Nutrition Scenario in India and Effect of Climate change on the Nutritional status of vulnerable population

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NCDC-CLIMATE CHANGE
HEALTH AND NUTRITION

HEALTH

“... is a state of complete physical, mental, and social well being and not merely absence of disease or infirmity”

- - - WHO

NUTRITION

“... is a process of ingestion of food, digestion, absorption, assimilation, and utilization of various nutrients”
SIGNIFICANCE OF NUTRITION

➢ Normal growth, development and various physiological functions

➢ Epidemiological data reveals strong association between undernutrition and morbidity & mortality.

➢ Chronic degenerative disorders such as coronary heart disease, hypertension, Type 2 diabetes, certain types of cancers, etc. are related to diet and nutritional status.
▪ Consumption of foods rich in dietary fiber, antioxidants is associated with reduced risk of certain types of cancer.

▪ Obesity and overweight is also associated with increased risk of developing cancer of the breast, colon, endometrium, gallbladder, esophagus, pancreas, kidney, etc.

▪ Undernutrition in early Childhood is associated with chronic degenerative disorders in later life – David Barkar’s hypothesis
What is Malnutrition?

MALNUTRITION

“….. is a pathological state that results from ingestion of one or more nutrients, either in excess or deficient quantities over a period of time.”
Who are vulnerable for nutrition?

- Infants and Young Children (<5 years)
- Adolescent Girls
- Pregnant & Lactating Women
- Elderly
- Socio-economically deprived Groups
  - Schedule Castes
  - Schedule Tribes
  - Urban Slum communities
Triple Burden of Diseases

1. Protein energy malnutrition (PEM)
   - Clinical forms of PEM (Kwashiorkor and Marasmus)
   - Sub-clinical forms of PEM (underweight/stunting/wasting)
   - Low birth weight (LBW)
   - Chronic energy deficiency (CED)

2. Micronutrient deficiencies (MND)
   - Vitamin A deficiency (VAD)
   - Iron deficiency anemia (IDA)
   - Iodine deficiency disorders (IDD)
   - Zinc deficiency disorders

3. Diet related chronic non-communicable diseases (NCDs)
   - Overweight and obesity
   - Insulin resistance
   - Type 2 Diabetes
   - Cardiovascular diseases (CVD),
   - Some GIT Cancers etc.
underfeeding and consequent malnutrition can have devastating effects on the health growth of children. This is particularly so in the case of pre-school children (under 5 years of age).

SEVERE PROTEIN-CALORIE MALNUTRITION CAN LEAD TO TWO TYPES OF NUTRITIONAL DISORDERS.

• LACK OF TIMELY MEDICAL ATTENTION AND DIETARY CORRECTION OFTEN LEAD TO DEATH

• MILD OR MODERATE DEGREES OF MALNUTRITION IN CHILDREN MAY NOT BE SO EASILY DIAGNOSED. SUCH CHILDREN SHOW GROWTH RETARDATION TO VARYING DEGREES.

Feeding adequate amounts of diets based on low cost, locally available food stuffs such as cereals, pulses and groundnuts can help prevent ill-effects of under feeding.
Prevalence (%) of undernutrition among Tribal, Rural and urban under five year Children in India

Time trends in the prevalence of Undernutrition among under five year Rural children in India

### Underweight
- 1988-90: 64%
- 2000-01: 49%
- 2005-06: 55%
- 2011-12: 45.6%

### Stunting
- 1988-90: 67%
- 2000-01: 60%
- 2005-06: 52%
- 2011-12: 49.6%

### Wasting
- 1988-90: 21%
- 2000-01: 23%
- 2005-06: 23%
- 2011-12: 18.4%

**UNDERNUTRITION (< Median - 2SD)**
Due to faulty feeding practices, undernutrition is increasing from 6 months of age onwards.

Significant increase in undernutrition.
INFANT AND YOUNG CHILD FEEDING PRACTICES (NFHS 3)

- **Early Initiation of BF**: Rural - 22, Urban - 23, Pooled - 29
- **Exclusive BF Upto 6 months**: Rural - 48, Urban - 40, Pooled - 46
- **Compl. Feeding among 6-9 months Children**: Rural - 54, Urban - 62, Pooled - 56
The Ugly Face of “Hidden Hunger”

Nutritional Deficiencies

Iron Deficiency

Vitamin A Deficiency

Iodine Deficiency

Folic Acid Deficiency

Zinc Deficiency
NIN and 4 partner Institutes carried out B12 study during 2017-19 was conducted in 8 states of India: Prevalence was about 25%
Interventions for the first 1000 days

- **WASH** *Safe water, hand washing, safe disposal of feces*
  - Iron-foic acid; Vitamin A; Deworming
- **Care of the malnourished child**
- **Supplementary nutrition** *Recipe reformulation*
- **Growth monitoring** *Address moderate malnutrition*
- **Feeding counseling** *Breast feeding*
  - Complementary feeding
- **Management of Severe Acute Malnutrition**
- **Immunization** *Strengthen, and Expand Antigens*
- Early detection and treatment of diarrhea and pneumonia
  - Community, Integrated Management of Neonatal and Childhood Illnesses
- **Home-based Young Child Care**

**HEALTH**

- **ICDS**
- **SMACH**

**Not to scale**

- **Beti Bachao, beti padhao**
- Adolescents

**Pre-pregnancy**
- Birth spacing
- Birth care
- Antenatal care

**Pregnancy**
- Pre-pregnancy care
- Antenatal care

**Birth**
- Facility Based New Born Care
- Institution Deliveries

**6 weeks**
- Home Based New Born Care

**6 months**

**1 year**

**2 years**

**Courtesy: Vinod Paul, NitiAyog Member**
Current burden of malnutrition among children and adults in India (presented in millions)

- Stunting in children under five 2016: 46
- Diabetes in adults 2016: 72
- Overweight and obesity in adults 2016: 166
- Anaemia in all ages, 2016: 447
CAUSES OF DEATHS AMONG <5 YEAR CHILDREN IN DEVELOPING COUNTRIES

- Malnutrition*: 54%
- Diarrhoea*: 19%
- Ac. Res. Inf.*: 19%
- Perinatal: 18%
- Others: 32%
- Malaria*: 5%
- Measles*: 7%

Source: Murray & Lopez, 1996; Pelletier et al, 1993
Good nutrition is the key to leading a healthy lifestyle.

Eating a balanced diet is an important part of good health. Nutrition plays a major role in promoting good health.

Diets full of fruits and vegetables, whole grains, nuts, and lean meats have proven health benefits like lowering blood pressure, improving glucose control in diabetics, weight loss, improving arthritis, and reducing the risk of some of cancers and cardiovascular events etc.
DETERMINANTS OF NUTRITIONAL STATUS

Agro-climatic factors
- Food production
- Land Ownership
- Type of land
- Rain fall
- Geographic conditions
- Agricultural techniques
- Use of hybrid seeds
- Use of fertilizers

Demographic factors
- Population
- Family Size
- Urbanisation

Socio-economic factors
- Religion
- Community
- Occupation
- Income

Disasters
- Drought/Floods/Wars

Availability & participation in developmental programmes
- PDS
- Rural Dev. Prog.
- NREGA.

Socio-cultural
- Illiteracy
- Ignorance
- Taboos

Environmental factors
- Environmental sanitation
- Personal hygiene
- Safe drinking water

Physiological factors
- Pregnancy
- Lactation
- BF Practices
- IYCF Practices

Pathological Conditions
- Infections
  - Diarrhoeas
  - Resp. Infections
  - Malaria
  - Others
- Infestations
  - Hook worms
  - Round worms
  - Giardiasis etc.
Maternal & child Undernutrition

**Short-term consequences:**
- Mortality, morbidity, disability

**Long-term consequences:**
- Adult size, intellectual ability, economic productivity, reproductive performance, metabolic and cardiovascular disease

Adapted from UNICEF, 1998
Regardless of who the Father of a disease is, Surely its Mother is IMPROPER DIET

Old Chinese Proverb
Average Daily Food Intake (% RDA) among 1-3 Year Children: By Gender

- **Cereals**: Boys 74, Girls 80
- **Pulses**: Boys 36, Girls 35
- **Green Leafy Veg.**: Boys 14, Girls 17
- **Other Veg.**: Boys 69, Girls 87
- **Roots & Tubers**: Boys 219, Girls 232
- **Milk & Milk Prod.**: Boys 31, Girls 26
- **Fats & Oils**: Boys 18, Girls 19
- **Sugar & Jaggery**: Boys 32, Girls 31

Percent RDA
Median Intake of Nutrients (as % RDA) Among 1-3 year children: By gender

- **Protein**: Boys 83%, Girls 87%
- **Energy**: Boys 54%, Girls 57%
- **Calcium**: Boys 40%, Girls 40%
- **Iron**: Boys 35%, Girls 38%
- **Vitamin A**: Boys 14%, Girls 14%
- **Thiamin**: Boys 67%, Girls 67%
- **Riboflavin**: Boys 43%, Girls 43%
- **Niacin**: Boys 56%, Girls 61%
- **Vitamin C**: Boys 32%, Girls 32%
- **Folic Acid**: Boys 58%, Girls 60%

Percent of RDA
Average Intake of Foodstuffs (per CU/day) as % of RDI by Period of Survey

- Cereals
- Pulses
- GLV
- O.Veg.

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<tr>
<td>Cereals</td>
<td>110</td>
<td>98</td>
<td>86</td>
<td>83</td>
<td>110</td>
</tr>
<tr>
<td>Pulses</td>
<td>110</td>
<td>85</td>
<td>83</td>
<td>80</td>
<td>100</td>
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<tr>
<td>GLV</td>
<td>20</td>
<td>23</td>
<td>38</td>
<td>40</td>
<td>43</td>
</tr>
<tr>
<td>O.Veg.</td>
<td>90</td>
<td>90</td>
<td>82</td>
<td>82</td>
<td>100</td>
</tr>
</tbody>
</table>
Average Intake of Foodstuffs (per CU/day) as % of RDI by Period of Survey (contd.)

- **Roots&Tub.**
  - 1975-77: 43%
  - 1988-90: 47%
  - 1996-97: 70%
  - 2005-06: 97%
  - 2010-11: 112%

- **Milk&MP**
  - 1975-77: 59%
  - 1988-90: 55%
  - 1996-97: 57%
  - 2005-06: 61%
  - 2010-11: 77%

- **Fats&Oils**
  - 1975-77: 50%
  - 1988-90: 57%
  - 1996-97: 61%
  - 2005-06: 65%
  - 2010-11: 70%

- **Sug&Jag.**
  - 1975-77: 65%
  - 1988-90: 60%
  - 1996-97: 70%
  - 2005-06: 77%
  - 2010-11: 97%

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**Legend:**
- **1975-77**
- **1988-90**
- **1996-97**
- **2005-06**
Average Intake of Nutrients (per CU/day) as % of RDI by Period of Survey

- **Protein**
  - 1975-79: 82%
  - 1988-90: 84.5%
  - 1996-97: 90%
  - 2005-06: 97%
  - 2011-12: 97%

- **Energy**
  - 1975-79: 76%
  - 1988-90: 87%
  - 1996-97: 94%
  - 2005-06: 97%
  - 2011-12: 103%

- **Calcium**
  - 1975-79: 53%
  - 1988-90: 89%
  - 1996-97: 106%
  - 2005-06: 110%
  - 2011-12: 130%

- **Iron**
  - 1975-79: 77%
  - 1988-90: 89%
  - 1996-97: 97%
  - 2005-06: 108%
  - 2011-12: 141%
Average Intake of Nutrients (per CU/day) as % of RDI by Period of Survey (Contd.)

- **Vitamin A**
  - 1975-79: 41%
  - 1988-90: 47%
  - 1996-97: 50%
  - 2005-06: 108%
  - 2010-11: 125%

- **Thiamin**
  - 1975-79: 43%
  - 1988-90: 57%
  - 1996-97: 64%
  - 2005-06: 100%
  - 2010-11: 108%

- **Riboflavin**
  - 1975-79: 40%
  - 1988-90: 57%
  - 1996-97: 64%
  - 2005-06: 92%
  - 2010-11: 110%

- **Niacin**
  - 1975-79: 89%
  - 1988-90: 79%
  - 1996-97: 92%
  - 2005-06: 100%
  - 2010-11: 110%

- **Vitamin C**
  - 1975-79: 98%
  - 1988-90: 93%
  - 1996-97: 108%
  - 2005-06: 113%
  - 2010-11: 113%
There was a significant reduction observed in consumption of millets among rural and tribal population in India, while it was increased in urban population over a period of two decades—NNMB Surveys.
MICRO-NUTRIENT DEFICIENCIES
Prevalence (%) of Bitot spots among 1 - <5 year children

- Boys: 0.9%
- Girls: 0.6%

Kerala: 0
Tamil Nadu: 0.5
Karnataka: 0.7
Andhra Pradesh: 1.2
Maharashtra: 1.3
Madhya Pradesh: 1.4
Orissa: 0.3
West Bengal: 0.6

Pooled: 0.7%
MANIFESTATIONS OF VITAMIN ‘A’ DEFICIENCY

**OCCULAR**

**MILD**
- Night blindness
- Conjunctival xerosis
- Bitot spots

**SEVERE**
- Corneal Xerosis
- Corneal ulcer
- Keratomalasia

**OTHERS**
- Morbidity
- Mortality
- Growth retardation
BITOT SPOTS - 1
MAGNITUDE
- Conjunctival signs: 5-10% among 1-5 yrs
- Corneal lesions: < 1%
- Blindness: 1/4th of the total blind

COMPLICATIONS
- Irreversible blindness
- Higher mortality in severe vitamin A deficiency (50-60% of X3b)
- Increased susceptibility to diarrhoea and respiratory infections

SOLUTIONS
- Simple – Feasible solutions available
- Not high technology
- Not expensive
Distribution (%) of 1-5 Yr. Children with Blood Vit. A Levels of < 20 µg/dL, Median Dietary Intake of Vit. A (as % RDA) and Extent of Coverage for Suppl. of Massive Dose Vit. A – By State

<table>
<thead>
<tr>
<th>STATES</th>
<th>Blood Vitamin A &lt; 20 µg/dL</th>
<th>Dietary Intake of Vitamin A &lt; 50% of RDA</th>
<th>Receipt of Massive Dose Vitamin A</th>
<th>No. of Doses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 or 2 Doses</td>
<td>One</td>
</tr>
<tr>
<td>Kerala</td>
<td>79.4</td>
<td>91.8</td>
<td>38.5</td>
<td>28.4</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>48.8</td>
<td>81.9</td>
<td>50.6</td>
<td>20.2</td>
</tr>
<tr>
<td>Karnataka</td>
<td>52.1</td>
<td>90.4</td>
<td>56.6</td>
<td>42.1</td>
</tr>
<tr>
<td>AP</td>
<td>61.5</td>
<td>92.9</td>
<td>49.3</td>
<td>14.2</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>54.7</td>
<td>88.8</td>
<td>52.1</td>
<td>29.4</td>
</tr>
<tr>
<td>MP</td>
<td>88.0</td>
<td>87.4</td>
<td>52.3</td>
<td>19.1</td>
</tr>
<tr>
<td>Orissa</td>
<td>57.7</td>
<td>77.5</td>
<td>80.0</td>
<td>38.8</td>
</tr>
<tr>
<td>West Bengal</td>
<td>61.2</td>
<td>80.6</td>
<td>50.6</td>
<td>46.8</td>
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<tr>
<td>Pooled</td>
<td>61.8</td>
<td>86.3</td>
<td>55.4</td>
<td>30.3</td>
</tr>
</tbody>
</table>

Source: NNMB-MND Survey : 8 States, 2003
IRON DEFICIENCY ANAEMIA

a major nutritional problem

ANAEMIA IS MOST COMMON AMONG PREGNANT WOMEN AND LACTATING MOTHERS

Causes
- Low iron, folate intake in pregnant, lactation
- Blood loss
- Hookworm infestation
- Increased needs in pregnancy lactation

consequences
- Fatigue
- Low work efficiency, productivity
- Maternal deaths
- Pregnancy wastage
- Premature delivery
- Low birth weight babies

ANAEMIA ASSESSMENT IS MADE THROUGH
- Standard method in clinic
- Filter paper method in the field

Folifer tablet distribution
## Definition of Anemia

<table>
<thead>
<tr>
<th>AGE / PHYSIOLOGICAL GROUP</th>
<th>Gender</th>
<th>Hb (g/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 months – 6 Years</td>
<td>Boys &amp; Girls</td>
<td>&lt;11</td>
</tr>
<tr>
<td>6 – 14 Years</td>
<td>Boys &amp; Girls</td>
<td>&lt;12</td>
</tr>
<tr>
<td>≥ 14 Years</td>
<td>Men</td>
<td>&lt;13</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>&lt;12</td>
</tr>
<tr>
<td>Pregnant Women</td>
<td></td>
<td>&lt;11</td>
</tr>
</tbody>
</table>

WHO, Nutritional Anemia - TRS No. 405, Geneva 1968.
Prevalence (%) of Anaemia by Age, Gender & Physiological Groups

10.2±0.03 11.2±0.03 11.0±0.03 9.9±0.03 10.6±0.03 10.7±1.99 12.6±2.09

>6 months 12.6±2.09

<6 months 8.4±0.00

Mean ±SE

Prevalence (%) by Age, Gender & Physiological Groups:

- 1-5 yr B+G: 10.2±0.03
- 12-14 Yr Girls: 11.2±0.03
- 15-17 Yr Girls: 11.0±0.03
- Preg. W >6 months: 9.9±0.03
- Lact. W <6 months: 10.6±0.03
- NPNI. W: 10.7±1.99
- Men: 12.6±2.09

Color Key:
- Normal
- Mild
- Moderate
- Severe
Computed from NNMB data, rural survey, 2001
FOLIC ACID DENSITY TO MEET RDA

Computed from NNMB data, rural survey, 2001

- Pregnant sedentary: Required density 183.9 mcg/1000 K cals, Available density 25.2 mcg/1000 K cals
- Lactating women: Required density 103.1 mcg/1000 K cals, Available density 28.4 mcg/1000 K cals
- Children: 1 - 3 yrs: Required density 24.2 mcg/1000 K cals, Available density 17.3 mcg/1000 K cals
Prevalence (%) of IDD among 6 – 11 Year Children

Source: MND-NNMB, Tech Rep 22, 2003
## Prevalence of Total Goitre (%) in Select Districts of Different Regions of the Country

<table>
<thead>
<tr>
<th>Districts</th>
<th>Northern</th>
<th>North-Eastern</th>
<th>Eastern</th>
<th>Central</th>
<th>Southern</th>
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<tr>
<td></td>
<td>PREV.</td>
<td>Current</td>
<td>PREV.</td>
<td>Current</td>
<td>PREV.</td>
</tr>
<tr>
<td>1</td>
<td>41.6</td>
<td>10.4</td>
<td>65.8</td>
<td>5.4</td>
<td>35.2</td>
</tr>
<tr>
<td>2</td>
<td>41.2</td>
<td>9.6</td>
<td>40.2</td>
<td>4.6</td>
<td>33.2</td>
</tr>
<tr>
<td>3</td>
<td>27.4</td>
<td>8.5</td>
<td>26.5</td>
<td>8.4</td>
<td>64.3</td>
</tr>
<tr>
<td>4</td>
<td>44.7</td>
<td>17.2</td>
<td>68.6</td>
<td>4.8</td>
<td>20.9</td>
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<td>5</td>
<td>45.7</td>
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<td>5.2</td>
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<tr>
<td>6</td>
<td>30.0</td>
<td>6.9</td>
<td>50.2</td>
<td>8.6</td>
<td>37.8</td>
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<td>7</td>
<td>52.3</td>
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<td>25.9</td>
<td>5.0</td>
<td>21.6</td>
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<tr>
<td>8</td>
<td>24.5</td>
<td>19.3</td>
<td>25.9</td>
<td>6.5</td>
<td>30.3</td>
</tr>
</tbody>
</table>
Myxodemmatous cretin
Neuro cretin
Percent of Households consuming salt having adequate Amount (≥15 ppm) of Iodine

* By spot test
Prevalence (%) of CED and Overweight/Obesity among urban, Rural and Tribal men in India

Prevalence (%) of CED and Overweight/Obesity among urban, Rural and Tribal women in India

Distribution (%) of Adult Men according to BMI Grades by Period of Survey

<table>
<thead>
<tr>
<th>Percent</th>
<th>BMI &lt;18.5</th>
<th>BMI:18.5 – 25.0</th>
<th>BMI: &gt;=25.0</th>
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</thead>
<tbody>
<tr>
<td>1975-79</td>
<td>49</td>
<td>42</td>
<td>2</td>
</tr>
<tr>
<td>1988-90</td>
<td>46</td>
<td>48</td>
<td>3</td>
</tr>
<tr>
<td>1996-97</td>
<td>33</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td>2005-06</td>
<td>36.2</td>
<td>54.3</td>
<td>8</td>
</tr>
<tr>
<td>2011-12</td>
<td>56</td>
<td>59</td>
<td>9.6</td>
</tr>
</tbody>
</table>
Distribution (%) of Adult Women according to BMI Grades by Period of Survey

<table>
<thead>
<tr>
<th>Period of Survey</th>
<th>CED</th>
<th>Normal</th>
<th>Over Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI &lt; 18.5</td>
<td>52</td>
<td>36</td>
<td>3</td>
</tr>
<tr>
<td>BMI: 18.5 – 25.0</td>
<td>49</td>
<td>47</td>
<td>4</td>
</tr>
<tr>
<td>BMI: &gt;=25.0</td>
<td>48</td>
<td>53</td>
<td>11</td>
</tr>
</tbody>
</table>

- 1975-79
- 1988-90
- 1996-97
- 2005-06
- 2011-12
Relationship Between BMI and Cardiovascular Disease Mortality

Central obesity and insulin resistance: South Asian susceptibility

Prevalence (%) of overweight and obesity (BMI ≥25 and above) by 16 NNMB States and Gender (N: Men: 39,415; Women: 54,436)

NNMB Urban Nutrition surveys 2015-16 Laxmaiah A et al
Consequences of Overweight/obesity

- Diabetes
- Stroke
- Heart Disease / Hypertension
- Gall Bladder Disease
- Osteoarthritis
- Sleep Apnoea
- Cancers
  - Breast/Colon
Prevalence (%) of hypertension* among urban men and women ≥18 years by gender and states (N: Men: 39,415; Women: 54,436)

* Age adjusted prevalence of hypertension by states

NNMB Urban Nutrition surveys 2015-16 Laxmaiah A et al
**Prevalence (%) of hypertension* among Rural men and women ≥18 years by gender and states** (N: Men: 21,918; Women: 27,041)

Population standardized and age adjusted all states pooled prevalence (%) of hypertension among men and women was 24.1% and 22.6%, respectively.

* Population standardized and age adjusted all states pooled prevalence (%) of hypertension among men and women was 24.1% and 22.6%, respectively.

* Age adjusted prevalence of hypertension by states

NNMB Rural Nutrition surveys 2011-12 Laxmaiah A et al
Prevalence (%) of diabetes (FBG ≥126mg/dL) among urban men and women ≥18 years and above by 16 NNMB states and gender
(N: Men: 18,130; Women: 22,672)

* Age adjusted prevalence of hypertension by states

NNMB Urban Nutrition surveys 2015-16 Laxmaiah A et al
Prevalence (%) of diabetes among Rural men and women ≥18 years by 10 NNMB states and gender
(N: Men: 14,312; Women: 18,519)

<table>
<thead>
<tr>
<th>State</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kerala</td>
<td>16.4</td>
<td>14</td>
</tr>
<tr>
<td>T.N.</td>
<td>13</td>
<td>11.6</td>
</tr>
<tr>
<td>Karnataka</td>
<td>6.4</td>
<td>7.8</td>
</tr>
<tr>
<td>A.P</td>
<td>7.5</td>
<td>4.4</td>
</tr>
<tr>
<td>Mahara.</td>
<td>6.4</td>
<td>5.3</td>
</tr>
<tr>
<td>Guj.</td>
<td>11.1</td>
<td>8.2</td>
</tr>
<tr>
<td>M.P.</td>
<td>5.1</td>
<td>4.7</td>
</tr>
<tr>
<td>Orissa</td>
<td>4.7</td>
<td>3.4</td>
</tr>
<tr>
<td>W.B.</td>
<td>3.3</td>
<td>3.2</td>
</tr>
<tr>
<td>Pooled</td>
<td>8.2</td>
<td>6.8</td>
</tr>
</tbody>
</table>

Per cent

Population standardized and age adjusted all states pooled prevalence (%) of hypertension among men and women was 5.9% and 6.8%, respectively

NNMB Rural Nutrition surveys 2011-12 Laxmaiah A et al
Impact of Drought due to Climate change and Nutritional status of population

- Rajasthan
DROUGHT DUE TO CLIMATE CHANGE

Drought is a condition of moisture deficit (due to deficit rainfall) sufficient to have an adverse effect on vegetation, animals, and man over a sizeable area.

❖ The monsoon related calamities such as drought and floods disturb pattern of life of agrarian population in India.

❖ Recurrent droughts result in primary scarcity of food, fodder and drinking water, in addition to health hazards associated with poor environmental hygiene and sanitation.
Drought–Nutrition: A conceptual framework

- Food insecurity
  - Reduced food intake and other responses
    - Destitution leading to distress migration
      - Health crisis
        - Death
  - Reduction in entitlements
    - Entitlement collapse
At household level **food security** is defined as access to food that is adequate in terms of quality, quantity, safety and cultural acceptability for all household members.

A household achieves nutrition security when it has secure access to food coupled with a sanitary environment, adequate health services and knowledgeable care to ensure a healthy life for all household members.
Food security is of supreme importance in improving the nutritional status of people who suffer from persistent hunger and undernutrition and many who are at risk of the same situation.

In rural areas household food security is most often determined by food availability and prices, which are commonly related agricultural production and income determined by both on farm and off farm employment opportunities.
National Nutrition Monitoring Bureau (NNMB) surveys have shown that even normal circumstances, within the rural groups including the Scheduled Castes and Scheduled Tribal population, landless labourers, small and marginal farmers consume nutritionally inferior diets.

During the earlier episodes of drought, average calorie consumption in affected areas of Andhra Pradesh, Bihar and Maharashtra was observed to be ranging from 1100 – 1400 Kcal per day – a level barely sufficient to meet the basic bodily needs.
Per cent of families consumed < 500 Kcal per capita per day (Starvation diet)

- Andhra Pradesh (1967) 26.1%
- Bihar (1969) 8.2%
- Maharashtra (1974) 3.8%
Prevalence of clinical signs of nutritional deficiency (0-5 Yrs Children)

<table>
<thead>
<tr>
<th>Clinical signs</th>
<th>Andhra Pradesh</th>
<th>Bihar</th>
<th>Maharashtra</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marasmus</td>
<td>6.0</td>
<td>10.6</td>
<td>2.4</td>
</tr>
<tr>
<td>kwashiorkor</td>
<td>2.0</td>
<td>0.8</td>
<td>1.6</td>
</tr>
<tr>
<td>Conj. Xerosis</td>
<td>4.2</td>
<td>3.3</td>
<td>30.0</td>
</tr>
<tr>
<td>Bitot spots</td>
<td>3.0</td>
<td>4.5</td>
<td>4.0</td>
</tr>
</tbody>
</table>
The State Rajasthan experienced drought conditions in the beginning of new millennium continuously for 2-3 years.

At the request of Ministry of Agriculture,GOI and ICMR, the present survey was carried out with an objective to assess the nutritional status of the community in drought affected areas of Rajasthan.
<table>
<thead>
<tr>
<th>Food Group</th>
<th>Mean intake</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>299</td>
<td>200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cereals &amp; Millets</td>
<td>357</td>
<td>489</td>
<td>483</td>
<td>460</td>
<td></td>
</tr>
<tr>
<td>Pulses &amp; Legumes</td>
<td>5</td>
<td>23</td>
<td>29</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Green Leafy Vegetables</td>
<td>0</td>
<td>2</td>
<td>24</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Roots &amp; Tubers</td>
<td>73</td>
<td>54</td>
<td>79</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Other Vegetables</td>
<td>17</td>
<td>12</td>
<td>45</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Milk &amp; Milk Products</td>
<td>77</td>
<td>150</td>
<td>198</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Fats &amp; Edible Oils</td>
<td>14</td>
<td>13</td>
<td>22</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Sugar &amp; Jaggery</td>
<td>22</td>
<td>21</td>
<td>25</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

Table –3
AVERAGE HOUSEHOLD CONSUMPTION (g/CU/day) OF FOODSTUFFS
Table – 4

AVERAGE HOUSEHOLD INTAKE (CU/ day) OF NUTRIENTS

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Mean intake</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Drought 2003</td>
<td>Drought 2000</td>
<td>Rajasthan DWCD 1998</td>
<td>RDI</td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>299</td>
<td>200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protein (g)</td>
<td>61</td>
<td>71</td>
<td>76</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Total Fat (g)</td>
<td>27</td>
<td>36</td>
<td>46</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Energy (Kcal)</td>
<td>1827</td>
<td>2163</td>
<td>2386</td>
<td>2425</td>
<td></td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>441</td>
<td>517</td>
<td>734</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>Iron (mg)</td>
<td>24</td>
<td>33</td>
<td>30</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Vitamin A (μg)</td>
<td>127</td>
<td>213</td>
<td>400</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>Thiamin (mg)</td>
<td>2.1</td>
<td>2.3</td>
<td>2.6</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Riboflavin (mg)</td>
<td>1.0</td>
<td>1.3</td>
<td>1.2</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>Niacin (mg)</td>
<td>18</td>
<td>18</td>
<td>21</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Vitamin C (mg)</td>
<td>14</td>
<td>18</td>
<td>46</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Free Folic Acid (μg)</td>
<td>63</td>
<td>46</td>
<td>-</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
Table – 5
PREVALENCE (%) OF NUTRITIONAL DEFICIENCY SIGNS AMONG 1-5 YEARS CHILDREN

<table>
<thead>
<tr>
<th>Clinical signs*</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAD</td>
<td>95.7</td>
</tr>
<tr>
<td>Emaciation</td>
<td>1.4</td>
</tr>
<tr>
<td>Marasmus</td>
<td>0.3</td>
</tr>
<tr>
<td>Conjunctival xerosis (XIA)</td>
<td>1.3</td>
</tr>
<tr>
<td>Bitot Spots (XIB)</td>
<td>1.3</td>
</tr>
<tr>
<td>Angular stomatitis</td>
<td>0.3</td>
</tr>
</tbody>
</table>

n = 1035  * Multiple responses
Table – 8
DISTRIBUTION (%) OF HOUSEHOLDS ACCORDING TO CURRENT HH FOOD SECURITY STATUS DURING PREVIOUS 3 MONTHS AS PERCEIVED BY HEAD OF THE HH

<table>
<thead>
<tr>
<th>Food group</th>
<th>No Change</th>
<th>Less than normal</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>25%</td>
<td>50%</td>
<td>75%</td>
<td>100%</td>
</tr>
<tr>
<td>Cereals &amp; Millets</td>
<td>63.1</td>
<td>33.4</td>
<td>3.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pulses</td>
<td>46.1</td>
<td>31.9</td>
<td>20.8</td>
<td>1.2</td>
<td>0</td>
</tr>
<tr>
<td>Vegetables</td>
<td>43.0</td>
<td>29.5</td>
<td>16.0</td>
<td>11.3</td>
<td>0.2</td>
</tr>
<tr>
<td>Roots &amp; Tubers</td>
<td>54.6</td>
<td>44.1</td>
<td>1.3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Milk &amp; Milk products</td>
<td>49.6</td>
<td>32.6</td>
<td>15.8</td>
<td>1.2</td>
<td>0.8</td>
</tr>
<tr>
<td>Fats &amp; Oils</td>
<td>54.7</td>
<td>38.8</td>
<td>4.5</td>
<td>2.0</td>
<td>0</td>
</tr>
</tbody>
</table>

n = 601
### Table 9

**DISTRIBUTION (%) OF HOUSEHOLD ACCORDING TO COPING STRATEGIES ADOPTED DURING CURRENT DROUGHT**

<table>
<thead>
<tr>
<th>Coping strategies</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of food stocks/ savings</td>
<td>22.8</td>
</tr>
<tr>
<td>Consumption of low cost food items</td>
<td>10.1</td>
</tr>
<tr>
<td>Borrow cash/ food</td>
<td>47.9</td>
</tr>
<tr>
<td>Obtained Govt./ NGO’s assistance</td>
<td>28.3</td>
</tr>
<tr>
<td>Reduce food consumption</td>
<td>24.5</td>
</tr>
<tr>
<td>Migration</td>
<td>6.3</td>
</tr>
<tr>
<td>Selling HH assets</td>
<td>3.3</td>
</tr>
<tr>
<td>others</td>
<td>53.5</td>
</tr>
</tbody>
</table>

*n = 601  
*Multiple responses
Prevention Is Better than cure.

THANK YOU FOR PATIENT HEARING