

Vitamins and Minerals



Vitamins and minerals are categorized as micronutrients. Micronutrient is the umbrella term used to represent vitamins and minerals required from the diet to sustain vital cellular and molecular functions of the body.

While micronutrients are required in smaller amounts, micronutrient deficiency (MND) can have a wide-range of negative health effects that might ultimately result in death if left untreated.

Micronutrient deficiency is of great public health and socioeconomic importance worldwide. Coexistence of multiple MNDs frequently occurs. MNDs often occur as part of a cycle of malnutrition and may be coupled with protein or energy malnutrition.

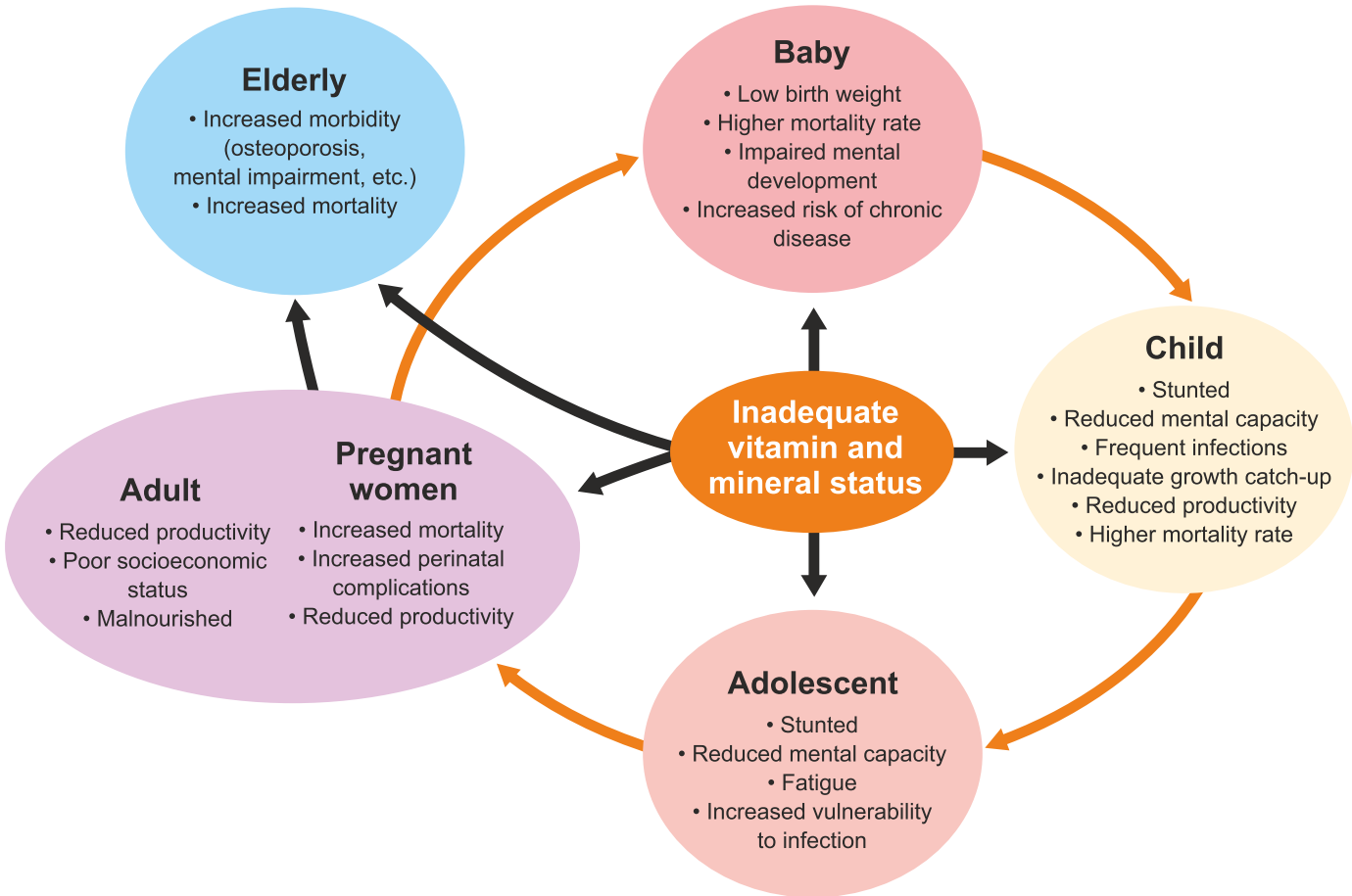


Figure 1. The conceptual framework for the cycle of micronutrient inadequacies across the life span.
Adapted from: Bailey R, et al. Ann NutrMetab 2015;66(suppl 2):22–33.

Micronutrient Malnutrition: The Hidden Hunger

Key Statistics:

- More than 2 billion people in the world today suffer from MND caused largely by a dietary deficiency of vitamins and minerals¹
- The most common deficiencies exist for vitamin A, folate, iron, iodine, and zinc; however, several other MND disorders exist
- Micronutrient deficiency is referred to as the 'hidden hunger' since it is not an obvious killer orcrippler, but extracts heavy human and economic cost²
- Worldwide, the three most common forms of micronutrient malnutrition are iron, vitamin A and iodine deficiency. Together, these affect at least one third of the world's population, the majority of whom are in developing countries¹

Micronutrient Malnutrition: Indian Scenario

- With one sixth of the global population residing in India, one third of about two billion people suffering from vitamin and mineral deficit are in India³
- The intake of micronutrient in the daily diet of over 70% Indian population is reported to less than 50% of the RDA³
- In India everyday more than 6,000 children below the age of five are reported to die. More than half of these deaths are known to be caused by malnutrition-mainly lack of vitamin A, iron, iodine, zinc and folic acid⁴

***'The disease burden caused by micronutrient deficiencies is substantial, but completely preventable.'*⁵**

Micronutrient Deficiencies of Greatest Concern:

Iron:

- Iron is an essential component of hemoglobin, myoglobin, enzymes, and cytochromes and is necessary for oxygen transport and cellular respiration. It also is critical for optimal growth and cognitive function⁶
- Iron deficiency is the most common MND in the world, affecting more than 30% of the world's population, an estimated 2 billion people⁶
- Anemia prevalence among children under five years is 69% and among women it is over 55%⁷

Vitamin A:

- Vitamin A is a fat-soluble vitamin that has multiple roles in the body including vision, cell differentiation, immune function, reproduction, and organ and bone formation and growth⁶
- Vitamin A deficiency (VAD) has been associated with increased rates and severity of infections and is a primary cause of childhood morbidity and mortality in the developing world, particularly in Africa and Southeast Asia⁶
- About 57% of preschoolers and their mothers have sub-clinical vitamin A deficiency⁴

***'Nutrition is the most powerful adaptable environmental factor that can be targeted in order to reduce the burden of disease across an individual's entire life span.'*⁵**

Iodine:

- Iodine is a trace mineral, and its primary function is in the synthesis of thyroid hormone. Approximately 60% of the total body pool of iodine is stored in the thyroid gland. Thyroid hormone is necessary for regulation of human growth and development⁶
- India has the largest number of children born vulnerable to iodine-deficiency⁸
- Universal salt iodization has been the most practical strategy to reduce iodine deficiency globally⁸

Folate:

- Folate is essential for synthesis of haemoglobin⁹
- Folate deficiency causes megaloblastic or macrocytic anemia and increases the likelihood for pregnancies affected by neural tube defects⁹
- Nearly 50,000 children are born deformed each year in India. Folic acid deficiency is one of the prime reasons for this⁴
- Folic acid supplementation in the periconceptional period unequivocally reduces the occurrence of neural tube defects. Several more countries allow folic acid to be added to flour on a voluntary basis⁶

Zinc:

- Zinc is an essential mineral that is involved in multiple aspects of cellular metabolism. It is required for the activity of more than 200 enzymes, and it is critical for immune system function, cell division, and protein and DNA synthesis⁶
- Almost 26% of India's population is zinc deficient which contributes directly to stunting in young children, a condition that afflicts 43% of the population⁴
- Zinc supplementation during pregnancy is associated with a significant reduction in preterm births without an effect on infant birth weight⁶

Strategy to combat Micronutrient Malnutrition:

Addressing MNDs has been accomplished through supplementation, fortification, and various food-based approaches including dietary diversification. Supplementation is a cost-effective solution but does not address the root cause of the MND. Food fortification seems to be an effective means to address MNDs, as it enables a larger segment of a population to be targeted.

Advantages of Food Fortification:

- Fortification of food can make an important contribution to the reduction of micronutrient malnutrition^{3,10}
- Food fortification is usually regarded as the deliberate addition of one or more micronutrients to particular foods, so as to increase the intake of these micronutrient(s) in order to correct or prevent a demonstrated deficiency and provide a health benefit¹
- Fortification generally aims to supply micronutrients in amounts that approximate to those provided by a good, well-balanced diet¹
- Consequently, fortified staple foods will contain “natural” or near natural levels of micronutrients, which may not necessarily be the case with supplements¹
- Fortification of widely distributed and widely consumed foods has the potential to improve the nutritional status of a large proportion of the population, both poor and wealthy¹
- Fortification requires neither changes in existing food patterns – which are notoriously difficult to achieve, especially in the short-term – nor individual compliance¹



Widely Used Fortified Foods	
Food/Vehicle	Fortifying agent
Salt	Iodine, iron
Wheat and corn flours, bread, pasta, rice	Vitamin B complex, iron, folic acid, vitamin B12
Milk, margarine, yoghurts, soft cheeses	Vitamins A and D
Sugar, monosodium glutamate, tea	Vitamin A
Infant formulas, cookies	Iron, vitamins B1 and B2, niacin, vitamin K, folic acid, zinc
Vegetable mixtures, amino acids, proteins	Vitamins and minerals
Soy milk, orange juice	Calcium
Juices and substitute drinks	Vitamin C
Ready-to-eat breakfast cereals	Vitamins and minerals
Diet beverages	Vitamins and minerals

Adapted from: Tulchinsky TH. 2010

In recognition of the importance of essential nutrients to good health, Kellogg’s has been providing breakfast cereals with added vitamins and minerals since 1940’s.

Kellogg’s Ready-to-eat Cereals are fortified with vitamins A, C, B1, B2, B3, B6, B12 and folic acid and minerals including iron, calcium and zinc. Minerals like magnesium, zinc and phosphorous also are naturally present in many cereals.



Cereals make a difference in people's diets:

Dietary studies demonstrate that eating breakfast cereals containing vitamins and minerals make a significant contribution to the intake of key essential vitamins and minerals:

- Studies have reported better intakes of B vitamins (thiamin, riboflavin, niacin, folic acid B6 and B12) and iron in those children who eat breakfast cereal regularly^{12–17}
- Barr et al, 2014 demonstrated that among Canadian children and adolescents, the prevalence of nutrition inadequacy for vitamin D, calcium, iron, and magnesium was lowest in consumers of RTEC breakfasts compared with those who skipped breakfast or ate other types of breakfasts¹⁸
- Fulgoni V & Buckley R found that, the prevalence of dietary inadequacy was significantly lower for consumers of fortified RTECs compared with non-fortified RTECs in US population (NHANES 2007–2010)¹⁹
- RTEC breakfast (19.5 %) was associated with improved nutrient intake (less fat and less sucrose; more fibre, protein and some micronutrients like vitamin B, calcium, magnesium and phosphorus) compared to bread breakfasts (39%) and all other breakfasts (41.5%) in European adolescents²⁰
- A study in low-income earners in the U.K. found that breakfast cereals were major contributors to micronutrient intakes in the group²¹
- A higher percentage of children who skip breakfast have reduced intakes of many nutrients such as vitamins A, E, C, B6, B12, folate; iron; calcium; phosphorus; magnesium; potassium; and dietary fibre¹²

Nutritionists recommend that around 20-25% of the day’s requirement of vitamins and minerals should be met at breakfast. One bowl of breakfast cereal each day provides up to 20-25% of daily intakes of essential vitamins and minerals, thus demonstrating the valuable contribution in an Indian diet.



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