



**BACKGROUND NOTE
ON**

Food Fortification in India

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Food Fortification in India¹

List of Abbreviations

BMI- Body Mass Index

FSSAI- Food Safety and Standards Authority of India

ICDS- Integrated Child Development Scheme

ICDS-CAS- ICDS- Common Application Software

ICT-RTM- Information and Communication Technology enabled Real-Time Monitoring

NAR- Nutrient Adequacy Ratio

NEWS- Nutrition Early Warning Access System

NFHS- National Family Health Survey

PDS- Public Distribution System

SDGs- Sustainable Development Goals

Structure of the Paper

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I. Introduction

According to the World Hunger Index 2021, India stands at 101 positions out of 116 countries. India's rank was worse than its neighbors, Bangladesh (76th), Pakistan (92nd), and Nepal (76th). India's rank was 97th on the world Hunger index in 2016. There has been a sharp decline in rank. In 2015, United Nations launched

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the 2030 Agenda for Sustainable Development, which is to be achieved by following 17 Sustainable Development Goals (SDGs). One of the aims of this 2030 Agenda is to eradicate poverty in all its forms and dimensions. With the help of Food fortification, various SDGs can be achieved like- No poverty (SDG 1), No Hunger (SDG 2), Good health and well-being (SDG 3), Gender Equality (SDG 5), Economic Growth (SDG 8), and Reduced Inequality (SDG 10). It is estimated that India along with other 16 nations won't be able to reach low hunger by 2030, which makes the accomplishment of other SDGs impossible.

The malnutrition figures were already terrible for India but they were further exacerbated by the COVID-19 pandemic. Firstly, people who were directly infected by COVID-19 and others who were either dependent on the government to fulfill their daily dietary needs (due to unanticipated lockdown) or others were indirectly affected by the pandemic. Although constant efforts were made during the pandemic by the government to supply the food grains and compensation was made for cooking costs. There are 17.76 lakh and 15.46 lakh severely acute malnourished children and moderately acute malnourished children in India respectively according to the Women and Children Development Ministry, 2021. The NFHS-5 dataset shows that over 90% of the children (6-23 months) did not receive an adequate diet.

Table 1: Different indicators of nutrition over NFHS 4 and NFHS 5

Different Indicators of nutritional status	NFHS 4 (2015-16)	NFHS 5 (2019-21)
Children younger than 5 yrs. who are stunted	38.4	35.50%
Children younger than 5 yrs. who are wasted	21	19.3

Children younger than 5 yrs. who are underweight	35.7	32.10%
Women whose BMI is below normal	22.9	18.7
Men whose BMI is below normal	20.2	16.20%
Women who are overweight or obese	20.7	24
Men who are overweight or obese	18.6	22.9
Children aged 6-59 months who are anemic	58.4	67.1
All women aged 15-49 yrs. who are anemic	53	57
Men aged 15-49 yrs. who are anemic	22.7	25

Source: NFHS 4 Report and NFHS 5 Report

There is a small decline in % of children less than 5 yrs. who are stunted, wasted, and underweight. According to a World Bank report, “1% loss in adult height due to childhood stunting is associated with a 1.4 percent loss in economic productivity”. Anemia is increasing in all different age groups, but the highest rise is seen in the case of children under 5 years. There is a rise in obesity among men and women. Although iron deficiency is the primary cause of anemia. Having a deficiency of vitamin B12 and folic acid can result in anemia. Women are more prone to suffer from anemia than men.

Data for NFHS-5 was collected in two phases (June 2019- Feb 2020 and Jan 2020- April 2021). Due to the pandemic, the data collection was stalled while in the second phase. A majority of the data collection was done before the pandemic. So, the NFHS-5 doesn't show a correct picture. With this dataset, the impact of covid on different health parameters cannot be obtained.

II. Malnutrition and Fortification

Hunger and malnutrition lead to loss of human capital, low economic productivity, low cognitive and learning skills, low retention rates in school and thereby leading to poverty. These effects are irreversible in nature but preventable in nature. Malnutrition begins in the womb of the mother. Malnutrition is a general term for undernutrition, overnutrition, and micronutrient deficiencies. Hidden Hunger refers to the deficiency of micronutrients, and these micronutrients lead to cognitive and mental development. Pregnant and lactating women and young children are found to be the most vulnerable groups affected by micronutrient deficiencies.

These micronutrients are added either before harvest (bio-fortification) or are added after harvest (food fortification). When it comes to making the best cost-effective policy to reduce malnutrition, food fortification programs are generally the best choice for policymakers. A reason for being successful in India is that a large section of the population experiences micro-nutrient deficiency. Considering the micro-nutrients added to the food follow a clinically prescribed limit, food fortification doesn't alter the eating pattern, leaving its taste, texture, and other characteristics unchanged. It turns out that food fortification is a cost-effective method to conduct interventions for malnutrition in India. Fortified staples commonly available in India are wheat flour, rice, oil, milk, and salt.

The Food Safety and Standards Authority of India (FSSAI) defines fortification as “the addition of key vitamins and minerals such as iron, iodine, zinc, Vitamins A and D to staple foods such as rice, wheat, oil, milk, and salt to improve nutritional value and provide a public health benefit with minimal risk to health”. Food fortification started in India in the 1950s and has been there since then. Studies

conducted over time in different states on different age groups report that fortification of various food items is successful in reducing nutritional deficiency.

Despite having enough policies to reduce the malnutrition problem in women and children we are not able to eradicate this problem. Fortification programs should choose appropriate commodities to fortify based on an in-depth understanding of local dietary habits. Supplying fortified wheat in south India will not be successful, customization of the fortification drive keeping in mind the staple food most consumed in the given region would enhance the results. Only 30% of total rice purchased in India comes from PDS compared with only 17% of wheat. Thus, PDS is not the right channel to distribute all fortified foods. For mandatory rice fortification Rs. 10.13 crores have been allocated to rice fortification under PDS in budget 2022-23.

i. Food Fortification Vehicles in India

Fortification vehicles in India are- the Public Distribution System (PDS), Mid-day Meal Scheme, Integrated Child Development Scheme (ICDS), and Rajiv Gandhi Scheme for Empowerment of Adolescent Girls (SABLA) are key vehicles of food fortification. POSHAN Abhiyan specifically takes care of the nutritional needs of children, pregnant and lactating women. Budget 2022-23 has allocated Rs. 20,623 crores to the POSHAN program and Saksham Anganwadi.

POSHAN Abhiyan was launched in 2018 with the vision of a malnutrition-free India by 2022. Under the POSHAN Abhiyan, Information and Communication Technology enabled Real-Time Monitoring (ICT-RTM) is used. The main objectives of ICT-RTM include- exhaustive inclusion of households, registering all members, capturing real-time information about the delivery of Anganwadi

Services, identifying top priority areas, and employing suitable interventions in that area. Firstly, ICT-RTM doesn't recognize the need to regularly monitor the people regarding the different deficiencies they face over time. Under ICDS a mHealth intervention known as Common Application Software was launched in 2018 with a key focus on better service delivery and supervision, along with providing interactive videos of child-care, care in pregnancy, reminders of the child's pending vaccines, etc.

On 15th August 2021, PM Narendra Modi announced a compulsory rice fortification program, under which the government will distribute fortified rice to the poor by 2024. This program is costing the government a whopping figure of Rs. 2,700 crore every year. Some huge concerns were raised with this program being implemented. There are some medical conditions that require less iron to be consumed making regular consumption of fortified rice harmful for such people. Pregnant women are already consuming iron and other supplements leading to excess iron consumption, associated with other health risks of children at the time of birth. A uniform solution like this, to the common problem of micronutrient deficiency, is not viable. Considering the side effects of excess consumption of micronutrients will make this program cost more than Rs. 2,700 crores.

But two recent studies (mentioned below) showed over-consumption of micronutrients and no intervention has been conducted to discover the issue and resolve it.

ii. Excessive Intake of Micronutrients

Studies done in Guatemala and Cameroon (both are developing nations, with high malnutrition numbers) were indicative of excess consumption of micro-nutrients

due to fortification. This can be possible for India as well. A study conducted in a village in UP in 2022 showed that out of 14 micronutrients, 4 micronutrients were over-consumed (phosphorus, manganese, magnesium, and sodium). In Table 2, NAR indicates the Nutrient Adequacy Ratio, a ratio greater than 1 indicates overconsumption of a particular nutrient. Consuming phosphorus and manganese beyond the limit is toxic. People with chronic liver illness won't be able to eliminate excess manganese and its accumulation leads to neurological issues. Problems like joint pain, muscle pain and muscle weakness, and red eyes are side effects of overconsumption of magnesium, whereas high sodium intake leads to high blood pressure eventually leading to heart stroke and other diseases.

Table 2- Different micronutrients intake by Rural UP Population

S. No.	Variables	Mean	SD	NAR
1.	Vitamin A (µg)	193.85	327.92	0.32
2.	Calcium (mg)	323.13	326.43	0.41
3.	Riboflavin (mg)	0.93	0.24	0.64
4.	Vitamin C (mg)	27.00	23.00	0.67
5.	Potassium (mg)	2344.90	674.64	0.67
6.	Zinc (mg)	8.67	3.42	0.76
7.	Iron (mg)	17.93	7.91	0.81
8.	Niacin (mg)	12.71	3.93	0.82
9.	Folates (µg)	168.79	25.65	0.89
10.	Thiamine (mg)	1.11	0.22	0.89
11.	Phosphorus (mg)	1355.17	297.08	2.02
12.	Manganese (mg)	11.54	7.22	2.25
13.	Magnesium (mg)	582.54	232.60	2.25
14.	Sodium (mg)	4735.83	355.37	2.37

Source- (Gautam, 2022)

In another study conducted in 2020 in two government-aided schools in Telangana, successful efforts by the government were able to meet the adequacy levels in children but the inclusion of double fortified salt, iron-folic acid supplements, and fortified rice lead to excessive intake of iron by more than 40% of the adequacy

limits. Leading to other risks in children. Bone density reduces along with higher chances of birth defects and liver damage due to excess consumption of vitamin A, risk of hemorrhagic stroke increases with excessive intake of vitamin E, and Cirrhosis, type 2 diabetes, cancer, and cardiovascular disease can all be brought on by consuming too much iron.

The aforementioned evidence suggests that there is a prevalence of excess micronutrient intake, which kills the whole essence of the food fortification programs. As the aim is to add different micronutrients to benefit public health and minimal risk being caused to health. The instances of excess micronutrient consumption turn a blind eye to a diversified and balanced diet.

III. Solution

When it comes to studies either conducted by the government or by other academicians and private research organizations they focus more on a specific section of the population. There is a need to have more holistic research for all age groups and other subsections of the population. Rather than making fortification mandatory in case of a single staple, the focus should be on people having a diversified diet. The government is providing fortified food via different vehicles with colossal budgets to address the problem of micronutrient deficiency, but what is needed here is regular monitoring.

i. Nutrition Early Warning Access System (NEWS)

With the use of big data and Machine Learning, Nutrition Early Warning Access System (NEWS) needs to be adopted for India. This system will be made available in Africa. Using Big Data and Machine learning, International Center for Tropical Agriculture is developing Nutrition Early Warning System (NEWS). This early

warning system will notify policymakers and authorities way before the crisis which will act as a nutrition threat. With the help of data on multiple variables, NEWS will swiftly identify hunger risk vis-à-vis conventional methods. Also, constant surveillance will provide different options for interventions to take place at the national as well as the regional level. Nutrition is indirectly affected by a plethora of factors like- changes in crop yields, climate change, inflation rates, government policies, migration, urbanization, armed conflicts, security threats, and diseases. Various international organizations, NGOs, govt. agencies along with independent researchers are conducting studies to estimate the nutritional levels of the population. With the same research objectives and resources used by different organizations, their hard work and resources could be utilized to reduce nutritional deficits among people. So, with the use of machine learning, this objective can be achieved in a wholesome manner, by keeping a track of different variables and the nutritional status of people, timely and region-specific solutions could be performed on the target population.

IV. Way Forward

The government is already making efforts to inculcate technology in the drive to end malnutrition. But the approach isn't correct. As the health conditions of an individual are changing constantly making changes in the dietary intake is mandatory. ICT-RTM and ICDS-CAS are primarily focused on monitoring the delivery services, another area to look into is constant monitoring of the health requirements of the individual. The already existing infrastructure of ICT-RTM and ICDS-CAS, providing as a strong base to build up this warning system. Along with the use of these technology-related innovations and programs initiated by the government and strengthening the existing program, the government will be able to reduce malnutrition in the long run, thereby achieving SDGs.

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