FOOD FORTIFICATION FOR FOOD & NUTRITIONAL SECURITY

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Three day Residential Training Programme on
“FOOD & NUTRITION SECURITY”
at AP HRDI, Bapatla
Sixty-seven Years Ago ……..

When India became independent, we faced two major problems, with grave nutritional impact:

✓ Threat of famine and low agricultural production and
✓ Lack of an appropriate food distribution system

These were compounded by:

➢ Low dietary intake because of poverty and low purchasing power
➢ High prevalence of infections due to poor access to safe water, sanitation & health care
➢ Poor utilization of available facilities due to low literacy and lack of awareness

RESULT: Population suffered from CED and micronutrient malnutrition

Our Constitutional Obligation:
Access to good nutrition and health is a fundamental human right and a cornerstone that defines health of all

Article 47 of our Constitution reflects our commitment. It states:
“The State shall regard the raising of the level of nutrition and the standard of living of its people and the improvement of public health as among its primary duties …….”
Despite substantial strides in food grain production,

- Malnutrition amongst children in India is highest in the world
- India has 35% of the world’s malnourished children
- Nearly a third of the world’s hungry reside in India
- About 26% of India’s population - 268 million – are considered food-insecure, consuming less than 80% of minimum energy requirements
The science of **food & its relationship to health**. Its is concerned primarily with part played by nutrients in body growth, development and maintenance. (WHO)

**Food security**
- Accessibility
- Availability
- Affordability

**ENSURING FOOD SECURITY**
- Enough food is available for all the persons
- Persons have the capacity to buy food of acceptable quality
- There is no barrier on access to food.
Malnutrition

Experts call it a **silent emergency** for the country:

Nearly **50%** of children under the age of **5** are malnourished.
Nutrients

- Nutrients are organic & inorganic complexes contained in food.

1. **Macronutrients**: These are Proteins, Fats & Carbohydrates which are often called “Proximate Principals” because they form the main bulk of food.

2. **Micronutrients**: These are Vitamins & Minerals. They are called micronutrients because they are required in small amounts which may vary from a fraction of a milligram to several grams.

**Key Micronutrients**

- Iodine
- Iron
- Vitamin A
- Folic acid
- Zinc
- Vitamin D
- Calcium
- Other micronutrients: Vitamin B2, B6, B12
The eatwell plate

Use the eatwell plate to help you get the balance right. It shows how much of what you eat should come from each food group.
Micronutrient Deficiencies in India

Micronutrient deficiencies such as:

- Iron deficiency anaemia (IDA)
- Vitamin A deficiency (VAD) and
- Iodine deficiency disorders (IDD) continue to be significant public health problems in India.

- Low plasma levels of **zinc, folic acid & vitamin D**
- Sporadic deficiencies related to **Vit B12, B1, B2**
- Evidence of increasing fracture risk of Indian population attributed to calcium & Vitamin D deficiency has also been reported in the recent past.
Why Focus on Hunger and Malnutrition?

Hunger and malnutrition stunt growth - intellectually and physically, leading to:

- **premature death,**
- **disability, life-long susceptibility to illness,**
- **poor cognitive and learning skills,**
- **low achievement in school,**
- **low productivity and low wages, and hence poverty**

**Malnutrition Affects:**

- Health and Survival
- Educability
- Economic Productivity
- Disability

These are Irreversible BUT Preventable!

**Micronutrient Malnutrition Impacts:**

- Learning ability
- School performance and Retention rates
- Speech & hearing defects

These are Permanent!

Malnutrition starts early... Right from the Womb

Stagnating child and maternal malnutrition rates, including micronutrient malnutrition are at very high levels and their impact is devastating…. *This is unacceptable!!*
Micronutrient Malnutrition: 3 Options to Control

**Supplementation**
- Two high-doses of Vit A per year
- Iron syrup and capsules
  - A safe and efficient strategy for eliminating VAD & Anaemia for improving child survival.

**Dietary Diversification**
- Food prices spiralling and hence mostly cereals and tubers. Low in vegetables, fruits and lentils
- Non-anima sources comprise > 80% of intake.
  - Implementation and Scaling up difficult,

**Food Fortification**
- High consumption of Staples
- Great hope for long-term control of MND.
  - Potential to reach all income groups through basic food items with minimal changes in eating habits.

**GOI programmes reach only about 55% of the children. Compliance is also an issue**

**Affordability of a diversified diet is a big question**

**Only about 2% foods available in the market are estimated to be fortified**

Of these options, **fortification** is most efficient on account of **comparatively lower cost to implement** & ability to **yield significant results** in a **short period of time**.
Food Fortification

• WHO – “The process whereby nutrients are added to foods (in relatively small quantities) to maintain or improve the quality of the diet of a group, a community or a population.”

• Food fortification is generally recognized as being the most efficient as well as the most cost effective measure of eliminating micronutrient deficiencies and has been successfully used as a tool to fight against these deficiencies.

• Pellagra in US was successfully combated through breads enriched with a combination of Vitamin B complex and iron.

• Multi-nutrient fortification further increases the cost effectiveness of fighting various deficiencies through one food product e.g., iron and vitamin C.
Food Fortification

• The right food to be fortified, the right amount and the combination of nutrient and the most bioavailable form of the nutrient should be selected for successful fortification.

• With the elimination of nutrition deficiencies, adverse consequences such as reduced IQ, impaired growth and work capacity are reduced.

• Food fortification is the safest way to deliver necessary amounts of micronutrients to the majority of a population in an effective manner – it even reaches secondary target risk groups like elderly and those who have an unbalanced diet.
Enrichment

- **Enrichment** is defined as "synonymous with fortification and refers to the addition of micronutrients to a food which are lost during processing."

- When foods are processed, they often lose some of the important nutrients such as vitamins and minerals in the process.

- If the food is labeled “enriched” then the vitamins and/or minerals which were lost have simply been added back to restore it to it’s original nutritional value.

- Many consumers think that “enriched” means that the food has extra nutrients added to it which will make it more nutritious. That is not true. It has simply been restored to it’s original state.
When foods are labeled “fortified” with something, that means that an extra amount has been added beyond the amount that was present before it was processed.

Companies which make foods high in sugar, such as breakfast cereals will label the package “fortified with vitamins and minerals”. Since the product is high in sugar, they are trying to make it look as if it is healthy.
Types of Food Fortification

The 4 main methods of food fortification

- **Biofortification** (i.e. breeding crops to increase their nutritional value, which includes both plant breeding and genetic engineering)
  - Examples: Iron-biofortification of rice, beans, sweet potato & legumes
  - Zincbiofortification of wheat, rice, beans, sweet potato & Maize
  - Provitamin A carotenoid-biofortification of sweet potato, maize, and cassava.

- **Microbial biofortification** and synthetic biology (i.e. addition of probiotic bacteria)

- **Commercial and industrial fortification** (i.e. flour, rice, oils)

- **Home fortification** (e.g. vitamin D drops)
Attempts have been made in India to fortify water and foods so as to prevent micronutrient deficiency. These include:

- Fluoridation of water to control dental caries,
- Iodization of salt to control Iodine Deficiency Disorder,
- Fortification of ‘Vanaspati’ (hydrogenated fat),
- Milk with Vitamin A and D.
History of Food Fortification

- 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
CRITERIA

1. Should be consumed by high proportion of population.
2. Unrelated to socio-economic status.
3. Low potential for excessive intake.
4. No change in consumer’s acceptability.

Technical Criteria
- Minimal segregation of fortificant and vehicle.
- Centrally processed
- Minimal regional variation.
- Good masking quality.
- Simple, low cost technology.
- Limited shelf-life.
- High bioavailability.
How Micronutrients Impact Our Quality of Life

- Improved Vitamin and Mineral Status
- Improves Immunity
- Decreases Anemia
- Improves Cognitive Skills & education
- Better School Achievement
- Increased Productivity & incomes
- Decreased Mortality
- Improved Quality of Life

As policy makers, nutrition professionals, economists and business representatives, we cannot stand by while micronutrient deficiencies cause enormous loss of life and impose chronic disabilities of mind and body on future generations in India
<table>
<thead>
<tr>
<th>Vehicles</th>
<th>Micronutrients</th>
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<tbody>
<tr>
<td>Edible common salt</td>
<td>Iron and iodine</td>
</tr>
<tr>
<td>Whole wheat flour &amp; Maida</td>
<td>Iron, folic acid, calcium, zinc</td>
</tr>
<tr>
<td>Rice</td>
<td>Iron, folic acid, calcium, zinc</td>
</tr>
<tr>
<td>Vegetable oils</td>
<td>Vitamins A &amp; D</td>
</tr>
<tr>
<td>Milk and Dairy products</td>
<td>Vitamin D, A iron, folic acid, calcium, Omega-3,6 fatty acids</td>
</tr>
<tr>
<td>ICDS supplementary foods</td>
<td>Iron, folic acid, calcium, zinc</td>
</tr>
<tr>
<td>Sugar</td>
<td>Vitamin A</td>
</tr>
<tr>
<td>How to Started..??</td>
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<td>✓ Brought together stakeholders including the Industry partners through informal and formal discussions</td>
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<td>✓ Discussed nutrition and health issues and highlighted their role in malnutrition reduction</td>
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<td>✓ Many food processors got encouraged and wanted to start fortification</td>
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<td>✓ Undertook Industry assessment to understand the need for capacity enhancement</td>
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<td>✓ Managed fears / apprehensions / eliminated myths of Industry and consumers through active scientific, social and media engagements</td>
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<td>✓ Strengthened systems for external regulatory monitoring, Tie up with govt officials</td>
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<td>✓ Organized many Media Workshops and Community Events to create awareness and demand through print, electronic and social media</td>
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Launch of Fortified Foods
Fortified Common Salt

• Common salt has been selected as a suitable vehicle for fortification of iodine to control IDD (Iodine Deficiency Disorder).
• Salt consumption is consistent & universal. It’s consumption lies within a narrow range of 12-20g/day, with an average intake of 15g/day.
• A relatively small number of industries produce most of the edible salt in India.

Iodine Fortified Salt: Iodization of salt is a time tested, effective and economical means of combating IDDs. Many developed countries have successfully eliminated IDD. In India, iodized salt was initially introduced in goiter endemic areas. Currently, the government has adopted the policy of universal iodization of salt.

• The technology involved in fortification of salt with iodine is either dry mixing/spray mixing of salt with iodine source.
• However, the impurities present in salt adversely influence the stability of iodine compounds added to it thus iodine stabilizers are added such as calcium carbonate/sodium aluminum silicate. 
Iron Fortified Salt:
• NIN (National Institute of Nutrition) has developed iron fortified salt which has been found to be very effective in reducing iron deficiency anemia in the community.
• This salt contains 1mg of iron/g salt (from ferrous sulphate), stabilizers and absorption promoters.

IRON & IODINE FORTIFIED COMMON SALT/DOUBLE FORTIFIED SALT (DFS):
• To maintain the stability of iodine in DFS (which is otherwise unstable in the presence of iron), a polyphosphate, sodium hexametaphosphate (SHMP) is included.
• This would provide 1mg iron and 30mg of iodine per gram of salt.
• The cost of DFS works out to about Rs.3/Kg

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Amount</th>
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<tbody>
<tr>
<td>Common salt g</td>
<td>1000</td>
</tr>
<tr>
<td>Ferrous sulphate g</td>
<td>5</td>
</tr>
<tr>
<td>Sodium hexametaphosphate</td>
<td>10</td>
</tr>
<tr>
<td>Potassium iodate</td>
<td>50</td>
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Composition of double fortified salt
Fortified Cereals

**RICE**

- Choosing rice as a vehicle for fortification has distinct advantages.
- It is the main dietary staple in many countries. Day-to-day consumption of rice is almost constant within each age group, gender and all income and occupational categories of population.
- The other reason which favor the selection of rice India produces 140.22 lakh tones and 400g/day per person consumption.

**ULTRA RICE**

- It is reconstituted vitamin A or iron fortified rice.
- A fortified rice is made by blending either Vitamin A acetate/palmitate as fortificant into rice flour and extruding the paste.
- Fortifying rice with both vitamin A and iron is not possible because Vitamin A gets oxidized by iron leading to discoloration of rice on storage.

**WHEAT FLOUR**

- Fortification of wheat is by Ferrous sulphate /ferrous fumerate/ferrous gluconate/ferric sodium EDTA are the fortificants for iron and retinyl palmitate for Vitamin A.
- An amount of 0.12g of food grade ferrous sulphate and 12mg of Vitamin A palmitate CWS (cold water soluble) is added for a kg of wheat flour.
Fortification of rice

- Paddy rice
- Rice millers
  - Broken rice / head rice
  - Fortified kernels
- Fortified kernel producers
- Fortified producers & suppliers
- Rice blending
  - Distribution and sales channels
  - Social distribution channels
  - Consumers

* For extrusion technology broken rice can be used to produce fortified kernels, with coating technology head rice is required.
SOME FORTIFIED PRODUCTS

Red Label Natural Care: Tea fortified with Ayurvedic herbs. Proven to enhance immunity.

Annapurna Salt was one of the first brands to market iodized salt in the country.

Kissan Creamy Spreads fortified with vitamin A, D, E and contains Omega 6, essential for growth & development of children.

Kissan Soya Milk and Fruit Juice and Soya range: Fortified with vitamin B1, B2, B3, B6, B12, C, iron and zinc.
Foods and Channels Used for Fortification

**Integrated Fortification Project**

- **Fortification of Foods Provided Under Public Funded Programs**
  - **ICDS**
    - Children 3-6 yrs: Fortified wheat flour/fortified rice/fortified soyadal analogue, iodized salt and fortified oil
  - **Midday Meal programme**
    - Fortified wheat flour/fortified rice/fortified soyadal analogue, iodized salt and fortified oil
  - **PDS**
    - Fortified wheat flour in place of/ conjunction with grains, iodized salt & fortified oil

- **Mass Fortification of Foods Through Commercial Channels**
  - Fortified Foods through Open market
    - Wheat flour
    - Rice
    - Milk
    - Oil
    - Salt
Fortification in Government Programmes

Children consuming midday meal at school provided through MDM Scheme (Source: Akhaya Patra)
Supplementary Nutrition (SN) supplied under ICDS Scheme is of two types for different beneficiaries, i.e.,
• Take Home Ration (THR) for pregnant women, lactating mothers, and children in the age group of 6 months to 3 years.
• Hot cooked meal for children in the age group of 3 to 6 years. SN served to the beneficiaries is to be prepared as per the National Food Security Act, 2013 which provides food security to the people.
Fortification in Government Programmes

• SABLA is a centrally sponsored scheme for all-round development of 11 to 18 years old adolescent girls.
• The scheme has a special focus on all out-of-school adolescent girls and is implemented using ICDS.

• Fortified wheat flour
• Fortified rice
• Fortified oil
• Double fortified salt:
Policy Advocacy Leading to Regulatory Support for Fortification

Current regulation and supportive environment:

- The Food Safety and Standards Authority of India (FSSAI) permits fortification of foods

- National Nutrition Mission highlights the need to focus on micronutrient fortification.

- India’s 10th, 11th and 12th Five Year Plans recommend food fortification as an important strategy to tackle micronutrient malnutrition.

- Ministry of Food Processing Industry, GOI, provides financial assistance to the Food Industry for capital equipment and its installation for undertaking fortification, and value addition.
Challenges

✓ Nutrition and Food Fortification are not sufficiently prioritized in India and resources for nutrition improvement are not optimised

✓ Lack of effective overall consensus and coordination between sectors at national level on how to move forward for improving nutrition and health

✓ Insufficient motivation and capacities at national and decentralized level to design, implement and monitor interventions

✓ Mainstreaming fortified wheat flour in the Public funded programs like Public Distribution System, ICDS and MDM

✓ Food Processors desire fortification to be made mandatory to give them a level playing field
WAY FORWARD

1. Staple Food Fortification is do-able and very cost-effective
2. Food fortification does not lead to organoleptic changes and hence widely acceptable
3. Processing is simple and does not require expensive equipment.
4. Food industry can thus do it at very low investment
5. Industry is responsible and ensures appropriate fortification and takes pride in contributing to nutritional improvement

✓ Strengthen regulatory monitoring to ensure the quality and safety of fortified foods
✓ Make it mandatory to fortify oil and milk with vitamin A and D
✓ Create awareness about the goodness of fortified foods.
✓ Nutrition is a cross-cutting issue and coordinated efforts of many sectors are required ….. We need to join hands and not work at cross-purpose
✓ Staple Food Fortification is an evidence based strategy and a practical solution which needs to be scaled up in India
Advantages & Disadvantages

• Providing certain nutrients simultaneously in the same food improves the utilization of certain vitamins and minerals, iron
  e.g. Vitamin C
• Enhances the absorption of nutrients through the regular food supply and distribution system reduces costs.

Disadvantages

• Shelf life of fortified milled cereals is reduced
• Regular quality control is essential.
• Prolonged cooking of fortified food leads to 90% loss of vitamin C
• Fortified commodity is more expensive.
Fortified Foods – Take a sneak peak

Start identifying the fortified brands & demand whenever you shop next

ffrc.fssai.gov.in

*Illustrative list of players
#WhyFortification
## Future Challenges of Food Fortification

- Create **community awareness** about benefits of food fortification.
- Private Sector, Governments & International Agencies need to make **commitments** for investing in food fortification.
- Ensure increased **availability** of fortified foods to the vulnerable groups of populations.
- Governments & International Agencies should encourage fortification by way of **tax concessions** or **duty rebates**.
- Regulatory authorities to recommend **Uniform Food Fortification Guidelines** to the group countries.
- Develop **Technologies** that will produce the Futuristic food.
Conclusion

• Food fortification is ready for globalization, and ready to target those micronutrient deficiencies highly prevalent in low- and middle-income countries.

• Opponents of fortification argue that nutritional education with respect to a well-balanced diet is a more logical approach than fortification.

• It is important to understand these different viewpoints, but equally important to move forward in a responsible way with what is most beneficial to the largest numbers of people whose lives would otherwise be compromised without the essential vitamins and minerals in their diet, what we needed is a balanced approach.
Conclusion

• Together with food fortification programs, public health interventions should focus on the elimination of other underlying causes of micronutrient deficiencies.

• In the developing world, e.g., these could include improvements in sanitation that would decrease infection and improve nutrition and decreased immunity because of Vitamins and mineral deficiency, that can improve the standard of living of a family that result in a better quality diet.
Let us not shy away from our collective responsibility of providing good health and improved quality of life to all!

Lets Eat Right … Lets Eat Fortified

THANK YOU !!