Hidden Hunger and its Interventions to Combat the Micronutrient Deficiencies: A Review

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***Abstract*-Food is basic to our survival as it satisfies hunger and nourishes our body. Hunger is characterized by the consumption of food that does not provide enough quality or quantity to support various activities of the body and supply all essential nutrients for growth, development and maintenance. Hunger manifests itself in various ways - Undernutrition, Imbalance of nutrition, specific micronutrient deficiency, malnourishment. Micronutrient deficiency (MND) form an important global health issue resulting from a relative or absolute lack of an individual nutrient, for example, anemia resulting from iron deficiency. The health impacts of micronutrient deficiencies are not always acutely visible; therefore, it is also termed as Hidden Hunger. Micronutrient deficiency affects more than two billion people worldwide, according to the World Health Organization (WHO). Due to their high occurrence and related health and developmental effects, iodine, Fe, vitamin A, and zinc deficiencies are the four micronutrient deficiencies of most public health concern worldwide.[16] Hidden hunger at early stages has been related to stunted physical growth, poor cognitive ability, low infection resistance, and later-life degenerative and chronic disorders.[8] To prevent these deleterious impacts of hidden hunger, effective intervention strategies through Fortification, Dietary diversification, Biofortification, Supplementation can be used to address the deficiencies.[13] The purpose of this study is to understand the interventions to combat the Hidden hunger. An electronic search was implemented in PUBMED, GOOGLE SCHOLAR, RESEARCHGATE, SCIENCE DIRECT databases.**

***Keywords*- Micronutrient deficiency, hunger, undernutrition, Imbalance of nutrition, malnourishment, anemia, hidden hunger, fortification, supplementation, biofortification, dietary diversification**

I. INTRODUCTION

Globally, more than 2 billion people, or one in every three people, suffer from hidden hunger, commonly known as micronutrient deficiencies (FAO 2013). Its consequences can be severe, resulting in mental illness, poor health, low productivity, and even death. It has particularly severe negative effects on child health and survival, especially in the first 1,000 days of a kid's life, from conception to age two, leading to significant physical and cognitive implications. Even minor inadequacies can have an impact on a person's health and development. Hidden hunger, in addition to compromising human health, can hamper socioeconomic progress, especially in low- and middle-income countries.[17]

Hidden hunger is a type of undernutrition that develops when vitamin and mineral intake and absorption are insufficient to support healthy development (zinc, iodine, iron) . Poor food, higher micronutrient needs during particular life stages, and health concerns such as illnesses, infections, or parasites are all contributing factors.[6] While clinical indicators of hidden hunger, such as night blindness due to vitamin A deficiency and goiter owing to insufficient iodine consumption,become noticeable as deficiencies become severe, less obvious "invisible" impacts impair the health and development of a considerably wider portion of the population. Micronutrient deficits are referred to as "hidden hunger" for this reason.[1]

II.WHAT CAUSES MICRONUTRIENT DEFICIENCIES?

Hidden hunger is frequently caused by apoor diet. Diets based mostly on staple foods such as maize, wheat, rice, and cassava, which supply a lot of energy but few necessary vitamins and minerals, often result in hidden hunger. Many factors influence what people eat, including relative costs and cultural

preferences, peer pressure, as well as regional, environmental, and seasonal considerations. The benefits of a well-balanced, healthy diet may be lost on victims of concealed hunger. They may also be unable to buy or obtain a diverse range of nutritious foods such as animal-source foods (meat, eggs, fish, and dairy), fruits, and vegetables, particularly in poor nations. Poverty is a major factor restricting access to appropriate nutritional food in non-emergency conditions.

Impaired nutrient absorption or utilisation is another cause of micronutrient deficits. Infection or parasites can decrease absorption, resulting in the loss of orincreased demand for numerous micronutrients. In unsanitary situations with limited water, sanitation, and hygiene, infections and parasites can readily spread. Nutrient losses might be exacerbated by unsafe food handling and feeding practises. [16] Absorption is also influenced by diet. Vitamins that are fat-soluble, such as vitamin A, are better absorbed when ingested with dietary fat, but tannins and phytates can limit iron absorption. Micronutrient absorption can be hampered by alcohol consumption.[17]

III.COMMON MICRONUTRIENT DEFICIENCIES AND THEIR ASSOCIATED RISKS

Iodine, iron, and zinc deficiency are the most frequent micronutrient deficiencies among people of all ages, in order of prevalence, Vitamin A deficiency is a less prevalent but important public health issue, affecting an estimated 190 million preschool children and 19 million pregnant women (WHO 2009). Other critical micronutrients, such as calcium, vitamin D, and Bvitamins like folate, are also commonly deficient (Allen et al. 2006). Although pregnant women, toddlers, and teenagers are concealed hunger, it affects people's health throughout their lives.[10]

IV. INTERVENTIONS TO COMBAT HIDDEN HUNGER

Hidden hunger can be addressed with the implementation of the following strategies

- Supplementation
- Fortification
- Diet diversification.

These strategies are considered by the Food Agriculture organization (FAO) as sufficient in meeting the nutritional requirements of the general population. [14]

SUPPLEMENTATION

Supplements are a technical strategy that delivers nutrients directly to the population via syrup or pills. Its key benefit is that it can provide a specified number of nutrients in an easily absorbed form.

Supplementation is a short-term solution that will eventually be replaced by diet-based approaches to promote food and nutritional diversity.

In India, supplementation initiatives focus on supplying iron to pregnant women and vitamin A to children under the age of five.In pre-school children, iron supplementation has been demonstrated to be useful in treating severe and moderate anemia. Another frequently used intervention for the prevention and treatment of vitamin A deficiency is the delivery of high-dose vitamin A supplements on a regular basis, either globally to all preschool children or to specific high-risk groups.[16]

FORTIFICATION

Consumers can acquire the appropriate levels of

COMMON MICRONUTRIENT DEFICIENCIES AND THEIR ASSOCIATED RISKS

Micronutrient deficiency	Risks include
Iodine	Goitre, irreversible brain damage, infertility, and diminished mental capacity[17]
Iron	Anaemia, poor motor and cognitive development, higher maternal mortality risk, early births, low birthweight, and low energy levels are all factors to consider[17]
Vitamin A	increased risk of severe sickness and death from common illnesses such as diarrhoea and measles, and night blindness, in preschool-aged children, significant visual impairments, maternal and childhood mortality .[17]
zinc	stunt growth; increase susceptibility to disease and infection; increase recovery time, reduce mental capacity; and increase the prevalence of maternal, neonatal and child complications.[17]
Vitamin D	Chronic disorders, such as cancer, chronic inflammatory and autoimmune diseases, such as type 1 diabetes, and decreased infection resistance, osteoporosis in post-menopausal women [17]

micronutrients through commercial food fortification, which adds trace quantities of micronutrients to staple meals or condiments during processing. Fortification of iodized salt has proven to be a scalable, sustainable, and cost-effective public health solution.Addition of B vitamins, iron, and/or zinc to wheat flour, as well as vitamin A to frying oil and sugar, are examples of fortification. For urban consumers who buy professionally processed and fortified foods, fortification may be very beneficial. It has a lower chance of reaching rural customers, who frequently lack access to commercially manufactured goods. Fortification must be sponsored or regulated to reach the most vulnerable; otherwise, individualswould opt for less expensive nonfortified options.[17]

DIET DIVERSIFICATION

The number and variety of micronutrient-rich meals can be enhanced by diversifying one's diet. Different sorts of foods, such as fruits, vegetables, legumes, dairy products, and so on, must be easily available and in sufficient amounts.

Many food elements such as antioxidants and probiotics can be consumed as a result of dietary diversity, hence enhancing the population's nutritional consumption. As a result, food variety is the most effective way to prevent hidden hunger. [14]

BIOFORTIFICATION

Biofortification is a relatively recent strategy that includes developing food crops to improve their micronutrient content using traditional or transgenic methods.Biofortified crops that have been released so far include vitamin A orange sweet potato, vitamin A maize, vitamin A cassava, iron beans, iron pearl millet, zinc rice, and zinc wheat. [17]

Advantages of Biofortification

- It first targets the poor, who consume vast quantities of food essential on a regular basis.
- Second, biofortification focuses on rural regions, where 75 percent of the poor are expected to be smallholder farmers, or landless workers. For nutrition, many people rely mostly on cheaper and more commonly accessible basic foods like rice or maize. In many places, despite urbanisation the rural poor's diets will remain primarily focused on staple foods such as grains and tuber crops. Increased reliance on basic foods is projected to increase as food costs rise, worsened by climate change. Supplements and fortified food items are frequently unavailable in rural regions; in fact, fortified food coverage in rural areas may be as low as one-third. As a result, a more nutritious staple that is produced locally could significantly improve nutrition.
- Biofortification is economical. Following an initial investment in producing biofortified crops, such crops may be adapted to other locales at a low extra cost and are accessible year after year in the food system.
- This technique is sustainable since it focuses on items that people already eat regularly. Farmers may generally conserve seeds, roots, and tubers and share them with people in their communities.Once the high-nutrition trait has been bred into the crops, it is permanent, and biofortified crops may be cultivated year after year to provide superior nutrition at no expense.[16]

V. DISCUSSION

From the above, the most common kinds of micronutrient deficiency with public health effects are iron, iodine, and vitamin A deficiencies. Other micronutrients, such as folic acid and calcium, have been proven to have a role in illness prevention or growth promotion (e.g., zinc). [2]

Community-based diagnosis: The exterior obvious consequences of micronutrient deficiencies, such as anemia or goiter, aid in detecting their existence. However, subclinical markers are used to assess and track the severity of the condition.[10]

To combat hidden hunger, nutritious diets should not only be given when a deficiency is identified, rather from the beginning stage of conceiving a child. The pregnant mother should be given balanced diet from all the food groups so that the mother pass on great nutrition to the growing foetus inside her womb.[6]

Food fortification is a simple, safe and cost-effective solution to combat hidden hunger. This strategy is particularly beneficial since it touches whole communities and results in significant increases in micronutrient consumption and deficit avoidance. [13] Although the implementation of large-scale

fortification programmes is improving, it doesn't yet reach all segments of populations in all countries, and often leaves vulnerable those who are most in need, including rural and remote families or those with limited financial resources, so more needs to be done. Vitamin and mineral shortages impose a major financial and social cost on those affected, as well as negative consequences such as lost human capital and diminished economic output. In a never-ending loop, hidden hunger affects physical growth and learning, reduces production, and ultimately reinforces poverty.

Components to fight hidden hunger other than food processing could be:

- Communication aimed at improving the use of health services, clean water, excellent sanitation, and hygiene by women, babies, and young children in order to prevent them from illnesses that interfere with nutrition absorption
- Early beginning of exclusive nursing for up to 6 months, followed by breastfeeding for up to 24 months with enough and sufficient supplemental meals as an affordable and sustainable method to minimise hidden hunger in children;
- Poor individuals have access to healthful food and are protected from price increases because of social protection
- A focus on empowering women by increasing access to education. [15]

Developing communities face multiple problems including health care, education, sanitation, water supply and housing. Therefore, focusing on a single micronutrient deficiency or on a single strategy is not the most effective means to eliminate micronutrient deficiencies. Successful strategies are those that address all these issues in an integrated and coordinated fashion with full political commitment.

VI. CONCLUSION

A long-term solution to hunger necessitates current action. Micronutrient deficiencies affect more than 2 billion individuals, or one-third of the world's population.Malnutrition and micronutrient deficiencies, which start with women and their early children, are responsible for a high number of child and maternal fatalities, mental impairment, and lower worker productivity.[20]

The present paradigm of seeing food security solely through the lens of energy security must shift. Pumping cereals to satisfy hunger is insufficient to provide nutrition and health. The objective should be to eat a well-balanced diet that includes both macro- and micronutrients. Early diagnosis and successful treatment of clinical deficiencies were aided by a combination of food fortification, dietary diversity, biofortification, and supplementation. The extension approach must be reliable. It is critical to have media support for raising awareness and encouraging compliance. Large-scale measures to avoid the disastrous effects of micronutrient deficiencies, such as fortification, dietary diversity, biofortification, and supplementation of micronutrients, have made significant headway in decreasing morbidity and death.[19]

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