# Fortification of Rice with minerals for addressing malnutrition.

**(FOT-238)**


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# Introduction: why rice fortification?

Rice is good source of macro and micronutrients in its un-milled form. During milling of rice, the layers of bran that are rich in fat and micronutrients are removed to produce starchy white rice which are commonly consumed. White rice is one of the staple foods in rice growing countries of northeast and southeast Asia, as they are one of the most populated regions in the world. On world's rice production 90% is produced and consumed in Asia. On average, 30% calories come from rice and it can reach up-to 70% in some low-income countries.

Rice is an excellent product for providing micronutrients to huge number of people and has potentially reduced the deficiency of micronutrients among them. However, this will only reach desired results if sensory characteristics of the final product are not significantly altered and people should not object to incorporating fortified rice into their daily diet. Besides using rice to provide micronutrients will only work, as long as people at the bottom of income pyramid can afford it. Rice has very best uptake in government safety net programs (3.4 million metric tonnes). Whether via midday meal school feeding program or by mass public distribution system that provides essential grains to millions of Indians at subsidized prices. In this context, rice fortification turns into superior automobile to build nutritional nutrient gaps and enhance health especially in prone populations.

Micronutrient fortification of staple meal is considered as one of the most cost effective and sustainable answers for enhancing the fitness of entire community. Food fortification prevents deficiency from taking place withinside the first place. It involves addition of essential nutrients like iron, folic acid, vitamin A, and iodine to commonly consumed meal like rice, wheat flour, oil, salt and milk. Only difference between fortified and milled rice is that it maintains its micronutrient content even after being boiled and washed. Generally, fortified rice is mixed with normal rice in ratio of 1:100 to enhance nutrition value of rice consumed by majority of population.

# Hidden hunger: One of the causes of Malnutrition

Malnutrition manifest itself in lot of forms, deficiencies and excesses of macro or micro nutrients. Since deficiencies of vitamins and minerals often go unnoticed, therefore it is also known as **"Hidden hunger"**. All over the world, deficiency of vitamin and minerals affect more than 2 billion people and India is at higher risk of such people because of its diverse population, **"being home to about 60% of anaemic preschool children, 50% of anaemic pregnant women and a quarter of anaemic men"** (source- news18). Although signs of hidden hunger are not visible at early stages as consequences are long lasting and destructive. Around the globe children below 5 years and pregnant women are more prone to micronutrient deficiency that contribute to poor growth, intellectual disability, prenatal complications and increased risk of morbidity and mortality.

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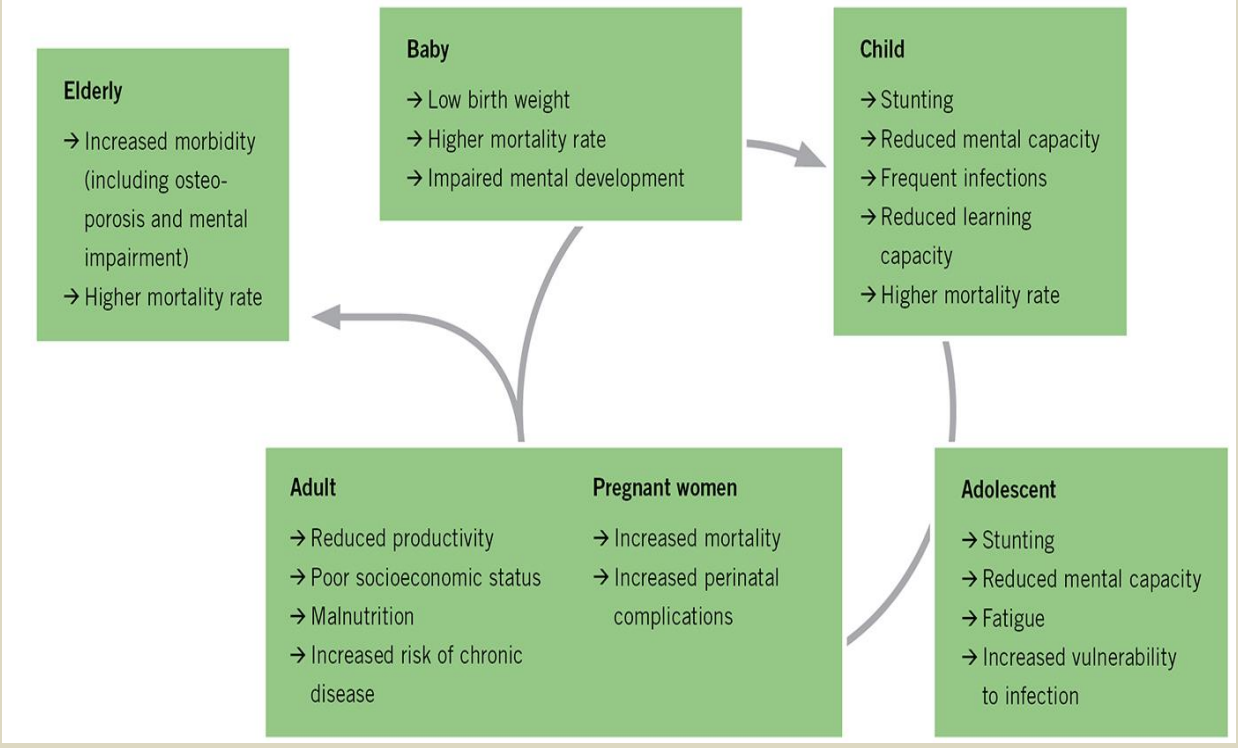
FIGURE 3.3 **CONSEQUENCES OF MICRONUTRIENT DEFICIENCIES THROUGHOUT THE LIFE CYCLE**



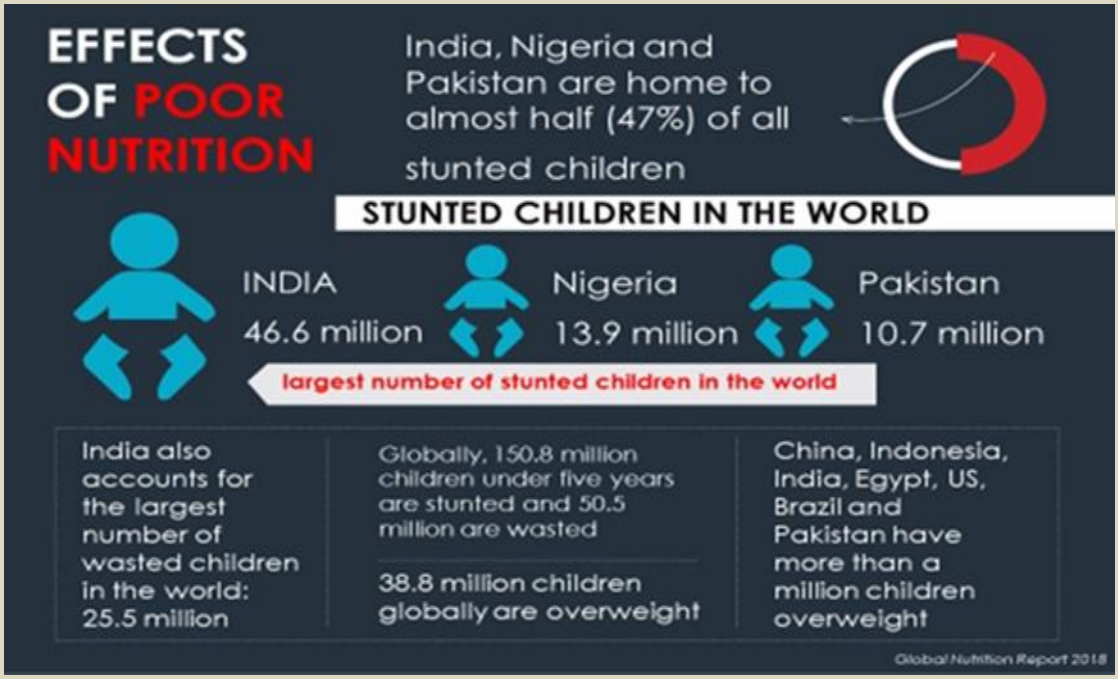
## How fortification of rice can help address Malnutrition? (Ranjan, 2021)

**"Be it rice available at ration shop, rice available in mid-day meal, rice available through every scheme will be fortified by the year 2024**", said Prime Minister Narendra Modi while addressing the nation from the Red Fort in New Delhi on the occasion of India's 75th Independence Day. This announcement via prime minister is great for nation and an act of futuristic approach as authorities distributes over three hundred lakh tonnes of rice under diverse schemes protected below National Food Security Act,2013 (NFSA). The centre has allotted 328 lakh tonnes of rice for Targeted Public Distribution System (TPDS), Mid-Day Meal (MDM) and Integrated Child Development Service (ICDS) under NFSA during 2021-2022.

## The Burden of Malnutrition in India (Ranjan, 2021)

India's greatest countrywide treasure is children; however, child malnutrition stays a primary risk to the survival, growth and development of children. According to Global Hunger Index (GHI) report 2020 India has ranked at 94$^{th}$ position out of 107 countries, while the level of hunger or stages of starvation is categorized as 'serious' with general rating of 27.2. It also says that superiority of wasting among young kids below five years of age in India is quite high. GHI states that, India has maximum wasted (low weight in comparison to their height) about 17.3% children out of the countries assessed.

India is likewise also a home for 14% young undernourished children and 34.7% stunted children of age less than 5 years. Neighbouring countries of India that are Pakistan, Bangladesh, Nepal have secured better rank than India.




## Why food fortification is answer to India's Malnutrition woes?

(Sahetiya, 2021)

According to National family health survey (NFHS) – four conducted via ministry of Health and Family Welfare in 2015-2016, 22.9% of women of age 15-49 years are underweight (BMI less than 18.5kg/$m^2$). These data are combined with number of young malnourished children in the country which are under these grim conditions.

According to FSSAI norms: - 1Kg of fortified rice contains

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|---|---|
| Iron | 28-42.5mg |
| Folic acid | 75-125 microgram |
| Vitamin-$B_{12}$ | 0.75-1.25 microgram |
| Zinc | 10-15mg |
| Vitamin-A | 500-750 microgram |
| Vitamin-$B_1$ | 1-1.5mg |
| Vitamin-$B_2$ | 1.25-1.75mg |
| Vitamin-$B_3$ | 12.5-20mg |

Therefore, rice fortification has the best ability to fill the gap in current food fortification programmes as for about 65% of Indian population staple diet is rice which they consume on daily basis.

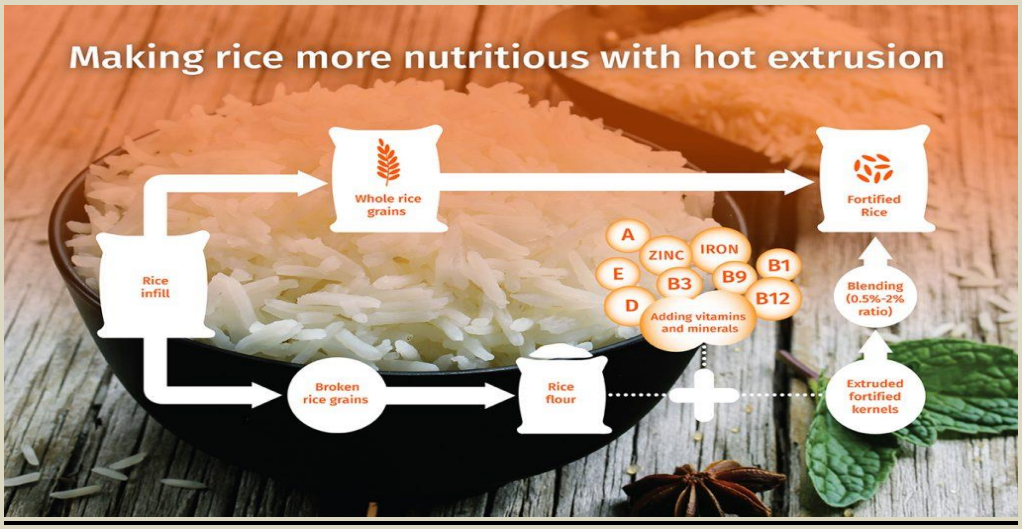
## Ensuring efficiency in Rice fortification methods

There are number of different ways in which rice can be fortified-

1. **Dusting: -** Kernels can be dusted with micronutrient power, counting on electrostatic pressure to bind dry powder to the surface of the grain. During dusting vitamins and minerals can be lost if rice is washed before cooking or cooked in extra water.

2. **Coating: -** Coating is also used in rice fortification. It includes fortification mix and or ingredients like wax or gum to fix micronutrient layer which is spread onto rice as coating. When we use coating to fortify rice, it is important to ensure that kernels are rinse resistant to prevent micronutrient loss through soaking or washing.

3. **Hot extrusion: -** This method provides most sturdy approach to add nutrients and minerals to rice. Nutrients are added to kernels in 2 process – firstly, broken and damaged rice grains are ground to rice flour and mixed with water and desired nutrients to produce rice dough. Then fortified dough is passed through extruder to produce fortified kernels which are blended together with standard rice in ratio of 0.5-2%.



# Success of Rice Fortification

Rice fortification programs provide wealth of sustainable opportunities, both commercially and for public health. Improving health and fitness of population which are vulnerable to malnutrition and 'hidden hunger' worldwide means people individually are able to attain their maximum capability and contribute completely to the society, additionally lowering public healthcare cost. The achievement of extruded fortified kernels attribute to wide variety of factors: -

- **Stability: -** Hot extrusion technology embed the specified micronutrient into the kernel increasing the steadiness of finished product. The nutrient and mineral cannot be washed off if rice is even cooked in extra water; this barrier often arise during dusting and coating technique.

- **Acceptability: -** Rice is a staple diet and are eaten by many on day-to-day basis. The use of hot extrusion technology does not change the appearance and taste of fortified kernels; however, we get the rice of having high nutritional content.

- **Flexibility: -** There are many of kinds of rice varieties to be had withinside the market, any of which may be fortified – from basmati to japonica. This guarantees that customer attraction may be maximized as there may be no want for an individual to alternate their nutritional behaviour to get hold of the advantages of fortification. With distinct necessities from distinct populations, it's far clean that a blanket method might now no longer achieve success in achieving all the ones in want of the advantages of fortification. Fortunately, a huge variety of micronutrient combos may be used to give a boost to rice, imparting bespoke blends in keeping with necessities. This method producers have the functionality to fulfil the wishes of particular groups, including the aged or prone people, in addition to create solution that attract to people to deal with specific health conditions, including immunity or mental health. In addition to assisting enhance the dietary reputation of at-risk people, rice fortification gives rice logo proprietors the possibility to differentiate their merchandise in a saturated market. By growing a healthier product which can deal with specific health needs, including boosting energy levels or immunity, manufacturers can attraction to new audiences and gain competitive edge.

# CONCLUSION

The rice marketplace is continuously evolving and the hooked up the reputation of rice gives a precise possibility to supply crucial micronutrients to human beings throughout the world via secure and cost-powerful fortification. Improving dietary repute of those maximum vulnerable to malnutrition can help to break the poverty cycle benefitting not only individual but also society as whole with increased citizen productivity and reduced healthcare costs.

As fortified rice turns into greater common and countries worldwide look to implement mandatory fortification legislation. It is critical that programs make use of high quality of vitamins, minerals and technology to ensure that malnutrition is addressed effectively

The success of fortification programs is measured through public health impact and sustainability. The latter implies an inter-sectoral method in which, similarly to public health authorities, research, trade, law, education, NGOs, and private sectors all are involved in making plans and implementation of programs. Food fortification can also be carried out with the aid of using harnessing the expertise of private sector to produce and distribute fortified foods.

In our country where change of lifestyle is need of hour, food fortification plays an important role in pushing boundaries, by providing more or less. This method is slow but step by step changing food habits and is supporting country widely devoid of nutritional foods to address micronutrient deficiency for individual and families.

# THANKYOU