WHO GUIDELINE¹: USE OF MULTIPLE MICRONUTRIENT POWDERS FOR POINT-OF-USE FORTIFICATION OF FOODS CONSUMED BY INFANTS AND YOUNG CHILDREN AGED 6–23 MONTHS AND CHILDREN AGED 2–12 YEARS

EXECUTIVE SUMMARY

Background

Approximately 300 million children globally had anaemia in 2011.²,³ The WHO African, South-East Asia, and Eastern Mediterranean Regions have the highest burden of anaemia, with approximately 62%, 54% and 48%, respectively, of children aged 6–59 months suffering from anaemia. Iron deficiency is thought to be the most common cause of anaemia. It is also estimated that 29% of preschool-age children in low- and middle-income countries are affected by vitamin A deficiency. The highest burden occurs in Saharan Africa and South Asia, with approximately 48% and 44% of children aged 6–59 months being vitamin A deficient.⁴ To date, no direct estimates of zinc deficiency are available for these age groups, but it is thought that it may also be widespread.

Purpose of the guideline

Member States have requested guidance from WHO on the effects and safety of the use of multiple micronutrient powders for point-of-use⁵ fortification of foods consumed by infants and young children aged 6–23 months and children aged 2–12 years. Point-of-use fortification is often referred to as “home fortification”; the word “home” has been substituted by “point-of-use”, to reflect the variety of settings where this intervention may take place.⁶ This guideline is intended to help Member States and their partners in their efforts to make evidence-informed decisions on the appropriate nutrition actions to improve the nutritional status of infants and children aged 6 months to 12 years. It will also support their efforts to achieve the Sustainable Development Goals,⁶ the global targets set by the Comprehensive implementation plan on maternal, infant and young child nutrition,⁷ and the Global strategy for women’s, children’s and adolescents’ health 2016–2030.⁸

The guideline is intended for a wide audience, including governments, nongovernmental organizations, health-care workers, scientists and donors involved in the design and implementation of micronutrient programmes and their integration into national and subnational public health strategies and programmes.

¹ A World Health Organization (WHO) guideline is any document, whatever its title, containing WHO recommendations about health interventions, whether they be clinical, public health or policy interventions. A recommendation provides information about what policy-makers, health-care providers or patients should do. It implies a choice between different interventions that have an impact on health and that have ramifications for the use of resources. All publications containing WHO recommendations are approved by the WHO Guidelines Review Committee.


⁵ Point-of-use fortification with multiple micronutrient powders refers to the addition of powders containing vitamins and minerals to energy-containing foods at home or in any other place where meals are to be consumed, such as schools, nurseries and refugee camps.


The guideline is an update of the 2011 WHO guideline on *Use of multiple micronutrient powders for home fortification of foods consumed by infants and children 6–23 months of age*. The present guideline supersedes the previous one for infants and young children aged 6–23 months and provides new recommendations for children aged 2–12 years.

**Guideline development methodology**

WHO developed the present evidence-informed recommendations using the procedures outlined in the *WHO handbook for guideline development*.

The steps in this process included: (i) identification of priority questions and outcomes; (ii) retrieval of the evidence; (iii) assessment and synthesis of the evidence; (iv) formulation of recommendations, including research priorities; and (v) planning for dissemination implementation; (vi) impact evaluation and updating of the guideline. The Grading of Recommendations Assessment, Development and Evaluation (GRADE) methodology was followed to prepare evidence profiles related to prioritized questions, determine the quality of the evidence based on up-to-date systematic reviews.

The guideline development group – nutrition actions 2013–2014 consisted of content and method experts, representatives of potential stakeholders and beneficiaries. The names and biographies of the members of the guideline development group are made available on the WHO nutrition website during 14 days prior to holding any guideline development group meeting, in order to promote transparency and allow the public to provide WHO with information and comments on these individuals. The first meeting to scope the guideline was held on 18–21 February 2013, Geneva, Switzerland. The second meeting held on 23–26 June 2014, Geneva Switzerland, aimed to examine the evidence and assess the results of the systematic reviews. The third and final meeting on 3–6 November 2014, Cancun, Mexico, was held to finalize the formulation of the recommendations, including their direction and strength and discussion of the research gaps. External experts, as resource persons, assisted the guideline development group during the guideline development process, in presenting the evidence and contributing to the identification of research gaps. All meeting participants completed a declaration-of-interests form before each meeting. The final guideline document was peer-reviewed by eight experts.

**Available evidence**

Two systematic reviews following the *Cochrane handbook for systematic reviews of interventions* were conducted to assess the effects and safety of point-of-use fortification of foods with multiple micronutrient powders.

Infants and young children from 6 to 23 months of age who consumed foods fortified at the point-of-use with multiple micronutrients powders had a lower risk for the critical outcome of anaemia, with a 26% reduction compared to placebo or no intervention (risk ratio [RR]: 0.74; 95% confidence interval [CI]: 0.66 to 0.83; 10 studies; 2802 participants, *high-quality evidence*). They also had a lower risk for the critical outcome of iron deficiency, with a 52% reduction (RR: 0.48; 95% CI: 0.36 to 0.62; 5 studies; 796 participants, *moderate-quality evidence*). Compared to no treatment or placebo, children receiving multiple micronutrient powders had a 5.12 g/L higher haemoglobin concentration at follow-up (mean difference [MD]: 5.12 g/L; 95% CI: 2.70 to 7.54 g/L; 12 studies; 3565 participants, *low-quality evidence*).

2. GRADE working group [http://www.gradeworkinggroup.org/].
3. De-Regil LM, Suchdev PS, Jeffers MED, Ota E. Home fortification of foods with multiple micronutrient powders for health and nutrition in children under two years of age (personal communication).
With respect to iron status, compared to no treatment or placebo, children receiving multiple micronutrient powders had an average increase in serum ferritin concentration of 16.47 μg/L at follow-up (MD: 16.47 μg/L; 95% CI: 3.03 to 29.91 μg/L; 3 studies; 694 participants, very low-quality evidence). Regarding weight-for-age z-score, the mean difference was minimal (MD: 0.04 in z-score; 95% CI: –0.13 to 0.21; 4 studies; 606 participants, low-quality evidence). None of the trials reported on the outcome of all-cause mortality.

Children aged 2–12 years receiving iron-containing multiple micronutrient powders for point-of-use fortification of foods were significantly less likely to have anaemia at follow-up than those children receiving no intervention or a placebo (prevalence ratio [PR]: 0.66; 95% CI: 0.49 to 0.88; 10 studies, 2448 participants, moderate-quality evidence). These children also had a 3.37 g/L higher haemoglobin concentration at follow-up (MD: 3.37 g/L; 95% CI: 0.94 to 5.80 g/L; 11 studies; 2746 participants, low-quality evidence). Also, children receiving iron-containing multiple micronutrient powders for point-of-use fortification of foods were significantly less likely to have iron deficiency at follow-up than those children receiving no intervention or a placebo (PR: 0.35; 95% CI: 0.27 to 0.47; 5 studies; 1364 participants, moderate-quality evidence). With respect to ferritin concentrations, children receiving iron-containing multiple micronutrient powders had, on average, 0.42 μg of ferritin more per litre at follow-up than those children receiving no intervention or a placebo (standardized mean difference [SMD]: 0.42 μg/L; 95% CI: –4.36 to 5.19 μg/L; 3 studies; 1066 participants, very low-quality evidence). Regarding all-cause mortality, only one trial reported on this outcome and there were no deaths reported during this trial (MD: 0; 95% CI: –0.03 to 0.03; 1 study; 115 participants, low-quality evidence). Finally, diarrhoea (three liquid stools or more per day) was reported by two trials and children receiving iron-containing multiple micronutrient powders for point-of-use fortification of foods were as likely to have diarrhoea at follow-up as those children receiving no intervention or a placebo (RR: 0.97; 95% CI: 0.53 to 1.78; 2 studies; 366 participants, moderate-quality evidence).

**Recommendations**

**Recommendation 1**

- In populations where anaemia is a public health problem, point-of-use fortification of complementary foods with iron-containing micronutrient powders in infants and young children aged 6–23 months is recommended, to improve iron status and reduce anaemia (strong recommendation, moderate-quality evidence).

Table 1 includes a suggested scheme for point-of-use fortification of complementary foods with iron-containing micronutrient powders in infants and young children aged 6–23 months.

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1 Populations where the prevalence of anaemia in infants and young children under 2 years of age or children under 5 years of age is 20% or higher.
2 According to the WHO 2003 publication, Complementary feeding: report of the global consultation (http://www.who.int/nutrition/publications/infantfeeding/924154614X/en/), appropriate complementary feeding should start from the age of 6 months, with continued breast feeding up to 2 years or beyond. Further guidance on complementary feeding may assist the implementation of this guideline, including the WHO/Pan American Health Organization document, Guiding principles for complementary feeding of the breastfed child (http://www.who.int/nutrition/publications/guiding_principles_complementary_feeding_breastfed.pdf) and the WHO publication, Guiding principles for feeding non-breastfed children 6–24 months of age (http://www.who.int/maternal_child_adolescent/documents/9241593431/en/).