

A community public health programme to control iron-deficiency anemia through iron-fortification of drinking water.

Um programa comunitário de saúde pública para controlar a anemia por deficiência de ferro, por meio da fortificação da água potável com ferro.

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ABSTRACT

On a global basic, an estimated 2 billion people are iron deficient or anaemic with small children and child bearing age women most likely to be affected. In Brazil a recent 2009 meta-analysis of anaemia considered it to be a serious public health problem affecting 53% of children under 5 years. Fortification and supplementation of food can make an important contribution to the reduction of iron anaemia. Our studies on anaemia and iron fortification of drinking water showed a large prevalence of anaemia among under 5 children attending day-care institutions. After 3 to 6 months drinking iron fortified water it was shown a decrease of anaemic children. It was shown that the iron fortification of drinking water can be considered an easy and practical way to supply iron to children at community level. It is a vehicle available everywhere. It is consumed everyday by everyone, has a much lower price than any other iron food carrier and/or pharmaceutical supplements. The water may be easily fortified locally, the iron sulfate is low-priced and used in small amounts with highly bioavailable iron. Its effectiveness was scientifically shown and was strategically supported by the Community, the Public Health Workers and got Municipal Government approval and support.

Keywords: Iron Anemia Children, Control Anemia, Drinking Water Fortification, Community Studies, Municipal Government Support

INTRODUCTION

Anaemia is considered the most frequent and widespread nutritional problem in both less developed and developing countries, with the vast majority of them are due to iron deficiency. On a global basic, an estimated 2 billion people are iron deficient or anaemic with small children and child bearing age women most likely to be affected. Anaemia in preschool age children is often greater than the one seen in pregnant women.

It has been shown that no population group is spared from the risk of nutritional anaemia and iron deficiency, and in many less developed countries where the prevalence of anaemia is below 50% there is an equal or greater number of people who are iron deficient but not truly anaemic.

Anaemia in children, especially in infancy, also causes delay physical and mental development that may not be reversible, decreased resistance to infectious and increased morbidity mainly in preschool children. It is difficult to look forward to socioeconomic development in poor and developing countries without first drastically decreasing the prevalence of anaemia in all age groups.

Fortification of foods as we make use today can be an important contribution to the reduction of iron anaemia when and where existing food supplies and limited access fails to provide adequate levels of some nutrients in the diet. To ensure that the target population will benefit from a food fortification programme an appropriate food vehicle must be selected. It has to be widely consumed throughout the year by a large portion of the population at risk that may

have different food habits. Fortification of a staple food will affects everyone including the poor, pregnant women, young children and population that several times are not be completely covered by social services. However there are limitations on the benefits of fortification and difficulties to its implementation and effectiveness such as lack of enthusiasm of food industry, production costs, children under five that will not be able to consume large enough quantities to supply the required amount of iron to prevent anaemia. Our experiments were carried out with iron fortification of drinking water one of the most basic and essential component of the human body.

Iron deficient anaemia is widespread in less and developing regions of the world, it has been estimated that that there are over 2 billion people in the world. According to WHO mortality data, around 0.8 million death (1.5%^h of the total) can be attributed each year to iron deficiency (1, 2).

Iron anaemia or iron deficiency anaemia countries need to familiarize themselves and support broad approaches to control iron malnutrition and increase the supply, access, consumption and utilization of adequate quantity, quality and variety of sources of iron to their population.

Public policy and programmes should include food based strategies as dietary diversification and food fortification, along with nutrition education, public health, food safety measures, diversity of food consumed, food fortification and supplementation to provide the best improvement of the iron deficient situation.

Increasing the diversity of food consumed would be one of the ideal approaches. In practice it requires availability, access and intake of different types of animal, vegetable and fruits, what makes it sometimes difficult to find in the less developed countries.

Food fortification requires addition of iron to processed food. It is a good strategy with reasonable cost that can be lead to relative rapid improvement of the iron status of the population. However it requests that the fortified food be consumed in adequate amounts and the iron be well absorbable. Actually it has been preferable to fortify food products that are centrally processed and supported by industry.

Supplementation is the term used to describe another condition to supply larger doses of nutrients to the population in several world programmes. In developing countries, supplementation programmes have been widely used to provide micronutrients to the population. Supplementation requires the purchase of relative expensive industrialized and pre-package forms and a high degree of consumer compliance, which has been its main barrier to their success.

Food fortification has a long and successful history in industrialized countries to control deficiencies of vitamin A and D, such as B vitamins, iodine and iron. In less

industrialized countries fortification has become an attractive option. Fortification of sugar with vitamin A started out in Central America. Lately it has been identified in at least 27 countries. Iron food fortification has been carried out all over the world. In Thailand (3), China (4) efficacy trials have established that food fortification with iron can significantly improve iron status and reduce anaemia and iron deficiency.

The effectiveness of iron fortification has been demonstrated in several regions, iron fortification of infant formula decreases anaemia in children under 5. In Venezuela wheat and maize flours and milk in Chile have been fortified with iron and showed a significant reduction in the prevalence of anaemia in children (5,6).

In Brazil a systemic review study evaluated 256 publications from January 1996 to January 2007, data of 20.952 children under 5 years, pointed out 53% of anaemia prevalence, with a large variation in different parts of the country (7). The magnitude of anaemia in Brazil represents our most serious public health problem, including the short and long term effect that anaemia can have on growth in at risk groups. Because of the high prevalence of iron-deficiency anaemia in Brazil, individual treatment tend to be ineffective and iron fortification of food is considered the most effective method to fight anaemia (8). Wheat flour, milk, rice, sugar, soya, sweets, beverages, dairy production etc have been iron fortified.

Our studies on anaemia and iron fortification in Brazil started several years ago because of the large prevalence of anaemia among under 5 children attending community day-care institutions. We did several animal experiments producing iron anaemia on then and preventing it or treating it with different kind of iron salts diluted in their drinking water. At the same time we started to check the nutritional status and the prevalence of iron deficient anaemia among children and found it to be over 30-40%. The first study that used drinking water for the control of children's anaemia in Brazil was carried out by Dutra de Oliveira et al, who followed 31 children who followed 31 preschool children, aged 2 to 6 years old, attending day-care centres in the city of Ribeirao Preto, State of São Paulo. The children drank water fortified with ferrous sulphate (20 mg of iron per liter) over a period of 8 months. There was a significant reduction in the prevalence of anaemia from 58% before fortification to 3% at the end of the study (9,10,11). The after 4 to 8 months drinking iron fortified water the number of anaemic children decreased to 16% and 3%. The same results showing the effectiveness of the fortification of drinking water on the prevention of anaemia where reproduced in other places of Brazil (7).

The strategy to introduce iron fortified potable drinking water at community level has been carried out in different cities of Brazil with success. We approached the Health Department of the Cities and/or the Mayor and show them our experience and results of treatment of the anemia

of the children with the iron fortification of their drinking water. In at least 3 small cities the Mayor sent and approved laws to add iron to the water offered to the under five children on the town day care center. We like to say that today the use of potable water as a carrier of micronutrients started to me known in other states in Brazil and it is interest to know that fortification of wheat flour in Brazil is law for several years but it has been checked the prevalence of anaemia among under 5 children and it was not found a decrease of the anaemia. We think this is happening because these small children do not eat enough wheat flour foods (bread and/or pasta) to supply them enough iron what would not happen with fortified drinking water. Another aspect of interest in relation to the supply of iron through drinking water is if a great number of children are anemic it is because they had a low iron food intake at their homes and then we suggested that the mothers should use the iron fortified drinking water to prepare the food family with this iron fortified water. The basic daily food in Brazil is rice and beans, both cooked with water. We studied this, showing that simple technique would improve the iron supply to all members of family. (12,13,14,15).

A recent 2011 Brazilian paper on the effectiveness of the fortification of drinking water with iron and vitamin C carried out in 316 children aged 6 to 74 months attending day-care centers in Belo Horizonte, a large city capital of one the Brazilian States of showed after 5 months of the water fortification a significant decrease of the anemia from 29.3% to 7.9% at the end of the study, with a significant increase in hemoglobin levels. It was also found a reduction in the prevalence of stunting and underweight in the children (16)

As a consequence of the Brazilian studies on iron fortification of drinking water for the control of anemia, it was demonstrated that drinking water iron fortification can be considered a simple and practical way to supply iron to children at community level. It is a vehicle to ferrous sulfate, the cheapest and easily available iron salt. We have also been using NaFeEDTA with similar good results, it produces less color changes and iron taste of the water. We advise the solutions to be prepared at the Public Health Department as a concentrate solution and could also be in a pharmacy or at homes giving a final iron fortified drinking water that gave in different studies from 5 to 20 mg of iron per liter. It could be consumed several times every day at lower price than any other iron food carrier and/or pharmaceutical supplement. The iron fortified drinking water can be easily fortified locally and used daily with highly bioavailable iron. It has scientific evidence of its effectiveness and was shown to have large cooperation of the community particularly of mothers, the participation of the primary health care people and authorization and support of the local community administration.

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