RESEARCH PAPER

# Incidence of Side-effects After Weekly Iron and Folic Acid Consumption Among School-going Indian Adolescents

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**Objective:** To estimate incidence of side effects after weekly iron and folic acid supplementation (WIFS) in Delhi and Haryana. **Methods:** In this cross-sectional school-based study, data were collected from 4,183 adolescents on WIFS consumption and side effects experienced first time of receipt of WIFS (week 1), and in last two consecutive weeks (week 2,3). Week 3 was 48 hours preceding the survey. **Results:** WIFS consumption in week 1, 2 and 3 was 85%, 63% and 52%, respectively. Side effects reported were highest in first week (25%) and reduced to 7% (week 2) and 5% (week 3). Side effects most reported were abdominal pain (80%) and nausea (10%). Adolescents (45%) who faced a side-effect in week 1 did not consume WIFS in subsequent week. **Conclusion:** Incidence of side effects was low, but it affected compliance. Positive reinforcement to students who face side effects requires strengthening by teachers.

**Keywords:** *Adverse effects, Anemia, Iron supplementation, Prevention*.

Anemia is a major public health problem among Indian adolescents [1]. In January 2013, the Indian Government launched the nationwide weekly iron and folic acid supplementation (WIFS) program for adolescent boys and girls (age 10-19 years) attending government/ government-aided schools, and for out of school adolescent girls [2]. Components of school-based WIFS program, when launched in 2013, included weekly administration of iron and folic acid (IFA) tablet (100 mg elemental iron and 0.5 mg folic acid) and bi-annual helminthic control (400 mg albendazole) along with nutrition and health education. After preparatory activities, the nation-wide program roll-out began in May-July, 2013 However, when WIFS was first time administered to adolescents, there were huge setbacks in Delhi and Haryana states, where the program was halted owing to mass hysteria triggered by media reports of hospitalization of school-going adolescents owing to vomiting, abdominal pain and nausea after consuming IFA tablets [3,4]. State Program managers raised a need for local survey data on the incidence of side effects as the only survey-based information available was from WHO (2011), which reported that side-effects are expected in 5-20% of children, and are mild (stomach-ache, nausea, and change in color of stool) with little effect on compliance [5]. Hence, this study was undertaken, when WIFS was re-launched in these states after a gap of three months.

## METHODS

This survey was conducted between 15 and 30 September 2013 in Haryana, and 15-30 October 2013 in Delhi, Six districts, three each in Delhi and Haryana, were selected in consultation with Ministry of Health and Family Welfare. Criteria used was districts having highest reported incidence of side-effects following implementation of WIFS in schools when the program was first rolled out in May 2013 (Haryana) and July 2013 (Delhi). From each state, 30 clusters (schools) were selected utilizing 30-cluster probability proportional to size sampling methodology. Written consent from the school authorities was obtained prior to the survey. Verbal consent was obtained from adolescents for participating in the survey.

Using maximum reported incidence of side effects of 20% from Delhi/Haryana in May/July, 2013 (from State Government Program Reports), 15% relative precision, 95% confidence interval and design effect of 3, estimated sample size calculated was 4,098 (2,049 per state and 70 adolescents grade VI-XII (35 boys and 35 girls) from each cluster (school).

Data were collected by 17 postgraduate nutritionists

trained in nutrition epidemiology. Information sought included socio-demographics, WIFS consumption, protocol followed, and side effects on first consumption (in May/July, 2013, considered as week 1) and in last two weekly consumptions (last two consecutive weeks, considered as week 2 and week 3). Height and weight was recorded using standard methods [6]. BMI-for-age Z score were calculated using WHO Anthroplus (version 1.0.4), with cut-off <-2 standard deviation (SD) taken as thinness [7]. Associations of frequency of side-effects faced with independent variables were examined using bivariate and binary logistic regression.

## RESULTS

A total of 4,183 adolescents (1,980 boys and 2,203 girls) from grades VI to XII present in the school, were covered and formed the analytical sample. Considering all three weeks, 23%, 26% and 42% adolescents consumed IFA once, twice and all three times.

In the first week *i.e.*, first time when WIFS day took place in May/July, 2013, 3568 (85%) of 4183 adolescents reported consuming IFA tablets (***Table* I**). Of those who consumed IFA tablets (*n*=3568), 907 (25%) reported facing side-effects. However, in week 2, only 2630 (63%) reported consuming IFA – a drop from 85% in week 1. Of those who consumed IFA (*n*=2630), only 195 (7%) reported side effects. A total of 410 out of the 907 adolescents (45%), who faced a side effect in first week did not consume IFA tablets in week 2. In week 3, 2181 (52%) reported consuming IFA — a further drop from 63% in second week. Reported incidence of side effects lowered to 5%. Eighty out of 195 (41%) adolescents who faced a side effect in second week did not consume IFA in week 3. Through the three weeks, 1050 adolescents faced atleast one side effect (25%); of these, 88% faced it only once, 8% twice and only 4% reported facing a side effect on all three consumptions. Most common reported side effects were abdominal pain (80%), nausea (10%) and dizziness (8%).

The odds of reporting side effects was higher among girls compared to boys, in Delhi compared to Haryana, students who chewed the tablet or took it empty stomach, and where positive reinforcement by parent, teacher or peer was missing (***Table* II**). Being undernourished (BMI-for-age Z score <-2 SD) was not significantly associated with reporting a side effect **(*Table* II)**.

## DISCUSSION

In this survey, we documented that following school-based implementation of WIFS supplementation program, incidence of side effects from first IFA tablet consumption was 25%, which reduced gradually over

**TABLE I** CONSUMPTION PATTERN AND REPORTED SIDE-EFFECTS IN THREE WEEKS OF IRON-FOLIC ACID SUPPLEMENTATION IN SCHOOL-GOING ADOLESCENTS (*N*=4183)

| *Characteristics* | *n (%)* |
|---|---|
| *Reported consuming WIFS (in three consumptions asked)** | |
| Never | 406 (9.7) |
| Once | 941 (22.5) |
| Twice | 1071 (25.6) |
| All three times | 1765 (42.2) |
| *Reported that WIFS was done in supervision of teacher*** | 1799 (43.0) |
| Week 1 (First Consumption) | |
| Consumed WIFS | 2568 (85.3) |
| Faced side effects | 907 (25.4) |
| IFA discontinued in subsequent week | 410 (45.2) |
| IFA continued in subsequent | 497 (54.8) |
| Did not face side effects | 2661 (74.6) |
| IFA discontinued in subsequent week | 694 (26.1) |
| IFA continued in subsequent | 1967 (73.9) |
| Week 2 | |
| Consumed IFA | 2630 (62.9) |
| Faced side effects | 195 (7.4) |
| IFA discontinued in subsequent week | 80 (41.0) |
| IFA continued in subsequent | 115 (59.0) |
| Did not face side effects | 2435 (92.6) |
| IFA discontinued in subsequent week | 685 (28.1) |
| IFA continued in subsequent | 1750 (71.9) |
| Week 3 (most recent consumption) | |
| Consumed WIFS | 2181 (52.1) |
| Faced side effects | 109 (5.0) |
| Did not face side effects | 2072 (95.0) |
| *Details of side effects among those who faced (N=1050)* | |
| Frequency | |
| Faced once | 928 (88.4) |
| Faced twice | 85 (8.1) |
| Faced on every consumption | 37 (3.5) |
| Types | |
| Nausea | 100 (9.5) |
| Dizziness | 80 (7.6) |
| Abdominal pain | 838 (79.8) |
| Black stool | 14 (1.3) |
| Allergy | 13 (1.2) |

**First time, when the programme was launched in May/July, and in last two weekly consumption days preceding the survey. **most recent consumption.*

**TABLE II** ASSOCIATION OF PROGRAMMATIC VARIABLES WITH REPORTING OF SIDE-EFFECTS

| *Independent variable* | *Reported frequency of facing side effects in the 3 study weeks (column %)* | | | *P value* | *OR* (95% CI) |
|---|---|---|---|---|---|
| | *None (2,7725)* | *Once (n=926)* | *≥ Twice (n=124)* | | |
| State | | | | | |
| Haryana | 78.3 | 30.1 | 4.3 | | |
| Delhi | 65.6 | 19.4 | 2.3 | 0.001 | 2.04 (1.6, 2.6) |
| Gender | | | | | |
| Boys | 50.9 | 40.4 | 31.5 | | 1.53 (1.3, 1.8) |
| Girls | 49.1 | 59.6 | 68.5 | 0.001 | |
| Grade | | | | | 1.16 (0.9, 1.4) |
| 6-8 | 80.4 | 72.8 | 58.1 | | |
| 9-12 | 19.6 | 27.2 | 41.9 | 0.001 | |
| BMI-for-age Z-score | | | | | |
| >=-2SD | 73.6 | 72.8 | 75.0 | | |
| <-2 SD | 26.4 | 27.2 | 25.0 | 0.53 | |
| Chewed the tablet | | | | | |
| No | 100 | 9.8 | 28.2 | 0.001 | 4.03 (2.3, 5.95) |
| Yes | 0.0 | 89.2 | 71.8 | | |
| Taken WIFS empty stomach | | | | | |
| No | 16.8 | 21.7 | 20.2 | | |
| Yes | 85.2 | 78.3 | 79.8 | 0.003 | 1.25 (1.01,1.5) |
| Parental pressure to have WIFS | | | | | |
| Positive | 77.6 | 50.0 | 46.0 | | |
| None | 22.4 | 50.0 | 54.0 | 0.001 | 2.8 (2.3,3.3) |
| Teachers' pressure to have WIFS | | | | | |
| Positive | 69.2 | 63.5 | 63.7 | | |
| None | 30.8 | 36.5 | 36.3 | 0.003 | 1.3 (1.1,1.6) |
| Peer pressure to have WIFS | | | | | |
| Positive | 70.1 | 52.3 | 51.6 | 0.001 | 1.3 (1.5, 1.8) |
| Negative | 29.9 | 47.7 | 48.4 | | |

three weeks (to 5% in week 3), but adversely affected compliance as 45% of those who faced a side effect in first week did not have the WIFS in subsequent week.

Not following the protocol was a significant determinant of side-effects. Effective training of service providers, parents and peer counselling has been instrumental in increasing effectiveness of WIFS programs [8]. Teachers should be trained to ensure students are equipped with information on types of side-effects, counselled on what to do, whom to contact when such side-effects happen, important helpline numbers to avoid panic, and also provide the tablet under supervision. Despite not facing any side-effects in week 1, 26% adolescents did not consume IFA in week 2, possibly owing to influence of peers who faced a side-effect in first week and stopped taking WIFS in subsequent weeks. Consumption of the tablet for mere programmatic reasons may be considered following a meal as 79.8% of students who reported side effects two or more times, had taken the tablet empty stomach.

Incidence of side-effects following school-based WIFS was low at week 3, the side-effects were mild, but they adversely affected the compliance. The study urges for response mechanisms to counter negative peer and parental pressure to be embedded within program-implementation framework. Parents, Peers and teachers can play a critical role to improve compliance of WIFS, despite the first instance of experiencing a side-effect.

**WHAT THIS STUDY ADDS?**

- Side-effects adversely influenced compliance to iron-folic acid consumption in a school-based supplementation program owing to negative family/peer pressure.

*Contributors*: VS, SD, JK: conceptualized the study; SY,PM, NK: managed the field conduct and logistics; VS,PM,NS: drafted the manuscript; SA: analyzed the data. All authors contributed to the critical revision of the manuscript, and its final approval.

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