



Importance of Food Fortification: Need of Present Era

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Food fortification is defined as the practice of adding vitamins and minerals to commonly consumed foods during processing to increase their nutritional value. It is a proven, safe and cost-effective strategy for improving diets and for the prevention and control of micronutrient deficiencies. Moreover, It refers to "the practice of deliberately increasing the content of an essential micronutrient, i.e., vitamins and minerals (including trace elements) in a food, to improve the nutritional quality of the food supply and to provide a public health benefit with minimal risk to health", (FAO/WHO 1994). Enrichment is defined as "synonymous with fortification and refers to the addition of micronutrients to a food which are lost during processing"

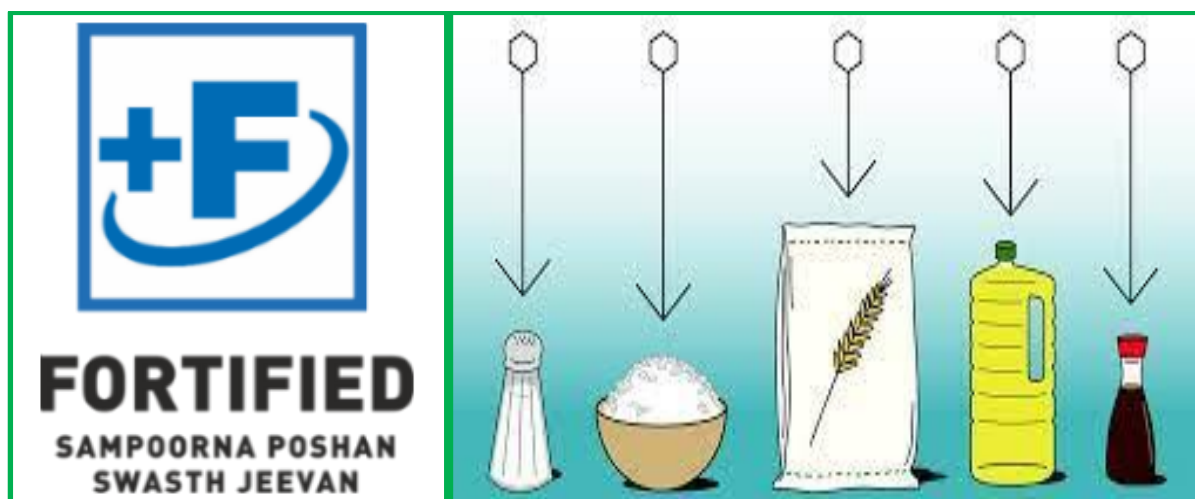
History of Food Fortification

In Switzerland around the 1920's, cretinism was common. Cretinism is a condition of severe physical and mental retardation due to iodine deficiency. Iodised Salt was used in the United States before World War II. Niacin has been added to bread in the USA since 1938. Vitamin D was added to margarine in Denmark in early 50's. Vitamin A & D were added to Vanaspati (hydrogenated Vegetable Oil) in India since 1954 as per mandate. Folic acid was added to bread for preventing neural tube defects in infants in 60's. Over the last 3 decades fortification of foods has become a public health measure for preventing deficiencies of Vitamin -A, Iron, Folic acid and Iodine.

Micronutrient deficiencies are common among women and children in the Indian state of Andhra Pradesh. In recognition of this challenge, in early 2018, the Prime Minister's office launched the *National Nutrition Mission* where staple food fortification as a cost-effective approach to control vitamin and mineral deficiencies. Among the various staples available in Andhra Pradesh, rice is the most effective vehicle to reach the poorest and only one of two staples, which when fortified well, can carry a range of minerals and vitamins. It is delivered to the most nutritionally vulnerable population through the government's three main food supplementation programs: (1) Mid-day Meal scheme (MDM), (2) Integrated Child Development Scheme (ICDS), and (3) Public Distribution System (PDS).

Iodine Deficiency Disorders (IDD)

Iodine deficiency is the world's most prevalent, yet easily preventable, cause of brain damage. In certain regions of Switzerland, 0.5% of the inhabitants were cretins, almost 100% of schoolchildren had large goitres, and up to 30% of young men were unfit for military service owing to a large goitre. Iodization of salt was introduced in Switzerland in 1922. The USA quickly followed.



Types of Food Fortification

The four main types of food fortification are:

1. Bio fortification (i.e., breeding crops to increase their nutritional value, which includes both plant breeding and genetic engineering),
2. Microbial bio fortification and synthetic biology (i.e. addition of probiotic bacteria),
3. Commercial and industrial fortification (i.e., flour, rice, oils) and
4. Home fortification (e.g., vitamin D drops)

Vitamin D Fortification

Foods are rarely fortified with vitamin D in India. Mostly milk and milk products and margarine were fortified with vitamin D. Two form of vitamin D are used to fortified foods and dietary supplements: vitamin D2 (ergocalciferol) and vitamin D3 (cholecalciferol).

Vitamins A Fortification

Sugar, flour and oil are fortified with vitamin A. A food-soluble (such as vitamin A) is usually prepared in the form of an oil solution, emulsion or dry, stabilized preparations or added directly to food. Vitamin A is important for visual health, immune function and foetal growth and development.

Iodine Fortification

The fortificant commonly used is: Potassium iodate (KIO_3). The addition does not change the colour, appearance, or taste of salt. Fortified salt contains iodine, an essential for preventing goitre, development disabilities and cognitive impairment.

Oil Fortification

Oil fortification is the process of adding micronutrients to edible oil to increase its nutritional value. At an individual level, fortified oil can help to person meet 25-30 percent of recommended dietary intake for vitamin A and D, according to FSSAI. The appearance, taste, texture, flavour and shelf life of edible oil not affected with fortification.

Fortification of Rice

Rice fortification is complex. The main technologies those are available to fortify rice are: Hot Extrusion (70-110 °C), Cold Extrusion (below 70 °C) Coating and Dusting.

Fortification of Flour

During the 1940s, Britain and the USA started enriching flour as a means to improve the health of their populations during World War II. While fortification of flour was never really embraced in Europe, countries all around the world started flour fortification in the late 20st and early 21st century. To date, more and more countries are adopting this measure.

Benefits of Food Fortification

Fortification prevents and treats nutritional anaemia in children.

Iron deficiency impairs cognitive development in children. This mental capacity is never regained and in turn limits academic performance and future earnings potential. Childhood anaemia globally is associated with a 2.5% drop in wages in adulthood.

Fortification prevents and treats nutritional anaemia in adults.

In 10 developing countries, annual physical productivity losses due to iron deficiency was up to 3% of GDP. Anaemia contributes to maternal death. In developing countries, one-fifth of perinatal mortality and one-tenth of maternal mortality are attributed to iron deficiency.

Folic acid prevents births defect of the brain and spine

Children born with spina bifida will undergo a lifetime of surgeries and face many health issues. Spina bifida cannot be cured. Almost 300.000 birth defects of the brain & spine can be prevented annually. Folic acid is a B vitamin that our bodies need to make new cells. In 1991, a study showed that 400 micrograms of folic acid daily taken from 8 weeks before conception till 12 weeks into the pregnancy can reduce the risk of birth defects of the brain and spine by up to 70%. This made it possible to prevent these debilitating birth defects. Pregnant women all over the world are given iron and folic acid tablets during pregnancy, mostly in the 3d trimester. That is too late for preventing birth defects of the brain and spine.

Who will benefit from Fortified Foods?

Food fortification is an industrial process. The industry ensures provision of essential vitamins and minerals according to government standards and regulations. Fortified foods reach all those who have access to the market and purchase their staple food/ oil/ salt. This includes the urban poor, a fast-growing group in many developing countries in Africa and Asia. Those who do not have access to fortified, packaged commercially processed foods need to receive essential vitamins and minerals through alternative mechanisms. This may include provision of multiple micronutrient powder sachets (“sprinkles”) or supplements, as well as social safety net approaches, which use fortified foods.

Global Progress

86 countries have mandates to fortify industrially milled wheat flour with at least iron or folic acid. Afghanistan, Democratic Republic of Congo, Gambia, Lesotho, Namibia, Qatar, Swaziland, and the United Arab Emirates fortify more than half their industrially milled wheat flour even though it is not mandatory.

Limitations of Food Fortification

Population groups who consume relatively small amount of food, such as infants, young children and the elderly are less likely to benefit from consumption of fortified food. The Impact of interactions among nutrients, for example the presence of large amount of calcium can inhibit the absorption of iron from fortified food.

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