



Short Review Paper

## Outpatient treatment protocol for iron deficiency anemia in Brazilian preschoolers

Geraldo GPL Coutinho\*, Jerônimo F A Neto, Kayron V Vieira, Ignácia J L Toledo and Pedro HC Tomita

Department of Pediatrics, UNILAGO Medicine School, São José do Rio Preto, São Paulo, Brazil  
gegac@terra.com.br

Available online at: [www.isca.in](http://www.isca.in)

Received 15<sup>th</sup> August 2017, revised 24<sup>th</sup> October 2017, accepted 27<sup>th</sup> October 2017

### Abstract

*Iron deficiency anemia is the most common type of nutritional disorder in childhood; the two most vulnerable groups are preschool children and pregnant women. The treatment of iron deficiency anemia involves iron supplementation, including food fortification and dietary guidance. This study proposes a protocol for the prophylaxis and treatment of iron deficiency anemia using ferrous sulfate supplementation in preschoolers in the outpatient clinic of the UNILAGO Medicine School. Along with iron supplementation, natural orange juice will be fortified with ferrous sulfate and parents will be counseled on the importance of meat in the diet. Special emphasis on the consumption of beef liver and chicken gizzards in the meals of six-month-old infants will be given. In case of side effects with daily oral iron supplementation, intermittent oral iron supplementation will be used once a week.*

**Keywords:** Anemia, Preschoolers, Protocol, Treatment, Outpatient clinic.

### Introduction

According to the World Health Organization (WHO), it is estimated that 1.62 billion people around the world are anemic, which corresponds to 24.8% of the world population. Of this figure, 47.4% are preschoolers between the ages of six months and five years old, 25.4% are school children between five and 14.9 years, 41.8% are pregnant women, 30.2% are non-pregnant women, 23.9% are elderly and 12.7% are men<sup>1,2</sup>. Iron-deficiency anemia affects cognitive performance, behavior and growth of both preschoolers and schoolchildren. Immunity is impaired and so children become sick easier and their thyroid gland does not function correctly<sup>3</sup>.

Besides iron supplementation, other actions have been developed or are encouraged by health organizations, such as fortification of food, which is cheap, easy, and is effective in the short and medium term, as well as dietary guidance<sup>3</sup>.

Thus, this work proposes a protocol for the treatment of iron-deficiency anemia in preschoolers.

### Methods

A literature review of publications about iron-deficiency anemia in children in the LILACS and MEDLINE electronic databases, as well as the WHO and OPAS (Pan-American Health Organization) websites was made that included papers in Portuguese, Spanish and English. The keywords for the search were 'fortified food', 'iron supplementation', 'anemia', 'children', and 'dietary guidance'.

### Results and discussion

The protocol to treat anemia will be performed with iron supplementation, food fortification and dietary guidance; intermittent iron supplementation (once a week) will be used in children who present side effects with daily doses (nausea, vomit).

Oral ferrous sulfate will be used for prophylaxis and treatment of iron-deficiency anemia in the outpatient protocol as follows:

The dose for preventing iron-deficiency anemia (prophylactic dose) is 1 mg/kg weight/day elemental iron at age six to 24 months for breastfeeding children born at term (gestational age over 37 weeks) with appropriate weight for gestational age<sup>4,5</sup>.

A daily dose of elemental iron, 2 mg/kg body weight/day will be administered to all underweight newborns (weight under 2,500g) from 2-23 months of age (universal supplementation)<sup>3</sup>.

Whenever the diet does not include fortified food, or the prevalence of anemia in one-year-old children is severe (over 40%), a 2mg/kg body weight/day dose will be administered to all children aged 6-23 months<sup>3</sup>.

For children aged 24-59 months in communities where the prevalence of anemia is over 40%, the dose is 2 mg/kg/day to 30 mg/day for three months of treatment<sup>3</sup>. For children over 60 months of age in communities where the prevalence of anemia is over 40%, the dose is 30mg/day elemental iron and 250µg folic acid/day for three months<sup>3</sup>.

For babies born with weights of 1-1.5 kg, 3mg/kg/day elemental iron is recommended and for children under 1 kg, 4mg/kg/day elemental iron will be administered<sup>6</sup>.

Anemia is characterized when the level of hemoglobin is below 11.0g/dL for children aged 6-59 months<sup>3</sup>.

The dose of iron to treat children with anemia is from 3mg/kg/day to 60mg/day for three months<sup>3</sup>.

Dietary guidance should be provided along with iron supplementation.

The recommended daily intake of iron for children is 0.27mg (0-6 months), 11mg (7-12 months), 7mg (1-3 years), 10mg (4-8 years), 8mg (9-13 years), 15mg (14-18 year-old females) and 11mg (14-18 year-old males)<sup>7</sup>.

Exclusive breastfeeding should be encouraged until 6months of age. After that, other foods should be gradually introduced keeping breast milk until two years of age or later<sup>3,8</sup>.

Non-heme iron inhibitors are found in phytates, tannins (polyphenols), calcium, phosphates and eggs; these inhibitors for min soluble precipitates with iron, making absorption difficult<sup>9</sup>.

Heme-iron, found in meat and offal, is highly bio available and is not affected by the action of inhibitors. Meat has approximately 4mg of iron per 100g with around 40% absorbed<sup>10</sup>.

At the pediatric outpatient clinic of the UNILAGO Medicine School, emphasis will be given to the consumption of meat and other foods containing substances that stimulate the absorption of non-heme iron. Our proposal will be the daily consumption of beef (70 to 100g/day) by infants at the beginning of complementary feeding (six months of age), especially beef liver (8.2mg iron/100g) once a week, which is rich in heme-iron<sup>5</sup>. Moreover, the consumption of chicken giblets (4.3g iron/100g), especially the gizzard and liver, once a week will be stimulated. Regarding the substances found in vegetables that stimulate non-heme iron absorption, the protocol underscores the importance of orange juice. Orange juice (25mg vitamin C/day) will be given to infants immediately after meals<sup>5,11</sup>.

Food fortification will be developed along with iron supplementation and dietary guidance.

The fortified food should provide 100g of the mineral, at least 15% to 30% of the reference daily intake<sup>3</sup>.

The food fortification protocol of the pediatric outpatient clinic at the UNILAGO Medicine School will mainly provide natural orange juice (50mL) from pera sweet oranges (*Citrus sinensis*) (62.50mg vitamin C per 100mL of juice) or Lima acid less sweet oranges (64.58 mg vitamin C per 100mL of juice). The

orange juice, fortified with 5 mg elemental iron (ferrous sulfate), will be consumed twice a day before or during meals<sup>12,13</sup>.

Intermittent iron supplementation (once a week), will be used in children who have digestion problems or who present with side effects from oral iron supplementation. The Federal government program “Saúde de Ferro” will be used to prevent anemia in infants aged between six and 18 months with a 25-mgdoseof elemental iron (ferrous sulfate) being provided once a week<sup>14</sup>.

## Conclusion

Iron supplementation, dietary guidance, food fortification and intermittent iron supplementation (once a week) will be part of the treatment of iron deficiency anemia in preschoolers at the pediatrics outpatient clinic of the UNILAGO Medicine School. Mothers will be provided with verbal explanations and leaflets. Thus, we aim to reduce the prevalence anemia in this needy community.

## Acknowledgements

The authors would like to thank the Board of Directors of the UNILAGO Medicine School, São José do Rio Preto, São Paulo, Brazil, for their support while developing this protocol.

## References

1. World Health Organization (2008). Worldwide prevalence of anaemia 1993-2005: WHO global database on anaemia. Edited by Bruno de Benoist, Erin McLean, Ines Egli and Mary Cogswell, WHO.
2. Coutinho G.G., Cury P.M. and Cordeiro J.A. (2013). Cyclical iron supplementation to reduce anemia among Brazilian preschoolers: a randomized controlled trial. *BMC Public Health*, 13, 21.
3. World Health Organization (2001). Iron deficiency anaemia: assessment, prevention and control. A guide for programme managers. Geneva: World Health Organization.
4. Gillespie S., Kevany J. and Mason J. (1991). Controlling iron deficiency. Geneva: United Nation/Administrative Committee on Coordinations/Subcommittee on Nutrition.
5. Sociedade Brasileira de Pediatria (2006). Manual de orientação para a alimentação do lactente, do pré-escolar, do escolar, do adolescente e na escola. Departamento de Nutrologia da Sociedade Brasileira de Pediatria. São Paulo: Sociedade Brasileira de Pediatria, 120.
6. Oski F.A. (1993). Iron deficiency in infancy and childhood. *New England Journal of Medicine*, 329(3), 190-193.
7. Sociedade Brasileira de Pediatria (2012). Manual de orientação para a alimentação do lactente, do pré-escolar, do escolar, do adolescente e na escola. Departamento de Nutrologia, 3ª ed. Rio de Janeiro, RJ: SBP, 148.

8. Brasil Ministério da Saúde (2002). Organização Pan-americana de Saúde. Dez passos para uma alimentação saudável. Guia alimentar para crianças menores de 2 anos.
9. Lynch S.R. (1997). Interaction of iron with other nutrients. *Nutr Rev*, 55(4), 102-110.
10. Hurrell R.F. (1997). Bioavailability of iron. *Eur J Clin Nutr*, 51 Supl 1, 54-58.
11. Vitolo M.R. and Bortolini G.A. (2007). Iron bioavailability as a protective factor against anemia among children aged 12 to 16 months. *Jornal de pediatria*, 83(1), 33-38.
12. Couto M.A.L. and Canniatti-Brazaca S.G. (2010). Quantification of vitamin C and antioxidant capacity of citrus varieties. *Food Science and Technology (Campinas)*, 30, 15-19.
13. de Almeida C.A.N., láudio Crott G.C., Ricco R.G., Del Ciampo L.A., Dutra-de-Oliveira J.E. and Cantolini A. (2003). Control of iron-deficiency anaemia in Brazilian preschool children using iron-fortified orange juice. *Nutrition Research*, 23, 27-33.
14. Brasil. Ministério da Saúde (2005). Secretária de Atenção à Saúde. Departamento de Atenção Básica. Manual Operacional do Programa Nacional de Suplementação de Ferro. Brasília: Ministério da Saúde.