

Current Status of Malnutrition- Causes and Their Remedies

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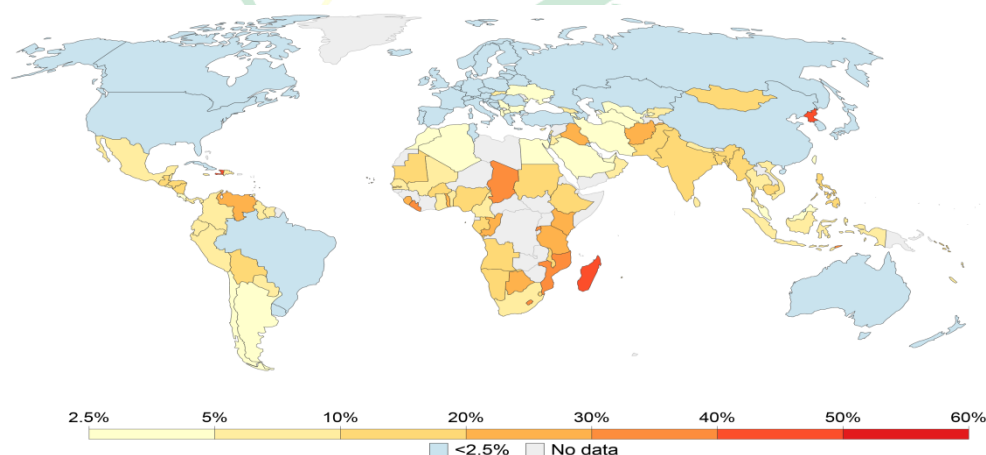
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Introduction:

Malnutrition is a term commonly used by people to represent the poor nutrition of all kinds. It may be broadly grouped as over nutrition and under nutrition. When the consumption is excess than the required level (Over nutrition) the body mass index of a person will increase slowly and the person will become obese which in turn brings several bodily ailments such as heart disease, stroke, diabetes, cancer etc. In the same time, the insufficiency of consumption and absorption of nutrients (Under nutrition) leads to poor growth and development in humans. Among the billions of people affected by malnutrition worldwide, the children and women are the most significant one.

Present status of malnutrition:



Source: UN Food and Agriculture Organization (FAO)
 Note: Undernourishment is defined as having food energy intake which is lower than an individual's requirements, taking into account their age, gender, height, weight and activity levels.

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Fig 1: Share of the Population that are Undernourished

The deficiency caused by protein, iron, vitamins and iodine deficiency alone affect one third of the world's population, mainly from developing countries and resulted in causing several health problems in humans as mentioned in Table 1. Based on the latest available data, the total number of undernourished people in the world is estimated to have reached 663 million in 2017 (Fig 1) and approximately 98 percent of the world's undernourished people lives in developing countries (FAO, 2010).

Table 1: Present status of malnutrition

Malnutrition	Population affected	Reference
Overnutrition	<ul style="list-style-type: none"> • 1.9 billion adults are overweight or obese • 38.9 million children were overweight or obese 	WHO, 2020
Undernutrition	<ul style="list-style-type: none"> • 462 million adults are underweight • ~150 million children under 5 were estimated to be stunted (too short for age) • ~50 million children were estimated to be wasted (too thin for height) • ~45% of deaths among children under 5 years of age are linked to undernutrition 	WHO, 2020
Vitamin deficiency	<ul style="list-style-type: none"> • 254 million preschool-aged children 	WHO, 2020
Iron, Vitamin A, B9 (Folate) and B12 deficiency	<ul style="list-style-type: none"> • estimated 42% of children under 5 years of age and 40% of pregnant women worldwide are anaemic as result of these micronutrient deficiency 	WHO, 2020
Iron deficiency	<ul style="list-style-type: none"> • 16.5% of the world's population <i>i.e.</i> reason for half of the anaemic problem in the World 	Pasricha et. al., 2021
Iodine deficiency	<ul style="list-style-type: none"> • Around 2 billion people suffered from Iodine deficiency of which ~50 million present with clinical manifestations 	Biban and Lichiardopol, 2017
Protein deficiency	<ul style="list-style-type: none"> • 12.2% of global population are affected 	Medek et. al.,

Reasons for Malnutrition:

The United Nations (UN) General Assembly proclaimed the “United Nations Decade of Action on Nutrition 2016-2025” on 1st April, 2016. This was led by WHO and FAO which made sustainable developmental goals to end hunger, achieve food security, improved nutrition, promote sustainable agriculture, ensure healthy lives and promote wellbeing for all at all ages. Despite the steps made at global scale to mitigate malnutrition, yet the people suffered, due to various reasons as discussed below.

- 1. Non availability of sufficient food (quantity):** The food sufficiency or surplus is still not achieved in under developed countries.
- 2. Non availability of nutritive food (quality):** Many of the food surplus crops are mainly starch based and lacks the presence of proteins, vitamins and minerals in sufficient level.
- 3. Food preferred by people with poor nutritive value:** Unfortunately, poor people live predominantly on starchy staples such as rice, wheat, maize, or cassava. In Africa the β -carotene levels in popular varieties of maize, sweet potato, and cassava are ~0%. The plant breeders envisage a maximally attainable level of 20 ppm β -carotene for maize and cassava based on the available genetic resources and typical daily dietary intakes.
- 4. Modern processing methods:** Modern processing and polishing methods remove the highly nutritive outer coats in grains as they aim to increase the keeping quality and customer preference
- 5. Role of nematodes:** Parasitic infections are thought to contribute to child malnutrition and micronutrient deficiency through subtle reduction in digestion and absorption, chronic inflammation and loss of nutrients. Intestinal worms such as *Ascaris lumbricoides* (causes ascariasis), *Trichinella spiralis* (causes trichinosis), cause malnutrition, anaemia, stunted growth, and impaired cognitive function. These occurrences of parasitic infections aggravate the already malnourished persons. For instance, hookworm infections like necatoriasis caused by *Necator americanus* (the new world hookworm), *Ancylostoma duodenale* (the old world hookworm) reduce food intake and/or increase nutrient wastage via vomiting, diarrhoea, or blood loss. In

addition to that, the nematode infested children lacks the opportunity of getting formal education in many occasions, which further damage their long term economic outlook. All these effects exasperate the malnutrition in children.

6. **Role of other parasites:** There are some other parasites like *Giardia lamblia* (causes Giardiasis), *Schistosoma mansoni* (causes schistosomiasis) which causes similar concern as that of Helminths.
7. **Economic status of a country:** Most of the world's undernourished people are found in Southern and Eastern Asia, sub-Saharan Africa, Latin America and the Caribbean. The countries in these regions have high human population together with poor economic growth which makes it difficult to tackle the malnutrition problem.
8. **Drawbacks of Traditional public health interventions to mitigate malnutrition:** Despite the notable reduction in malnutrition achieved by the traditional public health interventions (Fig 2), the mismanagement, underfunding, logistic problems and poor compliance of Government-run malnutrition mitigation programs have taken its toll from achieving the full success.



Fig 2: Traditional public health interventions to reduce malnutrition

Possible Strategies to Mitigate Malnutrition:

- Crop based fortification or Bio fortification is one of the options to tackle malnutrition as it has less immediate but much wider and more sustained impact. This process aims to increase the bio available concentrations of essential elements in edible portions of

crop plants through agronomic intervention or conventional breeding together with molecular breeding, transgenic approaches, fortification thru microbes and genome editing technologies.

- Food diversification is the most desirable approach for preventing malnutrition, but tragically poverty stands in its way, and hence this method can be employed to mitigate malnutrition in places where people can afford to have diverse food.
- Subsidizing the food material which are exported or imported exclusively to mitigate poverty and malnutrition.
- Reducing the wastage of food at one place, mainly by the affluent societies will directly or indirectly helps to mitigate malnutrition in other place. By means of diverting the valuable food resources.

Conclusion:

More than 10% of the world human population are affected by malnutrition. As malnutrition is caused by several factors such as non-availability of quality food, population density, poor economic status of country as well as person, wrong food preference etc., the comprehensive approach already existing at global level may be strengthened with new strategies. It is evident that crop based bio fortification holds great promise for improving the nutritive value of major crops. In the developing world, the majority of the population is rural and fortified food is neither accessible nor affordable for them. Improving the logistics of industrial fortified supplements should be done with an aim to reduce the distribution cost, so that we can reap its full benefit. Besides the general factors parasitic infections caused by nematodes and other parasites are also responsible for its aggravation which needs to be addressed *via* sanitary measures combined with proper medical diagnosis and treatment.

References:

- Biban, B. G. and Lichiardopol, C. (2017). Iodine Deficiency, Still a Global Problem?. Current health sciences journal, 43(2): 103–111. <https://doi.org/10.12865/CHSJ.43.02.01>.
- FAO,2010. https://www.fao.org/economic/es-policybriefs/briefs-detail/en/?no_cache=1&uid=45361. Accessed on 22nd December, 2021
- Medek, D. E., Schwartz, J., & Myers, S. S. (2017). Estimated Effects of Future Atmospheric CO2 Concentrations on Protein Intake and the Risk of Protein Deficiency by Country



and Region. Environmental health perspectives, 125(8): 087002.
<https://doi.org/10.1289/EHP41>.

Pasricha, S. R., Tye-Din, J., Muckenthaler, M. U., Swinkels, D. W. (2021) Iron deficiency. The Lancet 397: 233-248. DOI: 10.1016/s0140-6736(20)32594-0.

WHO,2021. <https://www.who.int/news-room/fact-sheets/detail/malnutrition>. Accessed on 22nd December, 2021.

