Vitamins & Minerals
ISSN: 2376-1318

Ray, Vitam Miner 2016, 5:3
DOI: 10.4172/2376-1318.1000e148

Editorial Open Access

Zinc Under-Nutrition in India

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Received date: July 11, 2016; **Accepted date:** July 12, 2016; **Published date:** July 16, 2016

Editorial

Micronutrients in terms of vitamins and minerals are essential for human beings for healthy and functional survival. It has been estimated that the global toll of people affected by several micronutrient deficiency of community interest is estimated to be exceeding two billions. It is increasingly becoming clear that malnutrition and socio-economic deprivation are virtually the causes and consequences of each other. Therefore, micronutrient deficiency is more prevalent in developing countries but these deficiencies can exist in populations even where the food supply is adequate in terms of meeting energy requirements [1].

It has been well documented that micronutrient deficiency predisposes a child to infections and further contributes to child mortality. Under nutrition that occurs during childhood, adolescents and pregnancy period of the expectant mother, creates an additive negative impact on the birth weight of infants. Low birth weight infants are exposed to higher risk of mortality at neonatal or later infancy period. Even if they survive, they do not significantly catch up on this lost growth later and are more likely to experience a variety of developmental deficits. The consequences of being born undernourished extend into adulthood and may be present as risk factors for future generations.

India is having the highest burden of malnutrition in the world. 2012, NAAS report says nearly 50 per cent of these children are underweight and stunted and 70 per cent suffer from serious nutritional deficiencies, which are avoidable through focused scientific approach. But the recent vibrant economic growth of GDP in India, coupled with advancement in technological and medical sciences could not make any dent on this staggering rate of malnutrition. Kotecha PV [1] reported that the intake of micronutrients in the daily diet is largely less than 50% RDA by about 70% of the Indian population. This is because people mainly consume monotonous staple food diet with little variation. They cannot afford to diversify their diets with adequate amounts of fruits, vegetables or animal-source foods that contain large amounts of these micronutrients and therefore deficiencies become inevitable.

These avoidable under nutrition among young children can reduce the effectiveness of investments, where the benefit-cost ratio for nutrition interventions has been calculated to be ranging from 5 to 200, much more than any other interventions.

In order to correct or prevent a demonstrated deficiency and provide a health benefit, the food based approach is the most effective, safe and therefore desirable way. But availability and accessibility of regular balanced diet for very large no of poverty stricken population from low socioeconomic strata makes the food scientists to think for other alternatives.

Food fortification is now adopted as most effective path in micronutrient eradication. The extent to which a national or regional food supply is fortified varies considerably. It may be in a single foodstuff or, might be in a whole range of foods fortified with single or combinations of micronutrients. The public health impact of food fortification depends on a number of parameters but predominantly the level of fortification, the bioavailability of the fortificants and the amount of fortified food consumed. As a general rule, the more widely and regularly a fortified food is consumed, greater proportion of the population likely to benefit from food fortification.

Food fortification is defined as the practice of deliberately increasing the content of essential nutrients in food as the vehicle so as to improve the nutritional quality of the food supply and to provide a public health benefit with minimal risk to health.

Kotecha [1] reported that every day, more than 6,000 children below the age of five die in India. More than half of these deaths are caused by malnutrition-mainly the lack of Vitamin A, iron, iodine, zinc and folic acid. It has been reported that Vitamin A, Zinc and iron deficiency when combined, constitute the second largest risk factor in the global burden of diseases.

Massive dose of Vitamin A [MDVA] prophylaxis program of Government of India made an effective impact in reduction in severity of Vitamin A deficiency. Due to multifaceted cause of Fe deficiency, it has not yet addressed effectively. Using estimates of zinc intake and bioavailability derived from FAO's food balance data, it has been calculated that about 20% of the world's population could be at risk of zinc deficiency.

Zinc is an essential component of a large number of enzymes including polymerases and proteases, involved in many cellular functions and plays an important role in cellular growth, differentiation in tissues including immune system and gastrointestinal tract. It is the cofactor of thymulin, a thymic hormone, essential for T cell maturation responsible for immune function. Therefore, impaired immune function, growth retardation, loss of appetite etc. are common symptoms of Zinc deficiency. Zn deficiency can be more pronounced in Alcoholics, People with sickle cell disease, Older infants who are exclusively breastfed, Vegetarians, People with gastrointestinal diseases etc. Absorption of Zn may be lower in presence of iron, copper and phytate.

In severe zinc deficiency hair loss, diarrhea, delayed sexual maturation, impotence, hypogonadism in males etc. can also be observed. Weight loss, delayed healing of wounds, taste abnormalities, and mental lethargy are also related to zinc deficiency. But most of these symptoms are non-specific symptoms, often observed in many other health conditions and therefore difficult to pinpoint the specific nutrient deficiency.

It is possible to have Zinc toxicity as well, in both acute and chronic high zinc intake. Acute high intake may result nausea, vomiting, loss of appetite, abdominal cramps, diarrhea, and headaches. Chronic high intake of Zn may result low copper status, altered iron function, reduced immune function, and reduced levels of high-density lipoproteins.

Therefore, a strict regulation should be in place to ensure that the consumption of the fortified food will not result in an excessive intake, as a general rule.

Unfortunately, due to lack of reliable and widely accepted indicators of zinc status, the extent of zinc deficiency worldwide is not well documented. Brown and Wuehler in 2000 reported that Prevalence of zinc deficiency in developing countries is very common, and 61% of the population is at an increased risk of low dietary zinc intake [2].

To evaluate zinc deficiency, plasma or serum zinc levels are most commonly measured. But these levels do not reflect the cellular zinc status due to tight homeostatic control mechanisms [3].

In India mild to moderate deficiency of Zinc may be widely prevalent due to cereal pulse based diets, low in Zn and high in phytates that may cause Zinc deficiency [4]. All age groups of the population are at risk of zinc deficiency where infants and young children, Pregnant and lactating women are the most vulnerable. Cutoffs for serum zinc concentration defined for zinc deficiency were 65 μg/dL for males and females aged <10 years, 66 μg/dL for non-pregnant females, and 70 μg/dL for males aged ≥ 10 years [5].

Zinc concentration in plasma and hair detect changes in zinc status only in cases of severe deficiency, and may fail to detect marginal and moderate deficiency [6-8]. Therefore, inadequate dietary intake and digestive diseases along with other symptoms of zinc deficiency are usually considered to propose zinc supplementation.

It is interesting to note that zinc was omitted from micronutrient priority list of the United Nations in 1999, but compelling evidence on health benefits of zinc nutrition in the last decade as positive impact of zinc supplementation on the growth of some stunted children, and on the prevalence of diarrhea suggests that zinc deficiency is a significant public health problem in developing countries, but addressing this specific issue is far from requirement [9,10]. The realization on the health significance of zinc nutrition was spurred only in early 2000. In India we have not even started to address this problem meaningfully. This is because, when Gazette of India was published, there was a major mistake in listing the Zinc in the toxicants list [11]. Therefore, fortification of this essential mineral could not be addressed earlier. It took almost 22 years to correct Indian Gazette. Same story was true for Folic acid also. It was classified as acid and not allowed for wheat fortification till 2008 [12]. Therefore, research in the area of food fortification, possible intervention strategies in India and initiatives from food industries under strict control of FISSA is the requirement of the day to address the possible approaches to combat zinc deficiency.

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