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Micronutrient Deficiency

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Abstract: ***Several micronutrients are required for adequate growth among children. However, it is unclear as to which nutrient deficiency contributes most often to growth faltering in populations at risk for poor nutrition and poor growth. The common micronutrient deficiency such as vitamin A, Iron, Iodine, Zinc and folate or folic acid are responsible directly or indirectly for more than 50% of all under - 5 death globally. Micronutrient malnutrition, particularly Vitamin A deficiency (VAD), Iron deficiency Anaemia (IDA) and iodine deficiency disorder (IDE), poses a serious threat to health of vulnerable segments of populations. Dietary inadequacy is the primary cause of micronutrient deficiency while poor intake of micronutrients which is essential for growth and development of under 5 year children. Nutritional programs in India for micronutrients have been able to prevent many micronutrient deficiencies among the vulnerable population, but there is still a long road to go.***

1. Introduction

Micronutrient deficiency is a major health problem in the country. Micronutrient deficiency are often referred to as hidden hunger. Millions of children suffer from stunted growth, cognitive delays, weakened immunity and disease as a result of micronutrient deficiencies. Under nutrition, both protein - energy malnutrition and micronutrient deficiencies, directly affects many aspects of children's development. The health impacts of micronutrient deficiency are not always acutely visible; it is therefore sometimes termed 'hidden hunger'

1.1 Micronutrients

Micronutrient plays a central part in metabolism and in maintenance of tissue functions. Micronutrients are vitamins and minerals needed by the body in very small amounts. They perform a range of functions, including enabling the body to produce enzymes, hormones and other substances needed for normal growth and development. Any individual can experience micronutrient deficiency, but pregnant women and children are at greatest risk of developing deficiencies. It is the result of low dietary intake, higher physiological requirements as pregnancy and childhood development often increases demand for specific vitamins and minerals. Essential micronutrients include (but are not limited to): iron, zinc, iodine, vitamin A and B - vitamins. Table no.1 depicts the common micronutrient with their functions and RDAs.

Table 1: Role and functions, Recommended Dietary allowances (RDA) of Micronutrients

Micronutrient	Role and function	RDA
Vitamin A– Helps in creation and repair of skin cells and maintaining vision.	• Vision maintenance, immune system, body growth, hair growth, maintain fertility and is vital for fatal development,	Infant 7 - 12 months: 500mcg, children 1 - 3 Years: 300 mcg, children 4 - 8 years: 400 mcg
Iron – Essential to child's growth and development, helps move oxygen from the lungs to the rest of the body and helpto form hemoglobin	• Increase energy production. • Reduce fatigue. • Improve your cognitive function. • Keep your immune system strong. • Transport oxygen in your body. • Create red blood cells. • Maintain healthy cell division	Infant 7 - 12 months - 11 mg per day Children 1 - 3 years - 7 mg Children 4 - 8 years - 10 mg
Iodine - Assists in thyroid regulation.	• Iodine helps to produce thyroid Hormones, growth and mental development.	Infants to 6 years - 90 mcg/day
Zinc – it is an essential part of growth and sexual reproductive development, prevent growth retardation	• helps immune system and metabolism function. • helps to wound healing and sense taste and smell.	1 - 3 years - 3mg 4 - 8 years - 5mg
FOLATE – it required for making DNA, repair DNA, produce red blood cells. It also prevent from Neural Tube defect.	• Helps tissues grow and cells work. • Works with vitamin B12 and vitamin C to help the body. break down, use, and create new proteins. • Helps produce DNA, the building block of the human body, which carries genetic information.	1 - 3 years - 150 mcg 4 - 8 years - 200 mcg

Micronutrient Deficiency

Micronutrient deficiency is defined as a lack of essential micronutrient such as iron, iodine, zinc, vitamin A and folic acid required in small amount by the body for proper growth and development in under 5 children.

Vitamin A deficiency - Vitamin A deficiency (VAD) occurs where diets contain insufficient vitamin A for meeting the needs associated with growth and development, physiological functions. Vitamin - A deficiency (VAD) is the leading cause of preventable blindess in children– manifesting in a milder form as night blindness, and progressing to permanent blindness in stronger cases. VAD also serves to exacerbate serious disease and illness, leading to increased rates of childhood mortality. The condition can be diagnosed by eye examination and measuring the levels of vitamin A in blood.

Iron deficiency - Iron deficiency in children is a common problem. It can occur at many levels, from a mild deficiency all the way to iron deficiency anemia - a condition in which blood doesn't have enough red blood cell or enough hemoglobin. Iron is needed to form hemoglobin. Infant and children at highest risk of iron deficiency include baby who are born prematurely or low birth rate, who drinks cow milk or goat milk before age of 1 year, baby who are not given complementary food containing iron after 6 - month, drink formula milk, overweight. It diagnosed by measuring hemoglobin levels in blood.

Iodine deficiency - A lack of sufficient iodine in the diet, which can lead to inadequate production of thyroid hormone (hypothyroidism) and enlargement of the thyroid gland (goitre). It is diagnosed through urine test, blood test, iodine patch test, iodine loading test. Complication of iodine deficiency are: Cognitive decline and personality changes, coma, congestive heart failure, mental retardation, deaf mutism, gate abnormalities, guitar, depression, still birth, weight gain.

Zinc deficiency - Zinc deficiency is characterized by growth retardation, loss of appetite, and impaired immune function. Zinc is an essential part of growth and sexual reproductive development. It diagnosed through blood test, urine test, hair analysis. Zinc deficiency can be prevented by adding zinc rich foods to diet, oral repletion via tablets of liquids. Oral zinc supplementation in healthy infants more than 6 months via multivitamins/ minerals containing zinc.

Folate deficiency – Folate deficiency in the periconceptional period contributes to neural tube defect; deficits in vitamin B_{12} (cobalamin) have negative consequences on the developing brain during infancy. of both vitamins are associated with a greater risk of depression during adulthood. The complication of folate deficiency are Megaloblastic Anaemia, low level of WBCs and platelets, serious birth defect in spinal cord and brain in a developing fetus (neural tube defect). It's treatment involves increasing the dietary intake of folate or folic acid supplement. Folate is frequently combined with other vitamin B supplements is called Vitamin B complexes. Table no.2 highlights the micronutrient deficiencies with their symptoms. It also enlists the foods to be included in diet to prevent micronutrient deficiencies.

Table 2: Sources, Sign and symptoms, food prevent deficiency

Micronutrient deficiency	Sign and symptoms	Foods prevent deficiency
Vitamin A deficiency or hypovitaminosis A or Night blindness	• Vision problem • Fatigue • Gray hair • Mouth sores • Tongue swelling, • Growth problems weakness	• Leafy green vegetables, Brussels sprouts, peas, citrus fruits, eggs, beans, legumes, mushrooms, asparagus, kidney, liver meat, poultry, pork shellfish, wheat bran, fortified cereals
Iron deficiency or Iron deficiency Anaemia	• Pale skin, • Fatigue, • Cold hands and feet, Poor appetite, Abnormality rapid breathing, • Frequent infections, • Unusual cravings, for non - nutritive substances, such as ice, dirt, paint or starch, pica	• Red meat, pork and poultry, Seafood, Beans, Dark green leafy vegetables, Dried fruit, iron - fortified cereals
Iodine deficiency	• Swelling of the thyroid glands in the neck (goiter). • hypothyroidism • Fatigue, increased sensitivity to cold, • Constipation, dry skin, weight gain, puffy face, muscle weakness, elevated blood cholesterol levels, pain or stiffness in the muscles and joint, slowed heart rate, thinning hair.	• Fish, seaweed, Dairy products, Iodized salt.
Zinc deficiency or acrodermatitis enteropathical	• Unexplained weight loss • Wounds that won't heal • Lack of alertness • Decreased sense of smell and taste Diarrhea • Loss of appetite • Open sores on the skin	• Red meat, shell fish, legumes, seeds, dried nuts, Dairy products, Eggs, whole grains
Folate deficiency or folate deficiency Anaemia or megaloblast anaemia	• Fatigue • Gray hair	• leafy, green vegetables, Brussels sprouts, peas, citrus fruits, eggs, beans, legumes, mushrooms, asparagus, kidney, liver meat,

	• mouth sores andtongue swelling, growth problems, fatigue, weakness, pale skin, shortness of breath, • Irritability	poultry, pork shellfish, wheat bran fortified cereals

Strategies to Overcome Micronutrient Deficiency

Micronutrient malnutrition, particularly vitamin A deficiency (VAD), iron deficiency anaemia (IDA) and iodine deficiency disorders (IDD), poses a serious threat to the health of vulnerable segments of population. The major intervention strategies are available for the control of micronutrient deficiency:

- **Supplementation of the specific micronutrients** - supplementation is a technical approach in which nutrients are delivered directly to the desired population by means of syrup or pills. In India, currently the national nutrition programs being implemented for preventing these deficiencies are based on short term supplementation like periodic mega dosing of Vitamin A, distribution of Iron and folic acid tablets and syrups, salt iodisation, zinc supplementation decrease the incidence of diarrhea.
- **Fortification of food with micronutrients** - fortification or enriched food means, to the addition of micronutrients to processed food. These are foods are meant to improve nutrition and add health benefits. For example, milk is often fortified with vitamin D, and calcium may be added to fruit juices. An enriched food means that nutrients that were lost during processing are added back in many refined grains are enriched. Wheat flour, for example, may have folic acid, riboflavin, and iron added back in after processing. This is intended to restore its original vitamin levels.
- **Horticulture intervention** - horticulture dealing with garden crops, generally fruits, vegetables and ornamentals plants it is a domestic gardening through all forms of cultivation naturally. Italso refers to increase production and nutrition education to ensure regular consumption of micronutrient rich food.
- **Biofortification –** biofortification, or plant breeding for the specific purpose of enhancing the nutritional properties of crop varieties by using better techniques of plant breeding or genetically modifying the plants to incorporate the desired qualities in the crop produced.

2. Conclusion

Micronutrients are the essential nutrient for under five children. Adequate nutrition in the first years of a child's life provides the essential building blocks for brain development, healthy growth and a strong immune system and helps to prevent future non - communicable disease and also reduce the child mortality and morbidity

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