

Combating Malnutrition among Vulnerable Groups (Goal 2) (End Hunger, Achieve Food Security and Improved Nutrition, and Promote Sustainable Agriculture)

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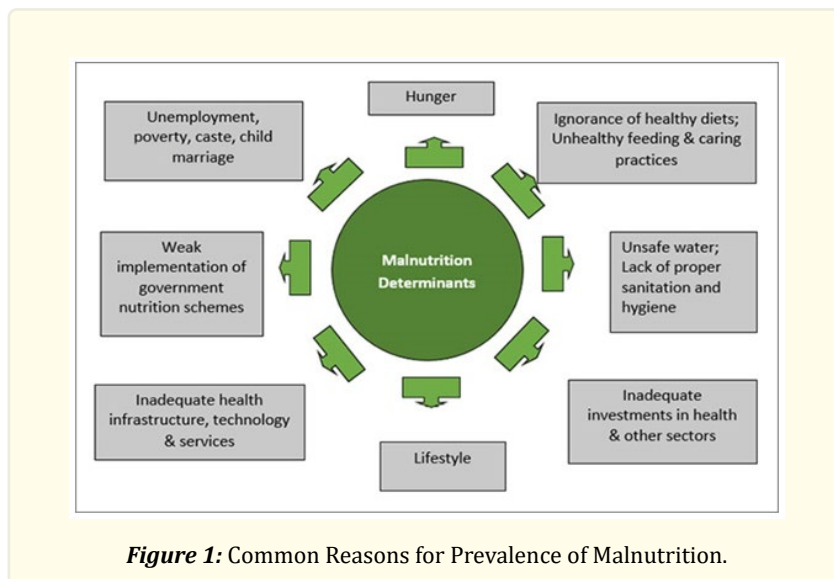
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Abstract

Intervention of various viable technologies to improve the food & nutritional status of the population proved the following facts: Promotion of malt-based small-scale food provides an opportunity for rural women to develop entrepreneurship and employment. It also provides food and nutritional security through additional income. Several technologies like value addition to fish & prawn products, artificial pearl culture, and processing of salted fish were developed under the National Agricultural Technological Project which helped the self-help group women of Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu to improve their economic status. Received two patents for fabricating I) a Low-Cost Ice Cream Freezer (to prepare ice cream with small quantity of milk in rural area) and II) Fresh Fish Vending and Display Table (which helped the fisherwomen to reduce their drudgery and also preserve fresh fish for a longer time without getting spoiled) The technology was licensed twice. Food Product development can be taken as an income-generating activity in the rural areas by the illiterate women which can be included in supplementary feeding programs mainly to improve the nutritional status of the children. The horse gram which is commonly used for cattle feed can be diversified for human consumption with less investment. Mothers as well as Anganwadi workers preferred amylase - rich supplementary foods as these supplementary foods better as compared to earlier supplied food i.e., ready-to-eat food. Introducing red palm oil is beneficial to overcome vitamin A deficiency. The supplementary income of women has a positive impact on the nutritional status of the family.

The South Asian Association for Regional Cooperation (SAARC) is the regional intergovernmental organization and geopolitical union of states in South Asia. Its members are Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. SAARC was founded in Dhaka on 8 December 1985. Its secretariat is based in Kathmandu, Nepal. The organization promotes economic development and regional integration.

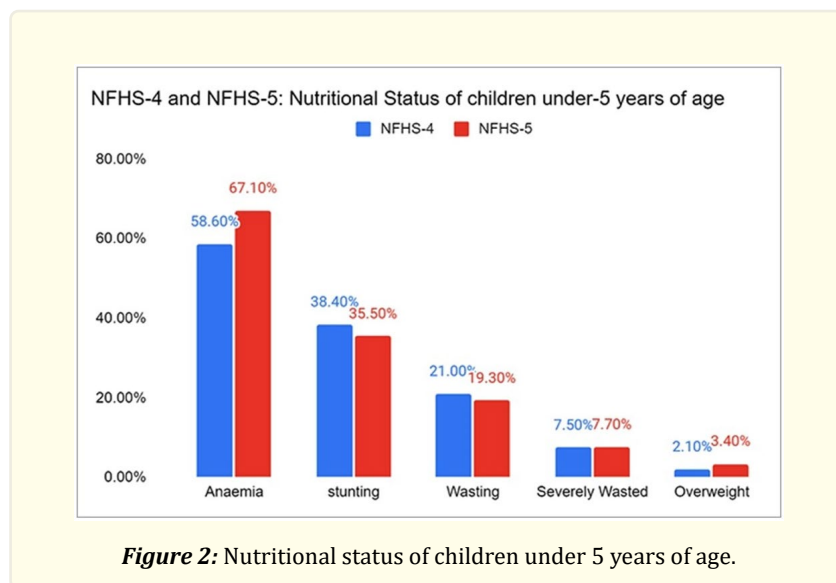
Poverty, hunger, and malnutrition are the main problems in India (Figure 1). The Green revolution contributed to an increase in food production to five-fold. But still 250 million people live in poverty and about 47 million children below five years are malnourished. Food and nutrition security is a prime concern of our country today, as the number of people suffering from lifestyle related diseases and specific nutrient deficiencies are on the steep rise. There is a need for more investment on nutrition for good health, wellbeing, and development of nutrient-rich value chains. Hunger is the leading cause of death in the world. If we promote sustainable agriculture with modern technologies and fair distribution systems, we can sustain the whole world's population and make sure that nobody will ever suffer from hunger again.



According to the National Family Health Survey (NFHS) 2019-21, India has seen no significant improvement in health and nutritional status. The latest data shows that 7.7% of children are severely wasted, 19.3% are wasted and 35.5% are stunted. At the same time, 3.4% of children are overweight which was 2.1% in NFHS-4 (Figure 2). Anemia among children under 5 has become significantly worse with the current prevalence as 67.1% compared to 58.6% according to NFHS-4 and 57% of women of reproductive age are anemic in the country.

Hunger Free India

The concept of Food and nutrition security implies that every individual has physical, economic, social, and environmental access to a balanced diet that includes the necessary macro & micronutrients, safe drinking water, sanitation, environmental hygiene, primary health care, and education so as to lead a healthy and productive life. A sustainable national nutrition security system should address the Three issues of Availability, Access, and Absorption. The decline in per capita food grain availability and its unequal distribution have serious implications for food security in both rural and urban areas. Nutrition literacy should be promoted at the school level. High priority should go to the elimination of iron deficiency anemia among pregnant women through the fortification of salt and kitchen gardens. Knowledge connectivity should be a key component of Bharat Nirman, designed to provide a new deal for Rural India. Three of the main strategies for addressing micronutrient malnutrition are dietary diversification, fortification (including biofortification), and supplementation.



Impact of climate change on health and nutrition outcomes

Child malnutrition in Asia tops even sub-Saharan Africa, 30% of children under five in Asia are underweight, while in Sub-Saharan Africa, it was 28%. India, Bangladesh, and Pakistan together account for half the world's underweight children. Extreme weather conditions decrease in food availability and possibly dietary diversity leading to decrease in food intake and eventually nutrient intake resulting in malnutrition, specifically severe wasting and micronutrient deficiencies.

The prevalence of child determinants among children aged 0-59 months in SAARC countries

The prevalence of stunting ranged from 15.3 – 37.6 in all the SAARC countries lowest in Maldives (15.3) and Sri Lanka (17.3). Wasted varied from 4.3 to 19.3 and was lowest in Bhutan (4.3) and Afghanistan (5.0). Underweight varied from 9.0 to 32.1, with Bhutan (9.0) having the lowest and India having the highest (32.1). Anemia levels varied from 43.8 to 67.1, with Bhutan having the lowest (43.8) and India having the highest (67.1).

Current trends in malnutrition in India

The Ministry of Health of GOI conducted the Comprehensive National Nutrition Survey to collect a comprehensive set of data on the nutritional status of Indian children from 0–19 years of age to provide robust data on both undernutrition and overweight and obesity, and micronutrient deficiencies and non-communicable diseases in India. The key indicators in children under five years of age showed a stunting prevalence of 35% in children under five years with high prevalence in Bihar, Madhya Pradesh Rajasthan, and Uttar Pradesh. Wasting was 17% with high prevalence (20%) in Madhya Pradesh, West Bengal, Tamil Nadu, and Jharkhand. 33% were underweight with a high prevalence (39%) in Bihar, Chhattisgarh, Madhya Pradesh, and Jharkhand. Overall, 5% of children aged 6 to 59 months were acutely malnourished with Jammu and Kashmir, Uttar Pradesh, Meghalaya, Assam, and Nagaland showing higher prevalence. Obesity was observed in 2 % of the children.

Micronutrient deficiencies showed anemia as most prevalent among children under two years of age in the majority of the states. The prevalence of Vitamin A deficiency was highest in Jharkhand and was a severe public health problem in 12 states among pre-school children. Vitamin D, Zinc, Vitamin B12, folate, and iodine deficiencies were also observed in children below five years. The recent National Family Health Survey 5 (2019-2021) reported a decrease in stunting prevalence to 36% from 38%, wasting from 21% to 19% and underweight from 36% to 32%. Prevalence of stunting and wasting however increased in certain states.

Sustainable Development Goals (SDGs) of the UN & The Agenda 2030

Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet and ensure that by 2030 all people enjoy peace and prosperity. The proposal contained 17 goals with 169 targets covering a broad range of sustainable development issues. These include ending poverty and hunger, improving health and education, making cities more sustainable, combating climate change, and protecting oceans and forests. Sustainable Development Goals (SDGs) were released by the UN in 2016 (till 2030) showing the unfinished agenda of the Millennium Development Goals (MDGs) ended in 2015. SDG 2 calls to end hunger, achieve food security and improve nutrition, and promote sustainable agriculture.

Eight targets to eradicate world hunger by 2030 (SDG -2)

1. Universal access to safe and nutritious food.
2. End all forms of MalNutrition.
3. Double the productivity and income of small-scale food producers.
4. Sustainable food production and resilient Agricultural practices.
5. Maintain the genetic diversity in food production.
6. Invest in rural infrastructure, agricultural research, technology, and gene banks.
7. Prevent agricultural trade restrictions, market distortions, and export subsidies.
8. Ensure stable food commodity markets and timely access to information.

Programs & Missions

Mid-day Meal Programme, 1962-63; Goitre Control Programme, 1962 (now known as National Iodine Deficiency Disorders Control Programme); Special Nutrition Programme, 1970-71; Balwadi Nutrition Programme, 1970-71; Nutritional Anaemia Prophylaxis Programme, 1970; Prophylaxis Programme against Blindness due to Vitamin A Deficiency, 1970; Integrated Child Development Services (ICDS), 1975; National Diarrhoeal Diseases Control Programme, 1981; Wheat-based Supplementary Nutrition Programme, 1986; National Plan of Action on Nutrition, 1995; Public Distribution System, 1997; National Nutrition Mission, 2003; National Health Mission, 2013 (subsumes former Rural & Urban Health Missions); National Iron+ Initiative, 2013; Promotion of Infant & Young Child Feeding Practices Guidelines, 2013; Weekly Iron & Folic Acid Supplementation, 2015; National Deworming Day, 2015; Establishment of Nutritional Rehabilitation Centres; Village Health Sanitation & Nutrition Committee; Bi-annual Vitamin-A Supplementation and Village Health & Nutrition Days (at Anganwadi centers).

Global Nutrition Report 2021 (India)

In 2012, World Health Organization identified 6 global nutrition targets to be achieved by 2025 that included – 50% reduction of anemia among women at reproductive age, 30% reduction in low birth weight, increase the rate of first 6 months' exclusive breastfeeding up to at least 50%, 40% reduction of stunting among under-5 children, ensuring below 5% reduction and maintenance of under-5 wasting, no increase in under-5 overweight; and seizing the rise in obesity and diabetes prevalence. The 2021 Global Nutrition Report (GNR 2021) revealed five out of six global maternal, infant, and young children nutrition (MIYCN) targets to address stunting, wasting, anemia, low birth weight, and childhood obesity are off track. At the same time, the global nutrition target (GNT) to combat the growing prevalence of non-communicable diseases (NCDs) is also off track. A shift from eating whole-food-based balanced meals to consuming sugary drinks, ultra-processed foods, and processed red meat is negatively impacting our health and environment.

Gaps and road to recovery

The global nutrition targets lack the environmental impact of food and how to address micronutrient deficiency. Additionally, nutritional assessments for childhood and adolescent malnutrition are not explicit. The first step for India to combat the dual burden

of malnutrition, nutrition inequality, and food insecurity is to fill the gaps in the nutrition composition of the daily diet. Ensuring sustainable eating by adding nutrient-dense, climate-smart crops such as millet to the Indian daily diet could be rewarding in preventing nutritional deficiency and diet-related NCDs. Policy initiatives are urgently needed to transform the existing food system by involving all stakeholders. More finance is needed to meet additional requirements to address pandemic-induced nutritional loss. At the same time, India needs a better data management system, greater accountability in the food distribution system, efficient resource management, adequate nutrition education, reinforcement of manpower, and systematic monitoring to aim at achieving global nutrition targets by 2030.

The Most Important National Nutrition Programs in India

Integrated Child Development Services program (ICDS), the targeted Public distribution system (TPDS), Food for Work, The National Mid Day Meals Program (NMMP), Micro nutrient (Iron folate; Vitamin A; Iodized salt) schemes. National Nutrition Policy (1993); National Nutrition Plan of Action (1995); National Nutrition Mission (2001) not yet achieved nutrition goals. Reasons: Nutrition improvement is not a defined goal with measurable characteristics in the National Food Security Mission, National Horticulture Mission, and National Rural Health Mission.

Research carried out by Vijaya Khader on the impact of diversification of agriculture on food, nutrition, and health security is discussed under Diversification of Agriculture; Horticulture; Mushrooms; Fisheries; Value Addition, and Economic Empowerment of Women.

Crop diversification/cropping systems

- *Intercropping* of ragi and red gram in an 8:2 ratio gave additional income of Rs.5,500/- ha compared to a single crop of ragi. Ground nut intercropped with either red gram or castor in a 7:1 ratio recorded maximum. Red gram-based cropping systems with cluster beans in a 1:7 ratio gave the highest.
- *Horticulture intervention*: This focused on increasing the supply of micronutrient-rich crops through the promotion of home gardening or a Nutrition Garden. Vitamin A and Iron Nutritional status of nutritionally vulnerable segments of the population subsisting on Horticulture crops and dairy farming in the East Godavari district of A.P.(Aruna,1997) showed very significant improvement in their nutritional status
- *Operational feasibility of Red Palm Oil (RPO)*: Vitamin A deficiency causes many health problems, especially among children. A study was undertaken to screen the effect of supplementation of RPO. The oil is rich in β -carotene, a precursor of Vitamin Supplementation of crude RPO to Anganwadi Children revealing a decrease in Grade IV and Grade III Malnutrition (Vijayakhader and Aruna, 2008).

Oyster Mushroom cultivation

- In rural areas, a woman can easily manage 4-10 beds depending on the space available, helping them to earn Rs.180 to Rs.450 per month. The results revealed that spawn multiplication can be done by women as a cooperative venture and mushroom cultivation can be undertaken at the household level as an income-generating activity (Vijaya Khader, 1994).

Studies on Intervention of Fisheries

- To elicit the information on the food consumption of preschool children population of 2203 (1072♂:1131♀) were selected in the 28 coastal villages of 13 districts spread over 4 states viz. Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu with a total of 5744 Households. (Vijaya Khader, R.Sathiadas and H.Mohamad Kasim , 2005). The intake of nutrients in the case of preschool children was found to be less than the RDA. It was observed that macronutrient intake was fairly better when compared to the micronutrient intake. 31 % of preschool children were anemic. The reason for high anemic might be due to low consumption of iron-rich foods, poor health, hygiene & sanitation (Vijayakhader, et.al, 2005).

- Two pieces of Equipment namely I) Low-Cost Ice Cream Freezer, II) Fresh Fish Vending and Display Table have been fabricated and received Patents and the technology was licensed to a woman entrepreneur for a period of two years (Vijaya Khader, et.al. 2004). After an expiry of two years, the technology of a low-cost ice cream freezer was licensed a second time to other women for a period of 6 years. These equipment were fabricated mainly to improve Health & Nutrition Security. Andhra Pradesh employs 32 percent of its fisherwomen in fish curing/drying/net making and 27 percent in processing plant works.
- Success Stories: The National Agricultural Technology Project entitled Studies on Fisherwomen in Coastal Ecosystem of Andhra Pradesh, Karnataka, Tamilnadu, and Kerala explored the socio-economic status of fisherwomen and found the families wherein women are actively involved in one or other occupation have flourished and achieved all-round development. Seven Fisherwomen (3 from Kerala; 2 from Karnataka and 2 from A.P) have attained the Training and Awareness from the National Agricultural Technology Project, implemented in their places, and enhanced their socio-economic status through various skill-oriented training programs and continuous day-to-day discussions with the Scientists.

Value addition

1. *Low-cost energy protein-rich preparations using Horse gram*: The horse gram which is commonly used for cattle feed can be diversified for human consumption with less investment. Processed horse gram flour was prepared using Puffing and Roasting, Processed Soya bean flour was prepared by Dehulling and Roasting. The low-cost energy protein-rich products namely RAGINA and EPRF were prepared using simple home-scale processing methods like germination, roasting, and puffing, to improve the nutritional status. Products can be included in supplementary feeding programs to improve the nutritional status of the vulnerable groups of the population (Vijaya Khader & P. Ashlesh, 1998).
2. *Effect of feeding malted food on the nutritional status of vulnerable groups* (Vijaya Khader & Umamaheswari, 2012) Amylase Rich Malted Mixes (ARMM) two types were formulated using Ragi / Wheat and suitable products namely *Laddu, Roti, Kheer*, and *Porridge* were prepared using the formulated malted mix. The ARMMs's found to be nutritional dense. For the supplementation of malted mixes 8 villages of Lepakshi Mandal, Anantapur District were selected. Preschool children (400), pregnant women (100), and Lactating women (100) were selected and fed with two types of malted mixes (Ragi / Wheat) for a period of 3 months. Supplementation of ARMM helped to improve the nutritional status of the vulnerable groups of population in rural areas, especially with regard to *protein, energy, iron, and calcium and B-complex vitamins*. The promotion of a malt-based small-scale food industry not only provides opportunities for rural women to develop entrepreneurship and employment but also provides Food and Nutritional Security through income generation.
3. *Therapeutic food supplementation in ICDS projects of Andhra Pradesh* (Yasoda Devi & Vijayakhader, 2004) Total of 2267 children of the age range of 1-3 years were selected. The three types of supplements were prepared and distributed by A.P. Foods, Hyderabad. The supplements were distributed either in the form of Laddu or as in the form of powder. Nutritive value of 100g of supplements provides 400 to 480 Kcal of 12.5 to 13.8 g of proteins. It was very encouraging to note that 92% of grade III children showed improvement in their weight and height; 80% of moderately malnourished; 42% of mildly malnourished and 44% with normal grade showed improvement.

Economic Empowerment of Women

- *Family income and nutritional status of pre-scholars in rural areas of Tenali division* (Vijayakhader & Kavitha, 1993) The increase in the annual per capita income of the family increased slightly the nutritional status of pre-scholars.
- *Impact of women's supplementary income on families' nutritional status* (Vijaya Khader, 1999) The study was carried out in 4 villages of Rajendarnagar Mandal & Ranga Reddy District on vegetable vendors, Shop Keepers, Washers, Fruit vendors, Tea & Snack Vendors.

The results reveal that the supplementary income of women has a positive impact on the food & nutrient intake of the family.

Conclusion

The impact of the intervention of various viable technologies improved the food & Nutrient intake of the family contributing towards Food & Nutrition security.

Way Forward

Remunerative Agriculture (Integrated Farming Systems); Self Sufficiency in pulses and reduced edible oil imports; Precision farming and farm mechanization; Reduced harvest & post-harvest losses; Generating quality human resources (Men & Mentoring); Achieving comprehensive agribio diversity; Overall Efficiency, Equity & Empowerment in Agri- Sector; Agricultural Extension Programs for increasing production; Doubling the farmer's income by 2022-23); Agriculture depends on Manson & Market; The mandated demand from agriculture should also include generating of other resources as raw materials to supply and support industrial enterprises (Chemicals, construction, energy, fiber, Food etc.); Setting new direction to Agriculture: Higher output for unit asset; reduce the cost of output and a higher degree of monetization of the farmers and Long term income Revolution for farmers.

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