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FOOD FORTIFICATION AS A PANACEA FOR INDIA'S MALNUTRITIONAL WOES

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Abstract

Micronutrient malnutrition is widespread throughout the world, with important health and economic consequences. Tools to address this situation include food fortification, supplementation and dietary diversification, each having different and complementary roles. Fortification (mandatory and voluntary) has been practiced over several decades in Western countries as well as in developing countries. Food fortification is an excellent method to improve the nutritional health of a large section of the population in the world wide. By the Copenhagen Consensus estimates, every 1 Rupee spent on fortification results in 9 Rupees in benefits to the economy. It has a high benefit-to-cost ratio ie, overall costs of fortification are extremely low even if It requires an initial investment to purchase both the equipment and the vitamin and mineral premix. Eventhough fortification process is not free from the criticisms, it is one of the most cost-effective tool to alleviate nutritional deficiency problem in the world wide.

Key words: Food fortification, Economic consequences, Copenhagen Consensus, Nutritional deficiency

Introduction

Intake of nutritional food is important to keep our health and the health of the agro ecosystem. Malnutrition includes undernutrition ie wasting, stunting, underweight, inadequate vitamins or minerals, overweight, obesity, and resulting diet-related noncommunicable diseases. Globally, 149 million children under 5 were estimated to be stunted, 45 million were estimated to be wasted and 38.9 million were overweight or obese. 1.9 billion adults are overweight or obese, while 462 million are underweight (WHO, 2020). Deaths among children under 5 years of age are linked to undernutrition and mostly occur in low- and middle-income countries. The developmental, economic, social, and medical impacts of the global burden of malnutrition are serious and lasting one.

Fortification is projected is a solution to address anaemia and nutritional issues experienced by people. Food fortification is a method of preventing or correcting a demonstrated deficiency of one or more nutrients in the population or specific population groups by adding essential vitamins and minerals to foods to increase their nutritional value. The food to which the nutrients are added is called 'vehicle' for fortification and the added nutrients are called as 'fortificants'. In the 1920s food fortification emerged as a strategy in the United States to address and prevent the lack of micronutrients in the population's diet. Specifically, it was discovered in the 1930s and 1940s that micronutrient deficiency is often linked to specific diseases and syndromes

Fortified foods can help maintain healthy micronutrient levels to keep bones strong, help digestion and prevent heart issues. Industrial or large-scale food fortification (LSFF) is the addition of micronutrients during processing to commonly consumed foods items such as salt, flours, oil, sugar and condiments. LSFF programs can be categorized as either mandatory meaning they are initiated and regulated by the government or voluntary where food processors add nutrients to their foods on their own volition but is still governed by regulatory limits. Salt iodization and fortified flour is the most common form of mandatory fortification programs. Basically, there are four types of food fortification ie, mass fortification, targeted fortification and market-driven fortification. Public health risk can be eradicated by mass fortification means fortification of cereals, condiments, milk, oil and vegetables etc. It is usually mandated/regulated by the government. Targeted fortification is done those foods that are specifically aimed at specific sub-groups of the population like complementary foods for infant and young children, foods for school feeding program, special biscuits, other products for small children, pregnant and lactating women. In market driven fortification, food manufacturer adopts a business-oriented initiative to add/fortify the food with certain micronutrients. Although this sort of fortification is voluntary, the manufacturer must abide by the government-set regulatory limits for fortification. Market driven fortification is more commonly found on industrialized countries compared to developing nations. The most commonly fortified foods are cereals, cereal-based products, milk, dairy products, fats, oils, accessory food items, tea, other beverages and infant formulas which is outlined by the FAO,

Why do we need fortification of food?

The father of Economics Adam Smith, observed that, wealth of nations depends in part on the health, nutrition, skills and knowledge of their people. But malnutrition, in all its forms imposes unacceptably high costs, experts say that multiple forms of malnutrition (MOM) reduce nearly 8 per cent of the nation's economic growth owing to reduced schooling, cognitive impairments, compromised adult labour productivity, and increased healthcare costs and so on. Eight million Indian children suffered from severe acute malnutrition (SAM), particularly worrying because children with SAM are nine times more likely to die than well-nourished children. In fact, 17.3 per cent of India's productive years of life (disability-adjusted life years or DALYs) were lost last year alone due to MOM caused ill-health, disability or early death. (Lancet 2019)

Access to safe and nutritious food is a must and sometimes due to lack of consumption of a balanced diet, lack variety in the diet or unavailability of food one does not get adequate micronutrients. Often, there is considerable loss of nutrients during the processing of food as well. One of the strategies to address this problem is fortification of food. This method complements other ways to improve nutrition such as diversification of diet and supplementation of food.

By the food fortification, nutrients are added to staple foods since they are widely consumed. Thus, this is an excellent method to improve the health of a large section of the population, all at once, It is a safe method of improving nutrition among people. The addition of micronutrients to food does not pose a health risk to people. The quantity added is small and well under the Recommended Daily Allowances (RDA) and are well regulated as per prescribed standards for safe consumption. It is a cost-effective intervention and does not require any changes in eating patterns or food habits of people. It is a socio-culturally acceptable way to deliver nutrients to people, It does not alter the characteristics of the food like the taste, aroma or the texture of the food too. Fortification helps to minimize or decrease the potential occurrence of micro-nutrient deficiency, helps to improve dietary intake and nutritional status of an individual. Fortification is one of the most cost-effective procedures that can be executed on a bigger scale. Fortified foods are better at bringing down the danger of different insufficiency that can result from shortfalls in the nutrition supply or a low-quality eating routine. It doesn't require an adjustment in the individual and utilization design. The amount of micro-nutrients added to the food is little and all-around managed. Thus, the probability of an overdose is far-fetched too.

India has a very high burden of micronutrient deficiencies caused by Vitamin A, Iodine, Iron and Folic Acid leading to Night Blindness, Goitre, Anaemia and various birth defects. According to the National Family Health Survey (NFHS-4), 4 percent of children (6-59 months) are anaemic, 53.1 percent women in the reproductive age group are anaemic and 35.7 percent of children under 5 are underweight. Fortification is a globally proven intervention to address the much prevalent micronutrient deficiencies in the population. The criteria for effective food fortification are the intake of the nutrient is below the desirable level in the diets of a significant number of people, the food used to supply the nutrient is likely to be consumed in quantities that will make a significant contribution to the diet of the population in need, the addition of the nutrient is not likely to create an imbalance of essential nutrients, the nutrient is stable under proper conditions of storage and use, the nutrient is physiologically available from the food there is reasonable assurance against excessive intake to a level of toxicity.

Global experiences on food fortification

Food fortification has been implemented for a long period of time in industrialized countries to achieve the successful control of vitamin A and D deficiencies, several B vitamins (thiamine, riboflavin, and niacin), as well as iodine and iron. The most successful global fortification experience has been the fortification of salt with iodine. Adding iodine to salt is a simple manufacturing process costing no more than 4 cents per person annually. A significant proportion of the populations in more than 120 countries have access to iodized salt. As of 2015, nearly 76% of salt consumed in the world is being iodized, protecting nearly 80 million newborns each year from the threat of mental impairment caused by iodine deficiency (UNICEF State of the World's Children, 2015).

As food fortification programs expand around the world, there will be increasing need to monitor the quality of the fortified food (in terms of its micronutrient content) and evaluate its contribution to the alleviation of micronutrient deficiencies. Monitoring activities should ensure that a fortified product contains a sufficient amount of the micronutrient and that it reaches the target population. While monitoring at production level is essential through quality assurance, monitoring also needs to be carried out periodically at various levels in the distribution chain from production or importation to wholesale, retail, and household levels. As a final indication of effectiveness, a biological impact evaluation, conducted after about 2 or 3 years, will determine whether the micronutrients are being well-absorbed and are reducing the prevalence of the deficiencies in the population. During these evaluations, problems not identified in the initial stages may be identified.

Currently, over 140 countries globally have guidance or regulations in place for fortification programs, the majority of which are mandatory, and almost 140 countries are implementing national salt iodization programs of which 102 are mandatory, 85 countries mandate at least one kind of cereal grain (maize, rice or wheat) be fortified with iron and folic acid, and over 40 countries mandate the fortification of edible oils, margarine and/or sugar with vitamin A and/or vitamin D. Food fortification can also be achieved by harnessing the expertise of the private sector to produce and distribute fortified foods. Voluntary fortification is the process by which a food manufacturer chooses to add one or more micronutrients to processed foods in compliance with government regulations and standards.

It is a dynamic area developing in response to the needs of population groups and global industries. Efforts should continue to develop new systems of delivering micronutrients to target populations through appropriate fortification procedures. To facilitate this, those involved in the establishment of food fortification programmes must have ready access to information concerning fortification techniques and procedures being used all over the world. A multi-disciplinary approach is essential for successful fortification, with active collaboration with all parties involved. Adequate monitoring of food fortification is essential and should include both monitoring of critical control points in the production and distribution of fortified foods and the strict monitoring of micronutrient status for target populations. In contrast to LSFF where nutrients are added during post-harvest processing, biofortification is the process by which food crops are grown to improve their nutritional value. Biofortification projects mainly concentrate on boosting iron, zinc and provitamin A carotenoid in different food

crops through plant breeding or agronomically (mineral fertilizer); some projects have also biofortified with amino acids and protein. Examples of biofortification projects include iron biofortification of rice, beans, maize and sweet potato; zinc biofortification of wheat, rice, beans, sweet potato and corn; and Vitamin A biofortification of sweet potatoes, corn and cassava.

Indian scenario

The Global Hunger Index (2020) which is calculated on the basis of total undernourishment of the population, child stunting, wasting and child mortality places India at the 94th spot among 107 countries. The bane of child and maternal malnutrition is responsible for 15 per cent of India's total disease burden. According to the Global Malnutrition Report 2020, India will miss targets for all four nutritional indicators for which there is data available. These indicators include stunting among under-5 children, Anaemia among women of reproductive age, childhood overweight and exclusive breastfeeding. According to the data available on stunting and wasting among children in the country, 37.9% of children under 5 years are stunted and 20.8% are wasted, compared to the Asia average of 22.7% and 9.4% respectively. Additionally, stunting prevalence is 10.1% higher in rural areas compared to urban areas. Moreover, Rate of overweight and obesity continues to rise, affecting almost a fifth of the adults, at 21.6% of women and 17.8% of men. There is nearly double as many obese adult females than there are males (5.1% compared to 2.7%). Anaemia is also highly prevalent in the country with one in two women of reproductive age being anaemic. There is an improvement seen in the number of underweight children in the country. Between 2000 and 2016, rates of underweight have decreased from 66.0% to 58.1% for boys and 54.2% to 50.1% in girls.

Rice and wheat are the main staple foods in India, especially the eastern and southern parts mostly depend on rice while the northern and western part of the country depends on wheat. India is one of the top rice-producing countries, accounting for 158.8 million tonnes in 2016. From the world scenario, on average 30% of calories come from rice and it could reach up to more than 70% in some low-income country. According to the GAIN report, the domestic consumption of milled rice is estimated at about 97.6 MMT in 2017/18 and wheat consumption has been estimated at about 93 million. Moreover, the milling process causes the loss of almost all vitamins and minerals of nutritional importance. Therefore, rice and wheat could be excellent vehicles for delivering micronutrients. Although in Indian context rice has been recommended for iron, folic acid, and Vitamin B12 fortification, there is practice of rice fortification with some other micronutrients also such as Vitamin B1, niacin, zinc, and few cases selenium and Vitamin A and E. Oil is almost indispensable part of daily diet, accounting for 99% of the households in India. The consumption of edible oil in the country is about 12–18 kg/per annum per person and Vitamin A and D are fat-soluble vitamins; thus, oil is a suitable vehicle for delivery of these two micronutrients. FSSAI operationalized the Food Safety and Standards (Fortification of Foods) Regulations, 2016 for fortifying staples namely Wheat Flour and Rice (with Iron, Vitamin B12 and Folic Acid),

Milk and Edible Oil (with Vitamins A and D) and Double Fortified Salt (with Iodine and Iron) to reduce the high burden of micronutrient malnutrition in India. The '+F' logo has been notified to identify fortified foods.

Food Safety and Standards Authority of India (FSSAI) established standards for fortification of rice, wheat flour, edible oil, double fortified salt (DFS), and milk. Its functions include to improve public health in India and combat negative nutritional trends to fight lifestyle diseases, FSSAI launched 'The Eat Right Movement' on 10th July, 2018. Framing of Regulations to lay down the Standards and guidelines in relation to articles of food and specifying appropriate system of enforcing various standards thus notified, laying down mechanisms and guidelines for accreditation of certification bodies engaged in certification of food safety management system for food businesses, laying down procedure and guidelines for accreditation of laboratories and notification of the accredited laboratories, to provide scientific advice and technical support to Central Government and State Governments in the matters of framing the policy and rules in areas which have a direct or indirect bearing of food safety and nutrition, collect and collate data regarding food consumption, incidence and prevalence of biological risk, contaminants in food, residues of various, contaminants in foods products, identification of emerging risks and introduction of rapid alert system, creating an information network across the country so that the public, consumers, Panchayats etc, It is receiving rapid, reliable and objective information about food safety and issues of concern, provide training programmes for persons who are involved or intend to get involved in food businesses, contribute to the development of international technical standards for food, sanitary and phyto-sanitary standards and promote general awareness about food safety and food standards and so on. Some of the CSR projects targeted to fight malnutrition in India such as Reliance Nutrition Gardens, 'Aarogya' by Tata Motors, 'Healthy Baby Wealthy Nation' by HDFC Standard Life Insurance, Nestle Healthy Kids Programme, Mondelez India's National CSR Program 'Shubh Aarambh' etc. Food fortification is playing an important role to tackle nutritional problems of India. Hopefully the FSSAI initiative will reach the eyes and ears of our population and a day will come when most companies will be manufacturing fortified food products.

Conclusion

Food fortification is an essential element in nutrition strategies to eradicate micronutrient deficiencies. The global gap between micronutrient deficiencies and effective measures to address them remains large in today itself due to various reasons, especially among the women, young children, and adolescents are particularly at risk. The causes include poverty and resulting poor diets, concomitant infectious diseases with increased requirements and losses, limited health services capacity and resources, and sociocultural practices. The consequences are poorer health outcomes, impaired growth and development, and severely affecting economic settings of nation too. Fortification process is criticized due to various reasons like use of only a handful of nutrients are added in the process of fortification, other nutritional deficiencies remain untreated by the process, many times fortified food products fail to reach the poorest segments of society who are among the worst section affected with nutritional deficiencies, low purchasing power and a weak distribution channel are responsible for this problem.

and in some cases fortified foods could lead to a nutritional overdose due to lack of research in concerned field and so on..Copenhagen consensus 2008, highlighted some of the arguments to address malnutritional problems like nutrition education at the community level,breastfeeding promotion,baby-friendly hospitals,anthelminths and biofortification etc.One evaluation (Waters et al., 2006) estimates the cost effectiveness of adding a health facility-based nutrition education program which including complementary feeding demonstrations,growth monitoring sessions,nutrition messages and motivation for the personnel using an accreditation process combined with training.The key messages involve diet of pregnant and lactating women,breastfeeding,complementary feeding of infants and young children particularly between six and twenty-four months, and identifying inadequate growth and weight gain particularly below age two.Delivering these messages effectively requires one-on-one discussion, typically with the mother and other concerned people.Importance of breastfeeding should be awared on mothers pregnancy period itself by health workers.Another concern is that infection with soil-transmitted helminths is very high and number of children infected by some type of soil-transmitted helminths. These infections have adverse effects on nutritional status, and hookworm infections also have adverse effects on iron status. Most existing treatment efforts are focused on school age children in part because data suggest that worm lods peak during these years too. In 2008 and 2012, the Copenhagen Consensus ranked food fortification as one of the most cost-effective development strategy and thereby attain economic development at full sense.

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