

FOOD FORTIFICATION - CURRENT STATUS AND FUTURE SCOPE OF FOOD FORTIFICATION IN INDIA

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ABSTRACT

India faces a serious public health challenge due to widespread micronutrient deficiencies, known as "hidden hunger." To address this, food fortification programs have been implemented, strategically adding essential vitamins and minerals to staple foods. The Food Safety and Standards Authority of India (FSSAI) spearheads this initiative, mandating fortification in wheat flour, rice, salt, milk, and edible oils. These fortified staples are enriched with iron, folic acid, vitamin A, vitamin D, and iodine. This approach offers significant advantages: regular consumption of fortified staples can substantially improve micronutrient intake, ensuring these essential nutrients reach a large portion of the population, including those dependent on government distribution programs. Moreover, fortification is cost-effective and minimally alters the taste, texture, or quality of the food. However, challenges persist. Effective blending of fortificants, especially at small-scale flour mills, requires refinement. Additionally, raising consumer awareness about the benefits of fortified foods is crucial to encourage their consumption. Overall, India's food fortification program represents a substantial step towards combating micronutrient deficiencies and improving public health. Continued efforts to enhance program implementation and raise consumer awareness are essential for its long-term success.

KEYWORDS: *Dietary Supplements, Microbiota, Antimicrobial*

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INTRODUCTION

India is the fastest growing economy in the world with more than 1.5 billion population and is expected to reach high middle income status by 2047 despite challenging climate changes. The Food Processing sector is one of the most vibrant sectors corresponding for higher economic growth in parallel to the IT sector. Production is in progress but consumption is not on par with production and processing. In Line, Recent Statistics reveal that nutritional status of people inside India seems to be low, especially in children. About 35.5 percent of children below 5 years were stunted previously and it rose to 67 percent in the last 5 years (World Bank, IBRD, IDA, 2023). Women obesity percentage raised to 20.6 percent and men

obesity percentage raised to 18.9 percent and is higher than previous years. (NFHS Survey -5, 2019-21).

The reason for this type of malnutrition is improper diet management, not having nutritious meals and over processing the foods for different culinary purposes. Consuming food only for satisfying hunger pangs may not help to achieve swasth India. Nutrition and portion sizes may also play a major role. Along with this, a method called fortification has been followed, which means deliberately increasing the content of essential micronutrients in a food so as to improve the nutritional quality of food and to provide public health benefit with minimal risk to health. Fortificants are used to fortify foods. It means a substance added to food to provide micronutrients but does not include nutraceuticals or foods for Special Dietary Uses(FSSAI, 2018)

STRATEGIES BY GOVERNMENT

History of Fortification

Food fortification has a long history that dates back several centuries, from crude attempts to combat starvation to highly developed scientific initiatives to improve public health. Here's a thorough rundown:

Ancient Times: Historically, civilizations have employed various methods to fortify foods, often unknowingly. For example, ancient Egyptians used beer as a source of nutrients, including B vitamins. Additionally, salt has been fortified with iodine for centuries, though the rationale behind this practice was not fully understood until modern times.

18th Century: The British Royal Navy was one of the earliest organizations to mandate food fortification. In the 1700s, they began adding lime juice to sailors' diets to prevent scurvy, a disease caused by vitamin C deficiency.

19th Century: In the 1800s, nutrient deficiencies became more widely recognized, leading to increased efforts to fortify foods. For example, iodized salt was introduced in Switzerland in 1822 to combat goiter, a thyroid condition caused by iodine deficiency. The fortification of milk with vitamin D began in the early 20th century in response to the prevalence of rickets, a bone disease caused by vitamin D deficiency.

20th Century: The early 20th century saw significant advancements in food fortification. In 1924, iodine was added to table salt in the United States to address iodine deficiency disorders. In the 1930s, the fortification of flour with B vitamins, including niacin, thiamine, riboflavin, and iron, began in the United States and other countries to combat deficiencies such as pellagra and beriberi. During World War II, fortification efforts intensified as governments sought to ensure adequate nutrition for soldiers and civilians. For example, the fortification of margarine with vitamin A and D became widespread.

In the latter half of the 20th century, fortification expanded to include a wider range of nutrients, such as folic acid, calcium, and vitamin C. These efforts were driven by growing awareness of the link between nutrition and health.

21st Century: Food fortification continues to be an essential strategy for addressing nutrient deficiencies and improving public health worldwide. Efforts have expanded to include fortified foods targeting specific populations, such as fortified cereals for children and fortified beverages for the elderly. There is also growing interest in biofortification, which involves enhancing the nutrient content of crops through agricultural practices or breeding techniques.

Challenges and Controversies: While food fortification has contributed to significant improvements in public health, it is not without challenges and controversies. Critics argue that fortification may lead to overconsumption of certain nutrients or interfere with the body's natural regulatory mechanisms. Additionally, there are concerns about equity

and access, as fortified foods may not reach those most in need, particularly in low-income communities. Furthermore, there is ongoing debate about which nutrients should be fortified and at what levels, as well as the potential risks and benefits of fortification programs. Overall, the fortification of foods represents a complex interplay of science, policy, and public health efforts aimed at addressing nutrient deficiencies and promoting overall well-being.

RECENT FORTIFICATIONS IN INDIA

In India, fortification of foods has gained importance as a strategy to address malnutrition and improve public health. While the practice has been around for some time, recent years have seen advancements and initiatives aimed at scaling up fortification efforts. Some recent advances in fortification of foods in India include:

Government Initiatives: The Government of India has launched various initiatives to promote food fortification as a public health intervention. For instance, the Food Safety and Standards Authority of India (FSSAI) has implemented mandatory fortification of certain staple foods such as wheat flour, rice, milk, and edible oils with essential vitamins and minerals.

Scaling Up Fortification Programs: There has been a concerted effort to scale up fortification programs across the country. This includes increasing the coverage of fortified foods through various distribution channels such as public distribution systems, mid-day meal schemes, and Integrated Child Development Services (ICDS).

Mandatory Fortification Regulations: The Government of India, through the Food Safety and Standards Authority of India (FSSAI), has implemented mandatory fortification regulations for staple foods such as wheat flour, rice, edible oil, and milk. This ensures that these foods are fortified with essential vitamins and minerals to address nutritional deficiencies.

Expansion of Fortified Foods: There has been a significant expansion in the variety of fortified foods available in the market. In addition to staple foods, there are fortified products such as salt, biscuits, snacks, and condiments, providing consumers with a wider range of options to increase nutrient intake.

Technological Innovations: Advances in food processing and fortification technologies have made it possible to fortify a wide range of foods without compromising taste, texture, or shelf life. These innovations include micronutrient premixes, encapsulation techniques, and novel fortification methods to ensure the stability and bioavailability of added nutrients.

Targeted Fortification Programs: There is a growing emphasis on targeted fortification programs to address specific nutritional needs of vulnerable population groups. For example, fortified foods targeting pregnant women, children, and lactating mothers are being promoted to address micronutrient deficiencies during critical life stages.

Public-Private Partnerships: Collaboration between the government, private sector, and non-governmental organizations (NGOs) has been instrumental in advancing fortification efforts. Public-private partnerships have been formed to promote fortification, improve access to fortified foods, and raise awareness about the benefits of fortified products.

Research and Development: There has been ongoing research and development in the field of food fortification to enhance the effectiveness and acceptability of fortified foods. This includes developing new fortification technologies, improving the bioavailability of nutrients, and conducting studies to assess the impact of fortification on nutritional outcomes.

Quality Assurance and Monitoring: Efforts have been made to ensure the quality and safety of fortified foods through stringent regulations, standards, and monitoring mechanisms. Regular testing and monitoring of fortified products are conducted to verify compliance with fortification standards and to maintain the efficacy of the fortification process.

Consumer Awareness and Education: Initiatives to raise awareness and educate consumers about the importance of fortified foods have been undertaken. This includes mass media campaigns, community outreach programs, and nutrition education efforts to encourage the consumption of fortified foods as part of a healthy diet.

These advances in the fortification of food in India demonstrate a multi-faceted approach to addressing malnutrition and improving public health outcomes through sustainable and evidence-based interventions. Continued investments, innovation, and collaboration are essential to further enhance the impact and reach of fortification programs across the country.

TYPES OF FOOD FORTIFICATION STRATEGIES

- Mandatory or mass fortification of staple foods, such as milk, cereal flour, etc., is mandated and regulated by the government. It is implemented when the majority of the population has a serious public health issue of being or becoming deficient in specific micronutrients, as in the case of mandatory fortification of milk and milk products and margarine with vitamin D in Canada to address the problem of vitamin D deficiency.
- Targeted fortification is the practice of adding sufficient amounts of micronutrients to provide large proportions of the daily needs through foods designed for specific population subgroups, such as complementary foods for infants and foods for institutional programs, such as those aimed at pre-school and school-aged children. These foods may provide a large proportion of the daily micronutrient requirements for specific target groups. A separate review addresses this strategy for children in India.
- Market-driven or voluntary fortification is a prerogative of a food manufacturer who voluntarily adds one or more micronutrients to processed foods with the purpose of adding value to their products, thereby increasing marketability and sales. The micronutrient(s) added and the levels of fortification are regulated by the government

STATUS OF FOOD FORTIFICATION IN INDIA

As a result of widespread consumption, rice and wheat are considered as suitable food vehicles for micronutrient delivery via fortification in India. Additionally, oil is a mandatory part of daily diet, accounting for 99% of households in India, and oil is primarily fortified with vitamins-A and -D.

In 2016, FSSAI implemented food fortification regulations for fortifying staple foods, namely wheat and rice flour with vitamin B-12, iron, and folic acid to reduce the prevalence of micronutrient deficiency across India.

On August 21, 2018, FSSAI introduced the Food Safety and Standards (Fortification of Foods) Regulations, 2018. These regulations established mandatory fortification standards for certain micronutrients, stipulating that products must be fortified with these nutrients if they are to be marketed and sold.

Additionally, the government has made it mandatory to mention the fortification logo '+F' (Schedule-II) with mentioned dimensions of each symbol and color codes used in the logo to be printed (in English or Hindi) on the package containing fortified foods.

Furthermore, the revision of regulations has been made at regular intervals and certain major inclusions/amendments are followed as: Compliance with Standards on Micronutrient Content in Fortified Food was release in 2018 as “any manufacturer who fortifies any food shall ensure that the level of micronutrient in such fortified food does not fall below the minimum level specified in Schedule-I”.

The amendment was done as “any manufacturer who fortifies any food shall ensure that the level of added micronutrients on the label of such fortified food shall fall within the range specified in Schedule-I”. Similarly, the statement to be given on the package of iron fortified foods was revised. [Amendment in force from 22nd September, 2021; FBOs to comply with the provisions by 1st April, 2022] (F. No. 1-116/Scientific Committee/Notif.28.6/ 2010-FSSAI, dated 22nd September, 2021).

Iron content substitution, insertion of new provisions for fortified milk powder and substitution of fortified raw rice as fortified rice are major amendments done in Schedule-I [Amendment in force from 27th August, 2021; FBOs to comply with the provisions by 1st March, 2022] (F. No. Stds/SP-18/A1.12/N-1, dated 27th August, 2021).

Furthermore, standards for fortified processed foods have been included as an amendment (Schedule-III) which covers the nutrients/sources and level of nutrient in fortified cereal products (breakfast cereals, pasta and noodles), fortified bakery wares (bread, biscuits, rusks and buns) and fortified fruit juices. A similar notification stated that multigrain atta may also be fortified with micronutrients at similar levels as specified for atta (Schedule-I; Table 3), provided that multigrain atta contains more than 50% as wheat our in it (F. No. REG/ Fortification Amendment (1)/Notification/FSSAI-2018, dated 18th December, 2020).

After years of promotion and advocacy, the mandatory iodization of salt for human consumption was established in 1997 and later reaffirmed in 2005. However, in 2000, the legislation mandating salt iodization was repealed, allowing for the sale of non-iodized salt but the same was revised and mandated in 2005.

Multiple programs in India have been followed at the state level to fortify wheat flour and vegetable oil. Similarly, small-scale rice fortification projects in Odisha and Andhra Pradesh states of India have been conducted.

The Ministry of Consumer Affairs, Food and Public Distribution had launched a centrally sponsored pilot scheme on “Fortification of Rice and Its Distribution under Public Distribution System (PDS)” for a period of three years beginning 2019–2020 where the rice blending is done at the milling stage. Wheat fortification was initiated in 12 states under POSHAN Abhiyan (2018) with the motive of improving nutritional status among children, adolescents, pregnant women and lactating mothers.

Milk fortification with vitamin-D was initiated in 2017 by the National Dairy Development Board of India (NDDB). During the period of 2010–2014, GAIN played a crucial role in supporting the production and distribution of a complementary take-home ration called Bal Amrutham to children in Telangana, India, through the Integrated Child Development Services (ICDS) program. Additionally, GAIN extended its support to staple food fortification initiatives in various other states across India.

The double fortified salt programme was initially part of the fortification scheme in Tamil Nadu, which began in 2004. The objective was to distribute double-fortified salt among school children in their mid-day meals.

Since then, other Indian states have been increasing the utilization of double-fortified salt to reduce iodine and iron deficiency. The state governments of Madhya Pradesh and Gujarat made double-fortified salt available by PDS. In current scenarios, double-fortified salt is available to more than 12 million people across 20 districts at a tremendously subsidized price of just one rupee per kilogram. Additionally, India has played an important role in communicating the benefits of double-fortified salt to the general public.

Eat Right India Initiatives – Eat Right India was initiated to overhaul the nation's food system on a wide scale to ensure that safe, nutritious and sustainable food is available to all Indians. Under demand-side initiatives of FSSAI, food fortification has been promoted on a large scale to address micronutrient deficiencies across India. Additionally, Eat Right India strengthens the coordinated efforts of the government, key players in the food industry, civil society organizations, experts, and professionals, as well as developing organizations and people in the end.

Eat Right India is associated with the National Health Policy 2017 with its focus on promotive and preventive programmes like POSHAN Abhiyan and Anaemia Mukh Bharat (<https://eatrightindia.gov.in/eatrightindia.jsp>). The Anemia Mukh Bharat programme was launched by the Ministry of Health and Family Welfare in association with UNICEF in 2018. The goal of this scheme was to reduce anemia among the vulnerable population including women and children. It is a strategic approach to dealing with the crises of anemia in the country along with POSHAN Abhiyan, which was launched in the same year.

The Mid-Day Meal Scheme was launched in 1995 as the National Programme of Nutritional Support to Primary Education (NP-NSPE) and was renamed PMPOSHAN (Pradhan Mantri POshan SHakti Nirman) in September 2021. This programme was started to enhance the nutritional status of children along with drawing attention for more admissions and regular attendance of children in schools.

SIGNIFICANCE OF FORTIFICATION IN INDIA

List of Fortified Foods across India

In India, fortified goods are increasingly becoming popular as a means to address malnutrition and improve public health. Here are some examples of recent fortified goods available in the Indian market:

Fortified Wheat Flour: Wheat flour fortified with essential micronutrients such as iron, folic acid, vitamin B12, and vitamin A is widely available in the Indian market. This fortified flour is used to make various staple foods such as chapatis, bread, and other wheat-based products.

Fortified Rice: Fortified rice is another staple food item that has gained popularity in India. It is enriched with vitamins and minerals such as iron, zinc, vitamin A, and folic acid to improve its nutritional content. Fortified rice is distributed through government nutrition programs and is also available in the retail market.

Fortified Edible Oil: Edible oils fortified with vitamins such as vitamin A and vitamin D are available in the Indian market. Fortified edible oils help address micronutrient deficiencies and promote better health outcomes among consumers.

Fortified Milk: Fortified milk containing added vitamins and minerals, such as vitamin D and calcium, is increasingly being marketed in India. Fortified milk products like milk powder and flavored milk drinks offer additional nutritional benefits to consumers, especially children and adolescents.

Fortified Salt: Iodized salt, fortified with iodine, has been a staple in Indian households for several decades. More recently, double-fortified salt, enriched with iodine and iron, has been introduced to address multiple micronutrient deficiencies in the population.

Fortified Snacks and Beverages: Various snacks and beverages fortified with vitamins and minerals are available in the Indian market. These include fortified biscuits, snacks, cereals, beverages, and instant noodles, offering consumers convenient and nutritious options for on-the-go consumption.

Fortified Infant and Child Nutrition Products: Infant formula, baby cereals, and other child nutrition products fortified with essential nutrients are widely available in India. These fortified products play a crucial role in ensuring optimal growth and development during the early years of life.

Fortified Condiments and Sauces: Some condiments and sauces, such as fortified soy sauce and fortified tomato ketchup, are also available in the Indian market. These fortified products provide an additional source of essential nutrients in everyday cooking.

These fortified goods reflect the growing trend towards incorporating essential vitamins and minerals into everyday food items to address nutritional deficiencies and promote better health outcomes among the Indian population.

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