

Dietary counseling for preventing iron deficiency anemia in infants in Brazil: something more is needed

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Anemia is a very common problem among children in Brazil.¹ Thus, it is not surprising that the incidence of iron deficiency and iron deficiency anemia is strikingly high in infants born at a single hospital from the state of Rio Grande do Sul at 12 to 16 months of age. Of the 369 infants who had serum hemoglobin measured in the report by Bortolini & Vitolo published in this issue of the journal, 64% were anemic (hemoglobin < 11 g/dL).² Of the 289 infants who had serum ferritin measured, 90% were iron deficient as defined by a serum ferritin < 15 µg/L (84% had serum ferritin < 12 µg/L). Within the group of 289 infants, 170 (58%) were also anemic and thus by definition had iron deficiency anemia. Therefore, it follows that the investigators had high hopes when they designed an intervention trial to impact on the local iron deficiency problem. The intervention was an intensive program of dietary counseling during the first year of life that promoted exclusive breastfeeding for the first 6 months and had an emphasis on iron-containing complementary foods in the last 6 months. Infants received very little iron-fortified formula and iron supplements were not recommended to improve iron intake. Unfortunately, the intervention had no effect on the iron status of the infants, though it did increase the duration of breastfeeding and the quality of complementary foods, which by itself is a significant positive outcome.

There are a number of ways to improve the iron status of infants. Improving the iron status of the mother is important; in the report mentioned above, we have no information on the maternal or infant iron status at the time of birth. Total body iron of the term fetus is roughly 75 mg/kg of body weight, regardless of the size of the infant. Seventy-five

percent of the iron is in the red blood cells and another 15% in the liver.³ The iron status of the infant at birth can also be improved by delayed umbilical cord clamping, which requires the cooperation of the nurse-midwife or the obstetrician.⁴ Finally, iron intake can be increased in the infant with medicinal supplements of iron or the introduction of high quality complementary foods containing iron.

In the United States, infants who are exclusively fed iron fortified formula (11 mg/L of iron) do not have a problem with iron deficiency. The recent report from the American Academy of Pediatrics on the prevention of iron deficiency and iron deficiency anemia recommended supplementing iron intake for breastfed infants after 4 months of age.⁵ (Disclosure: I was one of the primary authors of this

statement.) This recommendation has not been without controversy. The controversy has been enhanced by the worldwide distribution of iron deficiency, with its long-term effects on neurodevelopment and behavior that may not be reversible. However, the math is simple. By the time the full-term breastfed infant has doubled in birth weight, at approximately 4-5 months of age in the United States, the iron stores present at birth and the small amounts of iron in breastmilk are not sufficient to sustain the iron needs for the increasing red cell mass of the breastfed infant.⁵ As the introduction of complementary food commonly occurs before 6 months of age (80-85% of the infants in the United States are introduced to complementary foods by 5 months of age), this requirement for additional iron can be met with appropriate complementary foods, which includes iron-fortified cereals.⁶ The best source of iron is heme iron or organic iron, present in red meat, due to its

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high bioavailability (20-35% absorption rate) compared to non-heme iron.⁵ In the United States, however, red meat is not a dietary staple for an infant less than 6 months of age, though it should be introduced earlier rather than later, as it is also a good source of other minerals, including zinc. For the exclusively breastfed infant, the only available alternative to meet the iron needs after 4 months of age is a source of medicinal iron. When complementary foods are finally introduced, the emphasis should be placed on foods that are rich in heme iron (red meat), due to its higher rate of absorption, as done in the study by Bortolini & Vitolo.

We do have information about the iron intake of the infants in their study, from a single dietary recall done between 12 and 16 months of age. The target iron intake for the study was at least 3 mg/day, which equals the estimated average requirement (EAR) to meet the needs of only 50% of the infants. The recommended dietary intake of iron for infants 7-12 months of age is 11 mg/day (EAR + 2 standard deviations from EAR).⁷ Though the actual iron intake of the infants in the study averaged 5 mg/day, it is not clear why the authors selected a relatively low target intake of at least 3 mg/day. Perhaps, if iron intake had been increased with medicinal supplements of iron, there would have been a positive impact on iron status in the intervention group. There may have been concerns about iron toxicity, but the recommended upper limit of iron intake for this age group is 40 mg/day, and the infants in this report would have unlikely exceeded this intake, according to the dietary information available. Furthermore, the study was not done in an endemic area of malaria, where there has been some concern that medicinal iron increases the severity of malaria.⁸

The authors acknowledge that, to improve the iron status of these infants, it will be necessary to improve the iron status of the mothers, implement late cord clamping, improve the quality of complementary foods and use supplements of iron along with other micronutrients before infants reach 6 months of age. Indeed, supplements of multi-micronutrients which include iron have been recommended by the World Health Organization and have been shown to improve iron status in children 12-24 months of age.^{9,10} These steps to improve iron status are needed for the children of Brazil.

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