REVIEW PAPER

Suitability of Enteric Coated Iron and Folic Acid Tablets in WIFS Program in India

Radhika Kapil
Chief Resident, Department of Pathology, Jawaharlal Nehru Medical College, Belgaum, Karnataka

Corresponding Author

Address for Correspondence: Dr. Radhika Kapil, Chief Resident, Department of Pathology, Jawaharlal Nehru Medical College, Belgaum, Karnataka
E Mail ID: drradhikapath@gmail.com

Citation

Kapil R. Suitability of Enteric Coated Iron and Folic Acid Tablets in WIFS Program in India. Indian J Comm Health. 2017; 30, SUPP: 60-62.
Source of Funding: Nil Conflict of Interest: None declared

Abstract

Weekly iron folic acid supplementation (WIFS) programme is being implemented by Government of India for Prevention and control of anaemia amongst Adolescents since 2013. Under this program, enteric coated Iron and Folic Acid (IFA) tablet consisting of 100 mg of elemental iron with 500 mcg of folic acid, is given every week to all adolescent girls. Evidence suggests that there is a low absorption of iron from the enteric coated (EC) IFA tablets. The poor clinical response of EC IFA compared to the conventional sugar coated has also been reported The, present review describes the WIFS programme, cost, composition, evidence on absorption, clinical response on Hb from EC IFA tablets. There is an urgent need to take cognizance of available scientific evidence in to consideration and discontinue the EC tablets from WIFS programme.

Background

Iron requirements are increased during adolescence reaching a maximum at peak growth and remaining almost as high in girls after menarche to replace menstrual losses. (1) In India, there is a high magnitude of anaemia amongst adolescent girls (56%) and boys (30%). (2) The adolescent phase of life is also important due to the ever-increasing evidence that control of Anemia in pregnant women can be more easily achieved if satisfactory iron status can be ensured during adolescence. (1,3)

In view of magnitude of anaemia in adolescent group and it's health consequences, Government of India initiated WIFS programme in 2013. (4)

WIFS Programme

WIFS program aims to prevent and treat anaemia in adolescents (10-19 years). Under which supervised administration of one tablet of Iron (100 mg) and Folic acid (500 µg) (IFA) is administered on a fixed day of every week. These IFA tablets are enteric coated. Presently, this programme is being implemented in all the States and Union Territories. The programme covers 112 million beneficiaries including 84 million girls and boys in 6th to 12th classes enrolled in government/government aided/municipal schools through the platform of School and about 28 million out of school adolescent girls, through Anganwadi centers of ICDS scheme. The progamme is being implemented in both rural and urban areas. The activities undertaken are i) Administration of supervised Weekly IFA tablets to adolescent girls and boys in government schools and adolescent girls who are not in schools through Anganwadi centres. ii) Screening of target groups for mild/moderate/severe anaemia and referring these cases to an appropriate health facility. iii) Bi-annual de-worming (Albendazole 400mg), six months apart, for control of helminthes infestation. iv) Information and counselling for improving dietary intake and for taking actions for prevention of intestinal worm infestation. (4)

Composition of EC Tablets

The word "enteric" indicates small intestine. These tablets are 'gastro-resistant' and are designed to

remain intact in the acidic environment of the stomach. The Enteric coating prevent release of medications until after it leaves the stomach and reaches the small intestine. This coating protects medication from the acidity of the stomach. EC tablets are composed of three layers i) Inner most is a IFA containing core part ii) the middle coated polymer layer and iii) outer enteric coating layer which has acid resistance function. The tablet does not release it's Iron in the stomach due to the acid resistance provided by the outer enteric coated layer. The enteric coating layer rapidly dissolves after by passing stomach and reaching small intestine where the intestinal fluids erodes the coated polymer layer and release the Iron. (5)

Absorption of Iron from Enteric coated tablets

Ferrous iron is the form that is mostly used for correction of iron deficiency. About 3–5% of the Iron present in foods in alimentary canal is absorbed in the ferrous form. Acidic milieu of stomach facilitates the absorption iron by keeping it in the ferrous form. The enteric coating of tablet prevents it's dissolution/disintegration in stomach and there by avoids the contact of iron with gastric Mucosa. When the IFA tablets reaches the neutral or alkaline environment of the intestine, the coating gets dissolved and active ingredient of iron is released and become available for absorption into the bloodstream. By preventing this disintegration of tablet enteric coating prevents accumulation of iron, a chemical irritant of GI mucosa in stomach, which results lower in gastro intestinal side effects. The drugs like aspirin, potassium chloride which causes gastric irritation are routinely enteric coated to get dissolved only in the small intestine. (5-9)

Till 2012, under the National Anemia control programme, only sugar-coated IFA tablets were provided to beneficiaries in all age groups namely i) 6-59 months; ii) 6-10 years; iii) Pregnant Mothers; iv) Lactating Mothers, and v) Women in Reproductive age group. Enteric coated IFA tablets were possibly started in WIFS program to minimise the gastro-intestinal side. Sugar-coated IFA tablets are the least expensive formulations and disintegrate well in the stomach. India is the only country in which enteric coated tablets are provided under a National Anemia Control Progrmame. (6)

Absorption of Iron in Gastrointestinal system

The Indian diet contains approximately 7 mg of iron per 1000 kcal; however, only 1–2 mg is normally absorbed each day. The human diet contains two forms of iron heme iron and non-heme iron. Heme iron is derived from non-vegetarian foods and is well absorbed. Non heme dietary iron, which is found in cereals, beans, and some vegetables, is poorly absorbed. Gastric acid is considered to be one of the most important luminal factors necessary for optimal non heme iron absorption. For effective release of iron from ferrous sulphate, the acidic environment of the stomach is necessary. Gastric juice i) the acid pH and ii) the ligands required for the formation of soluble iron complexes. The absence of gastric Juice reduces the availability of iron at the site of absorption. Iron forms complexes with components of gastric juice at a low pH. These complexes are soluble when the pH neutral in the small intestine. The iron available in complexes is in the appropriate state for absorption in the small intestine. (9-11). The enteric coated ferrous sulphate tablet has a high dissolution time and delayed release (256-274 minutes) as compared to rapidly dissolving sugar-coated tablets (48-64 minutes). (11) There are convincing evidences that the patients with iron deficiency Anemia and histamine fast achlorhydria have a diminished ability to absorb non-heme dietary iron. This defect in absorption can be corrected by the administration of hydrochloric acid or gastric juice from patients with normal gastric acid output (13,14) but not with neutralized gastric juice, suggesting that gastric acid is necessary for optimal non-heme iron absorption. (12,13,14,15) The enteric coated tablet bypasses the favourable acidic pH of the stomach which favours maximum absorption. The iron is released in the intestine which results in 30% less availability of iron for absorption from enteric coated tablet as compared to sugar coated tablets. (16) Evidence exists that Iron absorption was lower from enteric coated IFA tablets (4.43±0.97%) as compared to sugar coated IFA (6.85±0.85%). (11,15)

Clinical response to EC IFA

Two clinical studies are from Canada have been reported in which poor response amongst of patients to enteric coated IFA tablets was found. When the same patients were provided with non-enteric coated IFA tablets, they responded with improvement in haemoglobin levels. (18,19)

Iron absorption in Presence of Antacid:

Antacid drugs reduces secretion of gastric acid in stomach. The evidence exists that Antacid medications which reduces lowering of gastric juices leads to 52% decrease in iron absorption. Iron

absorption studies in human volunteers have documented that when 600 and 900 mg of cimetidine (an antacid drug) when given a decrease in iron absorption of non-heme iron from a meal by 42% and 65% respectively was found. (20,21) Similar results were observed after intake of tablet Ranitidine hydrochloride (an antacid). The iron absorption was reported to be reduced substantially. (22)

Use of EC IFA in Other Countries

There is no country in the world which is presently utilising EC IFA tablet in a National Pogramme for prevention and control of anaemia. Regulatory bodies such as the United Kingdom National Health Services (NHS) have recommended that the modified-release iron formulations (also known as Enteric coated) should not be used for treatment of anaemia. (23)

Economics of EC Vs SC Tablets

The sugar-coated tablets are the least expensive formulations and disintegrate well in the stomach. Enteric-coated tablets are more expensive. (6) The sugar-coated IFA tablet is available at a unit cost of 12 - 15 paisa while the of enteric coated cost is as high as 25-30 paisa.

Way forward

India is committed to adopt and implement evidenced based health interventions. In view of poor efficacy of enteric coated IFA tablet, it will be appropriate that the adolescents are administered only sugar-coated IFA tablets.

References

1. Epidemiological Correlates of Nutritional Anemia in Adolescent Girls of Rural Wardha S. Kaur, P.R. Deshmukh, B.S. Garg Indian Journal of Community Medicine Vol. 31, No. 4, October-December, 2006 255
2. International Institute for Population Sciences (IIPS) and Macro International. National Family Health Survey (NFHS-3), 2005-06.
3. World Health Organization. Prevention of Iron Deficiency Anemia in Adolescents: A Role of Weekly Iron and Folic Acid Supplementation. Geneva: World Health Organization. 2011.
4. National Health Mission website accessed on 10March 2018 http://nhm.gov.in/nrhmcomponnets/reproductive-child-health/adolescent-health/wifs.html
5. Rickettes CD. Iron bioavailability from controlled-release and conventional iron supplements. J . Appl. Nutr ., 1993; 45:13–19.
6. World Health Organization Preventing and controlling iron deficiency anaemia through primary health care : a guide for health administrators and programme managers DeMaeyer, E, M Dallman, P Gurney, J. Michael, Hallberg, L, Sood, S K Srikantia, S. G 1989
7. Ghada, Z .A. Soliman 1 , Mohamed H. Mahfouz and Ibrahim A. Effect of Different Types of Oral Iron Therapy Used for the Treatment of Iron Deficiency Anemia and Their Effects on Some Hormones and Minerals in Anemic Rats . 2010 Journal of American Science ;6(6), 10-118
8. Engstrom, J. L. and Sittler, C. P. Nurse-midwifery management of iron-deficiency Anemia during pregnancy. Journal of Nurse-Midwifery, (1994), 39: 20S–34S.
9. Jacobs A , Miles P M Role of gastric secretion in iron absorption Gut, 1969, 10, 226-229
10. Dubois A, Castell DO. Gastric emptying in pernicious Anemia: A model for the study of gastric secretagogues in the absence of acid. In: Christensen J. ed. Gastrointestinal motility. New York: Raven Press, 1980;233-237.
11. Jacobs, A, Rhodes J,Peters DK, et al. Gastric acidity and iron absorption. Br J Haematol 1966;12:728-36.
12. Goldberg A, Lochhead AC, Dagg 1H. Histamine-fast achlorhydria and iron absorption. Lancet 1963;8:848-850.
13. Jacobs P. Bothwell T, Chariton RW. Role of hydrochloric acid in iron absorption. JAppi Physiol 1964;19:187-88.
14. Cook ID, Brown GM, Valberg LS. The effect of achlyia gastrica on iron absorption. JClin Invest 1964;43:1185-91.
15. Jacobs A, Rhodes J,Eakins JD. Gastric factors influencing iron absorption in anaemic patients. Scand I Haematol 1967; 4:105-10.
16. Jacobs A, Owen GM. Effect of gastric juice on iron absorption in patients with gastric atrophy. Gut 1969;10:488-90.
17. Skikne BS, Lynch SR, Cook JD Role of gastric acid in food iron absorption. Gastroenterology. 1981 Dec;81(6):1068-71.
18. Rudinskas L, Paton TW, Walker SE, Dotten DA, Cowan DH. Poor clinical response to enteric-coated iron preparations. CMAJ: Canadian Medical Association Journal. 1989;141(6):565.
19. Walker SE, Paton TW, Cowan DH, Manuel MA, Dranitsaris G. Bioavailability of iron in oral ferrous sulfate preparations in healthy volunteers. CMAJ: Canadian Medical Association Journal. 1989;141(6):543.
20. Jacobs A, Miles PM. Role of gastric secretion in iron absorption. Gut. 1969;10(3):226.
21. Fitzsimons EJ, Thomson W, Jacobs A. Iron absorption from 'Feospan' capsules and ferrous sulphate tablets BP. British journal of clinical pharmacology. 1984;17(1):111-3.
22. Bannerman J, Campbell NR, Hasinoff BB, Venkataram S. The dissolution of iron from various commercial preparations. Pharmaceutica Acta Helvetiae. 1996;71(2):129-33.
23. Joint Formulary Committee British National Formulary. 63rd Edition. London. British Medical association and Royal Pharmaceutical Society of Great Britain. (2012)