Universal Salt Iodization:

Prevention of Iodine Deficiency Disorders
What is iodine?

- Nutrient needed in a minute quantity daily.
  Recommended daily intake: 150 μg (Micronutrient)

- Total quantity present in body is (15-20 mg) mostly in thyroid gland
What is iodine? - 2

- Iodine: Essential component of thyroid hormones, which are needed for:
  - Optimal mental & physical development
  - Regulation of body metabolism
    (Generation & utilization of body energy)
  - One tea spoonful is needed for an entire lifespan of 70 years.
## Iodine: Daily Requirements

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Iodine Requirement (µg/day)</th>
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<tbody>
<tr>
<td>0 – 11 months</td>
<td>50</td>
</tr>
<tr>
<td>12 – 59 months</td>
<td>90</td>
</tr>
<tr>
<td>6 – 12 years</td>
<td>120</td>
</tr>
<tr>
<td>≥ 12 years</td>
<td>150</td>
</tr>
<tr>
<td>Pregnant &amp; Lactating Women</td>
<td>200</td>
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What is Iodine Deficiency Disorders (IDD)?

• Iodine is an essential component of Thyroid hormones, it is needed for – optimal mental and physical development and regulation of body metabolism.

• The disorders caused due to deficiency of nutritional iodine in the food/diet are called Iodine Deficiency Disorders (IDDs).

• It results in physical and mental retardation. It affects people of all ages, both sexes and different socioeconomic status.
Iodine deficiency disorders: A public health problem

Worldwide distribution
House Hold Iodised Salt Coverage: 2010

Source: Global Score Card 2010
Present Scenario in Odisha

- ODISHA
  - NFHS-III (2005-06) $\rightarrow$ 32.4%
  - CES (2009) $\rightarrow$ 64%
  - ISCS (2010) $\rightarrow$ 59%
  - RSOC (2014) $\rightarrow$ 85.7%
  - RSOC (2014) $\rightarrow$ 77.1% among STs.

- INDIA
  - CES, India (2009) $\rightarrow$ 71%
  - RSOC, India (2014) $\rightarrow$ 67.4%
Major findings of a documentation exercise done by MKCG Medical college - 2015

• Documentation was done in 9 districts, 3 from each of the 3 revenue divisions.
• Still 17.1% of households consume both Bargara salt and fine salt and 3.9% of households consume only Bargara salt.
• Awareness level on Iodised salt is only 31.4%.
• On an average 76% of households practice faulty salt storage practice.
• The mean iodine content of the salt samples collected from shop, AWC or school was <15 ppm.
• Mean Iodine content in household salt samples was also < 15 ppm (Rayagada and Malkangiri <10 ppm).
• Median urinary iodine level was <100 mcg/l in 4 districts (i.e. mild deficiency) – Malkangiri, Rayagada, Nayagada, Keonjhar.
• Problem is greater in Tribal and Southern districts. Presence of duplicate brands in the market cannot be denied.
• 50,000 brain cells produced/second in developing fetal brain

• 100 billion brain cells in adult

• One million billion connections between these brain cells: Determine IQ
Importance of iodine in brain development - 2

100 billion brain cells in adult human

Comparable to the number of stars in the sky
Importance of iodine in brain development - 2

- Diminished brain cell branching due to iodine deficiency
- Diminished branching $\rightarrow$ Less connections $\rightarrow$ Lower IQ
Importance of iodine in brain development - 3

90% of human brain development occurs between 3rd month of pregnancy & 3rd year of life
(Critical period)
Deficiency of iodine during critical period of development results in permanent brain damage.

Brain damage can be prevented by correcting iodine deficiency before & during pregnancy.

It's vital that all expectant & lactating mothers get their daily requirement of iodine.
Importance of iodine in brain development - 5

Iodine deficiency in foetal life and early childhood remains single most important and preventable cause of mental retardation globally

Spectrum of IDD

- Goiter
- Cretinism
  - Spontaneous Abortions, Stillbirths, Birth Defects
  - Defects of Speech & Hearing, Squint, Psychomotor defects
- Loss of 13 IQ points, Leading Cause of Mental handicap
Loss of Energy due to Hypothyroidism

Loss of IQ

Mild and Moderate Brain Damage

Cretinism

Severe Brain Damage

Goitre

Iceberg of IDD
Effects of Iodine Deficiency on Foetus

- Birth Defects
- Still Births
- Spontaneous Abortion
- Psychomotor Defects
- Mortality
Effects of Iodine Deficiency on Neonates

- Prematurity
- Hypothyroidism
- Mental Retardation
- Goitre
- Mortality
Effects of Iodine Deficiency on Children & Adolescent

- Hypothyroidism
- Goitre
- Impaired Mental Function
- Retarded Physical Development
Effects of Iodine Deficiency in Adults

- Impaired Mental Function
- Goitre & its Complications
- Iodine Induced Hyperthyroidism
- Hypothyroidism
The Intelligence Quotient (IQ) score of children living in an iodine deficient environment is nearly 13 IQ points less than those living in iodine sufficient environments.

Even mild iodine deficiency could prevent children from attaining their full intellectual potential.
Implications of loss of IQ

Human Resource development

Right of Children to Free and Compulsory Education Act, 2009. No. 35 of 2009

Every child in the age group of 6-14 years will be provided 8 years of elementary education in an age appropriate classroom in the vicinity of his/her neighbourhood

- Poor scholastic performance
- Frequent failures / grade repetitions
- Absenteeism / Dropouts
- Impact: Retarded social & economic growth
Effects on livestock

- Goiter
- Hypothyroidism
- Reproductive disorders
- Decreased productivity
  - (Milk, meat, wool, eggs)
- Lower work output
FACTORS RESPONSIBLE FOR IODINE DEFICIENCY DISORDERS

- **Environmental Factors** – Iodine is found in oceans which volatizes into the atmosphere. It is returned to earth by rain, completing the cycle. As this cycle is uneven and slow in many regions, soil and ground water become deficient in iodine content. Rivers flowing down the hills, flooding, modern agriculture methods are also responsible for this loss of trace element in the soil and food.

- **Goitrogen** – Chemical substances present in natural foods which interferes with the normal utilization of iodine in the body. These compounds are – Flavonoids, Sulfurated organics, lithium, DDT, phenol derivatives, inorganic iodine, poly-cyclic aromatic hydro-carbons etc.
Iodine deficiency – Disease of the soil

Gradual leaching of iodine from soil due to:

- Melting of Glaciers
- Floods
- Rivers changing course
Iodine deficiency: A disease of the soil

**SOIL EROSION**: WATER, SOIL  Environmental iodine deficiency

- **Low Availability**: PLANTS  Iodine poor feeds & fodders, goitrogens

- **Effect on animals**: LIVESTOCK  Clinical & Reproductive disorders, Decreased productivity

- **Effect on people**: HUMANS  Health & Socio-economic impact
Our Primary Concern

To ensure that:

• Every population *should* &
  • Every mother & child *must*

Get their daily supply of iodine
Vehicle for Iodine: Salt

- One food item consumed every day, by everybody in fixed quantities
- Everyone consumes salt almost everyday.
- **Average daily consumption in India per person is 10 gm.** Therefore salt iodine content at 15 ppm can provide 150 micrograms of iodine on a daily basis.
- **WHO recommendation** limits average consumption of salt per person per day at 5 gms. If the salt iodine content is 30 ppm at consumption level and on an average 5 gm of salt is consumed per day, it can provide 150 micrograms of iodine to our body.
- **Iodization of salt is a simple process**
- **Cost of salt iodization is: 10 paise/person/year.**
- The simplest method to prevent the broad spectrum of IDD is to consume iodated salt daily.
Iodized salt – The panacea for iodine deficiency

Salt production and iodization (Supply)

Promotion of Iodized Salt Consumption (Demand)
a. Manufacturing Level: Not less than 30 parts per million (ppm) on dry weight basis.

b. Distribution/Consumption level: Not less than 15 parts per million (ppm) on dry weight basis.

- Salt is iodized with potassium iodate (KIO3) in our country, as it is very stable and its melting point is 530°C.
- Lemon juice is not a test of salt iodine content. Specially procured ‘Salt testing kit’ is required to qualitative testing.
- Iodine content of iodated salt is estimated by a Lab test called iodometric titration. Urinary Iodine Excretion (UIE) is another method to determine iodine intake level an by individual or a population.
## IDD PREVALENCE INDICATORS AND CRITERIA FOR CLASSIFYING IDD AS A SIGNIFICANT PUBLIC HEALTH PROBLEM

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
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<tbody>
<tr>
<td>Goitre &gt; 0</td>
<td>5-19.9%</td>
<td>20-29.9%</td>
<td>&gt;_30%</td>
</tr>
<tr>
<td>Median Urinary Iodine Excretion (UIE) (Microgram/I)</td>
<td>50-99</td>
<td>20-49</td>
<td>&lt;20</td>
</tr>
</tbody>
</table>
Cost of Iodization

- Iodisation: 28%
- Common salt: 33%
- Polybags & packaging: 26%
- Rail freight & Dist. to retail: 11%
- Wholesalers and retailers margin: 2%
Overview of N.I.D.D.C.P.

- **In 1962** – National Goiter Control Programme after Kangra valley study (1956)
- **In 1968** - Iodized salt brought under PFA Act.
- **In 1987** - Iodized Salt brought under revised PFA Act.
- **1992(Aug)** - NATIONAL IODINE DEFICIENCY DISORDERS CONTROL PROGRAMME (NIDDCP) LAUNCHED.
- **In 1997** - Sale & storage of non-iodized salt banned.
- **In 2000** - Central Government lifted ban on sale of non-iodized salt.
- **In 2001** - Complete Ban on Sale & manufacture of Non-Iodised salt for human consumption imposed in Odisha - vide Notification No. 12544 Dated 18.10.2001
- **The Central Government banned the sale of non-iodated salt for direct human consumption in the entire country with effect from 17th May, 2006 under the Prevention of Food Adulteration Act 1954, under FSSAI Act 2006**

The Hourglass of IDD

Historic view 1962-1983

Iodine Deficiency = Goiter = Visible Swelling
No Pain, Cosmetic problem
Cretinism: A rare event
= LOW PRIORITY

Current view 1984 onwards

Brain Damage
Lack of Energy - hypothyroidism
Learning Disability, ↑ Deaths
Child Development & Child Survival
Human Resource Development
= HIGH PRIORITY
AIMS

• TO PREVENT, CONTROL AND ELIMINATE IDD (ABORTIONS, STILL BIRTHS, MENTAL RETARDATIONS, DEAF MUTISM, SQUINT, DWARFISM, GOITRE, NEUROMOTOR DEFECTS ETC.)

Goal: To reduce prevalence of Iodine deficiency disorders (goiter prevalence among school going children) below 10% in the country by 2012 A.D. Now it has been revised to reduce it to below 5% by 2017.
Objectives and components of NIDDCP

• Facilitate surveys to assess the magnitude of the Iodine Deficiency Disorders.
• Supply of iodated salt in place of common salt in every state.
• Resurvey after every 5 years to assess the extent of Iodine Deficiency Disorders and the Impact of iodated salt.
• Laboratory monitoring of iodated salt and urinary Iodine excretion.
• Health education & Publicity.
• Convergence with Salt dept, PDS, Food safety and other social safety net programs.
# Do’s and Don’t’s of Iodised salt

<table>
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<tr>
<th>Do’s</th>
<th>Don’t’s</th>
</tr>
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<tbody>
<tr>
<td>• Store Iodized salt in an airtight container made of plastic, glass, wood or clay with a well fitting lid.</td>
<td>• Do not leave the salt exposed in open as iodine gets lost due to evaporation. Do not store in metal box.</td>
</tr>
<tr>
<td>• Consume Iodized salt as early as possible.</td>
<td>• Long kept iodized salt loses iodine. Do not store salt beyond 6 months.</td>
</tr>
<tr>
<td>• Prevent moisturization of salt. Due to moisture, iodine gets dissolved and gets deposited at the bottom of the container.</td>
<td>• Never store iodized salt in damp, poorly ventilated place.</td>
</tr>
<tr>
<td>• Avoid direct heat and sunlight to iodized salt.</td>
<td>• Do not store salt in cut packets.</td>
</tr>
<tr>
<td>• Always check for the iodized salt logo on the packet before buying.</td>
<td>• Do not buy open Bargara salt (not even for cattle consumption)</td>
</tr>
</tbody>
</table>
What schools, teachers and headmasters can do –

• Ensure that only adequately iodized salt of known brands are procured for MDM and school hostels.
• Make sure that Iodized salt is stored in an air tight container (plastic/glass container).
• Orient school children on the importance of iodized salt so that they champion for the cause in their own households and community.
• Orient parents on use of Iodized salt during parents teachers meeting.
• Do not allow moisturization to happen in Iodized salt or store the salt packet cut open.
Way Forward:

- Supply of Iodised Salt through PDS (already proposed to Govt. of Odisha).
- Multi Sectoral approach in NIDDCP.
- Check presence of duplicate/poorer brands/non-iodized Bargara salt in the market.
- Community level monitoring by teachers/ASHAs/AWW/ANM/PRI.
thank you...