

Role of Micronutrients in Growth and Development of Human Beings

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Introduction

Children's health and well-being are determined by the combination of their genetic potential with external factors such as adequacy of nutrition, environmental safety, social contact, and stimulation. Nutrition plays a global role in promoting physical growth, neuromotor development, boosting host defences to ward off common day-to-day infections, delaying the ageing process, and preventing age-related degenerative diseases such as atherosclerosis, cataract, macular degeneration, and cancer, among other things, and thus improving the quality of life.

The clinical picture of nutrition-related illnesses in poor nations has changed dramatically over time. Kwashiorkor, severe protein energy malnutrition, and numerous diseases (such as scurvy, rickets, pellagra, beri-beri, and others) caused by extensive nutrient shortages have become uncommon. Nonetheless, conditions including iron deficiency anaemia, iodine deficiency disorders, and milder types of vitamin A insufficiency continue to be widespread and have public health implications. In clinical practise, however, isolated or single nutrient deficit is uncommon, and an individual is more likely to have a lack of numerous micronutrients. The survival of children in our country has improved as a result of the control of severe or widespread malnutrition, but the quality of life and human resource development have not. In India, more than half of all children under the age of five are stunted as a result of intrauterine growth retardation and postnatal protein-calorie malnutrition. Stunted children have a lower head size, poor neuromotor development manifested by awkwardness or incoordination, a lack of vitality and excitement, poor academic performance, and school absenteeism. There is mounting evidence that a lack of certain micronutrients might harm children's physical and mental development. With the gradual elimination of protein-energy shortfalls in diets, micronutrient deficiencies are emerging as a key stumbling block to achieving normal physical and mental development.

For their food intake, children are completely reliant on their parents and health care providers. According to India's National Nutrition Monitoring Bureau, more than half of children have subclinical vitamin A, B2, B6, folate, and vitamin C deficiencies. Individuals with subclinical deficits of certain micronutrients are more sensitive to developing a number of common day-to-day infections, according to growing clinical and scientific data. With

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prolonged convalescence, they are more likely to get more serious infections. Infectious diseases are known to exacerbate nutritional status by producing anorexia, tissue catabolism, and increased micronutrient use, resulting in a vicious cycle of malnutrition and recurrent infection. Children should be encouraged to eat a well-balanced, nutritious diet, which includes green leafy vegetables, lentils, soybeans, seasonal fruits, milk and dairy products, fish, eggs, and poultry. However, the widely held belief in nutritional science that a well-balanced diet is sufficient to provide all nutritional needs has been called into question. It is not possible to achieve the requirements of 100 percent recommended dietary allowances (RDA) of micronutrients from dietary sources alone, according to the recommendations of the United Nations Subcommittee on Nutrition.

Role of Micronutrients

Brain development

Neurons are more sensitive to nutrients and dietary substances than other body cells, which are not often recognised. Because 70% of the human brain develops during foetal life and the remaining 30% during pre-school years, optimal nutrition during pregnancy and the first three years of life is critical. Micronutrients are necessary for the creation of a variety of enzymes and co-factors in a variety of metabolic pathways. It's long been recognised that pellagra (a niacin deficit) causes memory loss and dementia. Other B-complex vitamins, including B1, B2, B6, B12, and folic acid, are required for the synthesis of a number of neurotransmitters, t0-t13. Elevated plasma homocysteine levels are linked to folate, B6, B12, and choline deficiency, which can lead to thromboembolic consequences including stroke. Iodine is necessary for tri-iodothyronine and

thyroxin production. The creation of dopamine, serotonin, and GABA need iron for the neurotransmission system to work properly. Zinc is found in high concentrations in the brain and is a component of a large number of metalloenzymes. Copper is a key component of the brain's cytochrome-C oxidase and superoxide dismutase enzymes. Omega-3 fatty acids and Decosahexaenoic Acid (DHA) are abundant in fish and fish oils. Omega-3 fatty acids are thought to minimise cellular and vascular inflammation in the brain, promote vasodilation, and keep brain cell membranes soft and malleable by ensuring their integrity. DHA is the primary component of synaptic connection and accounts for nearly half of the total fat in the brain cell membrane.

Physical development

In India, more than half of all children under the age of five are stunted. They lack vigour and stamina, as well as weak neuromotor

coordination, learning skills, and cerebral ability. Vitamins and trace minerals are essential for production of numerous enzymes, hormones and biochemical mediators for regulation of biological processes. They are necessary for energy production, RNA and DNA synthesis, and protection from reactive oxygen-free radicals. Micronutrients are necessary for physical development, sexual maturation, and neuromotor development. Vitamins (A, E, C, D, B2, B6, folic acid, and others) and trace minerals (iron, zinc, selenium, copper, and others) have been shown to improve the body's cell-mediated and humoral immune defences. Growth retardation in children in impoverished nations is caused by the interaction of poor nutrition and the occurrence of recurring illnesses. Dietary deficiencies and repeated infections interact to exacerbate nutritional status. Calcium, phosphorus, as well as vitamins A, C, D, and K, are needed to keep bones healthy and mineralized.