls[1]. Girls lose more blood due to physiological changes and menstruation and are more at risk of anemia[2]. Iron deficiency is one of the most important causes of anemia. Other causes such as diets, impaired iron absorption, inadequate intake and consumption of iron-rich diets, menstrual bleeding, acute and chronic infections, parasitic infections and hereditary disorders can cause[3–5] anemia. Anemia in adolescent girls can impair physical and mental development, decrease resistance to infection, decrease physical fitness, and decrease learning ability and school performance[6–8].

According to the results of the World Health Organization (WHO), about 42.3% of women aged 15–59 years and about 49% of school-age students in developing countries have iron deficiency anemia[9, 10]. The results of a study on adolescent girls in India showed that 87% of them suffer from iron deficiency anemia[11]. The results of a meta-analysis study conducted in Iran showed that about 27%

and 14% of students under 18 years of age suffer from anemia and iron deficiency anemia, and the prevalence of iron deficiency anemia in girls is about 8.5% [12].

Despite measures such as nutrition education, treatment, and prevention of parasitic infections and weekly iron supplementation, the problem of anemia in adolescent girls is still a worldwide health problem[13, 14]. According to the results of a study in India, only about 35% of students took iron pills regularly[15]. The results of a study on Italian adolescent girls showed that only 50% of them took iron supplements[16]. The results of a study in Iran showed that about 38% of female students did not take iron pills distributed in school[17]. Also in another study, about 70% of female students reported that they did not completely take iron supplements distributed in schools[18].

The National Iron Supplementation Program is a routine program conducted by the Ministry of Health of Iran for about 10 years in girls' high schools and 16 iron pills (ferrous fumarate) were given weekly to students, but based on the results, even by running this program and given that its free, a significant number of female students still suffer from iron deficiency anemia[12, 17, 19]. There are also concerns about the effectiveness of the program at the public level. For example, there are possibilities that some students may receive iron supplements but not take them or that iron supplements may not even be delivered to some people, or even some students may receive the supplements and do not fully take them. On the other hand, there are also concerns about providing high-quality supplements, the process of distributing supplements, the delivery to the students, and the use of supplements by the students. According to the above-mentioned descriptions, the present study was conducted to evaluate the high school girls' national iron supplementation program.

Methods And Materials

This cross-sectional-analytical study was designed and conducted to evaluate the Schools Iron Aid National program in Iranian schools from the viewpoint of high school female students in 2018. Based on the results of the previous study[20] and with 95% confidence level, test power of 0.80 and error of 0.05, the sample size required for this study was estimated to be 399 subjects.

Sampling method

In this study, cluster sampling was performed and each of the northern, southern, eastern, western and central districts of the country was considered as a cluster. Three cities were randomly selected from each cluster. Then, two clusters (one urban cluster and one rural cluster) and four clusters (three urban clusters and one rural cluster) were randomly selected from sparsely populated and densely populated cities, respectively. The list of girls' junior high schools was identified among the selected districts and 40 schools were selected through a simple random sampling. Then, students were selected from each school, according to their population and sample size needed for the study, through a simple random sampling, and the process of questioning was done in the selected provinces, cities, and schools. The questionnaires were completed by the students without the presence of principals and teachers in self-

reports. Inclusion criteria included students studied in junior high school (lower secondary school), students and their parents' consent to participate in the study.

Questionnaire

Self-designed questionnaire: A self-designed questionnaire designed by the researchers was used to collect information and evaluate. The questionnaire consisted of 18 questions about the process of implementing the supplementary program, including how to distribute the supplements, the reasons for not consumption of the supplements, the disadvantages of supplements, Implementation the educational program by schools and health centers, providing appropriate environmental conditions for consumption of distributed supplements in schools by students was evaluated.

Reliability and Validity

Face validity (qualitative and quantitative) and content validity (qualitative and quantitative) were used to determine the validity of the questionnaire. To assess qualitative face validity and quality content validity, a questionnaire was provided to 6 experts (health education and nutritionists) and necessary corrections were made. To determine the face validity of the questionnaire, the questionnaire was administered to 16 individuals in the target group and was evaluated by the impact score method. Questions that scored less than 1.5 were excluded from the questionnaire.

To determine the content validity of the questionnaire, 15 health professionals and nutritionists were asked to determine the quantitative content validity of the questionnaire. Content validity ratio(CVR) index and content validity index(CVI) for the whole instrument were 0.94 and 0.90, respectively. Finally, to determine the reliability, a pilot study was performed on the students. The questionnaire was completed by 60 students who did not enter the main study and Cronbach's alpha coefficient was 0.81.

Ethical considerations

After obtaining the necessary approval from the relevant authorities and conducting the necessary coordination (schools), the study began. At first, the aims of the research project were explained to the subjects and after obtaining informed consent from the students and their parents the questionnaires were provided to them and completed by self-report.

Data analysis

The collected data were entered into SPSS 24 software. Descriptive statistics and related charts, numbers, and percentages (for qualitative variables) and mean and standard deviation (for quantitative variables) were used to describe the data. The significance level was considered to be less than 0.5 in this study.

Results

Mean(SD) age of students, parents, and mothers were 16.08 (0.63), 46.20 (6.35) and 41.30 (5.63), respectively. Of all students, 249 (62%), 134 (34%) and 15 (4%) lived in the city, village, and suburbs,

respectively. Also, 92% of students (n=360) participating in the study were from governmental schools. Other demographic information is visible in Table 1.

According to the results of Table 2, the most important reasons for not taking iron supplements from the viewpoint of the subjects, in order of priority, were as follows: bad taste of iron supplements, nausea after taking the supplements, no foreign iron supplements, no doctor prescription for the supplements, and no need for iron supplementation due to the lack of disease (Table 2). Most students believed that inviting health care professionals and screening movies/clips about iron deficiency anemia to discuss issues related to taking iron supplements could have the most impact on encouraging students to take iron supplements. While less than 35 percent of students believed that hanging relevant posters and distributing relevant brochures could have an impact on encouraging students to take iron supplements (Table 2).

According to the results of Table 3, only 28% of students stated that they received educational content about the iron supplement program. 90% of students stated that teachers agreed with the consumption of iron supplements distributed at school by students. In the present study, about 45% of students reported that they had no training program on iron supplementation (Table 3).

According to the results of the present study, there was no significant difference between schools regarding taking iron supplements. Overall, 77% of students took iron supplements, of which 88% reported they took iron supplements distributed in school ($p > 0.05$). According to the results of Table 4, the distribution process of iron supplements was significantly different in public and nonprofit schools. In nonprofit and public schools, 10% and 3% of students respectively reported that all iron supplements were given to them at the beginning of the program. Regarding the pill distributor, in nonprofit schools, supplements were mainly distributed by schools' educational assistants and health educators, and in public schools, supplements were distributed by the students ($p < 0.001$) (Table 4).

The results of this study show that there was no significant relationship between governmental and private schools in terms of providing educational programs and educational content distribution related to the iron supplementation program. The results also showed that there was no significant relationship ($p> 0.05$) between governmental and private schools in terms of consumption of iron supplements ($p> 0.05$) (Table 4).

The results show that 71 % of student's report that there are not enough glasses for the consumption of iron supplement and there is no significant difference between governmental and private schools. Also, 80% of students reported that they were not informed about the time of iron supplement distribution and there was no difference between governmental and private schools ($p> 0.05$) (Table 4).

The results of Table 5 showed that most students in urban, suburban and rural schools reported receiving one pill each week, with no significant difference between schools. There was a statistically significant relationship between the distributor of iron supplements and school location, and in all schools, pills were mostly distributed by the students. There was also a significant relationship between informing before

the distribution of supplements and school location, and in all schools, most people reported that prior information was not provided to them. According to the results of the above table, there was no significant relationship between school locations in terms of taking iron supplements ($p > 0.05$). The results also showed that there was no significant relationship between school locations in terms of holding training sessions and distributing educational content regarding the Iron Supplementation Program, and most students reported that educational sessions were not held for them and they did not receive educational content in this regard ($p > 0.05$) (Table 5).

According to the results of Table 6, there was no significant relationship between the distribution process of iron supplements and the number of supplements consumed by the students, but when iron pills were distributed weekly, the number of supplements consumed by the students increased ($p > 0.05$). There was a significant relationship between the person distributing the pills and taking the pills. The number of supplements consumed increased when iron pills were distributed by the students ($p < 0.05$). The results also showed that there was a significant relationship between the availability of proper drinking water and the number of supplements consumed by the students. When students were provided with proper drinking water, the number of supplements consumed increased ($p < 0.05$). There was also a significant relationship between the amount of time spent on implementing the Iron Supplementation Program in schools and the number of supplements consumed. When more time was devoted to the Iron Supplementation Program by the schools, the number of supplements consumed by the students also increased ($p < 0.05$). The results of this study showed that there was a significant relationship between the person training the Iron Supplementation Program and the number of supplements consumed by the students, and when these training were done by a health educator, students took more iron supplements ($p < 0.05$) ($p < 0.05$).

Discussion

This study aimed to evaluate the process of implementing the Iron Supplementation Program for high school girls. In this study, only 38% of students took iron pills distributed in school. The results of a study by Kheirouri showed that only 62.3% of female students had taken iron supplements fully[17]. Another study on students conducted by khammarnia found that only 31% had fully taken iron supplements[18]. The results of Chauhan's research showed that out of 71.7% of students who had anemia, 89.5% did not take iron supplements[21]. Sajna’s study on Indian students showed a low consumption of iron supplements by only 34.6% of students[15]. The results of Sarada’s study also showed that 77 percent of students reported that they did not take iron supplements[22]. The results of Banayejeddi's study on high school girls also showed that only 31 percent of students took iron supplements[23].

In this study, the distribution of pills was mostly done by the students. There was a significant relationship between the person distributing the pills and taking the pills, and when the pills were distributed by the students, the number of supplements taken increased. One of the most effective groups in the selection of health behaviors by the students is the peer group, and adolescents usually get the most influence from their friends[24]. Therefore, one of the effective groups in school to encourage

students to practice health behaviors is the peer group, which can also be used in schools to increase the number of iron supplements taken by the students.

The most important reasons for not taking iron supplements from the viewpoint of the subjects, in order of priority, were as follows: bad taste of iron supplements, nausea after taking the supplements, no foreign iron supplements, no doctor prescription for the supplements, and no need for iron supplementation due to the lack of disease. In khammarnia's study, the most important reasons for not taking iron supplements have been identified, in order of priority, by students as follows: gastrointestinal problems, the influence of friends and family, unwillingness to take and lack proper environmental conditions and facilities for taking supplements[18]. In the Sajna's research, the most important reasons for not taking iron supplements were reported as the reluctance to take iron pills, fear of problems raised by taking iron pills, stomach pain, parental unwillingness, taking another supplement, and vomiting[15]. Priya's study also showed that the most important reasons students did not take iron supplements were: stomach pain, nausea and vomiting, headaches, and bad taste of iron supplements [25].

In this study, 71 percent of students said that there were not enough glasses for taking iron supplements. The results of a study showed that drinking water was not available in any class when distributing iron supplements and this problem was reported as a major obstacle to the effectiveness of the relevant program[17]. The results of the UNICEF evaluation showed that most students were dissatisfied with the side effects of supplements, and one school generally refused to continue taking supplements because of the severity of vomiting [26].

The results showed that there was a significant relationship between the availability of proper drinking water and the number of supplements consumed by the students, and the number of supplements taken by the students increased when they were provided with proper drinking water. One of the effective factors in performing any health behavior is the provision of enabling factors. One of the enabling factors that enhance behavior is the provision of appropriate environmental conditions for performing the behavior that ultimately increases the likelihood of performing behavior by individuals[27, 28]. Given the impact of environmental conditions on increasing iron supplement intake by the students, it is necessary to pay more attention to providing environmental conditions that increase the success of the program during the implementation of the relevant program.

More than half of the students in this study reported that there was no fixed time for pill distribution in schools. There was no significant relationship between how the supplements were distributed and devoting sufficient time to implement the program and the number of supplements consumed by the students, but when the pills were distributed weekly, the number of iron supplements taken by the students increased. The results of the Banayejeddi's study showed that the pills were not regularly distributed in schools, with only 22% reporting taking one iron supplement regularly each week. Also, 80% of students received at least one iron supplement during the implementation of the program[23]. Regularly distributing the pills and devoting sufficient time to run the program in the schools can highlight the importance of implementing an iron supplementation program by the school management and the

Department of Education, and if the students are informed of the importance of running the program, the implementation of the program is also considered important for them and it can increase the number of iron supplements taken by the students as well.

In this study, about 45 percent of students reported that they were not provided with any training in the iron supplementation program. In Kheirouri's study[17], students also reported that they did not receive the necessary training in the iron supplementation program. The results of a study showed that brochures and educational materials designed in schools are not targeted and their content is inappropriate and requires a great deal of time for students to learn[17].

The results of this study showed that implementing the educational program increased the number of supplements consumed by the students. The results of an evaluation study conducted by UNICEF found that 32% of students did not know the reason for taking iron supplements and 61% reported that they did not receive any training program in this regard[26]. The results of a study showed that the iron supplementation training sessions were weakly held for female students in schools, and 64 students reported having at least one training session in this regard [23]. Obtaining the knowledge and information necessary to perform a behavior is one of the prerequisites for conducting behavior and it is necessary to obtain accurate information about the importance of the subject, the need to perform the intended behavior and learning how to behave correctly to continue conducting a behavior[29]. Increased knowledge and awareness increase in iron supplement intake[30]. Therefore, to increase the effectiveness of the iron supplementation program and supplement use by the students, it is necessary to pay more attention to the educational programs and use appropriate and effective strategies to implement educational programs and increase students' awareness during the implementation of the iron supplementation program.

The majority of students stated that teachers agreed with the use of iron supplements distributed in schools by the students. In a study by Priya[25], the results showed that teachers were not comfortable with the program implementation, because they believed that the program was time-consuming, under government pressure, and required a lot of extra work. The results of studies by Roschnik[31], Risonar [32], and Dhikale[33] showed that teachers had the most significant influence on the acceptance of taking iron supplements among students. The results of Sarada's study on Indian students showed that 90% of teachers recommended taking iron supplements and 49% of them took iron supplements in the presence of students[22].

The results of this study showed that students took more iron supplements when training in an iron supplementation program was provided by a health educator. Health educators are people who are responsible for educating students and caring for students' health in schools and are closely associated with students and can play an effective role in enhancing students' health behaviors. The results of this study also confirmed the important role of health educators in encouraging students to perform health behaviors[34]. It seems that providing a health educator for each school can be one of the best ways to improve the quality of program implementation. Therefore, it is necessary to pay more attention to health

educators and to take an important step in enhancing students' health by holding appropriate training courses and empowering the health educators in this regard.

Most students have stated that inviting health care professionals to discuss the issue related to iron supplement intake could have the greatest impact on encouraging students to take iron supplements. Then, screening films/clips about iron deficiency anemia (over 45% agreed) can be one of the most effective methods. The results of Priya's study[25] showed that students were interested in having iron supplementation training sessions by health care professionals. In the Mehrabian's study[35], students reported that they received most of their information on iron supplements from physicians and health care personnel.

Overall, it appears that the distribution process of iron supplements was significantly different in public and nonprofit schools in this study. Students in nonprofit schools have reported that over 10% of cases delivered all iron supplements at the beginning of the program, while this was only 3% in public schools. On the other hand, 19% of students in public schools stated that they were only given one pill each month, compared to 10% in nonprofit schools. Regarding the pill distributor, it has also been stated that in nonprofit schools, supplements were mainly distributed by the school's educational assistant and health educators, while in public schools, supplements were distributed by the students themselves. One of the strengths of this study was the nationwide evaluation and sampling of public and non-public schools. One of the weaknesses of this study was the self-reported data collection as well as the lack of direct observation of behavior and the use of questionnaires for data collection.

Conclusion

Based on the results of the present study, it seems necessary to emphasize the continuity of program implementation and reinforce stages of the process that require quality improvement. Enhancing public awareness, especially through national and provincial broadcasting, increasing the quality and quantity of training-justification sessions for all forces involved in program implementation and monitoring, allocating specific funding for implementing the Iron Supplementation Program through the "Ministry of Health, Treatment and Medical Education", and the "Ministry of Education", providing executive staff in all schools, especially health educators, strengthening the regular and systematic registration and reporting system, enhancing the programs established for monitoring the implementation of the Iron Supplementation Program and supplement use by the students in schools were among the suggestions provided by the present study. It also seems necessary for policymakers and executives to review the goals, method, and process of overseeing the implementation of the high school girls' Iron Supplementation Program, and to reform the various stages of program implementation to ultimately enhance program efficiency.

Declarations

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Availability of data and materials
The data sets used and/or analyzed during the current study were available from the corresponding author on reasonable request.

Authors' contributions
Authors AA, ZH and AJ designed the study. AA, AJ, HT and ZH participated in the conception of the study. AA and AJ managed and conducted the statistical analyses and interpreted the data. AA, HT, and AJ wrote the first draft and AA, AJ, HT and ZH revised it to make the final manuscript. All authors have approved the final manuscript.

Consent for publication
Not applicable

Conflicts of interest

The authors have no conflicts of interest

Ethics approval and consent to participate

This study is based on a research project approved by the research council of the National Institute of Health Research with the code of ethics the code of ethics IR.TUMS.NIHR.REC.1397.021). Before the study written consent to participate in the study was obtained from the appropriate parents/legal guardians on behalf of all minors that took part in the study. Also, those that were not minors at the time or participation provided their own written consent. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

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Tables

Table 1. Frequency distribution of students' demographic characteristics

Variable		n	%
Location	Rural	134	33.7
	urban	249	62.6
	The outskirts of town	15	3.8
Type of school	Governmental	360	90.2
	Private	39	9.8
Father's education level	illiterate	16	4
	Diploma and under Diploma	274	68.8
	Academic	108	27.1
Mother's education level	illiterate	33	8.3
	Diploma and under Diploma	287	72.5
	Academic	76	19.2
Father's job	Employee	117	29.5
	Self-employee	264	66.5
	Unemployed	16	4
Mother's job	Housewife	352	88.7
	Employee	25	6.3
	Self-employee	20	5

Table 2. Frequency distribution of reasons for not consuming iron supplements distributed at school by students

Variable			n	%
Reasons for not consumption of iron supplements	I'm not sick	Yes	38	25.3
		No	112	74.7
	the Physician has not prescribed	Yes	42	28
		No	108	72
	Bad taste	Yes	59	39.9
		No	89	60.1
	Causes heartache	Yes	27	18.2
		No	121	81.8
	Causes deposition in the kidney	Yes	13	8.8
		No	135	91.2
	Consumption of supplementation is mandatory	Yes	12	8.1
		No	136	91.9
	It hurts my body	Yes	5	3.4
		No	143	96.6
	Supplements are not in good shape	Yes	7	4.8
		No	139	95.2
	They cause constipation	Yes	11	7.4
		No	137	92.6
	I don't trust iron supplements	Yes	15	10.1
		No	133	89.9
	Cause nausea	Yes	48	32.7
		No	99	67.3
	I am allergic to iron supplements	Yes	15	10.3
		No	131	89.7
	I feel that iron supplements is not necessary for me	Yes	27	18.4
		No	120	81.6
	I use similar iron supplements at home	Yes	23	15.4
		No	126	84.6
	My teachers don't intake pills	Yes	12	8.1
		No	136	91.9
Frequency of activities encouraging students to take iron supplement pills	Installing posters of iron supplement pills on the school hallway bulletin board	Yes	132	34.8
		No	247	65.2
	Distribution of relevant brochures among students	Yes	130	34.4
		No	248	65.6
	Invite healthcare professionals to discuss iron supplementation issues	Yes	248	65.4
		No	131	34.6
	Movie / video clips about IDA	Yes	172	45.4
		No	207	54.6
	Lecture by the school principal in the classroom or on the school grounds about iron supplements	Yes	126	33.2
		No	253	66.8
	Invite parents to school and talk about the importance of iron supplements	Yes	132	33.1
		No	243	64.8

Table 3. Frequency Distribution of Educational Content and Teacher Content on Iron Supplement Program at School

Variable		n	%
Distribution of educational content / educational media	Yes	111	28.2
	No	283	71.8
Type of educational content	Pamphlet	57	54.3
	Training book	30	28.6
	CD	11	10.5
	Others	7	6.7
Educator person	Health educator	76	36.5
	School Principal	18	8.7
	Physician	9	4.3
	Nutritionist	42	20.2
	Teachers	17	8.2
	I do not know	36	17.3
	Others	10	4.8
Time the implementation of educational program in schools	Before the beginning of program	89	22.5
	Simultaneous the beginning of program	50	12.7
	During the program	49	12.4
	Before and during the program	30	7.6
	No training	177	44.8
Teachers' opinion on intake iron supplementation	Agree with consumption of iron supplements tablets distributed at school	354	90.3
	Agree with consumption of iron supplementation, but they recommend intake of iron supplementation from the pharmacy	26	6.6
	They disagree with consumption of iron supplements	12	1.3

Table 4. Comparison of the process of implementation of the iron supplement program by school type

Variables		Type of school						
		Governmental		Private		All		P-value
		n	%	n	%	n	%	
How to distribute iron supplement pills?	One pill a week	276	78.4	31	79.5	307	75.5	0.033
	One pill every month	66	18.8	4	10.3	70	17.9	
	Take all the pills at the beginning of the program	10	2.8	4	10.3	14	3.6	
Exclusive distributor of iron supplements	School Principal	21	6.4	0	0	21	5.70	<0.001
	Deputy Assistant	52	15.8	23	59	75	20.38	
	Health educator	56	17	10	25.6	66	17.94	
	Servant School	29	8.8	1	2.6	30	8.16	
	students	171	52	5	12.8	176	47.82	
Place of consumption of iron supplement pills	In class or after class	131	36.7	20	51.3	151	38.1	0.396
	at home	126	35.3	10	25.6	136	34.3	
	No regular consumption at school and home	52	14.6	4	10.3	56	14.1	
	I never consumption	37	10.4	3	7.7	40	10.1	
Notification prior to the distribution of supplements pills	Yes	68	19.4	9	23.7	77	19.8	0.327
	No	283	80.6	29	76.3	312	80.2	
There are enough glasses for consumption of iron supplementation pills	Yes	104	29.3	12	30.8	116	29.4	0.848
	No	251	70.7	27	69.2	278	70.6	
Drinking water for iron supplementation	Yes	317	88.5	34	87.2	351	88.4	0.792
	No	41	11.5	5	12.8	46	11.6	
Allocate enough time to intake iron supplements	Yes	224	62.9	30	76.9	254	64.3	0.083
	No	132	37.1	9	23.1	141	35.7	
Implementation the educational program in schools	Yes	195	54.8	23	59	218	55.19	0.617
	No	161	45.2	16	41	177	44.81	
Deliver educational content / educational media about iron supplement pills to students	Yes	321	90.7	33	86.8	354	90.31	0.644
	No	21	5.9	5	13.2	26	6.63	
	I do not know	12	3.4	0	0	12	3.06	
Have you had a positive impact since consumption of iron supplement?	Yes	172	48.3	22	56.4	194	49.1	0.511
	No	81	22.8	6	15.4	87	22	
	I do not know	103	28.9	11	28.2	114	28.9	
consumption of iron supplement in general	Yes	276	76.9	31	79.5	307	77.1	0.842
	No	83	23.1	8	20.5	91	22.9	
Consumption of supplement distributed	Yes	243	88	29	93.8	272	88.6	0.552
	No	33	22	2	6.5	35	11.4	

in schools								

Table 5. Comparison of the Process of Implementation of the Iron Supplement Program by School Location

Variables		place of school						
		urban		rural		All		P-value
		n	%	n	%	n	%	
How to distribute iron supplement pills?	One pill a week	91	78.3	104	78.8	12	85.7	0.948
	One pill every month	44	18	23	17.4	2	14.3	
	Take all the pills at the beginning of the program	9	3.7	5	3.6	0	0	
Exclusive distributor of iron supplements	School Principal	5	2.2	13	10.6	3	23.1	0.004
	Deputy Assistant	53	22.9	20	16.3	2	15.4	
	Health educator	44	19	20	16.3	1	7.7	
	Servant School	17	7.4	13	10.6	0	0	
	students	112	48.5	57	46.3	7	53.8	
Place of consumption of iron supplement pills	In class or after class	89	36.2	57	42.5	4	26.7	0.261
	at home	83	33.7	47	35.1	6	40	
	No regular consumption in school and at home	36	14.6	19	14.2	1	6.7	
	I never consumption	38	15.4	11	8.2	4	26.7	
Notification prior to the distribution of supplements pills	Yes	37	15.2	36	27.7	4	26.7	0.013
	No	206	84.8	94	72.3	11	73.3	
There are enough glasses for consumption of iron supplementation pills	Yes	58	23.8	53	39.6	5	33.3	0.005
	No	186	76.2	81	60.4	10	66.7	
Drinking water for iron supplementation	Yes	214	86.6	123	91.8	13	86.7	0.318
	No	33	13.4	11	8.2	2	13.3	
Allocate enough time to intake iron supplements	Yes	149	60.6	94	70.7	10	66.7	0.144
	No	97	39.4	39	29.3	5	33.3	
Have you had a positive impact since consumption of iron supplement?	Yes	112	45.5	76	57.1	6	40	0.037
	No	62	25.2	24	18	1	6.7	
	I do not know	72	29.3	33	24.8	8	53.3	
consumption of iron supplement in general	Yes	186	75	106	79.1	14	93.3	0.206
	No	62	25	28	20.9	1	6.7	
Consumption of supplement distributed in schools	Yes	162	86.6	97	92.4	12	85.7	0.315
	No	25	13.4	8	7.6	2	14.3	
Implementation the educational program in schools	Yes	126	51.2	82	61.7	9	60	0.139
	No	120	48.8	51	38.3	6	40	
Deliver educational content / educational media about iron supplement pills to students	Yes	65	26.5	42	31.3	4	28.6	0.189
	No	108	44.1	65	48.5	4	28.6	
	I do not know	72	29.4	27	20.1	6	42.9	
The most effective people in taking iron supplement pills	Health care personnel recommendation	29	12.2	23	17.4	2	13.3	0.729
	Recommendation of Principal, Assistant,	42	17.7	25	18.9	5	33.3	

	Health educators and School teachers							
	Posters	9	3.8	69	4.5	0	0	
	My parents' advice	60	25.3	29	22	3	20	
	Physician's advice	47	19.8	18	13.6	2	13.3	
	My own Knowledge of the advantages of iron pills	50	21.1	31	23.5	3	20	

Table 6. Relationship between environmental conditions with iron supplementation by students

Variables		Consumption of supplement distributed in schools				
		Yes		No		P-value
		n	%	n	%	
How to distribute iron supplement pills?	One pill a week	216	80.6	26	74.3	0.636
	One pill every month	44	16.4	8	22.9	
	Take all the pills at the beginning of the program	8	3	1	2.9	
Exclusive distributor of iron supplements	School Principal	20	7.1	1	1.2	0.045
	Deputy Assistant	63	22.3	12	14.1	
	Health educator	52	18.4	14	16.5	
	Servant School	20	7.1	10	11.8	
	students	128	45.2	48	56.5	
Drinking water for iron supplementation	Yes	245	90.1	30	85.7	0.387
	No	27	9.9	5	14.3	
Allocate enough time to intake iron supplements	Yes	195	72	13	37.1	<0.001
	No	76	28	22	62.9	
Implementation the educational program in schools	Yes	188	61.8	30	33	<0.001
	No	116	38.2	61	67	
Type of educational content	Pamphlet	49	57	1	14.3	0.015
	Training book	24	27.90	4	57.1	
	CD	9	10.5	0	0	
	Others	4	4.7	2	28.6	
Educator person	Health educator	64	41	5	31.3	0.039
	School Principal	16	10.3	0	0	
	Physician	6	3.8	1	6.3	
	Nutritionist	32	20.5	2	12.5	
	Teachers	8	5.1	4	25	
	I do not know	24	3.8	2	12.5	
Teachers' opinion on intake iron supplementation	Agree	261	97.4	33	94.3	0.279
	Disagree	7	2.3	2	5.7	