Iodine Deficiency Disorders:

Reaching the goals in the 12th plan period

NAMS - NFI SYMPOSIUM
on
MICRONUTRIENT DEFICIENCIES

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Salt for Freedom And Iodized Salt For Freedom from Preventable Brain Damage

Outline

1. 12th Five Year Plan and IDD
2. Burden of IDD- global/India
3. Success story IDD program in India
   - Research to policy to program
4. Key challenges in IDD
   - Inequitable coverage
   - Lack of national/state level data
   - Monitoring and Quality control
5. The way forward
Take Home Message

• For elimination of Iodine Deficiency Disorders (IDD), adding iodine to salt is a simple technology

• IDD elimination program is one of the public health success stories in India

• Sustainable elimination of IDD in 12th plan period is imminently feasible goal

• What is required is “mission approach” with mainstreaming and up scaling of IDD elimination activities
Earliest evidences of Goitre

• Chinese text from 2838 – 2698 B.C. lists the seaweeds *Sargassum* as an efficacious remedy against goitre

• Incantation on goitre 2000 BC in *Atharva Veda*

• "*Galaganda*” referenced in works of Sushruta and Charaka (500 BC)
Goitre has been known since the days of Lord Buddha -500 BC

Goitre is as old as human civilization
Iodine deficiency – A disease of soil

- **Climate Change**
  - Glaciations, Deforestation, Flooding
    - Gradual Leaching of Iodine

- **Soil erosion**
  - Environmental iodine deficiency

- **Low iodine content of food**
  - Iodine poor feeds & fodders, goitrogens

- **WATER, SOIL**

- **PLANTS**
  - Iodine poor feeds & fodders, goitrogens

- **HUMANS**
  - Health & Socio – economic impact

- **LIVESTOCK**
  - Clinical & Reproductive disorders, decreased productivity

**Effect on Humans**

**Effect on Animals**
Severe Brain Damage: Tip of the Iceberg

- Loss of Energy due to Hypothyroidism
- Loss of IQ
- Mild and Moderate Brain Damage
- Severe Brain Damage
- Cretinism
- Goitre

Loss of Energy due to Hypothyroidism
Importance of Iodine in Brain Development

• 90% brain development takes place from 3rd month of pregnancy to 2nd year of life

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
Salt for Freedom And Iodized Salt For Freedom from Preventable Brain Damage

Outline

12th Five Year Plan and IDD goals
12th Five year plan
IDD goals (2012-17)

• Universal use of iodine fortified salt
  – To bring down prevalence of IDD below 5% in the entire country by 2017 AD
  – To ensure 100% consumption of adequately iodated salt (15 PPM) at the household level
Proposed activities to achieve 12\textsuperscript{th} Plan IDD goals (1)

- IDD Surveys
- Establishment of IDD Control Cells
- Establishment of IDD Monitoring labs
- Training Programme
- Production and distribution of iodated salt
- Health Education and Publicity
Proposed activities to achieve 12th Plan IDD goals (2)

• Community level iodated salt testing

• Incentive to ASHA for Community level awareness of iodated salt

• Strengthening of Central IDD Control Cell

• Health education and publicity by the State/UT’s Health Directorate
Salt for Freedom And Iodized Salt For Freedom from Preventable Brain Damage

Outline

Burden of IDD
Global Burden of IDD

Degree of public health importance of iodine nutrition in SAC based on median UIC in 2011

- Moderate iodine deficiency (UIC 20-49 μg/L)
- Mild iodine deficiency (UIC 50-99 μg/L)
- Optimal iodine nutrition (UIC 100-199 μg/L)
- Risk of iodine induced hyperthyroidism (UIC 200-299 μg/L)
- Risk of adverse health consequences (UIC > 300 μg/L)
- Subnational data *
- No data

* The country estimates in the cross-hatched countries are based on subnational data. The national coverage of iodized salt in these countries is incomplete, there are large variations in the iodine intake and some regions likely remain deficient.

Burden of IDD in India

Total estimated population at risk of IDDs in India: 350 million

Calculated based on 71% iodised salt coverage as per Coverage Evaluation Survey -2009 and Population of India (Census – 2011)
### IDD Endemic states and districts in India

Survey by Central & state Health Directorates, ICMR and Medical Institutes

#### 365 Districts Surveyed and 303 were Endemic

<table>
<thead>
<tr>
<th>States</th>
<th>TD</th>
<th>SD</th>
<th>ED</th>
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<tr>
<td>Meghalaya</td>
<td>7</td>
<td>4</td>
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</table>

**TD:** Total Districts  
**DS:** Surveyed Districts  
**ED:** Endemic districts

Endemic districts: Prevalence of Goitre ≥10%
Iodine Deficiency Disorder
Endemic States (Cont…)

Survey by Central & state Health Directorates, ICMR and Medical Institutes

365 Districts Surveyed and 303 were Endemic

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<th>States</th>
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<td>Tamil Nadu</td>
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<td>Tripura</td>
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<td>Uttar Pradesh</td>
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<td>West Bengal</td>
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<td>Andaman &amp; Nicobar</td>
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<tr>
<td>Daman &amp; Diu</td>
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<td>1</td>
<td>1</td>
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<tr>
<td>Dadra &amp; Nagar Haveli</td>
<td>1</td>
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<td>1</td>
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<td>NCT of Delhi</td>
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<tr>
<td>Lakshadweep</td>
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<td>0</td>
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<tr>
<td>Puducherry</td>
<td>4</td>
<td>4</td>
<td>2</td>
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</tbody>
</table>

TD: Total Districts
DS: Surveyed Districts
ED: Endemic districts

Endemic districts: Prevalence of Goitre ≥10%
Evolution of success story of IDD program in India
Iodized salt consumption at household level in India (Coverage Evaluation Survey 2009)

Phases of Evolution of IDD program in India

Phase 1 (1956-83)
Research to Policy to Programme

Phase 2 (1983-2000)
From Goiter to Iodine Deficiency Disorders

Phase 3 (2000-2005)
Lifting of ban on sale of Non-Iodized Salt
Reinstating the ban on sale of non-iodized salt

Phase 4 (2005-2012)
Consolidation of sustainable elimination of IDD
The Kangra Valley Study (1956 – 1972)

Legacy of The Legend of Science & Society
Prof. V. Ramalingaswami
8th August 1921 – 28th May 2001

Pioneer study conducted in Kangra District of Himachal Pradesh
The Kangra Valley Study (1956 – 1972)

- **Zone A, B, & C**: 40% (Control Group)
- **Zone B Intervention**: 42%
- **Goitre Prevalence in %**
  - 1956: 24%
  - 1962: 19%
  - 1968: 15%

- **Intervention**
  - Zone A
  - Zone B
  - Zone C
National Goitre Control Programme (NGCP) 1962-1992

- **Objectives:**
  - Baseline survey to identify goitre endemic and non-endemic districts
  - Produce and supply iodized salt to identified endemic districts
  - Conduct impact assessment of the program every five years
The Hourglass of IDD

Iodine Deficiency = Goitre
No Pain, Cosmetic problem
Cretinism: A rare event
(Low Priority)

Brain Damage
Lack of Energy,
Hypothyroidism,
Learning Disability, \( \uparrow \) Deaths
\( \downarrow \) Child Development & Child Survival
\( \downarrow \) HRD (HIGH PRIORITY)

Historic view
1962-1983
Extra Himalayan foci

Current view
1984 onwards
Neonatal hypothyroidism
National Iodine Deficiency Disorders Control Program (NIDDCP)

1. Surveys to assess the magnitude of the IDD
2. Supply of iodated salt in place of common salt
3. Resurvey after every 5 years to assess the extent of IDD and the impact of iodated salt
4. Laboratory monitoring of iodated salt and urinary Iodine excretion
5. Health education and Publicity
Withdrawal of the ban

• Government of India withdrew ban on sale of non-iodized salt for human consumption (13th September 2000)

• Reason given by Government of India: “Matters of public health should be left to the informed choice, and not enforced through compulsion”

• Ban lifted due to pressure from salt producers
Tracking progress: Re-instating ban on non-iodised salt sale in India

- September 13, 2000
  - Ban on Sale of Non-iodised salt lifted

- October 2000
  - Advocacy Documents
  - Meeting with stakeholders
  - Media campaign
  - Technical meeting in AIIMS Board Room

- November 17, 2005
  - Ban on Sale of Non-iodised Salt re-instated

- Sustaining Universal Salt Iodisation (USI)

- Tracking of USI in states:
  - Kerala
  - Goa
  - Bihar
  - Jharkhand
  - Tamil Nadu
  - Rajasthan
  - Orissa

- Yearly activities:
  - Year 2001
  - Year 2002
  - Year 2003
  - Year 2004
  - Year 2005
  - Year 2006
  - Year 2007
  - Year 2008
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>1968</td>
<td>Iodized salt brought under PFA Act</td>
</tr>
<tr>
<td>1984</td>
<td>Policy decision taken for Universal Salt Iodization</td>
</tr>
<tr>
<td>1997</td>
<td>National level ban on sale &amp; storage of non-iodized salt</td>
</tr>
<tr>
<td>2000</td>
<td>Ban on sale of non-iodized salt revoked</td>
</tr>
<tr>
<td>2005</td>
<td>Ban on sale of non-iodized salt reinstated</td>
</tr>
<tr>
<td>2006</td>
<td>PFA act repealed, FSS Act promulgated</td>
</tr>
<tr>
<td>2010</td>
<td>Supreme Court declares ban on non-iodized salt under PFA Act ultra vires</td>
</tr>
</tbody>
</table>

Current status ????
# Progress in iodized salt production in India

<table>
<thead>
<tr>
<th>Variables</th>
<th>1962-1983</th>
<th>2010-2011</th>
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<tbody>
<tr>
<td>No. of salt iodization plants</td>
<td>12</td>
<td>764</td>
</tr>
<tr>
<td>Production capacity (in million tons)</td>
<td>0.038</td>
<td>17</td>
</tr>
<tr>
<td>Estimated requirement/year (in million tons)</td>
<td>0.1</td>
<td>5.5</td>
</tr>
<tr>
<td>Actual production (in million tons)</td>
<td>0.015</td>
<td>6.2</td>
</tr>
<tr>
<td>Actual Production/Required production</td>
<td>15%</td>
<td>112%</td>
</tr>
<tr>
<td>Production in public sector</td>
<td>100%</td>
<td>2%</td>
</tr>
<tr>
<td>Production in Private Sector, including cooperatives</td>
<td>0%</td>
<td>98%</td>
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</table>
Salt iodization and IQ points saved

- Nearly **4 billion IQ** points saved in last two and half decade in India (cumulative 1985 to 2011)
- Nearly **250 million IQ** points saved annually in India
IDD and AIIMS (1956 to .....)

Mentorship and Institutional continuity
Generations of IDD researchers at AIIMS-1

1. Prof. V. Ramalingaswami

2. Prof. Madhu G Karmarkar, Prof. Lalit M Nath, Prof. M. G. Deo, Prof. N. Kochupillai, Prof. Achyutanand Sinha, Prof. Subimal Roy, Prof. TAV Subramanyam

3. Prof. Chandrakant S. Pandav, Prof. Madan Godbole

4. Dr. Rajan Sankar

5. Dr. K Anand, Dr. Sanjay Zodpey, Dr. Shyam Prakash
Generations of IDD researchers at AIIMS -2

6. Dr. Danish Moorthy

7. Dr. Anil Kumar, Dr. Zubair Kabir, Dr. Sunil Agrawal

8. Dr. Arijit Chakravarty, Dr. Binod Kumar Patro, Mr. Amit Shukla, Dr. Prashant Subodh

9. Dr. Kapil Yadav, Dr. Vipul Kubavat

10. Dr. Kshitij Khaparade, Dr. Rakesh Kumar, Dr. Palnivel C, Dr. Prashant Jharyan, Dr. Rahul Srivastava, Dr. Aslesh OP, Dr. Abhishek Wahi, Dr Rizwan
Key challenges for achieving 12th Plan IDD goals
Key challenges for achieving 12th Plan IDD goals

Inequitable iodized salt coverage

Lack of national/state level IDD status data
  - Obsolete methodology district IDD surveys

Monitoring and Quality control
  - Sub-optimal production end monitoring
  - Absence of consumer end monitoring/ FSS Act implementation
  - Lack of laboratory support for monitoring

Budget allocation for NIDDCP
Urban and Rural Iodised salt coverage

UNICEF and Ministry of Health and Family Welfare
Percentage of Households using Adequately* Iodized Salt by State in 2009-10

Source: Dr Jee Hyun Rah, Unicef
Iodized salt coverage by wealth index quintile - NFHS 3

% Iodised Salt Coverage

Wealth index quintiles

Lowest: 30
Second: 36
Middle: 42
Fourth: 61
Highest: 84
Lack of national level IDD data

Sub-optimal production end monitoring

• Salt Commissioner ‘s Office
  – No statutory power
  – Does not cover salt transported by road (~40%)
  – Lack of human resources (no recruitment since 1996)
  – Laboratory network needs to be strengthened
Inadequate consumer end monitoring

- Mandate of Ministry of Health and Family Welfare
- FSS Act 2006
  - Food Safety Officer/ Food Inspectors
  - Lack of laboratory support
  - Long drawn legal process
- Low priority at state level
Budget allocation for NIDDCP

• Budget allocation inadequate

• INR 50,000 for district IDD survey inadequate

• Treasury – reimbursement

• Increase in international price of raw iodine
## Criteria for tracking progress towards elimination of IDD

<table>
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<tr>
<th>Indicator</th>
<th>Goal</th>
<th>Goal</th>
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<tbody>
<tr>
<td><strong>Salt iodisation</strong></td>
<td></td>
<td>To reduce the prevalence of iodine deficiency disorders below 5 percent in the entire country by 2017 A.D.</td>
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<tr>
<td>Proportion of Households</td>
<td>&gt;90%</td>
<td></td>
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<tr>
<td>consuming adequately iodised salt</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Urinary Iodine</strong></td>
<td></td>
<td></td>
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<tr>
<td>Median in the general population</td>
<td>100-199ug/L</td>
<td></td>
</tr>
<tr>
<td>Median in pregnant</td>
<td>150-249ug/L</td>
<td></td>
</tr>
<tr>
<td><strong>Programmatic Indicators</strong></td>
<td>At least 8 of 10</td>
<td></td>
</tr>
<tr>
<td>Attainment of indicators</td>
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Current status of program indicators for tracking progress towards sustainable elimination of IDD in India - 1

<table>
<thead>
<tr>
<th>S no</th>
<th>Indicator</th>
<th>Current Status</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Presence of a national multi-sector coalition</td>
<td>Partially attained</td>
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<tr>
<td>2</td>
<td>Demonstration of political commitment</td>
<td>Attained</td>
</tr>
<tr>
<td>3</td>
<td>Enactment of legislation and supportive regulations on universal salt iodization</td>
<td>Attained</td>
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<tr>
<td>4</td>
<td>Establishment of methods for assessment of progress in the elimination of IDD</td>
<td>Partially attained</td>
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<tr>
<td>5</td>
<td>Access to laboratories to provide accurate data on salt and urinary iodine levels and thyroid function</td>
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Current status of program indicators for tracking progress towards sustainable elimination of IDD in India - 2

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<td>6</td>
<td>Establishment of a programme of education and social mobilization</td>
<td>Partially attained</td>
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<td>7</td>
<td>Routine availability of data on salt iodine content, at the factory level at least monthly, and at the household level at least every five years.</td>
<td>Attained</td>
</tr>
<tr>
<td>8</td>
<td>Routine availability of population-based data on urinary iodine every five years</td>
<td>Partially attained</td>
</tr>
<tr>
<td>9</td>
<td>Demonstration of ongoing cooperation from the salt industry</td>
<td>Attained</td>
</tr>
<tr>
<td>10</td>
<td>Presence of a national database for recording of results of regular monitoring procedures which include population-based household coverage and urinary iodine</td>
<td>Not attained</td>
</tr>
</tbody>
</table>
Way forward to achieve 12th Plan IDD goals
IDD Control Programme: A Multi-pronged Strategy

Sustained Political Commitment
Data For Decision Makers

Regular, Reliable, & Representative
State-level Scientific Data

Promotion of Consumption of Adequately Iodized Salt Forever

Supply  PUSH  Demand  PULL
Reaching the unreached

- Small scale salt producer
- Public Distribution System
- Rural areas
- High priority states- 8 states
- Lower socioeconomic groups
- Bottom of the pyramid
  - Small packaging
  - Low cost adequately iodized salt
State level activities

• State level coalitions
• State action plans
• Targeting state level stakeholders
  – Salt traders/wholesalers
  – Salt retailers
  – Civil society groups
  – State policy makers
Regular, reliable, representative National/State level scientific data

- Need for regular National/State level surveys
- Revision of IDD survey guidelines
  - Obsolete district centric approach
- Surveys to include-
  - Household iodized salt coverage
    (Only iodometric titration should be used)
  - Urinary iodine estimation
  - Pregnant women
Strengthening monitoring and Quality Assurance

• Capacity building of laboratory personnel of small and medium scale salt producers
• QA & MIS in Salt Commissioner’s laboratories
• National IDD Cell
• State IDD Cell
• Regional Urinary iodine monitoring laboratory
• Strict implementation of FSS Act, 2006
Our Primary Objective

To ensure that:
Every individual *should*
&
Every mother & child *must*
Get their daily requirement of iodine

“With *accelerated* efforts we can achieve the IDD control goal in 12th Plan period and most importantly *sustain* it thereafter”
Take Home Message

• For elimination of Iodine Deficiency Disorders (IDD), adding iodine to salt is a simple technology

• IDD elimination program is one of the public health success stories in India

• Sustainable elimination of IDD in 12th plan period is imminently feasible goal

• What is required is “mission approach” with mainstreaming and up scaling of IDD elimination activities
Daily consumption of adequately iodized salt is a healthy habit

Towards Sustainable Elimination of IDD

THANK YOU