



## No. 2.4 Micronutrient Deficiencies in Emergencies

### What are micronutrients and micronutrient deficiencies?

Micronutrients are substances found in foods, which are required in only tiny amounts for body growth and function. **They include vitamins and minerals.**

Vitamins can be water-soluble (those not stored by the body e.g., vitamin B complex, vitamins C, folic acid), or fat-soluble (those that can be stored by the body e.g., vitamins A, D, E and K).

Micronutrients occur naturally in foods, though they may be added (food fortification). **Foods are fortified to increase the level of specific nutrient(s)** (e.g., vitamin A in oil, iodine in salt) or to restore nutrients lost during processing (e.g., fortification of cereal flours).

Micronutrient deficiencies (MDD) occur when people lack access to micronutrient-rich foods and/or face exceptional nutrient losses during disease. Deficiencies of one micronutrient are unlikely to occur in isolation.

*Micronutrient deficiencies in emergency situations may well appear as complex multiple deficiencies.*

The most common MDDs—in stable and emergency situations—are **goitre**, **anaemia** and **exophthalmia**. These are endemic and widespread in many developing countries. **Scurvy** (vitamin C), **pellagra** (niacin), **beriberi** (thiamine) and **riboflavin deficiency**—rarely observed in stable situations—occur as epidemic deficiencies in emergencies.<sup>1</sup>

Box 1 outlines some of the reasons why we should address micronutrient deficiencies in emergencies.



**Fig. 1: Micronutrient deficiencies can compromise child development (Credit: Nick Danziger/OXFAM)**

### What risks do micronutrient deficiencies pose in emergencies?

Some emergencies involve previously well-nourished populations that suddenly face a risk of malnutrition. Others compound an already compromised situation, bringing acute and chronic malnutrition into play simultaneously.

Thus, affected populations may face endemic risks of MDD as well as risks that are more specifically seen in emergencies.<sup>4</sup> *Micronutrient malnutrition can be a serious public health problem in an emergency, even when levels of acute malnutrition are low.*<sup>6</sup>

MDD in emergencies can arise even when numerous fortified food aid commodities are provided, if the range of foods eaten is limited.

Populations reliant on a limited range of food items for more than one month are at risk of MDD, especially if emergency rations contain no fresh foods.<sup>4</sup>

#### **Box 1: Why should we address micronutrient deficiencies?**

Micronutrient deficiencies increase the risk of infectious illness and of dying from diarrhea, measles, malaria and pneumonia. MDDs are critical to morbidity and mortality in emergencies (and indeed long after a crisis has passed).

Micronutrient availability matters in determining the evolution of emergencies, contributing not only to outbreaks of disease but also to diminished capacity of individuals to cope.<sup>2</sup>

Some MDD risks are linked to the type of staple cereal included in the emergency food ration. Thus, it is possible to make certain generalisations about expected micronutrient shortfalls based on emergency ration composition<sup>7</sup> (see Table 1).

**Table 1. Diseases, risks and sources associated with micronutrients and their deficiencies**

| Disease caused by deficiency                                | Risks leading to deficiency   | Sources of micronutrient  |
|---|---|---|
| <b>Vitamin A</b>  |   |   |
| Night blindness, Xerophthalmia and weakened immune system   | All rations are likely to be deficient in <i>vitamin A</i> unless fortified foods are included                                      | Dairy products, liver, fatty fish<br>Yellow, red and green leafy vegetables and fruits<br>Red palm oil, fortified vegetable oils and blends |
| <b>Vitamin C</b>  |   |   |
| Scurvy  | All rations are likely to be deficient in <i>vitamin C</i> unless there is access to fresh fruit and vegetables, or fortified foods | Fresh fruit and vegetables<br>Fortified blended food  |
| <b>Niacin</b>   |   |   |
| Pellagra  | Where the staple is maize or sorghum, additional sources of <i>niacin</i> are required  | Meat (especially offal), fish, milk dried fruits, nuts, and pulses<br>Fortified blends of cereal  |
| <b>Thiamine</b>   |   |   |
| Beriberi  | Where the staple is polished rice additional <i>thiamine</i> is required  | Unrefined cereals, pulses, nuts, eggs, legumes, and organ meats<br>Parboiled rather than polished rice<br>Fermented cereals                 |
| <b>Riboflavin</b>   |   |   |
| Riboflavin deficiency, angular cheilitis                    | Highly refined rice   | Animal foods and green vegetables<br>Whole wheat  |
| <b>Vitamin D</b>  |   |   |
| Rickets and osteomalacia                                    | Limited exposure to sunlight<br>Populations dependent on milk as a major food source  | Sunlight on the skin<br>Fatty fish, canned fish, eggs and milk<br>Fortified margarine or oil  |
| <b>Iron</b>   |   |   |
| Anemia (caused also by lack of iron, folate or vitamin B12) | The bioavailability of <i>iron</i> is generally low in all rations composed of cereals and legumes                                  | Meat, fish, eggs, pulses, green leafy vegetables and fortified blends<br>Vitamin C can improve iron bioavailability                         |
| <b>Iodine</b>   |   |   |
| Cretinism and goitre  | Situations where <i>iodine</i> deficiency disorders are endemic and households lack access to iodized salt                          | Seafood and iodized salt  |

SOURCE: WHO 2000<sup>4</sup> and WFP 2000<sup>7</sup>

### What options are there for responding to micronutrient needs?

MDD should be tackled by population-wide interventions as well as individual treatment, where: a) all clinical cases of MDD should be treated according to WHO supplementation protocols; b) for at-risk populations, procedures should be set to respond and health staff trained in how to identify and treat MDDs; and, c) Where there is evidence that MDDs are endemic, their levels should be reduced at least to pre-emergency levels.

In general, the most effective strategy for addressing MDD is to combine different approaches, including diet, supplementation and food fortification.<sup>1</sup>

Table 2 outlines some options for addressing micronutrient needs in emergencies, as well as their corresponding strengths and weaknesses.

### Can blended foods mitigate or treat micronutrient deficiencies?

Blended foods are produced in many developing countries for local consumption as a complementary food for infants and young children (e.g., UNILITO in Nepal, Famix in Ethiopia, Likuni Phala in Malawi, UNIMIX in Kenya, INDIAMIX in India).<sup>7</sup>

**Table 2. Options to address micronutrient deficiencies in emergencies**

| Strength of response   | Weakness of response  | Examples and remarks  |
|--|---|---|
| <i>Facilitating the production of/access to fresh foods</i>  |   |   |
| <ul style="list-style-type: none"> <li>• Supports self-reliance</li> <li>• Provides foods of preferred choice</li> <li>• Better ration acceptability and quality</li> </ul>  | <ul style="list-style-type: none"> <li>• Requires access to land, water and agricultural inputs</li> <li>• Expensive and logistically difficult</li> <li>• May increase market prices</li> <li>• Feasibility of providing for whole population unlikely</li> </ul>      | <ul style="list-style-type: none"> <li>• Provision of fresh foods in aid ration</li> <li>• Cultivation of homestead gardens or communal garden plots</li> <li>• Livestock programmes</li> <li>• Market interventions</li> <li>• Food or cash for work programmes</li> </ul>   |
| <i>Food diversification: adding to the ration a food rich in a particular vitamin or mineral</i>   |   |   |
| <ul style="list-style-type: none"> <li>• Reaches large numbers of people</li> <li>• Rapid implementation</li> </ul>  | <ul style="list-style-type: none"> <li>• Needs to be sustained until access to fresh food improves</li> <li>• Food safety can be difficult</li> </ul>   | <ul style="list-style-type: none"> <li>• Ground nuts, dried fish</li> <li>• Restricted to foods that the population is familiar with and that contain the relevant micronutrients</li> </ul>  |
| <i>Inclusion of fortified food items in the general ration</i>   |   |   |
| <ul style="list-style-type: none"> <li>• Reaches a large number of people</li> <li>• Rapid implementation</li> <li>• Cost effective</li> </ul>   | <ul style="list-style-type: none"> <li>• Limited to commodities that are suitable vehicles for micronutrients</li> <li>• Need to be sustained until access to fresh food improves</li> <li>• Difficult to ensure constant micronutrient levels in food items</li> </ul> | <ul style="list-style-type: none"> <li>• Oil with vitamin A, fortified flours, blended foods</li> <li>• Requires participation of the food industry/ donors</li> <li>• Need to ensure fortification specifications are met by food items through regular testing</li> </ul>   |
| <i>Nutrition education</i>   |   |   |
| <ul style="list-style-type: none"> <li>• May support indigenous food-consumption and preparation practices</li> <li>• People are empowered</li> <li>• Sustainability</li> </ul>  | <ul style="list-style-type: none"> <li>• Introduced practices may be unfamiliar, demanding substantial communications</li> <li>• Access to the food not guaranteed due to markets/prices</li> </ul>   | <ul style="list-style-type: none"> <li>• Having 'something to eat' is not in itself enough. Diet quality (diversity and nutritional adequacy) is essential for ensuring proper micronutrient intake. Good <i>nutrition</i> access is embedded in household knowledge about micronutrient needs and nutrient-rich food sources, and food-preparation and income expenditure practices</li> </ul> |
| <i>Distribution of vitamin/mineral supplements</i>   |   |   |
| <ul style="list-style-type: none"> <li>• Can be very effective if linked with immunizations or health programmes (e.g. vitamin A)</li> </ul>   | <ul style="list-style-type: none"> <li>• Distribution system needs to be maintained</li> <li>• May be expensive/time-intensive/ unsustainable</li> <li>• Households may sell micronutrients if they fail to understand their uses/ importance</li> </ul>                | <ul style="list-style-type: none"> <li>• Supplementation is useful for addressing MDD outbreaks, as a preventive measure when emergency-affected populations face a known risk (endemic MDD), when food-based approaches are not feasible or when populations are fed on a diet that is poor in micronutrients for a long time</li> </ul>   |
| <i>Other strategies</i>  |   |   |
| <ul style="list-style-type: none"> <li>• Providing additional food items, cash grants/vouchers in rations that people can exchange for nutrient-rich foods, where such foods are available and cost-effective, and market impact has been taken into account<sup>1</sup></li> <li>• Monitoring food aid e.g., food utilisation, intra-household distribution and micronutrient losses during transport, storage and processing</li> <li>• Capacity building of health staff for identifying and responding to MDD</li> <li>• Implementation of public health responses (e.g., de-worming, preventing and addressing aggravating diseases)</li> <li>• Development of surveillance systems for MDD outbreaks</li> <li>• Advocacy. Unlike food commodities, micronutrients are invisible, so public action intended to remedy MDD is rare. This raises the challenge of advocating for access to both <i>adequate</i> food and an <i>appropriate</i> basket of foods to meet nutrition and health requirements<sup>2</sup></li> </ul> |   |   |

SOURCE: Webb & Thorne-Lymann 2005<sup>2</sup>, WHO et al. 2006<sup>3</sup> and UN System 2007<sup>5</sup>

These wheat soya and corn soya blends are made up of wheat or corn flours, sugar and oil, and are fortified with vitamins and minerals, and require cooking before consumption. They are usually targeted at vulnerable members of the community (e.g., children, elderly, pregnant/lactating mothers) as part of a complimentary feeding programme to prevent malnutrition or MDDs, or as supplementary foods to treat moderate malnutrition children.

Blended foods should specify that they have been produced in accordance with the *Codex Alimentarius* and that its local producers use micronutrient premix from reputable suppliers. (For information on fortification specifications for different food commodities, see WFP 2000.<sup>4</sup>)

WHO, WFP and UNICEF outlined a joint statement<sup>8</sup> calling for micronutrient supplementation of pregnant and lactating women and children (6–59 months) in emergencies, based on a daily multiple micronutrient formula. This supplementation would be in addition to any ongoing supplementation or food fortification programme on a specific scheme. Two multiple micronutrient supplements for the formul are currently available from UNICEF, one for pregnant and lactating women and one for children aged from 6 to 59 months.<sup>3</sup>

### How is MDD assessed in emergencies?

There are two ways to assess MDDs: **biochemical analyses** and **clinical diagnosis**. In emergency situations, biochemical analyses are usually un feasible. Therefore, clinical diagnosis based on signs and symptoms is recommended (though clinical diagnosis is not without problems<sup>1</sup>).

In many emergency situations, when clinical diagnoses or biochemical analyses are impossible, it has been recommended to assess **MDD risk factors**. These include history of endemic MDD in the affected population, food ration composition, poor dietary diversity and access to fresh fruit and vegetables, and high rates of infectious diseases.<sup>6</sup>

### Where can I find further reading and more detailed information?

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|--|---|
| Checklists and critical questions for assessing MDD risks, and examples of micronutrient calculations:<br>WHO et al. 2002. <i>Food and Nutrition Needs in Emergencies</i> . <a href="http://www.who.int/publications">www.who.int/publications</a> | Micronutrient Initiative (Micronutrient assessment questionnaire for field-based staff, plus other resources): <a href="http://www.micronutrient.org">www.micronutrient.org</a>                       |
| Cut-offs for indicators and examples of sample sizes for assessments –<br>UN Standing Committee on Nutrition 2007. <i>Assessing micronutrient deficiencies in emergencies</i> . <a href="http://www.unscn.org">www.unscn.org</a>                   | World Food Programme (Recommended nutrient intakes, upper tolerable nutrient levels plus other information about micronutrients): <a href="http://foodquality.wfp.org">http://foodquality.wfp.org</a> |

### Who can I contact for more information and guidance?

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### References

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